FINAL

PRELIMINARY SOIL INVESTIGATION REPORT

9242-M-GAN-CIV-SIY-00001

# SOIL INVESTIGATION REPORT OF

# FGH / SBP AREA, BOILER AND COOLING TOWER AREA, LOADING GANTRY AREA & NEW TANK AREA.

# FOR OIL & NATURAL GAS CO., HAZIRA.

**PROJECT : 99046**

**OCT.-NOV.:1999**

**UNIQUE ENGINEERING TESTING & ADVISORY SERVICES**

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**INTRODUCTION :**

The work of soil investigation for FGH/SBP project at Hazira Gas Processing Complex was awarded to us by ONGCL authority. The area is fairly leveled.

The schedule of testing decided and carried out as under :

**SCOPE OF WORK :**

1. Field Tests.
2. Laboratory Tests.
3. Submission of the reports.

**FIELD TESTS :**

1. Drilling 10 nos. of 150 mm ø bore hole with casing whenever required up to maximum depth of 25.0 M.
2. Carry out Standard Penetration Test (SPT) alternate to Undisturbed sampling or continuous SPT at 1.0 mt. depending on stiffness of cohesive soil & non-cohesive formation.
3. Collecting disturbed soil sample at every metre interval or as per the stratification of soil, recording depth at which soil changes.
4. Collecting undisturbed samples (UDS) alternate to S P Test or continuous UD Sampling at 1.0 mt. interval if subsoil is cohesive. The UDS Collectionis replace by SPT for cohesive strata having SPT values more than 30.
5. Observation of ground water table using drilled holes.
6. Contour Survey for the related area.

**LABORATORY TESTS :**

1) Field Density, Moisture Content and Dry Density of undisturbed samples.
2) Grain size Analysis of selected samples from SPT samples, UD samples and disturbed samples covering each soil strata.

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| Bore Hole No. | Northing | Easting | R.L. | Area |
|---|---|---|---|---|
| 4. | 915.00 | 1130.00 | 10 | F G H Area |
| 5. | 880.00 | 1130.00 | 2 | " |
| 6. | 900.00 | 1095.00 | 00 | " |
| 7. | 740.00 | 1400.00 | | Boiler Area |
| 8. | 720.00 | 1400.00 | 5 | " |
| 9. | 700.00 | 1350.00 | 5 | Cooling Tower |
| 10. | 880.00 | 1760.00 | 99.5 | oading Area |

Drilling below water table is made by percussion method. Casing is required to be lowered if the bore hole do not retain it's shape. Care is taken that ground water level is maintained during the drilling and particularly before testing or sampling levels. In no case casing is allowed to advance below the bottom of bore hole. Chiseling is carried out if required while drilling.

**STANDARD PENETRATION TEST :**

The Standard Penetration Tests are carried out as per I. S. - 1981. In general the tests are conducted at 2.0 mt. interval - nate to the undisturbed sampling or as dictated by soil existing.

Before testing, the bore hole is cleaned properly and Split Spoon Sampler is centrally seated in bore hole. In case of SPT to be conducted below water table care is taken that casing position is above the bore hole depth. The water level in bore hole is maintained above or at least at the water tabl

A standard hammer of 63.5 kg. is m a height of 75 cms. and the no. of blows for penetration of Sp Spoon Sampler for 0-15, 15-30 and 30-45 cms ter Table-3. Standard Penetration Test value N is co penet ation values. Sample for moisture cont sture cans. For non-plastic silts and fine sands, corrected for effective overburden pres

sure and dilatancy correction is added for tests con d below water table. Results are shown in Table-3.

**DISTURBED AND UNDISTURBED SAMPLES :**

Disturbed samples from shell or from Split Spoon Sampler is collected in polythene bags with proper levels such that we shall get the data of 0.5 mt. interval or change in strata.

Undisturbed sampling is collected in 100 mm ø Shelby tube. 'A' drill rods are connected by suitable adopter with ball check valve to the Shelby tube. Before lowering the sampler, the bore is cleaned properly and sampling tube is lightly oiled from inner and outer side.

Sampling tube is pushed into the bore hole by pressure or light hammering as per the soil stiffness. The sampling tube is immediately waxed after covering with aluminum foil.

In case of medium to coarse, non cohesive, sand samples, where sampling is unsuccessful, standard penetration test is carried out on cleaning the bore hole.

**LABORATORY TEST :**

Disturbed, undisturbed and S P Test samples from the field are brought to the laboratory with care and are grouped according to observations in the fields. On completion of shear, compressibility, permeability etc. tests on UD samples , these samples are placed in oven along with the S P Test samples and disturbed samples. Samples are selected such that each soil strata is adequately represented by the physical properties. The representative samples are dried in oven for 24 hours at 110 ± 5 ° C.

**PHYSICAL PROPERTIES :**

The moisture cans collected from S P T samples and from pit samples are weighed and placed in oven for drying to determine natural moisture content (NMC). Results are tabulated in Table - 3.

U D Samples are extracted using screw type extractor and samples are prepared as per the required sizes of the test to be performed. Before extracting from tube, weight and volume of sample are noted. Average bulk density is calculated in laboratory and sample is placed in oven to get the field moisture content for computing the dry density. Results are tabulated in Table - 4.

Specific gravity with specific gravity bottle/pycknometer is calculated as per I.S. 2720(part 3, section 1&2) 1980. Results are tabulated in Table - 4. From the results of dry density and specific gravity the saturation of sample in % is calculated which is a useful data for deciding the condition of triaxial shear test.

Grain size analysis is made by I. S. sieves and sieving is done on timer switch electrically operated sieve shaker.I.S. sieves commonly used are 4.75 mm, 2.00 mm, 1.00 mm, 425 microns, 250 microns and 75 microns. For the coarse grain soil a graph of partial size v/s cumulative % finer is plotted. For fine grain soil wet analysis is made on plummet balance, modern version of hydrometer. Mechanical digital single pan balance of 1 kg capacity with 0.1 gram least count is used. Results are tabulated in Table - 5.

Liquid limits and plastic limits tests are carried out with distilled water as per I.S. 2720 (part-5) 1985. The samples are wetted for minimum 24 hours after the addition of water. For liquid limit test cone penetration method is adopted but occasionally value is checked on Casagrande standard.

For the foundation soil sample shows high plasticity are checked for swelling and shrinkage. Firstly for rough estimate, free swell test as per I.S. 2720 (part-40) 1977 is being carried out and on getting positive indication of swelling, shrinkage limit test is carried out as per I.S. 2720 (Part-6) 1972.

**SHEAR PROPERTIES :**

Shear tests are carried out by three methods.

1. Unconfined compressive strength as per I.S. 2720 (part - 10) 1973 for the saturated plastic soil undisturbed samples and cores of SPT samples.

2. Triaxial shear test is carried out on sample size of 38 mm ø and 76 mm in height on motorized 30 speed load frame with digital display arrangements for load and pore-pressure. The confining pressure $\sigma_3$ is applied to the cell by oil-water constant pressure system. The tests are carried out for the condition.
   a) Unconsolidated undrained (UU) test without pore-pressure measurement as per I.S. 2720 (part-11) 1971.
   b) Consolidated undrained (CU) test with or without pore-pressure measurement as per I.S. 2720 (part-11) 1981.
   The condition is decided on type of sample and water table condition or designers specifications.

3. Direct box shear test is carried out on non-plastic medium to coarse sand soil as per I.S. 2720 (part-13) 1986.

The graph for triaxial shear test is plotted by modified method where X axis represents $\frac{1}{2}(\sigma_1 + \sigma_3)$ and Y axis represent $\frac{1}{2}(\sigma_1 - \sigma_3)$.
A consolidated statement is prepared.

**COMPRESSIBILITY :**

The foundation soil having medium to high plasticity with possibility of saturation are tested for compressibility tests. The sample is placed on digital display odometer instrument and comuterised data acquisition system. In case of U D Sample is not representative of field, tests on remolded soil to natural moisture content and average density is used for predicting shear and compressibility properties. The results are tabulated in the table.

CONTOUR SURVEY WAS CARRIED OUT BY TOTAL STATION THEODOLITE AND CONTOUR PLOTTED ON COMPUTER WITH THE DATA. THE DRAWING SHEETS ARE ATTECHED.

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TYPICAL EVOLITION FOR PILE FOUNDATION :

The ultimate bearing capacity of pile in granular soil is given by the formula : ( As per IS 2911 part I /Sec 2 cluase B 1.1 )

$Q_u = A_p (\frac{1}{2} D \Gamma N_\gamma + P_D N_q ) + \Sigma K P_{Di} \tan \delta A_{si}$

Where

$A_p$ = Cross sectional area of pile toe in $cm^2$.

D = Stem dia. in cms.

$\Gamma$ = Effective unit weight of soil at pile toe in $Kg/cm^2$.

$P_D$ = Effective overburden pressure at pile toe in $Kg/cm^2$.

$N_q$ & $N_\gamma$ = Bearing capacity factor as per I S 6403.

$\Sigma$ = Summetions of layers in which pile is installed.

K = Coefficient of earth pressure.

$P_{Di}$= Effective overburden pressure in $Kg/cm^2$ for $i^{th}$ layer where i varies from 1 to n.

$\delta$ = Angle of wall friction between pile and soil, in degrees (may be taken as equal to $\phi$)

$A_{si}$= Surface area of pile stem in $cm^2$ in $i^{th}$ layer where i varies from 1 to n.

The ultimate bearing capacity of pile in cohesive soil is given by the formula : (As per is 2911 part I/ Sec 2 clause B 2.1)

$Q_u = A_p N_c C_p + \alpha C A_s$

$A_p$ = Cross sectional area of pile toe in $cm^2$.

$N_c$ = Bearing capacity factor.

$C_p$ = Average cohesion at pile tip in $Kg/cm^2$.

$\alpha$ = Reduction factor ( as per note 1 of I S code Page - 25)

C = Average cohesion throught the length of pile in $Kg/cm^2$

$A_s$ = Surface area of pile shaft in $cm^2$.

Typical calculation for 400 mm dia bored cast-in situ pile in F G H area for the depth 15.0 m from cutof level is as under. ( Cutoff level assumed 2.0 M below FGL.

F G L is 100.2 M. Cutoff level of pile is 98.2 M. The 15 M deep pile will rest on 83.2 M that is just on stiff cohesive soil strata. The pile will be in cohesive strata for the R L between 98.2 to 93.75 and rest in cohesionless soil.

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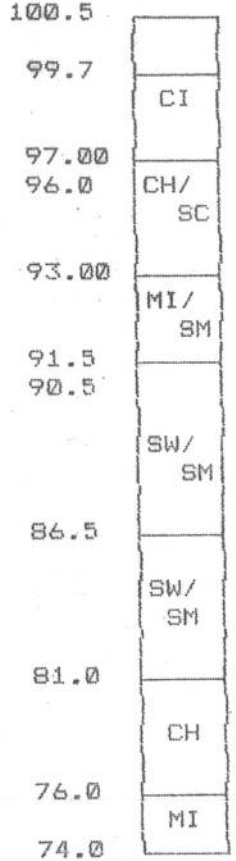
## DESIGN SOIL PROFILE WITH DESIGN PARAMETERS FOR TANK AREA ( B H No 1 2 3 )




| | | Over Burden Pressure |
|---|---|---|
| 100.5 | F G L | |
| 99.7 | Cohessive dessicated clay, | |
| | | 0.630 Kg/cm² |
| 97.00 | | 0.810 Kg/cm² |
| 96.0 | Water Table | |
| | Soft Clay, c = 0.3 Kg/cm², ø ≈ 10° | |
| 93.00 | | 1.050 Kg/cm² |
| | Loose Sand, $N_{\bar{}}$ < 10, c = 0.0, ø = 30° | |
| 91.5 | | 1.185 Kg/cm² |
| 90.5 | | 1.280 Kg/cm² |
| | Dense Sand, $N_{\bar{}}$ = 10 to 30, c = 0.0, ø = 32° | |
| 86.5 | | 1.280 Kg/cm² |
| | Very Dense Sand, $N_{\bar{}}$ > 50, c = 0.0 kg/cm², ø = 34° | |
| 81.0 | | 1.280 Kg/cm² |
| | Stiff Cohesive clay c = 0.9 kg/cm², ø > 10° | |
| 76.0 | | |
| | Stiff Cohesive Clay & Silt, c = 0.9 kg/cm², ø > 15° | |
| 74.0 | | |

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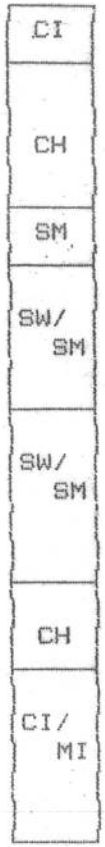
## DESIGN SOIL PROFILE WITH DESIGN PARAMETERS FOR F G H ( B H No 4 5 6 )




| | | Over burden pressure |
|---|---|---|
| 100.2 | F G L | |
| | Cohesive dessicated clay c = 0.6 kg/cm², ø ≈ 0° | |
| 97.5 | | 0.485 Kg/cm² |
| 96.0 | Water Table | 0.756 Kg/cm² |
| | Soft clay c = 0.3 kg/cm², ø ≈ 10° | |
| 93.75 | | 0.936 Kg/cm² |
| | Medium Sand, $N_{cor}$ < 10, c = 0.0, ø = 30° | |
| 92.50 | | 1.049 Kg/cm² |
| | Dense Sand, $N_{cor}$ = 10 to 30, c = 0.0, ø = 32° | |
| 90.2 | | 1.267 Kg/cm² |
| 89.0 | | 1.267 Kg/cm² |
| | Very Dense Sand, $N_{cor}$ > 50, c = 0.0, ø = 34° | |
| 83.0 | | 1.267 Kg/cm² |
| | Stiff Cohesive clay c = 0.8 kg/cm², ø ≈ 10° | |
| 80.5 | | 1.267 Kg/cm² |
| | Stiff Cohesive Silt & clay c = 0.8 kg/cm², ø ≈ 16° | |
| 75.5 | | 1.267 Kg/cm² |

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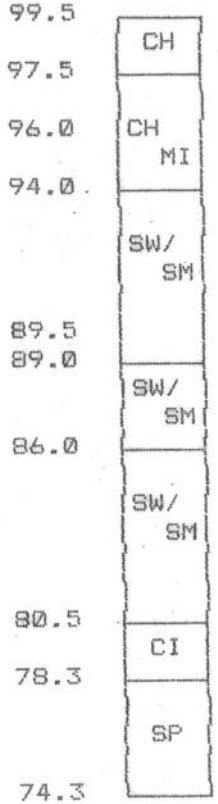
## DESIGN SOIL PROFILE WITH DESIGN PARAMETERS FOR BOILER HOUSE ( B H No 7 8 )




F G L
Cohesive dessicated clay c = 0.6 kg/cm², ø ≈ 0°

Water Table
Soft clay c = 0.3 kg/cm², ø ≈ 10°

Sand, $N_{\bar{}}$ = 10, c = 0.0, ø = 30°

Dense Sand, $N_{\bar{}}$ = 10 to 30, c = 0.0, ø = 32°

Very Dense Sand $N_{\bar{}}$ > 50, c = 0.0, ø = 34°

Stiff Cohesive clay c = 0.85 kg/cm², ø ≈ 10°

Sand, $N_{\bar{}}$ > 50, c = 0.0, ø = 34°

Over Burden Pressure

0.380 Kg/cm²

0.650 kg/cm²

0.810 Kg/cm²

1

1.238

1.5

1.238 Kg/cm²

1.238 Kg/cm²

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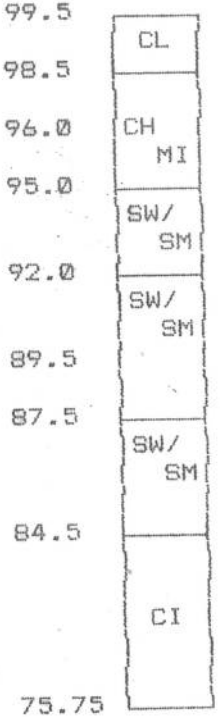
# DESIGN SOIL PROFILE WITH DESIGN PARAMETERS FOR COOLING TOWER ( B H No 9 )




| | Over Burden Pressure |
|---|---|
| F G L | |
| Cohesive dessicated clay | 0.190 Kg/cm² |
| Water Table | 0.665 kg/cm² |
| Soft clay c = 0.3 kg/cm², ø ≈ 10° | 0.745 Kg/cm² |
| Loose Sand, $N_{SPT}$ < 10, c = 0.0, ø = 30° | 1.015 Kg/cm² |
| Dense Sand, $N_{SPT}$ = 20 to 50, c = 0.0, ø = 32° | 1.240 Kg/cm² |
| | 1.240 Kg/cm² |
| Very Dense Sand $N_{SPT}$ > 50, c = 0.0, ø = 34° | 1.240 Kg/cm² |
| Stiff Cohesive clay c = 0.87 kg/cm², ø = 14° | |

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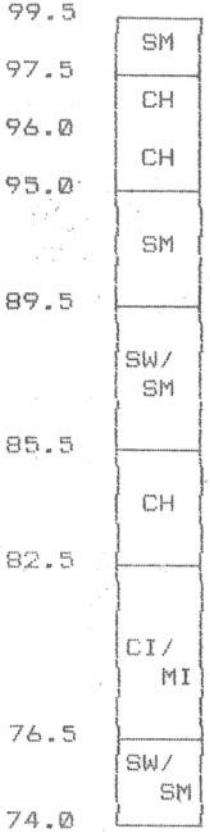
## DESIGN SOIL PROFILE WITH DESIGN PARAMETERS FOR GANTRY ( LOADING AREA B H No 10 )




| | | Over Burden Pressure |
|---|---|---|
| 99.5 | F G L | |
| | | 0.380 Kg/cm² |
| 97.5 | Cohessive dessicated clay, C = 0.6 Kg/cm² | |
| 96.0 | Water Table | 0.655 Kg/cm² |
| | Soft clay, C = 0.3 Kg/cm², ø ≈ 10° | |
| 95.0 | | 0.745 Kg/cm² |
| | Fine sand, $N_{\bar{s}}$ 10 to 30, c = 0.0 Kg/cm², ø ≈ 30° | |
| 89.5 | | 1.268 Kg/cm² |
| | Fine sand, $N_{\bar{s}}$ = 15 to 40 | |
| 85.5 | | 1.268 Kg/cm² |
| | Stiff clay, c = 1.0 kg/cm², ø ≈ 10° | |
| 82.5 | | 1.268 Kg/cm² |
| | Stiff Cohesive Silty Clay c = 0.8 kg/cm² | |
| 76.5 | | |
| | Sand and gravel, $N_{\bar{s}}$ > 50. | |
| 74.0 | | |

Refering the design soil strata with design soil parameters for FGH :

$Q_{ult}$ = ( 1256.8 x 8.35 x 0.8 ) + ( 1.5 x 1.267 x 580 x 125 x tan 34 ) + ( 1.5 x 1.267 x 120 x 125 x tan 32 ) + ( 1.5 x 1.158 x 230 x 125 x tan 32 ) + ( 1.5 x .993 x 125 x 125 x tan 30 ) + ( .7 x .3 x 125 x 375 ) + ( .3 x .6 x 70 x 125 )

$Q_{ult}$ ≈ 168000 Kg i e 170 T.

With factor of safety 3.0, capacity of pile = 56.00 T.

For the different pile dia sizé of 400 mm, 450 mm & 500 mm for the depth 15.0 M, 17.5 M & 20.0 M load carrying is calculated and tabulated as per attached.

## PILE CAPACITY IN TONN FOR THE DIFF. SIZE AND LENGTH

| PILE DIA. | 400 MM | | | 500 MM | | | 600 MM | | |
|---|---|---|---|---|---|---|---|---|---|
| PILE LENGTH IN M | 15.0 M | 17.5 M | 20.0 M | 15.0 M | 17.5 M | 20.0 M | 15.0 M | 17.5 M | 20.0 M |
| TANK AREA | 61.5 | 68.5 | 71.0 | 71.0 | 77.5 | 80.5 | 80.5 | 87.0 | 90.5 |
| F G H AREA | 56,0 | 59.0 | 61.5 | 65.0 | 69.0 | 72.5 | 73.0 | 78.0 | 83.0 |
| BOILER AREA | 62.5 | 68.5 | 71.0 | 72.5 | 78.5 | 81.5 | 82.0 | 87.5 | 90.0 |
| COOLING TOWER AREA | 53.5 | 56.0 | 58.5 | 61.0 | 64.5 | 68.0 | 68.5 | 71.5 | 74.0 |
| LOADING AREA AREA | 51.0 | 55.0 | 57.5 | 58.0 | 61.0 | 64.0 | 65.0 | 68.5 | 72.5 |

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**CONCLUSION :**

1. SCOPE OF WORK

Soil design parameters are enclosed herewith are based on Soil Investigation report for the proposed units ( FGH, SBP, Additional Boiler House, Cooling tower, extention of loading Gantry, New additional Tank area) carried out during Nov.- Dec. 1999. The foundation design bases shall be proposed clearly stating type of foundation for various structures to be submitted to ONGC/EIL for approval.

2. SOIL PROFILE

The general profile is top filled up soil followed by black soft plastic clay in tidal fluctuation zone. This layer lateer shall have thin fine sand/silt layers. Next layer is of non plastic sand with increasing S P Test value up to avr. 84-85 M R L. Next layer is of very stiff clay and silt with fine sand stone layers below R L 78.0 M. This is follwed by dense gravelly sand layer in some cases up to investigation depth.

The above is shown in DESIGN SOIL PROFILE WITH DESIGN PARAMETERS for the area (A) Tank area (B H 1, 2 & 3), (B) F G H plant & control room (B H 4, 5, & 6) (C) Boiler House (B H 7 & 8), (D) Cooling Tower (B H 9) & (E) Loading area for Gantry (B H 10).

At present there is grass in most of the area and hence finish level shall be maintained removing the top 200-300 mm soil with organic material with Cohesive Nonswelling Soil compacted to 95 % standard proctor density in layers of 150 mm.

3 WATER TABLE

Water table in bore hole during soil investigation in Nov. Dec. 1999 is reported to be around 4.0 to 5.0 M from existing G L that is around R L 96.0 M.

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4 TYPE OF FOUNDATION

4.1 SHALLOW FOUNDATION

This shall be placed at 1.0 M below finished level. The foundation strata shall be compacted and refilled by Cohesive Non-swelling Soil up to 400 mm from from F G L in layers compacted to 95 % standard proctor density. This layer shall be extended 300 mm all around the footing. The net allowable bearing capacity of 10 T/M² may be consider for design for footing up to 2.0 M width for the expacted settlement of 25 mm. For the wider footing size, the bearing capacity shall be reduce as the pressure bulb cover the soft plastic clay strata also.

4.2 PILE FOUNDATION

All major structures shall be placed on pile foundation. The design for the diff. area is as discussed earlier.

Note : The bearing capacity / pile capacity mentioned above may be increased by 25 % for wind and seismic loading condition.

5.0 The backfilling in foundation shall be done by suitable cohesive nonswelling soil. This shall be compacted for not more exceeding 150 mm thickness to 95 % standard proctor density.

In no case the back filling shall be done by expansive soil present at the site.

6.0 TYPE OF CEMENT

Sulphate Resistance Cement shall be used for all structures below FGL and upto 300 mm above FGL. For cement concrete work above this, Ordinary Portland Cement shall be used. Min. clear cover to all main reinforcement shall be 75 mm for all structures.

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## I. S. CLASSIFICATION

GW Well graded gravels,gravel-sand mixtures,little or no fines.

GP Poorly graded gravels or gravel sand mixtures, little or no fines.

GM Silty gravels, poorly graded gravel-sand-silt mixtures.

GC Clayey gravels, poorly graded gravel-sand-clay mixtures.

SW Well graded sands, gravely sands, little or no fines.

SP Poorly graded sands or gravely sands; little or no fines.

SM Silty sands, poorly graded sand silt mixtures.

SC Clayey sands, poorly graded sand-clay mixtures.

ML Inorganic silt and very fine sands rock flour, silty or clayey fine sands or clayey silts with non to low plasticity.

CL Inorganic clays, gravely clays, sandy clays,silty clays, lean clays of low plasticity.

OL Organic silts and organic silty clay of low plasticity.

MI Inorganic silts, silty or clayey fine sands or clayey silts of medium plasticity.

CI Inorganic clays, gravely clays,sandy clays, silty clays, lean clays of medium plasticity.

OI Organic silts and organic silty clays of medium plasticity.

MH Inorganic silt of highly compressibility,micaceous or diatomaceous fine sandy or silty soils, elastic silts.

CH Inorganic clays of high plasticity, fat clays.

OH Organic clays of medium to high plasticity.

Pt Peat & other highly organic soil with very high compressibility..pa

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## CHEMICAL TEST RESULTS

| B H No. | Type of sample | Depth | pH | Chloride in mg/l | Sulphate in mg/l | Total Dissolve Solids in mg/l |
|---|---|---|---|---|---|---|
| 1. | Water | - - | 8.0 | 2300 | 5.2 | 3800 |
| 2. | Water | - - | 8.0 | 5600 | 3.4 | 7380 |
| 3. | Water | - - | 8.2 | 4050 | 4.4 | 6720 |
| 4. | Water | - - | 7.9 | 3170 | 3.8 | 6340 |
| 5. | Water | - - | 8.1 | 2990 | 4.6 | 3290 |
| 6. | Water | - - | 8.0 | 3460 | 3.9 | 5780 |
| 7. | Water | - - | 8.1 | 4400 | 4.8 | 7510 |
| 8. | Water | - - | 8.1 | 2870 | 4.2 | 5560 |
| 9. | Water | - - | 7.9 | 6780 | 3.6 | 8590 |

SO3 & SO4 %.

N

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## CHEMICAL TEST RESULTS

| B H No. | Type of sample | Depth in Mt. | pH | Chloride in mg/l | Sulphate in mg/l | Total Dissolve Solids in mg/l |
|---|---|---|---|---|---|---|
| 1. | Soil | 2.0 | 8.8 | 195 | 4.4 | 610 |
| 1. | Soil | 16.0 | 9.0 | 290 | 4.8 | 700 |
| 2. | Soil | 6.0 | 8.7 | 1080 | 5.0 | 2530 |
| 2. | Soil | 22.0 | 9.1 | 740 | 3.8 | 1690 |
| 3. | Soil | 15.0 | 9.3 | 445 | 3.6 | 980 |
| 4. | Soil | 9.0 | 9.2 | 190 | 4.0 | 515 |
| 4. | Soil | 19.5 | 8.9 | 515 | 3.2 | 1200 |
| 5. | Soil | 6.0 | 8.6 | 1450 | 5.2 | 3000 |
| 5. | Soil | 13.0 | 8.6 | 230 | 3.4 | 620 |

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## CHEMICAL TEST RESULTS

| B H No. | Type of sample | Depth in Mt. | pH | Chloride in mg/l | Sulphate in mg/l | Total Dissolve Solids in mg/l |
|---|---|---|---|---|---|---|
| 6. | Soil | 1.0 | 8.8 | 270 | 3.6 | 750 |
| 6. | Soil | 13.0 | 8.9 | 220 | 4.2 | 680 |
| 7. | Soil | 4.0 | 8.7 | 1530 | 4.0 | 3050 |
| 7. | Soil | 22.0 | 9.1 | 670 | 3.2 | 1380 |
| 8. | Soil | 4.0 | 8.6 | 1790 | 3.0 | 3690 |
| 8. | Soil | 16.0 | 9.3 | 240 | 3.2 | 670 |
| 9. | Soil | 2.0 | 9.0 | 180 | 4.4 | 580 |
| 9. | Soil | 24.0 | 8.8 | 800 | 4.6 | 1920 |
| 10. | Soil | 8.0 | 8.9 | 305 | 3.6 | 885 |

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## RESULTS OF C B R TEST

| AREA | SAMPLE | UNSOAKED CBR (2.5) | SOAKED CBR (2.5) |
|---|---|---|---|
| New Tank Area | Undisturbed | 1.8 | 0.8 |
| FGH / SBP Area | Undisturbed | 2.1 | 1.2 |
| Boiler Area | Undisturbed | 1.9 | 1.0 |
| Loading Area | Undisturbed | 1.8 | 0.9 |

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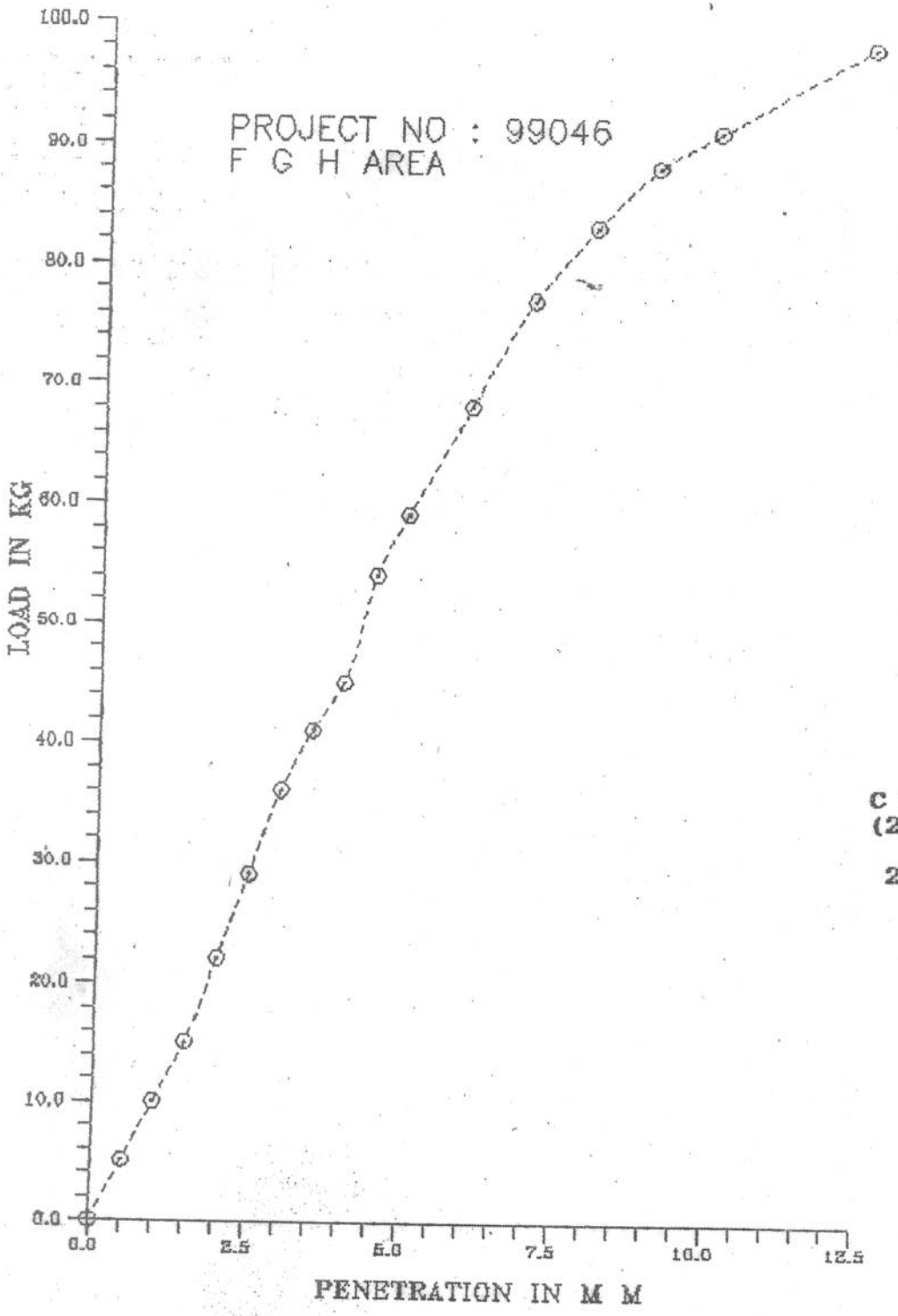
# C B R TEST (UNSOAKED)




**C B R (2.5)**

**2.12**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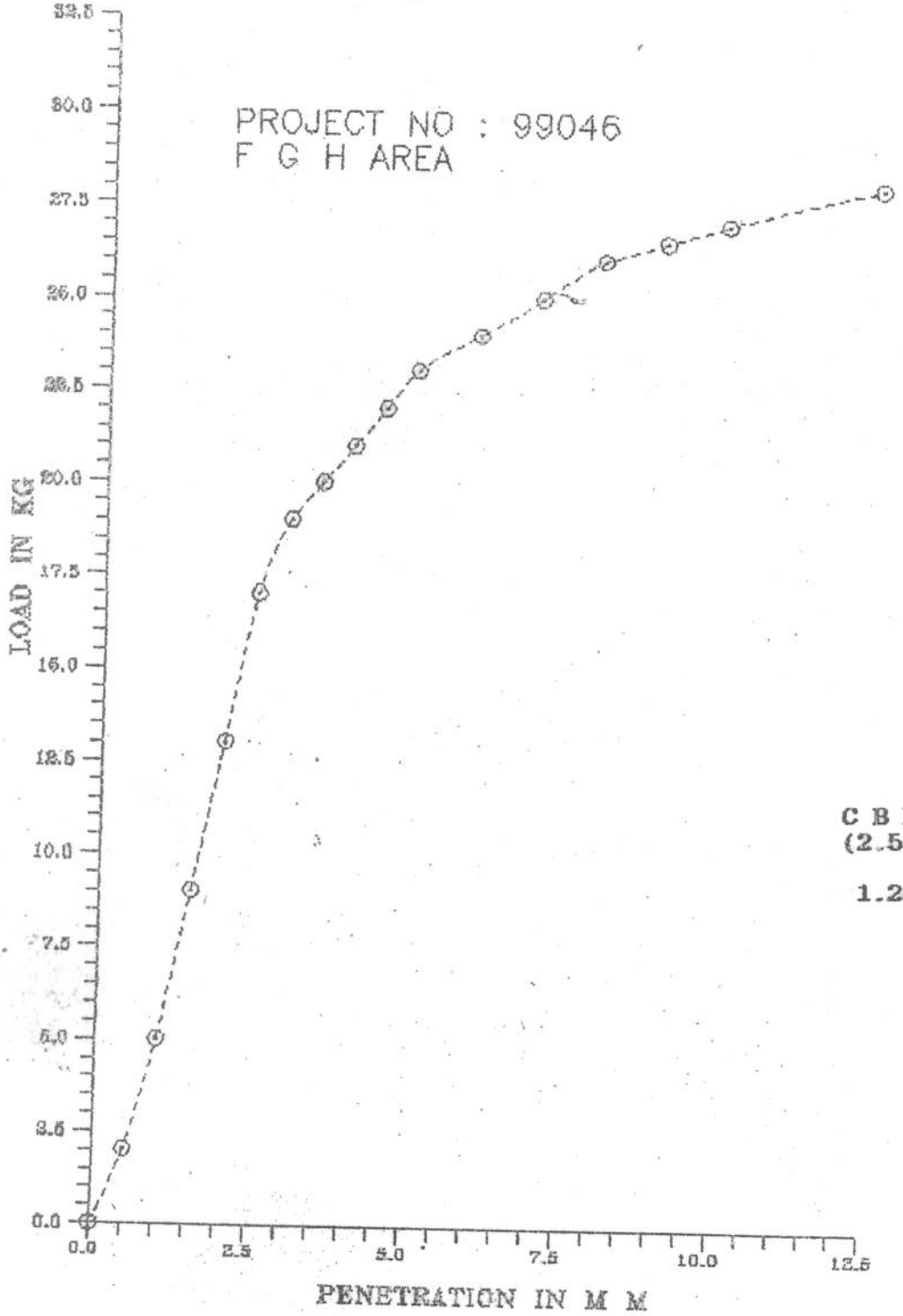
# C B R TEST (SOAKED)

PROJECT NO : 99046
F G H AREA




C B R
(2.5)

1.24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# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046 | Bore Hole No: 1
R. L. 96.90 mt. | Sp. Gr. 2.614 | Final M.C. 38.57 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| 0.10 | 27.250 | | 2.0060 | | 2.6249 |
| | | -0.0620 | | -0.1124 | |
| 0.25 | 26.940 | | 1.9380 | | 2.5126 |
| | | -0.2020 | | -0.3661 | |
| 0.50 | 25.930 | | 1.7360 | | 2.1465 |
| | | -0.3620 | | -0.6561 | |
| 1.00 | 24.120 | | 1.3740 | | 1.4903 |
| | | -0.3820 | | -0.6924 | |
| 2.00 | 22.210 | | 0.9920 | | 0.7980 |
| | | -0.3900 | | -0.7069 | |
| 4.00 | 20.260 | | 0.6020 | | 0.0911 |
| | | 0.5060 | | 0.9171 | |
| 0.10 | 22.790 | | 1.1080 | | 1.0082 |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.25 | 2.6249 | 2.5126 | 2.0667E-01 | | |
| 0.25 - 0.50 | 2.5126 | 2.1465 | 4.1692E-01 | | |
| 0.50 - 1.00 | 2.1465 | 1.4903 | 4.1705E-01 | 3.25 | 8.0887E-06 |
| 1.00 - 2.00 | 1.4903 | 0.7980 | 2.7802E-01 | 3.20 | 4.8290E-06 |
| 2.00 - 4.00 | 0.7980 | 0.0911 | 1.9657E-01 | | |
| 4.00 - 0.10 | 0.0911 | 1.0082 | 2.1552E-01 | | |

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# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046 | Bore Hole No: 2
R. L. 96.67 mt. | Sp. Gr. 2.790 | Final M.C. 37.90 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| 0.10 | 24.520 | | 20.0000 | | 1.1530 |
| | | -0.0520 | | -0.0056 | |
| 0.25 | 24.260 | | 19.9480 | | 1.1474 |
| | | -0.1900 | | -0.0205 | |
| 0.50 | 23.310 | | 19.7580 | | 1.1270 |
| | | -0.3440 | | -0.0370 | |
| 1.00 | 21.590 | | 19.4140 | | 1.0899 |
| | | -0.3920 | | -0.0422 | |
| 2.00 | 19.630 | | 19.0220 | | 1.0477 |
| | | -0.4300 | | -0.0463 | |
| 4.00 | 17.480 | | 18.5920 | | 1.0014 |
| | | 0.5200 | | 0.0560 | |
| 0.10 | 20.080 | | 19.1120 | | 1.0574 |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.25 | 1.1530 | 1.1474 | 1.7333E-02 | | |
| 0.25 - 0.50 | 1.1474 | 1.1270 | 3.8099E-02 | | |
| 0.50 - 1.00 | 1.1270 | 1.0899 | 3.4821E-02 | 3.05 | 1.4571E-03 |
| 1.00 - 2.00 | 1.0899 | 1.0477 | 2.0192E-02 | 3.15 | 1.3152E-03 |
| 2.00 - 4.00 | 1.0477 | 1.0014 | 1.1303E-02 | | |
| 4.00 - 0.10 | 1.0014 | 1.0574 | 7.1715E-03 | | |

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# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046
R. L. 81.67 mt.

Sp. Gr. 2.851

Bore Hole No: 2
Final M.C. 24.92 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| 0.10 | 35.440 | | 20.0000 | | 0.7617 |
| | | 0.0000 | | 0.0000 | |
| 0.25 | 35.440 | | 20.0000 | | 0.7617 |
| | | -0.0300 | | -0.0026 | |
| 0.50 | 35.290 | | 19.9700 | | 0.7591 |
| | | -0.0660 | | -0.0058 | |
| 1.00 | 34.960 | | 19.9040 | | 0.7533 |
| | | -0.0940 | | -0.0083 | |
| 2.00 | 34.490 | | 19.8100 | | 0.7450 |
| | | -0.1900 | | -0.0167 | |
| 4.00 | 33.540 | | 19.6200 | | 0.7283 |
| | | -0.3280 | | -0.0289 | |
| 8.00 | 31.900 | | 19.2920 | | 0.6994 |
| | | 0.1260 | | 0.0111 | |
| 0.10 | 32.530 | | 19.4180 | | 0.7105 |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.25 | 0.7617 | 0.7617 | 0.0000E+00 | | |
| 0.25 - 0.50 | 0.7617 | 0.7591 | 5.9999E-03 | | |
| 0.50 - 1.00 | 0.7591 | 0.7533 | 6.6100E-03 | | |
| 1.00 - 2.00 | 0.7533 | 0.7450 | 4.7226E-03 | 1.70 | 4.8207E-03 |
| 2.00 - 4.00 | 0.7450 | 0.7283 | 4.7956E-03 | 1.75 | 4.4844E-03 |
| 4.00 - 8.00 | 0.7283 | 0.6994 | 4.1794E-03 | | |
| 8.00 - 0.10 | 0.6994 | 0.7105 | 8.2673E-04 | | |

# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046 | Bore Hole No: 3
R. L. 80.40 mt. | Sp. Gr. 2.799 | Final M.C. 23.96 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| 0.10 | 17.830 | | 20.0000 | | 0.7093 |
| | | -0.0060 | | -0.0005 | |
| 0.25 | 17.800 | | 19.9940 | | 0.7088 |
| | | -0.0280 | | -0.0024 | |
| 0.50 | 17.660 | | 19.9660 | | 0.7064 |
| | | -0.0480 | | -0.0041 | |
| 1.00 | 17.420 | | 19.9180 | | 0.7023 |
| | | -0.0860 | | -0.0073 | |
| 2.00 | 16.990 | | 19.8320 | | 0.6949 |
| | | -0.1480 | | -0.0126 | |
| 4.00 | 16.250 | | 19.6840 | | 0.6823 |
| | | -0.2760 | | -0.0236 | |
| 8.00 | 14.870 | | 19.4080 | | 0.6587 |
| | | 0.1400 | | 0.0120 | |
| 0.10 | 15.570 | | 19.5480 | | 0.6706 |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.25 | 0.7093 | 0.7088 | 2.0000E-03 | | |
| 0.25 - 0.50 | 0.7088 | 0.7064 | 5.6017E-03 | | |
| 0.50 - 1.00 | 0.7064 | 0.7023 | 4.8082E-03 | | |
| 1.00 - 2.00 | 0.7023 | 0.6949 | 4.3177E-03 | 1.65 | 5.1266E-03 |
| 2.00 - 4.00 | 0.6949 | 0.6823 | 3.7313E-03 | 1.55 | 5.7413E-03 |
| 4.00 - 8.00 | 0.6823 | 0.6587 | 3.5054E-03 | | |
| 8.00 - 0.10 | 0.6587 | 0.6706 | 9.1310E-04 | | |

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# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046
R. L. 95.64 mt.

Sp. Gr. 2.766

Bore Hole No: 4
Final M.C. 39.06 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| | | | 20.0000 | | 1.3673 |
| 0.10 | 35.780 | -0.3260 | | -0.0386 | |
| | | | 19.6740 | | 1.3287 |
| 0.25 | 34.150 | -0.5060 | | -0.0599 | |
| | | | 19.1680 | | 1.2688 |
| 0.50 | 31.620 | -0.4100 | | -0.0485 | |
| | | | 18.7580 | | 1.2203 |
| 1.00 | 29.570 | -0.6920 | | -0.0819 | |
| | | | 18.0660 | | 1.1384 |
| 2.00 | 26.110 | -0.9400 | | -0.1113 | |
| | | | 17.1260 | | 1.0271 |
| 4.00 | 21.410 | 0.4500 | | 0.0533 | |
| | | | 17.5760 | | 1.0804 |
| 0.10 | 23.660 | | | | |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.25 | 1.3673 | 1.3287 | 1.0867E-01 | | |
| 0.25 - 0.50 | 1.3287 | 1.2688 | 1.0288E-01 | | |
| 0.50 - 1.00 | 1.2688 | 1.2203 | 4.2780E-02 | 3.15 | 1.2805E-03 |
| 1.00 - 2.00 | 1.2203 | 1.1384 | 3.6891E-02 | 2.95 | 1.3764E-03 |
| 2.00 - 4.00 | 1.1384 | 1.0271 | 2.6016E-02 | | |
| 4.00 - 0.10 | 1.0271 | 1.0804 | 6.7374E-03 | | |

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# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046 Bore Hole No: 5
R. L. 97.82 mt. Sp. Gr. 2.831 Final M.C. 27.28 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| 0.10 | 21.740 | | 20.0000 | | 0.8597 |
| | | -0.0820 | | -0.0076 | |
| 0.25 | 21.330 | | 19.9180 | | 0.8521 |
| | | -0.1720 | | -0.0160 | |
| 0.50 | 20.470 | | 19.7460 | | 0.8361 |
| | | -0.3300 | | -0.0307 | |
| 1.00 | 18.820 | | 19.4160 | | 0.8054 |
| | | -0.3960 | | -0.0368 | |
| 2.00 | 16.840 | | 19.0200 | | 0.7686 |
| | | -0.4300 | | -0.0400 | |
| 4.00 | 14.690 | | 18.5900 | | 0.7286 |
| | | 0.4700 | | 0.0437 | |
| 0.10 | 17.040 | | 19.0600 | | 0.7723 |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.25 | 0.8597 | 0.8521 | 2.7333E-02 | | |
| 0.25 - 0.50 | 0.8521 | 0.8361 | 3.4542E-02 | | |
| 0.50 - 1.00 | 0.8361 | 0.8054 | 3.3424E-02 | 2.60 | 2.0040E-03 |
| 1.00 - 2.00 | 0.8054 | 0.7686 | 2.0396E-02 | 2.45 | 2.1740E-03 |
| 2.00 - 4.00 | 0.7686 | 0.7286 | 1.1304E-02 | | |
| 4.00 - 0.10 | 0.7286 | 0.7723 | 6.4827E-03 | | |

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# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046
R. L. 95.00 mt.

Sp. Gr. 2.837

Bore Hole No: 6
Final M.C. 42.62 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| 0.10 | 33.430 | | 20.0000 | | 1.4470 |
| | | 0.0380 | | 0.0046 | |
| 0.25 | 33.620 | | 20.0380 | | 1.4516 |
| | | -0.6000 | | -0.0734 | |
| 0.50 | 30.620 | | 19.4380 | | 1.3782 |
| | | -0.6300 | | -0.0771 | |
| 1.00 | 27.470 | | 18.8080 | | 1.3011 |
| | | -0.7160 | | -0.0876 | |
| 2.00 | 23.890 | | 18.0920 | | 1.2135 |
| | | -0.6760 | | -0.0827 | |
| 4.00 | 20.510 | | 17.4160 | | 1.1308 |
| | | 0.6400 | | 0.0783 | |
| 0.10 | 23.710 | | 18.0560 | | 1.2091 |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.25 | 1.4470 | 1.4516 | -1.2667E-02 | | |
| 0.25 - 0.50 | 1.4516 | 1.3782 | 1.1977E-01 | | |
| 0.50 - 1.00 | 1.3782 | 1.3011 | 6.4822E-02 | 3.00 | 1.4357E-03 |
| 1.00 - 2.00 | 1.3011 | 1.2135 | 3.8069E-02 | 2.90 | 1.4301E-03 |
| 2.00 - 4.00 | 1.2135 | 1.1308 | 1.8682E-02 | | |
| 4.00 - 0.10 | 1.1308 | 1.2091 | 9.4225E-03 | | |

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# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046
R. L. 97.80 mt.

Sp. Gr. 2.881

Bore Hole No: 7
Final M.C. 26.35 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| | | | 20.0000 | | 0.8432 |
| 0.10 | 20.440 | -0.0560 | | -0.0052 | |
| | | | 19.9440 | | 0.8380 |
| 0.25 | 20.160 | -0.1920 | | -0.0177 | |
| | | | 19.7520 | | 0.8203 |
| 0.50 | 19.200 | -0.3420 | | -0.0315 | |
| | | | 19.4100 | | 0.7888 |
| 1.00 | 17.490 | -0.3620 | | -0.0334 | |
| | | | 19.0480 | | 0.7555 |
| 2.00 | 15.680 | -0.4000 | | -0.0369 | |
| | | | 18.6480 | | 0.7186 |
| 4.00 | 13.680 | 0.4400 | | 0.0406 | |
| | | | 19.0880 | | 0.7591 |
| 0.10 | 15.880 | | | | |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.25 | 0.8432 | 0.8380 | 1.8667E-02 | | |
| 0.25 - 0.50 | 0.8380 | 0.8203 | 3.8508E-02 | | |
| 0.50 - 1.00 | 0.8203 | 0.7888 | 3.4629E-02 | 2.65 | 1.9291E-03 |
| 1.00 - 2.00 | 0.7888 | 0.7555 | 1.8650E-02 | 2.75 | 1.7276E-03 |
| 2.00 - 4.00 | 0.7555 | 0.7186 | 1.0500E-02 | | |
| 4.00 - 0.10 | 0.7186 | 0.7591 | 6.0500E-03 | | |

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# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046 | Bore Hole No: 9
R. L. 96.73 mt. | Sp. Gr. 2.834 | Final M.C. 35.62 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| 0.10 | 19.870 | | 20.0000 | | 1.2350 |
| | | -0.0840 | | -0.0094 | |
| 0.25 | 19.450 | | 19.9160 | | 1.2256 |
| | | -0.3520 | | -0.0393 | |
| 0.50 | 17.690 | | 19.5640 | | 1.1863 |
| | | -0.4740 | | -0.0530 | |
| 1.00 | 15.320 | | 19.0900 | | 1.1333 |
| | | -0.6480 | | -0.0724 | |
| 2.00 | 12.080 | | 18.4420 | | 1.0609 |
| | | -0.9260 | | -0.1035 | |
| 4.00 | 7.450 | | 17.5160 | | 0.9574 |
| | | 0.4660 | | 0.0521 | |
| 0.10 | 9.780 | | 17.9820 | | 1.0095 |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.25 | 1.2350 | 1.2256 | 2.8000E-02 | | |
| 0.25 - 0.50 | 1.2256 | 1.1863 | 7.0697E-02 | | |
| 0.50 - 1.00 | 1.1863 | 1.1333 | 4.8456E-02 | 3.00 | 1.4665E-03 |
| 1.00 - 2.00 | 1.1333 | 1.0609 | 3.3944E-02 | 2.85 | 1.5319E-03 |
| 2.00 - 4.00 | 1.0609 | 0.9574 | 2.5106E-02 | | |
| 4.00 - 0.10 | 0.9574 | 1.0095 | 6.8216E-03 | | |

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# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046
R. L. 96.73 mt.

Sp. Gr. 2.834

Bore Hole No: 9
Final M.C. 35.62 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| | | | 20.0000 | | 1.2350 |
| 0.10 | 19.870 | -0.0840 | | -0.0094 | |
| | | | 19.9160 | | 1.2256 |
| 0.25 | 19.450 | -0.3520 | | -0.0393 | |
| | | | 19.5640 | | 1.1863 |
| 0.50 | 17.690 | -0.4740 | | -0.0530 | |
| | | | 19.0900 | | 1.1333 |
| 1.00 | 15.320 | -0.6480 | | -0.0724 | |
| | | | 18.4420 | | 1.0609 |
| 2.00 | 12.080 | -0.9260 | | -0.1035 | |
| | | | 17.5160 | | 0.9574 |
| 4.00 | 7.450 | 0.4660 | | 0.0521 | |
| | | | 17.9820 | | 1.0095 |
| 0.10 | 9.780 | | | | |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.25 | 1.2350 | 1.2256 | 2.8000E-02 | | |
| 0.25 - 0.50 | 1.2256 | 1.1863 | 7.0697E-02 | | |
| 0.50 - 1.00 | 1.1863 | 1.1333 | 4.8456E-02 | 3.00 | 1.4665E-03 |
| 1.00 - 2.00 | 1.1333 | 1.0609 | 3.3944E-02 | 2.85 | 1.5319E-03 |
| 2.00 - 4.00 | 1.0609 | 0.9574 | 2.5106E-02 | | |
| 4.00 - 0.10 | 0.9574 | 1.0095 | 6.8216E-03 | | |

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# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046 | Sp. Gr. 2.813 | Bore Hole No: 10
R. L. 96.58 mt. | Final M.C. 37.26 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| 0.10 | 21.580 | | 20.0000 | | 1.2820 |
| | | -0.0640 | | -0.0073 | |
| 0.25 | 21.260 | | 19.9360 | | 1.2747 |
| | | -0.3340 | | -0.0381 | |
| 0.50 | 19.590 | | 19.6020 | | 1.2366 |
| | | -0.4860 | | -0.0555 | |
| 1.00 | 17.160 | | 19.1160 | | 1.1812 |
| | | -0.6780 | | -0.0774 | |
| 2.00 | 13.770 | | 18.4380 | | 1.1038 |
| | | -0.9780 | | -0.1116 | |
| 4.00 | 8.880 | | 17.4600 | | 0.9922 |
| | | 0.4900 | | 0.0559 | |
| 0.10 | 11.330 | | 17.9500 | | 1.0481 |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.25 | 1.2820 | 1.2747 | 2.1333E-02 | | |
| 0.25 - 0.50 | 1.2747 | 1.2366 | 6.7014E-02 | | |
| 0.50 - 1.00 | 1.2366 | 1.1812 | 4.9587E-02 | 3.15 | 1.3345E-03 |
| 1.00 - 2.00 | 1.1812 | 1.1038 | 3.5468E-02 | 3.25 | 1.1794E-03 |
| 2.00 - 4.00 | 1.1038 | 0.9922 | 2.6521E-02 | | |
| 4.00 - 0.10 | 0.9922 | 1.0481 | 7.1959E-03 | | |

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# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046
R. L. 96.58 mt.

Sp. Gr. 2.813

Bore Hole No: 10
Final M.C. 37.26 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| 0.10 | 21.580 | | 20.0000 | | 1.2820 |
| | | -0.0640 | | -0.0073 | |
| 0.25 | 21.260 | | 19.9360 | | 1.2747 |
| | | -0.3340 | | -0.0381 | |
| 0.50 | 19.590 | | 19.6020 | | 1.2366 |
| | | -0.4860 | | -0.0555 | |
| 1.00 | 17.160 | | 19.1160 | | 1.1812 |
| | | -0.6780 | | -0.0774 | |
| 2.00 | 13.770 | | 18.4380 | | 1.1038 |
| | | -0.9780 | | -0.1116 | |
| 4.00 | 8.880 | | 17.4600 | | 0.9922 |
| | | 0.4900 | | 0.0559 | |
| 0.10 | 11.330 | | 17.9500 | | 1.0481 |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.25 | 1.2820 | 1.2747 | 2.1333E-02 | | |
| 0.25 - 0.50 | 1.2747 | 1.2366 | 6.7014E-02 | | |
| 0.50 - 1.00 | 1.2366 | 1.1812 | 4.9587E-02 | 3.15 | 1.3345E-03 |
| 1.00 - 2.00 | 1.1812 | 1.1038 | 3.5468E-02 | 3.25 | 1.1794E-03 |
| 2.00 - 4.00 | 1.1038 | 0.9922 | 2.6521E-02 | | |
| 4.00 - 0.10 | 0.9922 | 1.0481 | 7.1959E-03 | | |

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# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046
R. L. 84.58 mt.

Sp. Gr. 2.857

Bore Hole No: 10
Final M.C. 25.78 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| | | | 20.0000 | | 0.7805 |
| 0.10 | 18.710 | -0.0440 | | -0.0039 | |
| | | | 19.9560 | | 0.7766 |
| 0.50 | 18.490 | -0.0580 | | -0.0052 | |
| | | | 19.8980 | | 0.7714 |
| 1.00 | 18.200 | -0.1160 | | -0.0103 | |
| | | | 19.7820 | | 0.7611 |
| 2.00 | 17.620 | -0.1980 | | -0.0176 | |
| | | | 19.5840 | | 0.7435 |
| 4.00 | 16.630 | -0.3720 | | -0.0331 | |
| | | | 19.2120 | | 0.7104 |
| 8.00 | 14.770 | 0.2940 | | 0.0262 | |
| | | | 19.5060 | | 0.7365 |
| 0.10 | 16.240 | | | | |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.50 | 0.7805 | 0.7766 | 5.5000E-03 | | |
| 0.50 - 1.00 | 0.7766 | 0.7714 | 5.8128E-03 | | |
| 1.00 - 2.00 | 0.7714 | 0.7611 | 5.8297E-03 | 1.75 | 4.5414E-03 |
| 2.00 - 4.00 | 0.7611 | 0.7435 | 5.0046E-03 | 1.65 | 5.0280E-03 |
| 4.00 - 8.00 | 0.7435 | 0.7104 | 4.7488E-03 | | |
| 8.00 - 0.10 | 0.7104 | 0.7365 | 1.9371E-03 | | |

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# TABLE - 8

## CONSOLIDATION TEST

Project No: 99046 Sp. Gr. 2.857 Bore Hole No: 10
R. L. 84.58 mt. Final M.C. 25.78 %

| PRESSURE in Kg/cm² | FINAL READING | CHANGE IN HEIGHT in mm | HEIGHT OF SAMPLE in mm | CHANGE IN VOID RATIO | VOID RATIO |
|---|---|---|---|---|---|
| | | | 20.0000 | | 0.7805 |
| 0.10 | 18.710 | -0.0440 | | -0.0039 | |
| | | | 19.9560 | | 0.7766 |
| 0.50 | 18.490 | -0.0580 | | -0.0052 | |
| | | | 19.8980 | | 0.7714 |
| 1.00 | 18.200 | -0.1160 | | -0.0103 | |
| | | | 19.7820 | | 0.7611 |
| 2.00 | 17.620 | -0.1980 | | -0.0176 | |
| | | | 19.5840 | | 0.7435 |
| 4.00 | 16.630 | -0.3720 | | -0.0331 | |
| | | | 19.2120 | | 0.7104 |
| 8.00 | 14.770 | 0.2940 | | 0.0262 | |
| | | | 19.5060 | | 0.7365 |
| 0.10 | 16.240 | | | | |

| PRESSURE RANGE in Kg/cm² | INITIAL VOID RATIO ei | FINAL VOID RATIO ef | COEFF. OF VOL. CHANGE Mv in cm²/Kg | ROOT OF TIME IN MINUTES | COEFF. OF CONSOLIDATION Cv in cm²/sec |
|---|---|---|---|---|---|
| 0.10 - 0.50 | 0.7805 | 0.7766 | 5.5000E-03 | | |
| 0.50 - 1.00 | 0.7766 | 0.7714 | 5.8128E-03 | | |
| 1.00 - 2.00 | 0.7714 | 0.7611 | 5.8297E-03 | 1.75 | 4.5414E-03 |
| 2.00 - 4.00 | 0.7611 | 0.7435 | 5.0046E-03 | 1.65 | 5.0280E-03 |
| 4.00 - 8.00 | 0.7435 | 0.7104 | 4.7488E-03 | | |
| 8.00 - 0.10 | 0.7104 | 0.7365 | 1.9371E-03 | | |

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| | | | SPT / VST | UDS / DS | per 300 mm | Natural Moisture Content in % | gms/cc Bulk | gms/cc Dry | Gravity | G % | S % | M+C % | LL % | PL % | PI % | Shrink L. % | Index in % | Test Type | c in Kg/cm² |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99.90 / 99.40 | CI - CH | BLACK PLASTIC CLAY | SPT | DS | 19 | 12.87 | | | | 0 | 0 | 100 | 36 | 22 | 14 | | | | |
| 98.40 / 97.90 | | | SPT | UDS / DS | 21 | 18.39 / 19.63 | 1.83 | 1.55 | 2.86 | 0 / 0 | 0 / 0 | 100 / 100 | 54 / 51 | 23 / 22 | 31 / 29 | | 47 / 46 | UCC | 0.66 |
| 96.90 / 95.90 | CH - SC | BLACKISH YELLOW SOFT PLASTIC CLAY WITH FINE SAND LAYERS | | UDS | | 40.57 | 1.77 | 1.26 | 2.61 | 0 | 0 | 59+41 | 53 | 27 | 26 | 19 | 41 | Tuu | 0.39 |
| 95.40 / 94.90 | MC | BLACKISH GRAY PLASTIC SOFT SILT | SPT | DS | 06 | | | | | 0 | 57 | 43 | 41 | 24 | 17 | | | | |
| 94.40 / 93.90 | | FINE TO MEDIUM SAND | SPT | DS | 04 | | | | | 0 | 18 | 52+30 | 49 | 28 | 21 | | | | |
| 92.90 | | | SPT | DS | 12 | | | | | 4 | 90 | 6 | | NP | NP | | | | |
| 91.90 | | | SPT | DS | 19 | | | | | 7 | 84 | 9 | | NP | NP | | | | |
| 90.90 | SM - SW | | SPT | DS | 23 | | | | | 0 | 92 | 8 | | NP | NP | | | | |
| 89.90 | | | SPT | DS | 24 | 18.89 | | | | 3 | 92 | 5 | | NP | NP | | | | |
| 88.90 | | | SPT | DS | 20 | | | | | 13 | 84 | 3 | | NP | NP | | | | |
| 87.90 | | | SPT | DS | 31 | | | | | 10 | 82 | 8 | | NP | NP | | | | |
| 86.90 / 86.40 | SM - SW | MEDIUM SAND WITH GRAVEL & THIN SOFT CLAY LAYERS | SPT | DS | 34 | | | | | 14 | 75 | 11 | | NP | NP | | | | |
| 84.90 / 84.40 | | | SPT | DS | 33 | | | | | 6 | 89 | 5 | | NP | NP | | | | |
| 83.40 | SP | FINE TO MEDIUM SAND AND GRAVEL WITH KANKER | | UDS | | 23.43 | 2.05 | 1.66 | 2.81 | | | | | | | | | Tcu | 0.01 |
| 81.90 | | | SPT | DS | 48 | | | | | 1 | 98 | 1 | | NP | NP | | | | |
| 80.40 | CH | YELLOW PLASTIC SILTY CLAY WITH SAND AND GRAVEL | | UDS | | 24.97 | 2.01 | 1.61 | 2.86 | | | | | | | | | UCC | 1.21 |
| 78.90 | | | SPT | DS | 70 | 28.94 | | | | 21 | 5 | 74 | 54 | 28 | 26 | | | | |
| 77.40 / 76.40 | MC | - DO - WITH THIN STONE LAYER | | UDS | | 25.17 | 2.03 | 1.62 | 2.86 | 8 | 3 | 89 | 48 | 32 | 16 | | | Tcu | 0.91 |
| 75.90 / 75.40 | | FINE TO MEDIUM SAND AND GRAVEL | SPT | DS | 100 | | | | | | | | | | | | | | |
| 74.90 / 74.40 | MI | YELLOW STIFF PLASTIC CLAYEY SILT | SPT | DS | 122 | | | | | 12 | 63 | 25 | 29 | NP | NP | | | | |
| | | TERMINATION | | | | | | | | 9 | 9 | 83 | 41 | 28 | 13 | | | | |

SPT - Standard Penetration Test
UDS - Undisturbed Sample
VST - Vane Shear Test
G - Gravel
M - Silt
PL - Plastic Limit

| | | | VST | DS | 300 mm | Desig | % | Bulk | Dry | ity | % | % | % | % | % | % | % | % | Type | Kg/cm² | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99.67 | | | | | | | | | | | | | | | | | | | | | |
| 99.17 | | BLACKISH PLASTIC CLAY | SPT | DS | 19 | | | | | | 0 | 0 | 100 | 37 | 22 | 15 | | | | | |
| | CI-CH | | | | | | | | | | | | | | | | | | | | |
| 98.17 | | | | UDS | | | | | | | | | | | | | | | | | |
| 97.67 | | | SPT | DS | 18 | | 23.34 | 1.87 | 1.52 | 2.75 | 0 | 0 | 100 | 50 | 28 | 22 | | | UCC | 0.75 | |
| | | | | | | | | | | | 0 | 0 | 62+38 | 54 | 25 | 29 | 22 | 51 | | | |
| 96.67 | | | | UDS | | | | | | | | | | | | | | | | | |
| | CI-SC | BLACKISH SOFT PLASTIC SILTYCLAY WITH FINE SAND LAYERS | | | | | 40.32 | 1.79 | 1.28 | 2.79 | 0 | 0 | 100 | 39 | 25 | 14 | | | Tuu | 0.36 | |
| 95.67 | | | SPT | DS | 06 | | | | | | 0 | 65 | 35 | 34 | 18 | 16 | | | | | |
| 95.17 | | | | | | | | | | | | | | | | | | | | | |
| 94.67 | CH | BLACKISH GRAY PLASTIC SOFT CLAY | | UDS | | | 38.83 | 1.80 | 1.30 | 2.79 | 0 | 5 | 66+29 | 56 | 24 | 32 | | 48 | UCC | 0.22 | |
| 94.17 | | | | | | | | | | | | | | | | | | | | | |
| 93.67 | ML-MI | SILTY FINE SAND WITH SOFT CLAY | SPT | DS | 03 | | | | | | 0 | 41 | 59 | 27 | 20 | 7 | | | | | |
| 93.17 | SM | FINE SAND WITH SOFT CLAY LUMPS | | | | | | | | | | | | | | | | | | | |
| 92.67 | | | SPT | DS | 05 | | | | | | 0 | 83 | 17 | 22 | NP | NP | | | | | |
| 91.67 | | | SPT | DS | 16 | | | | | | | | | | | | | | | | |
| | | FINE TO MEDIUM SAND WITH GRAVEL | | | | | | | | | | | | | | | | | | | |
| 90.67 | | | SPT | DS | 10 | | | | | | 0 | 93 | 7 | | NP | NP | | | | | |
| 89.67 | SM-SW | | SPT | DS | 18 | | | | | | 0 | 94 | 6 | | | | | | | | |
| 88.67 | | | SPT | DS | 20 | | | | | | 0 | 91 | 9 | | NP | NP | | | | | |
| 87.67 | | | SPT | DS | 18 | | | | | | | | | | | | | | | | |
| 86.67 | | | | | | | | | | | | | | | | | | | | | |
| 86.17 | | FINE TO MED. SAND WITH GRAVEL & CLAY LUMPS | SPT | DS | 21 | | | | | | 13 | 82 | 5 | | NP | NP | | | | | |
| | SM-SW | | | | | | | | | | | | | | | | | | | | |
| 84.97 | | | | DS | | | | | | | | | | | | | | | | | |
| 84.17 | | | | | | | | | | | | | | | | | | | | | |
| | | FINE TO MEDIUM SAND WITH GARVEL | | | | | | | | | | | | | | | | | | | |
| 83.17 | SM-SW | | SPT | DS | 56 | | | | | | 11 | 82 | 7 | | NP | NP | | | | | |
| 82.07 | | | | | | | | | | | | | | | | | | | | | |
| 81.67 | | BLACKISH YELLOW PLASTIC CLAY WITH KANKER | | UDS | | | 25.18 | 2.03 | 1.62 | 2.85 | 5 | 26 | 69 | 53 | 26 | 27 | | | Tcu | 0.92 | 11. |
| | CH | | | | | | | | | | | | | | | | | | | | |
| 80.17 | | | SPT | DS | 71 | | | | | | 24 | 8 | 68 | 59 | 29 | 30 | | | | | |
| 79.17 | | | | | | | | | | | | | | | | | | | | | |
| 78.67 | | BLACKISH YELLOW CLAYEY SILT W/H THIN SAND STONE LAYERS | | UDS | | | 24.43 | 2.04 | 1.64 | 2.84 | 11 | 2 | 59+28 | 43 | 30 | 13 | | | Tcu | 0.77 | 18. |
| | MI | | | | | | | | | | | | | | | | | | | | |
| 77.17 | | | SPT | DS | 58 | | | | | | 8 | 15 | 77 | 45 | 32 | 13 | | | | | |
| 76.67 | | | | | | | | | | | | | | | | | | | | | |
| | SW-SM | GRAVELLY SAND | | | | | | | | | | | | | | | | | | | |
| 75.67 | | | SPT | DS | 70/100 mm | | | | | | 10 | 79 | 11 | | NP | NP | | | | | |
| 75.17 | | | | | | | | | | | | | | | | | | | | | |
| 74.67 | MI | YELLOW PLASTIC CLAYEY SILT WITH THIN SAND STONE LAYER | SPT | DS | 90 | | 26.40 | | | | 8 | 15 | 77 | 38 | 30 | 8 | | | | | |
| 74.17 | | | | | | | | | | | | | | | | | | | | | |
| | | TERMINATION | | | | | | | | | | | | | | | | | | | |

SPT - Standard Penetration Test
UDS - Undisturbed Sample
DS - Disturbed Sample

VST - Vane Shear Test
G - Gravel
S - Sand

M - Silt
C - Clay

PL - Plastic Limit
PI - Plasticity Index

| | | | SPT VST | UDS DS | per 300 mm | Quali. Desig. | in % | Bulk | Dry | Gravity | G % | S % | M+C % | LL % | PL % | PI % | L. % | in % | Type | in Kg/cm² | i De |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99.90 | | | | | | | | | | | | | | | | | | | | | |
| 99.40 | CI | BLACK PLASTIC SILTY CLAY | SPT | DS | 06 | | 24.46 | | | | 0 | 0 | 100 | 38 | 24 | 14 | | | | | |
| 98.40 | | | | UDS | | | 24.69 | 1.85 | 1.48 | 2.76 | | | | | | | | | UCC | 1.02 | |
| 97.90 | | | SPT | DS | 06 | | 38.87 | | | | 0 | 3 | 61+36 | 54 | 29 | 25 | | 47 | | | |
| | | BLACK PLASTIC SILTY CLAY | | | | | | | | | | | | | | | | | | | |
| 96.90 | | | | UDS | | | 39.12 | 1.84 | 1.32 | 2.76 | 0 | 0 | 100 | 72 | 29 | 43 | 21 | 64 | Tuu | 0.30 | 5 |
| 95.90 | CH-SC | | SPT | DS | 06 | | | | | | 0 | 63 | 37 | 38 | 17 | 21 | | | | | |
| 94.90 | | | | UDS | | | 40.47 | 1.82 | 1.30 | 2.78 | 0 | 12 | 59+29 | 42 | 26 | 16 | | | UCC | 0.19 | |
| | | BLACKISH GRAY SOFT PLASTIC CLAY WITH SILT LAYER | | | | | | | | | | | | | | | | | | | |
| 93.90 | SM-SC | | SPT | DS | 17 | | | | | | 0 | 92 | 8 | | NP | NP | | | | | |
| 92.90 | | | SPT | DS | 18 | | | | | | | | | | | | | | | | |
| 92.40 | | | | | | | | | | | | | | | | | | | | | |
| 91.90 | | FINE TO MEDIUM SAND WITH GRAVEL | SPT | DS | 22 | | | | | | 1 | 96 | 3 | | NP | NP | | | | | |
| 90.90 | | | SPT | DS | 27 | | | | | | 5 | 91 | 4 | | NP | NP | | | | | |
| 89.90 | SP | | SPT | DS | 25 | | | | | | | | | | | | | | | | |
| 88.90 | | | SPT | DS | 33 | | | | | | 6 | 89 | 5 | | NP | NP | | | | | |
| 87.90 | | | SPT | DS | 35 | | | | | | 25 | 68 | 7 | | NP | NP | | | | | |
| 86.90 | | | | | | | | | | | | | | | | | | | | | |
| 86.40 | | | SPT | DS | 28 | | | | | | 1 | 96 | 3 | | NP | NP | | | | | |
| 86.10 | | | | DS | | | | | | | | | | | | | | | | | |
| | | MED. TO COARSE SAND WITH GRAVEL AND SOFT PLASTIC CLAY LUMPS | | | | | | | | | | | | | | | | | | | |
| 84.90 | | | SPT | DS | 51 | | | | | | 48 | 49 | 3 | | NP | NP | | | | | |
| | | SAND AND GRAVEL | | | | | | | | | | | | | | | | | | | |
| 83.40 | SP | | SPT | DS | 56 | | | | | | 9 | 85 | 6 | | NP | NP | | | | | |
| 81.90 | | | SPT | DS | 132 | | | | | | 19 | 55 | 26 | 32 | 18 | 14 | | | | | |
| | SC | BLACKISH YELLOW SAND AND KANKER WITH CLAY (BINDED LAYER) | | | | | | | | | | | | | | | | | | | |
| 80.40 | | | | UDS | | | 24.61 | 2.01 | 1.62 | 2.80 | 12 | 3 | 63+22 | 41 | 26 | 15 | | | Tcu | 0.94 | 11. |
| | | YELLOW PLASTIC CLAYEY SILT-WITH THIN SAND STONE LAYER | | | | | | | | | | | | | | | | | | | |
| 78.90 | CI-CH | | SPT | DS | 77 | | 30.03 | | | | | | | | | | | | | | |
| 77.40 | | | SPT | DS | 92 | | | | | | 16 | 9 | 75 | 61 | 32 | 29 | | | | | |
| 75.90 | | | SPT | DS | 100/150m | | | | | | | | | | | | | | | | |
| | SM | GRAVELLY SAND WITH BINDED SILT | | | | | | | | | | | | | | | | | | | |
| 74.90 | | | SPT | DS | 112/225m | | | | | | 21 | 64 | 15 | | NP | NP | | | | | |
| 74.40 | | TERMINATION | | | | | | | | | | | | | | | | | | | |

SPT - Standard Penetration Test
UDS - Undisturbed Sample
VST - Vane Shear Test
G - Gravel
M - Silt
C - Clay
PL - Plastic Limit
PI - Plasticity Index

| | | |
|---|---|---|
| 98.64/S | CI | 22/300 mm (12.06) |
| 97.64/U | | 1.95 (27.18) 1.53<br>Cuu=0.60,øuu=06.82° |
| 96.64/S | | 3/300 mm (41.44)<br>Water Table |
| 95.64/U | CI | 1.80 (40.58) 1.28<br>Ccu=0.22,øcu=08.61° |
| 94.64/S | | 7/300 mm (34.74) |
| 93.64/U | SM | 2.04 (23.86) 1.65 |
| 92.64/S | | 15/300 mm |
| 91.64/S | | 18/300 mm |
| 90.64/S | | 23/300 mm |
| 89.14/S | CH | 26/300 mm |
| 87.64/S | | 5/300 mm |
| 86.14/S | | 42/300 mm |
| 85.04 | | |
| 84.64/U | CI | 2.02 (25.53) 1.61<br>Ccu=0.98,øcu=10.36° |
| 83.14/S | | 75/300 mm |
| 81.64/S | CH | 70/225 mm |
| 81.14 | | |
| 80.14/U | MI | 2.04 (26.73) 1.61<br>Ccu=0.84,øcu=16.29° |
| 78.64/S | | 60/150 mm |
| 77.14/S | MI | 60/125 mm |
| 75.64/S | | 60/100 mm |
| 75.14 | | Termination |

| | | |
|---|---|---|
| 98.82/S | | 18/300 mm (13.08) |
| 97.82/U | CH | 1.84 (17.96) 1.56<br>Cuu=0.70,øuu=17.23° |
| 96.82/S | | 12/300 mm (34.59) |
| 95.82/U | CH | 1.84 (38.99) 1.32<br>Ccu=0.28,øcu=09.00° |
| 95.32 | | Water Table |
| 94.82/S | | 2/300 mm (43.04) |
| 93.82/U | CI | 1.83 (40.21) 1.31<br>Cu = 0.23 Kg/cm² |
| 92.82/S | | 17/300 mm (15.16) |
| 91.82/S | | 19/300 mm (14.95) |
| 90.82/S | | 23/300 mm |
| 89.32/S | SW-SM | 34/300 mm |
| 87.82/S | | 36/300 mm (11.64) |
| 86.32/S | | 37/300 mm |
| 85.52 | | |
| 84.82/S | SP | 45/300 mm (16.57) |
| 83.32/U | | 2.02 (26.07) 1.60<br>Ccu=1.13,øcu=09.85° |
| 81.82/S | CH | 65/300 mm (24.09) |
| 80.32/U | | 1.99 (22.73) 1.62<br>Ccu=0.82,øcu=15.22° |
| 78.82/S | MI | 79/300 mm (23.41) |
| 77.32/S | | 70/150 mm (20.72) |
| 75.82/S | MI | 89/150 mm (19.22) |
| 75.32 | | Termination |

| | |
|---|---|
| 99.00/U | |
| 98.00/S | |
| 97.70 | |
| 97.00/U | |
| 96.00/S | |
| 95.00/U | |
| 94.00/S | |
| 93.00/U | |
| 92.00/S | |
| 91.00/S | |
| 89.50/S | |
| 88.00/S | |
| 86.50/S | |
| 84.70 | |
| 83.50/U | |
| 82.00/S | |
| 80.50/U | |
| 79.00/S | |
| 77.50 | |
| 76.00/S | |
| 75.50 | |

NOTE :

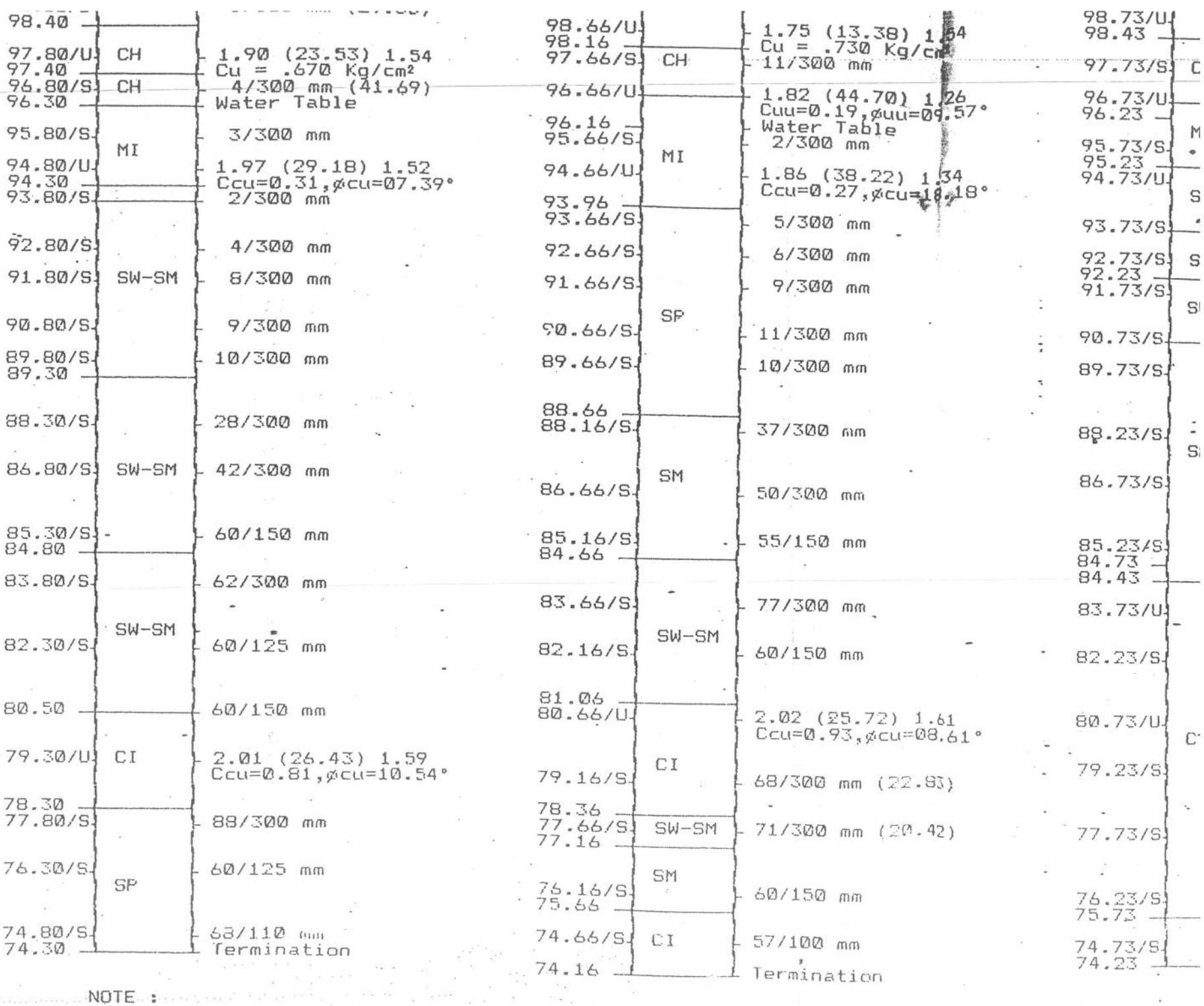
(1) Figures on the Left Side shows R.L. and Type of Sample (D - DS, U - UDS, S -

| in mt. | Classif-ication | Visual Description | Samples SPT VST | Samples UDS DS | No. of blows per 300 mm | Recov /Rock Quali. Desig | Moisture Content in % | gms/cc Bulk | gms/cc Dry | Grav ity | G % | S % | M+C % | LL % | PL % | PI % | nk L. % | Index in % | Test Type | c in Kg/cm² | ø in Degres | P in |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100.64 | | | | | | | | | | | | | | | | | | | | | | |
| 99.64 | CI | BLACKISH YELLOW PLASTIC SILTY CLAY WITH FINE SAND LAYER | | UDS | | | 10.18 | 1.57 | 1.43 | 2.89 | 0 | 13 | 87 | 31 | 22 | 9 | | | | | | |
| 99.44 | | BLACKISH YELLOW SILT & PLASTIC CLAY LAYERS | SPT | DS | 22 | | 12.06 | | | | 0 | 2 | 98 | 35 | 22 | 13 | | | | | | |
| 98.64 | | | | UDS | | | 27.18 | 1.95 | 1.53 | 2.75 | 0 | 0 | 100 | 59 | 24 | 35 | 20 | 48 | Tuu | 0.60 | 6.8° | |
| 97.64 | CI-CH | | | | | | | | | | | | | | | | | | | | | |
| 96.64 | | | SPT | DS | -03 | | 41.44 | | | | 0 | 0 | 63+37 | 43 | 25 | 18 | | | | | | |
| 95.64 | | | | UDS | | | 40.58 | 1.80 | 1.28 | 2.77 | 0 | 0 | 73+27 | 41 | 22 | 19 | | | Tcu | 0.22 | 8.6° | 0.<br>1. |
| 94.64 | | | SPT | DS | 07 | | 34.74 | | | | 0 | 61 | 39 | 26 | NP | NP | | | | | | |
| | SM | LOOSE FINE SAND | | | | | | | | | | | | | | | | | | | | |
| 93.64 | | | | UDS | | | 23.86 | 2.04 | 1.65 | 2.81 | | | | | | | | | | | | |
| 92.64 | | | SPT | DS | 15 | | | | | | 0 | 93 | 7 | | NP | NP | | | | | | |
| 91.64 | | MEDIUM SAND AND GRAVEL WITH 0.5 M THICK SOFT PLASTIC CLAYLAYER AT 13.0 M DEPTH | SPT | DS | 18 | | | | | | 1 | 92 | 7 | | NP | NP | | | | | | |
| 90.64 | | | SPT | DS | 23 | | | | | | 14 | 83 | 3 | | NP | NP | | | | | | |
| 89.14 | SW-SM | | SPT | DS | 26 | | | | | | 13 | 82 | 5 | | NP | NP | | | | | | |
| 87.64 | | | SPT | DS | 05 | | | | | | 2 | 10 | 88 | 72 | 34 | 38 | | | | | | |
| 86.14 | | | SPT | D6 | 42 | | | | | | 6 | 89 | 5 | | NP | NP | | | | | | |
| 85.04 | | | | | | | | | | | | | | | | | | | | | | |
| 84.64 | CI | SAND & GRAVEL WITH CLAY LAYERS | | UDS | | | 25.53 | 2.02 | 1.61 | 2.77 | 7 | 8 | 59+26 | 36 | 24 | 12 | | | Tcu | 0.98 | 10.4° | 1.<br>2. |
| 83.14 | | | SPT | DS | 75 | | | | | | | | | | | | | | | | | |
| | CH | BLACKISH YELLOW PLASTIC SILTY CLAY WITH KANKER | | | | | | | | | | | | | | | | | | | | |
| 81.64 | | | SPT | DS | 70/225 mm | | | | | | 8 | 25 | 67 | 51 | 23 | 28 | | | | | | |
| 81.14 | | BLACKISH YELLOW PLASTIC CLAY WITH SILT LAYES | | | | | | | | | | | | | | | | | | | | |
| | MI | | | UDS | | | 26.73 | 2.04 | 1.61 | 2.88 | 21 | 16 | 63 | 37 | 28 | 9 | | | Tcu | 0.84 | 16.3° | |
| 80.14 | | | | | | | | | | | | | | | | | | | | | | |
| 78.64 | | | SPT | DS | 60/150 mm | | | | | | | | | | | | | | | | | |
| | | BLACKISH YELLOW PLASTIC SILTY CLAY WITH THIN SAND STONE LAYERS | | | | | | | | | | | | | | | | | | | | |
| 77.14 | MI | | SPT | DS | 60/125mm | | | | | | 18 | 13 | 69 | 40 | 26 | 14 | | | | | | |
| 75.64 | | | SPT | DS | 60/100mm | | | | | | | | | | | | | | | | | |
| 75.14 | | TERMINATION | | | | | | | | | | | | | | | | | | | | |

SPT - Standard Penetration Test  VST - Vane Shear Test  M - Silt  PL - Plastic Limit

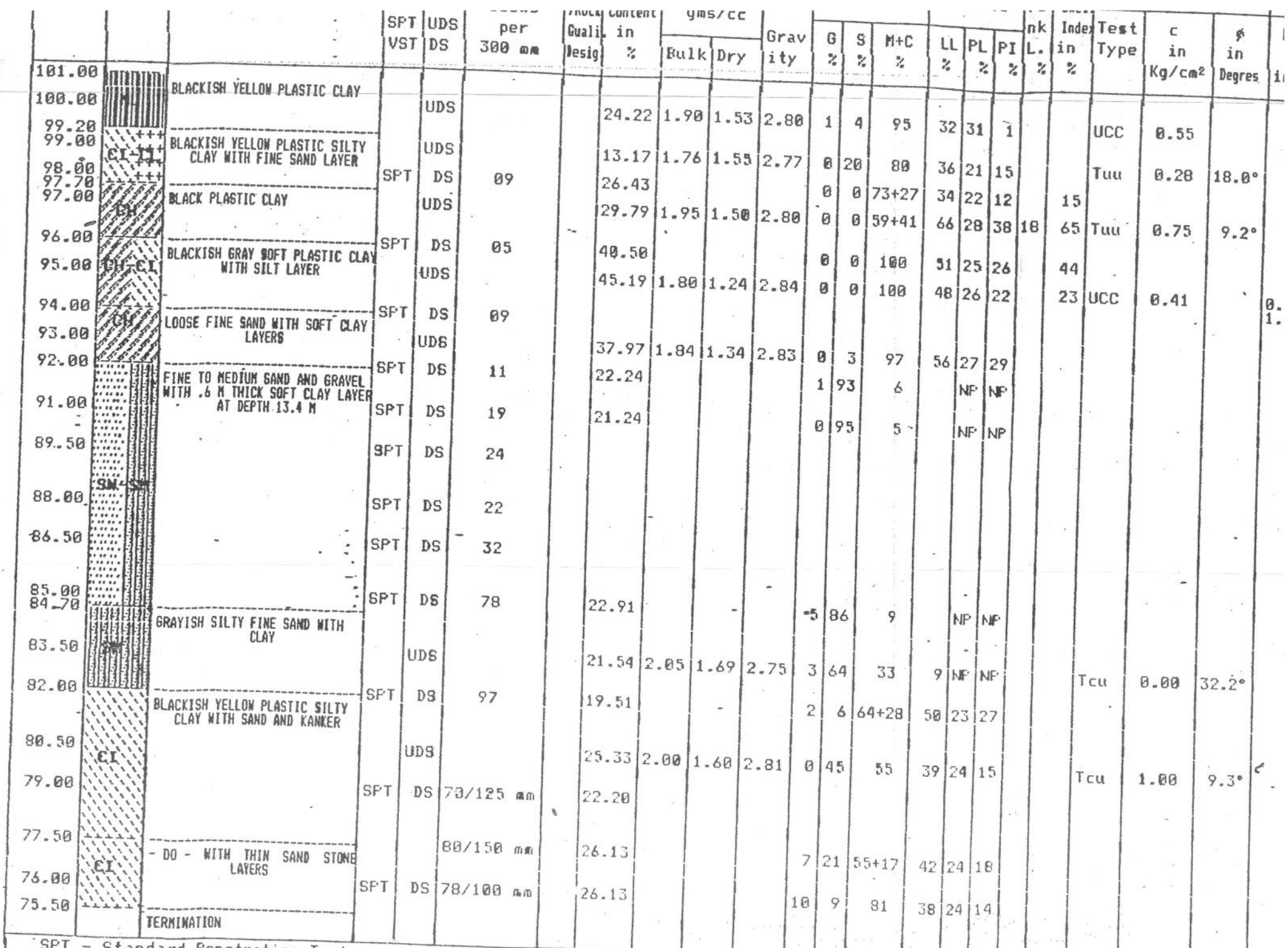
| | | | VST | DS | per 300 mm | Desig | % | Bulk | Dry | ity | % | % | % | % | % | % | % | % | | Kg/cm² | Degres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100.82 | | | | | | | | | | | | | | | | | | | | | |
| | +++++ | BLACKISH YELLOW PLASTIC SILTY CLAY WITH FINE SAND AND KANKER | | UDS | | | 12.80 | 1.70 | 1.51 | 2.91 | 0 | 20 | 80 | 31 | 20 | 11 | | | | | |
| 99.82 | +++++ | | | | | | | | | | | | | | | | | | | | |
| | +++++ | | SPT | DS | 18 | | 13.08 | | | | 0 | 1 | 99 | 34 | 23 | 11 | | | | | |
| 98.82 | +++++ | | | UDS | | | 17.96 | 1.84 | 1.56 | 2.83 | 0 | 0 | 68+32 | 51 | 24 | 27 | 19 | 44 | Tuu | 0.70 | 17.2° |
| 97.82 | CH | YELLOWISH BLACK PLASTIC SILTY | | | | | | | | | | | | | | | | | | | |
| 96.82 | CH | BLACKISH YELLOW SOFT PLASTIC CLAY WITH SILT LAYERS | SPT | DS | 12 | | 34.39 | | | | 0 | 0 | 100 | 55 | 19 | 36 | | 31 | | | |
| 95.82 | | | | UDS | - | | 38.99 | 1.84 | 1.32 | 2.73 | 0 | 0 | 100 | 54 | 23 | 31 | | 52 | Tcu | 0.28 | 9.0° |
| 95.32 | | | SPT | DS | 02 | | 43.04 | | | | 0 | 0 | 62+38 | 46 | 26 | 20 | | 21 | | | |
| 94.82 | CL | BLACKISH GRAY SOFT PLASTIC CLAY WITH SILT LAYER | | | | | | | | | | | | | | | | | | | |
| 93.82 | | | | UDS | | | 40.21 | 1.83 | 1.31 | 2.82 | 0 | 0 | 100 | 47 | 21 | 26 | | | UCC | 0.23 | |
| 92.82 | | | SPT | DS | 17 | | 15.16 | | | | 0 | 91 | 9 | | NP | NP | | | | | |
| 91.82 | SM-SP | FINE TO MEDIUM SAND AND GRAVEL WITH .4 M THICK SOFT CLAY LAYER AT DEPTH 13.3 M | SPT | DS | 19 | | 14.95 | | | | 1 | 92 | 7 | | NP | NP | | | | | |
| 90.82 | | | SPT | DS | 23 | | | | | | | | | | | | | | | | |
| 89.32 | | | SPT | DS | 34 | | | | | | | | | | | | | | | | |
| 87.82 | | | SPT | DS | 36 | | 11.64 | | | | 6 | 87 | 7 | | NP | NP | | | | | |
| 86.32 | | | SPT | DS | 37 | | | | | | | | | | | | | | | | |
| 85.52 | | | | | | | | | | | | | | | | | | | | | |
| 84.82 | SP | FINE TO MED. SAND WITH CLAYEY SILT LAYERS | SPT | DS | 45 | | 16.57 | | | | 0 | 86 | 14 | 27 | NP | NP | | | | | |
| 83.32 | | | | UDS | | | 26.07 | 2.02 | 1.60 | 2.83 | 5 | 2 | 64+29 | 52 | 24 | 28 | | | Tcu | 1.13 | 9.9° |
| 81.82 | CH | BLACKISH YELLOW PLASTIC CLAY WITH KANKER | SPT | DS | 65 | | 24.09 | | | | 9 | 12 | 79 | 79 | 29 | 50 | | | | | |
| 80.32 | | | | UDS | | | 22.73 | 1.99 | 1.62 | 2.82 | 0 | 7 | 56+37 | 47 | 30 | 17 | | | Tcu | 0.82 | 15.2° |
| | | BLACKISH YELLOW PLASTIC SILT | | | | | | | | | | | | | | | | | | | |
| 78.82 | ML | | SPT | DS | 79 | | 23.41 | | | | 5 | 3 | 92 | 42 | 31 | 11 | | | | | |
| 78.32 | | | | | | | | | | | | | | | | | | | | | |
| 77.32 | | | SPT | DS | 70/150 mm | | 20.72 | | | | | | | | | | | | | | |
| | ML | BLACKISH YELLOW PLASTIC CLAYEY SILT WITH THIN SAND STONE LAYERS | | | | | | | | | | | | | | | | | | | |
| 75.82 | | | SPT | DS | 89/150 mm | | 19.22 | | | | 12 | 7 | 81 | 45 | 32 | 13 | | | | | |
| 75.32 | | TERMINATION | | | | | | | | | | | | | | | | | | | |

SPT - Standard Penetration Test
UDS - Undisturbed Sample
VST - Vane Shear Test
G - Gravel
M - Silt
C - Clay
PL - Plastic Limit
PI - Plasticity Index




NOTE :

(1) Figures on the Left Side shows R.L. and Type of Sample (D - DS, U - UDS, S - SP




| SPT / VST | UDS / DS | Blows per 300 mm | Rock Quality Design | Moisture content in % | Bulk gms/cc | Dry gms/cc | Specific Gravity | G % | S % | M+C % | LL % | PL % | PI % | Shrinkage Limit % | Liquidity Index in % | Test Type | c in Kg/cm² | φ in Degrees |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | UDS | | | 24.22 | 1.90 | 1.53 | 2.80 | 1 | 4 | 95 | 32 | 31 | 1 | | | UCC | 0.55 | |
| | UDS | | | 13.17 | 1.76 | 1.55 | 2.77 | 0 | 20 | 80 | 36 | 21 | 15 | | | Tuu | 0.28 | 18.0° |
| SPT | DS | 09 | | 26.43 | | | | 0 | 0 | 73+27 | 34 | 22 | 12 | | 15 | | | |
| | UDS | | | 29.79 | 1.95 | 1.58 | 2.80 | 0 | 0 | 59+41 | 66 | 28 | 38 | 18 | 65 | Tuu | 0.75 | 9.2° |
| SPT | DS | 05 | | 40.50 | | | | 0 | 0 | 100 | 51 | 25 | 26 | | 44 | | | |
| | UDS | | | 45.19 | 1.80 | 1.24 | 2.84 | 0 | 0 | 100 | 48 | 26 | 22 | | 23 | UCC | 0.41 | |
| SPT | DS | 09 | | | | | | | | | | | | | | | | |
| | UDS | | | 37.97 | 1.84 | 1.34 | 2.83 | 0 | 3 | 97 | 56 | 27 | 29 | | | | | |
| SPT | DS | 11 | | 22.24 | | | | 1 | 93 | 6 | | NP | NP | | | | | |
| SPT | DS | 19 | | 21.24 | | | | 0 | 95 | 5 | | NP | NP | | | | | |
| SPT | DS | 24 | | | | | | | | | | | | | | | | |
| SPT | DS | 22 | | | | | | | | | | | | | | | | |
| SPT | DS | 32 | | | | | | | | | | | | | | | | |
| SPT | DS | 78 | | 22.91 | | | | 5 | 86 | 9 | | NP | NP | | | | | |
| | UDS | | | 21.54 | 2.05 | 1.69 | 2.75 | 3 | 64 | 33 | 9 | NP | NP | | | Tcu | 0.00 | 32.2° |
| SPT | DS | 97 | | 19.51 | | | | 2 | 6 | 64+28 | 50 | 23 | 27 | | | | | |
| | UDS | | | 25.33 | 2.00 | 1.60 | 2.81 | 0 | 45 | 55 | 39 | 24 | 15 | | | Tcu | 1.00 | 9.3° |
| SPT | DS | 70/125 mm | | 22.20 | | | | | | | | | | | | | | |
| | | 80/150 mm | | 26.13 | | | | 7 | 21 | 55+17 | 42 | 24 | 18 | | | | | |
| SPT | DS | 78/100 mm | | 26.13 | | | | 10 | 9 | 81 | 38 | 24 | 14 | | | | | |

SPT - Standard Penetration Test
UDS - Undisturbed Sample
VST - Vane Shear Test
G - Gravel
M - Silt
PL - Plastic Limit

| mt. | ication | Visual Description | Samples SPT VST | Samples UDS DS | No. of blows per 300 mm | Recov /Rock Quali Desig | Moisture Content in % | Bulk in gms/cc | Dry in gms/cc | Specific Gravity | ANALYSIS G % | ANALYSIS S % | ANALYSIS M+C % | LIMITS LL % | LIMITS PL % | LIMITS PI % | Shrink L. % | Swell Index in % | Test Type | c in Kg/cm² | ϕ in Degrees |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99.80 | | | | | | | | | | | | | | | | | | | | | |
| 98.80 | CI | BLACKISH YELLOW PLASTIC SILTY CLAY | SPT | DS | 05 | | 29.35 | | | | 0 | 0 | 100 | 42 | 23 | 19 | | | | | |
| 98.40 | CH | BLACK PLASTIC CLAY | | | | | | | | | | | | | | | | | | | |
| 97.80 | | | | UDS | | | 23.53 | 1.90 | 1.54 | 2.88 | 0 | 0 | 100 | 56 | 19 | 37 | | 58 | UCC | 0.67 | |
| 97.40 | | | | | | | | | | | | | | | | | | | | | |
| 96.80 | | BLACKISH GRAY SOFT PLASTIC CLAY | SPT | DS | 04 | | 41.69 | | | | 0 | 0 | 65+35 | 57 | 25 | 32 | 18 | 52 | | | |
| 96.30 | | | | | | | | | | | | | | | | | | | | | |
| 95.80 | MI | BLACKISH SOFT PLASTIC SILT WITH FINE SAND LAYERS | SPT | DS | 03 | | | | | | 0 | 10 | 69+21 | 36 | 25 | 11 | | 18 | | | |
| 94.80 | | | | | | | | | | | | | | | | | | | | | |
| 94.30 | | | | UDS | | | 29.18 | 1.97 | 1.52 | 2.76 | 0 | 40 | 60 | 37 | NP | NP | | | Tcu | 0.31 | 7.4° |
| 93.80 | | LOOSE SILTY FINE SAND | SPT | DS | 02 | | | | | | 0 | 90 | 10 | | NP | NP | | | | | |
| 92.80 | SM-SW | | SPT | DS | 04 | | | | | | 0 | 95 | 5 | | NP | NP | | | | | |
| 91.80 | | | SPT | DS | 08 | | | | | | 0 | 92 | 8 | | NP | NP | | | | | |
| 90.80 | | | SPT | DS | 09 | | | | | | 0 | 95 | 5 | | NP | NP | | | | | |
| 89.80 | | | SPT | DS | 10 | | | | | | | | | | | | | | | | |
| 89.30 | | | | | | | | | | | 0 | 96 | 4 | | NP | NP | | | | | |
| 88.30 | SM-SW | FINE TO MEDIUM SAND AND GRAVEL WITH .2 M THICK SOFT CLAY LAYER AT DEPTH 14.2 M | SPT | DS | 28 | | | | | | 5 | 90 | 5 | | NP | NP | | | | | |
| 86.80 | | | SPT | DS | 42 | | | | | | 23 | 73 | 4 | | NP | NP | | | | | |
| 85.30 | | | SPT | DS | 60/150 mm | | | | | | 7 | 80 | 13 | | NP | NP | | | | | |
| 84.80 | | | | | | | | | | | | | | | | | | | | | |
| 83.80 | SM-SW | FINE TO MEDIUM SAND WITH CLAY LAYERS | SPT | DS | 62 | | | | | | 0 | 95 | 5 | | NP | NP | | | | | |
| 82.30 | | | SPT | DS | 60/125 mm | | | | | | 0 | 96 | 4 | | NP | NP | | | | | |
| 80.80 | | | SPT | DS | 60/150 mm | | | | | | | | | | | | | | | | |
| 80.50 | | | | | | | | | | | 0 | 91 | 9 | | NP | NP | | | | | |
| 79.30 | CI | YELLOW PLASTIC SILTY CLAY WITH KANKER | | UDS | 85 | | 26.43 | 2.01 | 1.59 | 2.85 | 4 | 9 | 87 | 46 | 24 | 22 | | | Tcu | 0.81 | 10.5° |
| 78.30 | | | | | | | | | | | | | | | | | | | | | |
| 77.80 | | SILTY FINE SAND WITH THIN SAND STONE LAYERS | SPT | DS | 88 | | | | | | 0 | 97 | 3 | | NP | NP | | | | | |
| 76.30 | SP | | SPT | DS | 60/125 mm | | | | | | 1 | 95 | 4 | | NP | NP | | | | | |
| 74.80 | | | SPT | DS | 69/110 mm | | | | | | | | | | | | | | | | |
| 74.30 | | TERMINATION | | | | | | | | | | | | | | | | | | | |

SPT - Standard Penetration Test VST - Vane Shear Test

| Depth in mt. | Classification | Visual Description | Samples SPT/VST | Samples UDS/DS | No. of blows per 300 mm | Recov./Rock Quali. Desig | Moisture Content in % | In gms/cc Bulk | In gms/cc Dry | Grav ity | Analysis G % | Analysis S % | Analysis M+C % | Limits LL % | Limits PL % | Limits PI % | Fl nk L. % | Swell Index in % | Test Type | c in Kg/cm² | ϕ in Degres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99.66 | | | | | | | | | | | | | | | | | | | | | |
| 98.66 | CI | BLACKISH YELLOW PLASTIC SILTY CLAY AND SILT LAYER | | UDS | | | 13.38 | 1.75 | 1.54 | 2.81 | 0 | 26 | 74 | 37 | 22 | 15 | | | UCC | 0.73 | |
| 98.16 | | | | | | | | | | | | | | | | | | | | | |
| 97.66 | CH | BLACK PLASTIC CLAY | SPT | DS | 11 | | | | | | 0 | 0 | 57+43 | 60 | 29 | 31 | 22 | 52 | | | |
| 96.66 | | | | UDS | | | 44.70 | 1.82 | 1.26 | 2.89 | 0 | 0 | 60+40 | 46 | 25 | 21 | | 30 | Tuu | 0.19 | 9.6° |
| 96.16 | | BLACKISH GRAY SOFT PLASTIC CLAY WITH SILT LAYER | | | | | | | | | | | | | | | | | | | |
| 95.66 | | | SPT | DS | 02 | | | | | | 0 | 46 | 54 | 38 | NP | NP | | | | | |
| 94.66 | | | | UDS | | | 38.22 | 1.86 | 1.34 | 2.94 | 0 | 38 | 62 | 36 | NP | NP | | | Tcu | 0.27 | 18.2° |
| 93.66 | | | SPT | DS | 05 | | | | | | 0 | 96 | 4 | | NP | NP | | | | | |
| | ML-SP | | | | | | | | | | | | | | | | | | | | |
| 92.66 | | | SPT | DS | 06 | | | | | | 0 | 92 | 8 | | NP | NP | | | | | |
| 91.66 | | | SPT | DS | 09 | | | | | | | | | | | | | | | | |
| 90.66 | | | SPT | DS | 11 | | | | | | 0 | 94 | 6 | | NP | NP | | | | | |
| 89.66 | | | SPT | DS | 10 | | | | | | 0 | 90 | 10 | | NP | NP | | | | | |
| 88.66 | | | | | | | | | | | | | | | | | | | | | |
| 88.16 | | SAND WITH GRAVEL | SPT | DS | 37 | | | | | | 7 | 57 | 36 | | NP | NP | | | | | |
| | SW-SM | | | | | | | | | | | | | | | | | | | | |
| 86.66 | | | SPT | DS | 50 | | | | | | 42 | 58 | 0 | | NP | NP | | | | | |
| 85.16 | | | SPT | DS | 55/150 mm | | | | | | 9 | 80 | 11 | | NP | NP | | | | | |
| 84.66 | | | | | | | | | | | | | | | | | | | | | |
| 83.66 | | DENSE SILTY FINE SAND | SPT | DS | 77 | | | | | | 0 | 94 | 6 | | NP | NP | | | | | |
| | SW-SM | | | | | | | | | | | | | | | | | | | | |
| 82.16 | | | SPT | DS | 60/150 mm | | | | | | | | | | | | | | | | |
| 81.06 | | | | | | | | | | | | | | | | | | | | | |
| 80.66 | | BLACKISH YELLOW PLASTIC SILTY CLAY WITH KANKER | | UDS | | | 25.72 | 2.02 | 1.61 | 2.87 | 8 | 10 | 57+25 | 35 | 24 | 11 | | | Tcu | 0.93 | 8.6° |
| | CI-ML | | | | | | | | | | | | | | | | | | | | |
| 79.16 | | | SPT | DS | 68 | | 22.83 | | | | 8 | 2 | 90 | 49 | 30 | 19 | | | | | |
| 78.36 | | | | | | | | | | | | | | | | | | | | | |
| 77.66 | SW-SM | SILTY FINE SAND WITH KANKER | SPT | DS | 71 | | 20.42 | | | | 4 | 84 | 12 | | NP | NP | | | | | |
| 77.16 | | FINE TO MEDIUM SAND AND GRAVEL WITH SILTY CLAY LAYERS | | | | | | | | | | | | | | | | | | | |
| 76.16 | SW | | SPT | DS | 60/150 mm | | | | | | 11 | 71 | 18 | 30 | NP | NP | | | | | |
| 75.66 | | | | | | | | | | | | | | | | | | | | | |
| 74.66 | CI | YELLOW STIFF SLTY CLAY WITH THIN SAND STONE LAYERS | SPT | DS | 57/100 mm | | | | | | 4 | 16 | 80 | 46 | 24 | 22 | | | | | |
| 74.16 | | | | | | | | | | | | | | | | | | | | | |
| | | TERMINATION | | | | | | | | | | | | | | | | | | | |

SPT - Standard Penetration Test VST - Vane Shear Test M - Silt

| R. L. in mt. | I. S. Classification | Visual Description | Tests/ Samples SPT | Tests/ Samples UDS | Ns No. of blows per 300 mm | Core Recov /Rock Quali. Desig | Natural Moisture Content in % | Density in gms/cc Bulk | Density in gms/cc Dry | Specific Gravity | Particle Size Analysis G % | Particle Size Analysis S % | Particle Size Analysis M+C % | Atterberg Limits LL % | Atterberg Limits PL % | Atterberg Limits PI % | Shrink L. % | Swell Index in % | Shear Properties Test Type | Shear Properties c in Kg/cm² | Shear Properties ϕ in Degrees |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | VST | DS | | | | | | | | | | | | | | | | | |
| 99.58 | | | | | | | | | | | | | | | | | | | | | |
| 99.08 | SC | SILTY FINE SAND AND SILTY CLAY LAYER | SPT | DS | 06 | | | | | | 0 | 72 | 28 | 29 | NP | NP | | | | | |
| | | | | UDS | | | 26.44 | 1.95 | 1.54 | 2.86 | | | | | | | | | UCC | 0.66 | |
| 98.08 | | | | | | | | | | | | | | | | | | | | | |
| 97.58 | | BLACKISH YELLOW PLASTIC CLAY | SPT | DS | 07 | | | | | | 0 | 0 | 100 | 51 | 24 | 27 | 23 | 47 | | | |
| 96.88 | | | | | | | | | | | | | | | | | | | | | |
| 96.58 | CH | BLACKISH YELLOW SOFT PLASTIC CLAY | | UDS | | | 39.67 | 1.82 | 1.30 | 2.81 | 0 | 4 | 57+39 | 57 | 26 | 31 | | 54 | Tuu | 0.31 | 6.0° |
| | | | SPT | DS | 05 | | | | | | | | | | | | | | | | |
| 95.58 | | | | | | | | | | | | | | | | | | | | | |
| 95.08 | | | | UDS | | | 22.34 | 2.05 | 1.68 | 2.81 | 0 | 81 | 19 | 30 | NP | NP | | | Tcu | -0.00 | 30.9° |
| 94.58 | SM | SILTY FINE SAND | | | | | | | | | | | | | | | | | | | |
| 93.58 | | | SPT | DS | 15 | | | | | | | | | | | | | | | | |
| | | FINE SAND WITH GRAVEL | SPT | DS | 17 | | | | | | 1 | 93 | 6 | | NP | NP | | | | | |
| 92.58 | SM-SP | | SPT | DS | 30 | | | | | | | | | | | | | | | | |
| 91.58 | | | SPT | DS | 29 | | | | | | 0 | 96 | 4 | | NP | NP | | | | | |
| 90.58 | | | | | | | | | | | | | | | | | | | | | |
| 89.58 | | | SPT | DS | 43 | | | | | | | | | | | | | | | | |
| | | MEDIUM SAND WITH GRAVEL | SPT | DS | 42 | | | | | | 10 | 88 | 2 | | NP | NP | | | | | |
| 88.58 | | | SPT | DS | 39 | | | | | | | | | | | | | | | | |
| 87.58 | SM-SP | | | | | | | | | | | | | | | | | | | | |
| | | | SPT | DS | 40 | | | | | | 25 | 68 | 7 | | NP | NP | | | | | |
| 86.08 | | | | | | | | | | | | | | | | | | | | | |
| 85.58 | | YELLOW STIFF PLASTIC CLAY WITH KANKER | | | | | | | | | | | | | | | | | | | |
| | | | | UDS | | | 26.39 | 2.01 | 1.59 | 2.86 | 11 | 2 | 87 | 52 | 24 | 28 | | | Tcu | 0.96 | 5.4° |
| 84.58 | CH | | | | | | | | | | | | | | | | | | | | |
| | | | SPT | DS | 61 | | 37.92 | | | | | | | | | | | | | | |
| 83.08 | | | | | | | | | | | | | | | | | | | | | |
| 82.58 | | YELLOW PLASTIC CLAY WITH SAND AND KANKER | | | | | | | | | | | | | | | | | | | |
| | | | | UDS | | | 25.41 | 2.03 | 1.62 | 2.83 | 13 | 28 | 59 | 47 | 24 | 23 | | | UCC | 0.97 | |
| 81.58 | CI | | | | | | | | | | | | | | | | | | | | |
| | | | SPT | DS | 75 | | | | | | | | | | | | | | | | |
| 80.08 | | | | | | | | | | | | | | | | | | | | | |
| 79.58 | | YELLOW CLAYEY SILT & THIN SAND STONE LAYERS | | | | | | | | | | | | | | | | | | | |
| | | | SPT | DS | 100/150m | | | | | | 15 | 25 | 60 | 45 | 29 | 16 | | | | | |
| 78.58 | ML | | | | | | | | | | | | | | | | | | | | |
| | | | SPT | DS | 105 | | | | | | | | | | | | | | | | |
| 77.08 | | | | | | | | | | | | | | | | | | | | | |
| 76.58 | | | | | | | | | | | | | | | | | | | | | |
| | | SAND AND GRAVEL WITH THIN SAND STONE LAYERS | SPT | DS | 100/200mm | | | | | | 11 | 84 | 5 | | NP | NP | | | | | |
| 75.58 | | | | | | | | | | | | | | | | | | | | | |
| | SM-SW | | SPT | DS | 100/225m | | | | | | | | | | | | | | | | |
| 74.58 | | | | | | | | | | | | | | | | | | | | | |