SUB-SOIL INVESTIGATION REPORT

Government of the People's of Bangladesh
Local Government Engineering Department
Office of the Upazila Engineer
Upazila: Pirganj, District:rangpur

A Report on Sub-soil investigation for construction of 301.30m Long Psc Girder Bridge at Nundaha Ghat Over the River Kartoa at CH. 4+500 Km on Chatra GC- Gilabari Ghat Via Nischintobati Primary School Road (Road ID: 185764034) Upazila: Pirganj, District:Rangpur.

SITE LOCATION :
Upazila: Pirganj, District: Rangpur

ZONE: RANGPUR.

WORKING DATE: 14-01-2026

Report prepared by:

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PRINCIPLE ACTIVITIES INCLUDES: Sub-soil Investigation, Pile Load Test, Boring & Casting work of Cast in situ C.C/ R.C.C Pile applying both Mechanical and labor intensive method and Preparation of plan, Design & Estimates for Commercial & Residential Building and of Small Bridge.

REPORT ON SUB-SOIL INVESTIGATION:

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1. INTRODUCTION:

The TEC soil test have been awarded the opportunity to work at the proposed site for sub-soil investigation including necessary laboratory tests to prepare this report, the soil condition of the area corresponding to bearing capacity, shearing resistance and settlement characteristics. This report contains relevant data in the form of drawings, bore-logs, curves & graphs for necessary cases in addition to the abstract of the test results. Discussion and recommendation about the right type of foundation for the probable load has been made with the results obtained in the field & in the laboratory. In the present report, a brief description of the techniques employed during the field works and the methods used in the laboratory tests have been presented with significance.

2. PURPOSE:

Sub-soil investigation is a predominant feature for designing foundation of important structure in an intelligent and satisfactory manner. Both the result of field & laboratory tests are essential to obtain information's required by the structural engineers to design the right type of foundation. The purpose of various soil-strata and the determination of bearing capacity, shearing resistance & settlement characteristics of sub-soil and eventually to establish their physical properties for safe and economic design of foundation.

3. SCOPE OF WORK:

The main scopes of the investigation work were:-

a) Reconnaissance survey of the site and fixing the exact points for boring holes.
b) Drilling of exploratory borings to the proposed depths to determine the sequence of strata and the depth of each strata.
c) Execution of standard penetration test at 5 ft. intervals of depth to ascertain relative state of compaction and to closely evaluate allowable bearing capacity.
d) Collection of representative disturbed and undisturbed samples of the soil for laboratory tests and visual classifications.
e) Execution of various laboratory tests with some selected samples to determine mechanical and physical characteristics of the soil.

4. FIELD WORK:

4.1 Executive of boring by percussion method

The exploratory borings had been executed at the fixed points by the percussion method in the following way. First a 6" diameter casing pipe was driven vertically into the ground to sufficient depth. A chopping bit attached to the lower end of a drill rod was lowered into the casing pipe and moved up and down with the help of a rope. The other end of the drill rod was fitted with a swivel head shish was connected to a water pump through a high pressure hosepipe. The up and down movement of the drill rod helped the chopping bit to disintegrate the soil and make it loose. The water circulated through the swivel head into the drill rod and was emerged through the pores of the chopping bit at a high pressure. Water then rose up the annular space between the drill rode and the casing and carried the loose soil out of the drill hole which was advanced in this way. No further casing was used with the advanced of drillings. The hole was always kept full with water. As a result the excess hydrostatic pressure above the formation water pressure prevented the uncased wall of the hole from collapsing. In case of loose sandy soil, special type of drilling mud is used which forms a thin lining on the wall of the boring and prevents the hole from collapsing.

4.2 EXECUTION OF STANDARD PENETRATION TEST:

The standard penetration tests were performed at 5' intervals in all the borings. The tests were executed by using a split spoon sampler of 1.75 inches inner and 2 inches outer diameter having an overall length of 2"-8" and a 140 lb. hammer falling freely from a constant height of 30 inches on the drill rod. The number of blows necessary to produce the penetration was recorded in three different stages at six inches interval. The N-values were taken as summation of the number of blows required in 2^{nd} and 3^{rd} six inches. For executing the test the sampling spoon was attached to the lower end of the drill rod and the rod was lowered into the bore hole. The upper end of the drill rod was fitted with a socked on which a 140 lbs. hammer was allowed to fall freely form the required height of 30 inches.

4.3 COLLECTION OF UNDISTURBED SAMPLES:

Important soil properties; such as shear strength, unit weight, void ratio, compression index Cc, Unconfined compressive Undisturbed sampling is very important in soil investigation for determination of some strength, angle of internal friction etc.

The soil samples are collected from cohesive layers in thin walled sampler tubes know as Shelby tubes. The Shelby tubes are 3 inches in diameter having 1/16th inches wall thickness. The length of the tubes is usually 18 to 24 inches. Before collection of a sample the hole is washed and cleaned for some time and Shelby tube is attached to the lower end of the drill rod with the help of an adapter head. The sampler is pressed down into the ground in continuous movement until the tube except 4 inches from the top is filled with soil sample. After the Shelby tube is taken out of the hole the ends are cleaned and sealed with paraffin wax in order to prevent any change in moisture content.

5. LABORATORY TEST:

Disturbed and undisturbed soil samples collected at the time of execution of exploratory boring have been subjected to a number of laboratory tests to determine their physical and mechanical properties. The procedures of laboratory tests performed on carefully preserved samples are briefly described here.

5.1 ATERBERG LIMITS:

Physical properties of clay are greatly influenced by water content. A given soil may behave as a fluid, as a solid or as a plastic material, depending on how much water it contains. These tests indicate the range of plastic state of the materials through which the soils may be classified as if high medium and low plastic. The limit tests are arbitrary test for classification of soils. The water contains corresponding to the boundaries between the states of consistency are called the Batterers limit (liquid limit and plastic limit).

Liquid limit is the minimum water content which a clay soil just starts behaving like a fluid .It is determined with the help of a standard liquid limit device which consists of a brass cup and an arrangement to impart blows to the cup at an uniform rate. A groove of standard dimension is cut into a paste of soil contained in the cup. The water content at which 25blows are sufficient to close the standard groove is termed the liquid limit of the soil sample.

The water content at which the soil changes from liquid state to plastic state is called the liquid limit of the soil and the water content at which the soil changes from plastic state to solid state is called plastic limit of the soil.

5.2 GRAIN SIZE ANALYSIS:

A soil may contain various sizes of grains ranging from large boulders, gravel, silt clay and colloids. The dividing lines, between the size limits are arbitrary and vary with different system. According to ASTM classification –

Gravel	----------	Larger than 4.75 mm
Coarse sand	---------	4.75 to 2.00 mm
Medium sand	---------	2.00 to 0.425 mm
Fine sand ---------	0.425 to	0.075mm
Fines	----------	0.075mm.

The object of grain size analysis is to determine the size of soil grains and the percentage by weight of soil particles of different particles size comprising of soil sample. The process consists of either sieves analysis or hydrometer analysis or combined.

For hydrometer analysis, 50 gms. Of the oven dry samples is thoroughly mixed with required quantity of water in calibrated glass calibrated glass cylinder . In order to avoid flocculation's a little dispersing agent is added. The density of the suspension is measured at specified time intervals by a hydrometer of special design. At any particular time the size of the largest particles remaining in suspension of the level of the hydrometer can be computed means of stockless law whereas the weight of the particles finer than that size can be computed from the density of the suspension at the same level. The mixture is then washed through u's standard sieve. No. 200 and the fraction retained is dried. This fraction is then passed through sieve of different opening sizes. The fraction retained on each sieve is weighted for calculation of the percentage of different fraction. The results are represented by cumulative curves plotted on semi-logarithmic graph paper.

5.3 SPECIFIC GRAVITY TESTS:

The specific gravity of solid is defined as the ratio of the unit weight of solid in air to the unit weight of water. Specific gravity does not indicate the behavior of the soil mass under external load, but it is important factor, which is used in computing other soil properties, for example; the void ration of a soil, its unit weight, soil particle size determination by means of hydrometer method. To determine the specific size gravity of soil sample, 25 grams of the oven dried sample is thoroughly unversed and is placed in a calibrated cyclometer. Water is poured inside the photometer until its top is slightly below the calibrated mark. The mixture is then boiled thoroughly in order to eliminate all the air bubbles. More water is then added to the mixture till it touches the calibrated mark. It is then allowed to feel overnight, the temperature recorded and the bottle weighted.

The specific gravity G is given by:

$$Gs = \frac{Gt \chi Ws}{W_1 - W_2}$$

Where G_t = Specific gravity of water at T°C;
W_s = the weight of oven dry soil (50 gms.)
W_1 = Weight of flask + soil + water and
W_2 = Weight of flask + distilled water
G_t = at 30^0 C = 0.9758
W_s = 50 gms.
W_1 = 378.64 gms.
W_2 = 360.0 gms.

$$Gs = \frac{50 \chi .9785}{378.64 - 360.00} = \frac{49.925}{18.64} = 2.678$$

5.4 WET AND DRY DENSITY

Density of soil samples means mass of the sample per unit volume. To find the densities of soil sample in undisturbed satiate, specimens of regular sizes are trimmed out of the original samples and the same are weighed in both natural and over dry states.

Wet and dry density:

Wet density = Wt. Of sample (qu) /volume of sample $(cm)^3$
Dry density = Wet density / 1+w%

5.4 (a) DIRECT SHEAR TEST:

Direct shear test can be performed for both cohesion less & cohesive soil to determine shear strength, angle of internal friction 0 cohésion C volume change etc. under 0. 0C/& S conditions.

The test is done in a direct shear machine which consists of a normal loading is device, shearing device 2``x 2`` two pieces sample square box etc.

The rate on shearing displacement of approximately .05" per minute in offends used for a sample thickness of about 0.5 inch.

The results of a direct shear test on cohesion less & cohesive soil can be presented in a summary table & by a stress strain curves.

A stress- strain curve normally of shear stress various shear displacement for both the undisturbed and the remolded tests under a specified normally load. The normal usually varies from 1/3 TSF to 1 TSF.

Another curve of normal stress various shearing stress will give angle of internal friction and cohesion for cohesive soil.

5.5 NATURAL MOISTURE CONTENT:

Natural moisture content is one of the most important index properties of fine grained soil, which is used to determine degree of saturation, compressibility, void ratio, dry unit weight of soil, porosity of soil etc.

The water content of a soil samples is the ratio of the weight of the water in the sample to its weight. It is usually expressed as a percentage. The soil sample is weighed both in natural state and in oven dry state and the moisture content is calculated by dividing the loss of weight of the sample by the dry weight of the sample.

5.6 UNCONFINED COMPRESSION TEST:

Unconfined compression test is a simple method for determination of shearing strength of cohesive soil which is important to determine the bearing capacity of soil. As the name implies, the lateral confining pressure in an unconfined compression test is kept zero. The load is applied directly on the top of the laterally unsupported specimen and the stress and strain at failure is measured.

The specimen is prepared from the undisturbed soil sample by carefully trimming it to a cylindrical shape of 2.8 inch height and 1.4 inch dia. The specimen is then placed on the level pedestal of the unconfined compression apparatus in a vertical position .The load is applied axially on the top of the specimen and is distributed uniformly over the surface of the specimen with the help of double proving ring assembly fitted with a strain gage, fitted with the apparatus. The load is applied at such a rate that the vertical deformation of the sample is nearly 2% percent per minute in order to avoid any drainage during compression. The load is kept increasing until the specimen fails along its shearing plane. The maximum load at failure known as the unconfined compressive strength of the sample. The shearing strength of the sample is half of the unconfined compressive strength.

5.7 CONSOLIDATION TEST:

The gradual process of compression of soil under the action of static load and with decrease of void ratio due to expulsion of water from the soil pores is termed consolidation. The phenomenon is of great important in foundation engineering in the study of compressibility characteristics of a soil as the period and magnitude of settlement of a foundation depends on these characteristics.

The test is performed on a specimen circular shape of 2.5 inch. diameter and 1 inch thickness. The specimen is prepared from the undisturbed sample by carefully trimming it to the required dimension with the help of a cutting edge and a wire saw. The specimen is then placed in the consolidation ring and its top and bottom are trimmed off level with that of the ring. The specimen along with the ring on the top and the other at the bottom of the specimen. The load is then applied on the porous stone and on the specimen with the help of a level arrangement fitted with the apparatus. decreases in volume of specimen is read from a strain gauge attached to the consolidation unite at specified time intervals. the consolidation unite is always kept full with water in order to avoid evaporation of the specimen.

The load increment is allowed after each twenty-four hours. The observed readings are then plotted on semi logarithmic graph paper to give the pressure void ratio curve from which compression index Cc can be calculated. Compression index Cc is important factor governing the settlement process of underlying soils.

6. DESCRIPTION OF SOIL COMPOSITION:

a) The following terms are used in this report for description of soil composition :

Trace	:	1 to 10%
little	:	11 to 20%
some	:	20 to 35%
sandy	:	35 to 50%
clayey	:	35 to 50% clay
salty	:	35 to 50% silt

b) On the basis of N- values the relative density/consistency of soil formation may be said to very as, vary loose, medium , dense and very dense for non-cohesive soil and very soft, soft. medium, stiff , very stiff and hard for cohesive soil according to the following correlation table (After k. Tragi and R. B. peck.).

c) Based on N- values other very useful soil parameters may be obtained from the correlation charts given by different research workers. Two such useful correlations for cohesive and non-cohesive soils after proof. K. Tragic are given below.

6.1 Values of Unite Weight and Angle of International Friction of Non-Cohesive Soil... Based on N- values. Ref : (Terzaghi and Peck)

Table-1

N- values	Condition	Relative density	Angle of Internal friction	moist unit wt. in pcf	Allowable soil pressure in tsf
00 – 04	Very loose	00 – 2.00	25^0 - 30^0	70-100	0.0– 0.40
04 – 10	Loose	2.00-4.00	30^0 - 35^0	90-115	0.4 – 0.7
10 – 30	Medium	4.00-6.00	35^0 - 40^0	110-130	0.7 – 2.5
30 – 50	Dense	6.00-8.00	40^0 - 45^0	110-140	2.5 – 4.5
Over 50	Very dense	10.00-Over	45^0	130-150	Over 4.5

The co—relation between the relative density of granular soil and the standard penetration resistance is shown in the Table. In conjunction with this index, the following points must be considered.

N- Value at the shallow depth usually show lesser value than actually it appears, value should be corrected by N adjust=$N \frac{(50)}{P+10}$ where P effective over burden pressure in PSI. If sand is very fine or contains large amount of silt and in addition is in submerged condition may indicate a relative density of considerably greater than acute density of the soil formation. Under these conditions N-values greater than 15 should be corrected according to the following formula:

N`=15+0.5(N-15)

Where N = actual number of blows obtained from the test.

N = number of blows to be assumed for design purpose. The tabulated values apply for dry/moist cohesion less sand. For salty sands the bearing capacity values must be reduced by study of grain size classification and applying judgment. Correction for water table close to bottom of foundation the bearing values should be reduced to half. The bearing caules are however, not affected by the water table at a depth greater than B, width of the footing.

6.2 ALLOWABLE SOILS PRESSURE OF COHESIVE SOIL BASED ON VALUES :

From Standard penetration test:

For small jobs where a better economy can be achieved by using a conservative design value based on simple test results, the standard penetration test is used. The relationship between the standard penetration resistance, the consistency of the soil and allowable bearing capacity as indicated in the accompanying table (Tragic and peck 1948) is very approximate.

6.3 CORRALATION BETWEEN STANDARD PENETRATION RESISTANCE AND BEARING PRESSURES FOR COHESIVE SOILS .

Ref : Torah and peck, 1948 , Foundation Analysis and Design ,W.C. Tang page-120.

Standard Penetration	Description of	Qu	Sq. footing (TSF)	Cont. footing (TSF)
0-2	Very soft	0.25	0.30	0.22
2-4	Soft	0.26-0.60	0.30-0.60	0.22-0.45
4-8	Medium Stiff	0.50-1.00	0.60-1.20	0.45-0.90
8-15	Stiff	1.00-2.00	1.20-2.40	0.90-1.80
15-30	Very stiff	2.00-4.00	2.40-4.80	1.80-3.60
Over 30	Hard	Over 4.80	Over 4.80	Over 3.60

Ref: Soil Mechanics and Foundation by B. C. Punier 4th Edition, 1977.

The ultimate bearing capacity for footing or raft.

$Qu = CN_c$ $= (qu)\, N/2\ c = N_c = N_C\ 5(H.2.B/2)\ (H.2\ L/2$

Where; qu = Ultimate bearing capacity.

qu = Unconfined compressive strength.

B = Width of footing or raft.

L = Length of footing or raft.

qa = Proposed normal allowable bearing in tsf.

7. GENERAL DESCRIPTION :

THE PROPOSED STRUCTURE IS TO BE REPORT ON SUB-SOIL INVESTIGATION construction of 301.30m Long Psc Girder Bridge at Nundaha Ghat Over the River Kartoa at CH. 4+500 Km on Chatra GC- Gilabari Ghat Via Nischintobati Primary School Road (Road ID: 185764034) Upazila: Pirganj, District:Rangpur.

The sub-soil exploration of the site consists of 02 (Two) exploratory borings up to the maximum depth of 42.0 m/140 ft. from the existing ground surface. The sub-soil exploration and testing of the materials at the site has been undertaken with a view to ascertain the following geo-technical aspects regarding the construction of the

construction of 301.30m Long Psc Girder Bridge at Nundaha Ghat Over the River Kartoa at CH. 4+500 Km on Chatra GC- Gilabari Ghat Via Nischintobati Primary School Road (Road ID: 185764034) Upazila: Pirganj, District:Rangpur.

at the site

---Physical and Engineering properties of different soil formation.
---Allowable bearing capacity of proposed foundation.
---Maximum consolidation settlement of compressible formation.
---Prediction of practical and economic type of foundation.

8. DISCUSSIONS OF FIELD ON LABORATORY TESTS:

The project site under investigation consists of a small area. The geo-technical and engineering properties is in general behaves. The strength properties of all the boreholes behave similarity.

The summery of field and Laboratory tests result shows that, the underlying materials of all the bore hole is in medium condition and sandy in nature. The subsoil is dense clay from 11'-0" from the EGL. The admixtures are consisting major parts of sand up to the depth of 11'-0" from EGL. But the textural classification of soil and engineering properties are gradually increased in between the depth of 11'-0" to 135'-0" from EGL. The subsoil is Fine from 11'-0" from the EGL. The subsoil is Gray Clay from 11'-0" to 18'-0" from the EGL. The subsoil is Fine to Medium Sand from 18'-0" to 43'-0" from the EGL. The subsoil is Clay from 43'-0" to 55'-0" from the EGL. The subsoil is Fine to Medium Sand from 55'-0" to 100'-0" from the EGL. The subsoil is dense Gray Medium sand from 100'-0" to 140'-0" from the end of the investigated for that borehole (i.e. 140ft) from the EGL.

9. OBSERVATION:

From the previous discussions, the soil profile bore logs and summary sheet of the result, it is observed that.

- **At BH # 01** Underlying materials of the borehole is in loose Condition and cohesive in nature and consisting of Gray Medium Sand above 11'-0". The subsoil is dense clay from 11'-0" from the EGL. The admixtures are consisting major parts of sand up to the depth of 11'-0" from EGL. But the textural classification of soil and engineering properties are gradually increased in between the depth of 11'-0" to 135'-0" from EGL. The subsoil is Fine from 11'-0" from the EGL. The subsoil is Gray Clay from 11'-0" to 18'-0" from the EGL. The subsoil is Fine to Medium Sand from 18'-0" to 43'-0" from the EGL. The subsoil is Clay from 43'-0" to 55'-0" from the EGL. The subsoil is Fine to Medium Sand from 55'-0" to 100'-0" from the EGL. The subsoil is dense Gray Medium sand from 100'-0" to 140'-0" from the end of the investigated for that borehole (i.e. 140ft) from the EGL.

- **At BH # 02** Underlying materials of the borehole is in loose Condition and cohesive in nature and consisting of Gray Medium Sand above 11'-0". The subsoil is dense clay from 11'-0" from the EGL. The admixtures are consisting major parts of sand up to the depth of 11'-0" from EGL. But the textural classification of soil and engineering properties are gradually increased in between the depth of 11'-0" to 135'-0" from EGL. The subsoil is Fine from 11'-0" from the EGL. The subsoil is Gray Clay from 11'-0" to 18'-0" from the EGL. The subsoil is Fine to Medium Sand from 18'-0" to 43'-0" from the EGL. The subsoil is Clay from 43'-0" to 55'-0" from the EGL. The subsoil is Fine to Medium Sand from 55'-0" to 100'-0" from the EGL. The subsoil is dense Gray Medium sand from 100'-0" to 140'-0" from the end of the investigated for that borehole (i.e. 140ft) from the EGL.

- Subsoil layer is more or less same in case of **BH # 1, BH # 2,** From the very beginning up to the end and so the characteristic of sub-soil is quite similar in color, composition and consistency.

RECOMMENDATION:

The most appropriate type of foundation for a structure depends on several factors, among them -

1. The type of the structure.
2. The framing pattern of the structure.
3. The loading condition of the structure.
4. The economy of the structure is important.

IN THE PRESENT CASE OF STUDY, THE PROPOSED STRUCTURE IS TO BE **construction of 301.30m Long Psc Girder Bridge at Nundaha Ghat Over the River Kartoa at CH. 4+500 Km on Chatra GC-Gilabari Ghat Via Nischintobati Primary School Road (Road ID: 185764034) Upazila: Pirganj, District:Rangpur.**

But nothing is known about the framing & loading pattern of the structure.

The R.C.C Cast in situ pile may use with following category (F.S=3.0):

SUGESSION NO: 01 (One)

LENGTH OF PILE FROM EGL.	Average load bearing capacity of 500mm/20" dia R.C.C cast in situ pile. (F.S=3.0)	Average load bearing capacity of 600mm/24" dia R.C.C cast in situ pile. (F.S=3.0)
24.0m/80'-0"	140.00 Tone	195.00 Tone
25.5m/85'-0"	150.00 Tone	200.00 Tone
27.0m/90'-0"	160.00 Tone	210.00 Tone
30.0m/100'-0"	175.00 Tone	220.00 Tone
33.0m/110'-0"	190.00 Tone	230.00 Tone
36.0m/120'-0"	210.00 Tone	240.00 Tone
Particularly at and around for B.H-01,		

(Ref: Soil Mechanics and Foundation engineering by Dr. KRARORA.)

NOTE The foundation base should be kept dry in the construction period.

a) 1Tsf=1.094 Kg/cm² =2 ksf,
b) 1Ton = 2000 lbs.=1000 kg =9.96 KN.
c) 1m=3.28 ft,EGL=Existing Ground level & F.S =Factor of safety

a. **The design Engineer will have to be decided the exact type size & depth of foundation depending upon the various type structural loads and loading pattern imposed on it.**
b. **However, the plate bearing test or other field test must confirm the improved bearing capacity. Hence the designer should be taken final decision in this respect.**

24/11/26

Recommended By,

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F/14483 Fellow Member (IEB)
Structural Designer,
(CONSULANT)
Rangpur Engineering Construction
& Design Consultancy.

RECOMMENDATION:

RANGPUR SUB-SOIL INVESTIGATION Date:.....

The most appropriate type of foundation for a structure depends on several factors, among them

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LENGTH OF PILE FROM EGL.	Average load bearing capacity of 500mm/20" dia R.C.C cast in situ pile. (F.S=3.0)	Average load bearing capacity of 600mm/24" dia R.C.C cast in situ pile. (F.S=3.0)
24.0m/80'-0"	105.00 Tone	145.00 Tone
25.5m/85'-0"	150.00 Tone	200.00 Tone
27.0m/90'-0"	150.00 Tone	210.00 Tone
30.0m/100'-0"	170.00 Tone	230.00 Tone
33.0m/110'-0"	190.00 Tone	240.00 Tone
36.0m/120'-0"	220.00 Tone	250.00 Tone
Particularly at and around for B.H-02,		

(Ref: Soil Mechanics and Foundation engineering by Dr. KRARORA.)

NOTE The foundation base should be kept dry in the construction period.

d) 1Tsf=1.094 Kg/cm² =2 ksf,
e) 1Ton = 2000 lbs.=1000 kg =9.96 KN.
f) 1m=3.28 ft,EGL=Existing Ground level & F.S =Factor of safety

c. **The design Engineer will have to be decided the exact type size & depth of foundation depending upon the various type structural loads and loading pattern imposed on it.**
d. **However, the plate bearing test or other field test must confirm the improved bearing capacity. Hence the designer should be taken final decision in this respect.**

24/12/26

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Structural Designer,
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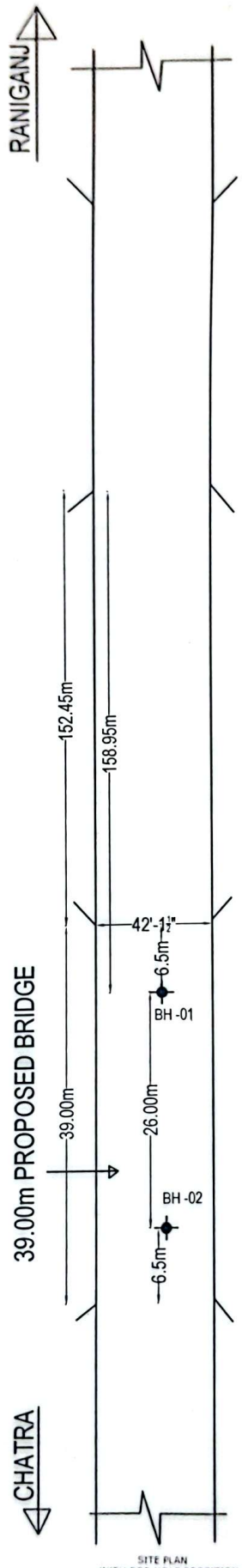
Project: Consruction of 301.30m Long ~~Rcc~~ Psc Girder Bridge
Client: *LGED*
Location: *Upazila: Pirganj, Distr:Rangpur.*

DWG. NAME:
Site Plan



SITE PLAN
WITH BOR HOLE FOSSITION

০৪.০২.২৬
মোঃ আসাদুজ্জামান রাজী
উপজেলা প্রকৌশলী
পীরগঞ্জ, রংপুর।

০৪.০২.২৬
মোঃ আসাদুজ্জামান হোসেন
উপজেলা প্রকৌশলী
এল, জি, ইডি
পীরগঞ্জ, রংপুর।

08.02.2026
Tanimul Reza Rahat
Assistant Field Engineer
CEER, LGED, Rangpur & Lalmonirhat

RANGPUR ENGINEERING CONSTRUCTION & DESIGN CONSULTANCY
RANGPUR SUB-SOIL INVESTIGATION

Head Office: Aladiba Bhovan, 2ND Floor, Station Road, Shapla Chattar, Kotwali, Rangpur.
E-mail: recdc6868@gmail.com/ noormohammod2028@gmail.com
Mobile: 01755-516868, 01517-842028

RANGPUR SUB-SOIL INVESTIGATION Date:.....

FIELD DATA RECORDING SHEET

Client Name:		Location:			
Work Stared:		Work Comp		Date:	14-01-2026

BORE HOLE NO - 01

Depth of water table :		From soil surface:	EGL = 19.587
Depth of soil surface :		From road level:	

Depth of (m)	Depth of (ft)	Penetration Data 6in	12in	18in	SPT	Soil Color	Soil type
1.50m	05'-0"	1	1	1	2	Grey	very Loose fine sand
2.44m	07'-6"						
3.00m	10'-0"	3	3	3	6	"	Loose - "
4.50m	15'-0"	2	1	2	3	"	very Loose - clay & silt
6.00m	20'-0"	4	5	6	11	"	fine sand
7.50m	25'-0"	5	6	7	13	"	"
9.00m	30'-0"	6	7	8	15	"	"
10.5m	35'-0"	6	8	10	18	"	fine to medium - medium
12.0m	40'-0"	7	9	12	21	"	" " "
13.5m	45'-0"	2	2	2	4	"	very Loose - clay
15.0m	50'-0"	2	2	4	6	"	Loose - clay with fine sand
16.5m	55'-0"	2	2	8	10	Grey	fine sand
18.0m	60'-0"	4	8	12	20	"	" " medium
19.5m	65'-0"	5	9	13	22	"	" " "
21.0m	70'-0"	6	13	15	28	"	" " "
22.5m	75'-0"	21	45	5-	50(4" over)	Brown	fine to medium / very Dence-
24.0m	80'-0"	18	43	7 -	50(4" ")	"	" "
25.5m	85'-0"	16	32	18	50(2" ")	"	" "
27.0m	90'-0"	17	39	11	50(3" ")	"	"
28.5m	95'-0"	18	42	08	50 (4" ")	"	" "
30.0m	100'-0"	18	#37	13	50(5" ")	"	" "
31.5m	105'-0"	23	41	9	50(3.0")	Grey	fine sand - / very Dence
33.0m	110'-0"	25	50	6" over		"	" "
34.5m	115'-0"	28	50	6"	"	"	" "
36.0m	120'-0"	33	50	6"	"	"	" "
37.5m	125'-0"	35	50	6.5"	over	"	medium sand / very D.
39.0m	130'-0"	37	50	7"	"	"	"
40.5m	135'-0"	42	50	8"	"	"	"
42.0m	140'-0"	40	50	9"-	over	"	"
43.5m	145'-0"						
45.0m	150'-0"						

NOTE: (i) 11'-0" to 18'-0" dry
(ii) 43'-49'-10" dry (iii) 52'-6" to 55'-0"

01.	Project Engineer Signature & Date:	02.	Field Data Recording By:
1	14.01.26		

A copy of this Field-Data-Recording-Sheet must be handed-over to the client, after Complying each borehole.

AFE, CIBRR

মো: আলমগীর হোসেন
উপ-সহকারী প্রকৌশলী
এল, জি, ইডি
পীরগঞ্জ, রংপুর।

মো: আলী ইমান বাপ্পী
উপজেলা প্রকৌশলী
এলজিইডি
পীরগঞ্জ, রংপুর

8/02/26

RANGPUR ENGINEERING CONSTRUCTION & DESIGN CONSULTANCY

RANGPUR SUB-SOIL INVESTIGATION

Head Office: Aladiba Bhovan, 2nd Floor, Station Road, Shapla Chattar, Kotwali, Rangpur.
E-mail: recdc6868@gmail.com/ noormohammod2028@gmail.com
Mobile: 01755-516868, 01517-842028

RANGPUR SOIL INVESTIGATION ★ Date:.....

FIELD DATA RECORDING SHEET

Client Name:		Location:	
Work Stared:		Work Comp	Date: 15-01-2026 – 16-01-2026

BORE HOLE NO - 02

Depth of water table :		From soil surface:	EGL. 19.382
Depth of soil surface :		From road level:	

Depth of		Penetration Data			SPT	Soil Color	Soil type
(m)	(ft)	6in	12in	18in			
1.50m	05'-0"	2	2	2	4	Grey	Clay / very Loose
2.44m	07'-6"						
3.00m	10'-0"	2	2	3	5	"	Fine Sand / Loose
4.50m	15'-0"	3	3	4	7	"	"
6.00m	20'-0"	2	2	2	4	"	Clay / very Loose
7.50m	25'-0"	3	4	5	9	"	fine to medium / medium
9.00m	30'-0"	4	5	6	11	"	" " "
10.5m	35'-0"	5	7	7	14	"	" " "
12.0m	40'-0"	5	7	8	15	"	" " "
13.5m	45'-0"	2	2	3	5	"	Clay / very Loose
15.0m	50'-0"	2	2	3	5	"	" "
16.5m	55'-0"	5	7	9	16	"	fine to medium / medium
18.0m	60'-0"	3	5	8	13	"	" " "
19.5m	65'-0"	8	14	17	31	"	" / very Dense
21.0m	70'-0"	10	15	18	33	"	medium Sand / " "
22.5m	75'-0"	12	14	18	32	"	" " "
24.0m	80'-0"	20	25	25	50 (1.5") over	"	" " "
25.5m	85'-0"	23	37	13	50 (5") over	Brown	" " "
27.0m	90'-0"	23	36	14	50 (4.5" over)	"	" " "
28.5m	95'-0"	27	42	8	50 (3" over)	"	" Coarse "
30.0m	100'-0"	21	37	13	50 (4" over)	"	" "
31.5m	105'-0"	29	41	9	50 (5" over)	"	" "
33.0m	110'-0"	25	30		(50) 8" over	"	" "
34.5m	115'-0"	28	50		8" over	"	medium to Coarse / very D.
36.0m	120'-0"	26	50		7 " over	"	" "
37.5m	125'-0"	27	50		5" over	"	" "
39.0m	130'-0"	29	50		5" over	"	" "
40.5m	135'-0"	43	50	9" over		"	" "
42.0m	140'-0"	42	50	10" over			
43.5m	145'-0"						
45.0m	150'-0"						

NOTE: ① 11'-6" to 17'-6" = dry ⑪ 43' to 42'-6" = dry

01.	Project Engineer Signature & Date:	02.	Field Data Recording By:
	16.01.26		16-1-26

A copy of this Field-Data-Recording-Sheet must be handed-over to the client, after Complying each borehole.

AFE, CSBRD

16.1.26

মোঃ শাহাবুদ্দিন হোসেন
উপ-সহকারী প্রকৌশলী
এল, জি, ইডি
পীরগঞ্জ

মোঃ আসাদুজ্জামান বাপ্পী
উপজেলা প্রকৌশলী

RECDC SUB-SOIL INVESTIGATION

RANGPUR SUB-SOIL INVESTIGATION Date:.....

Project: Consruction of 301.30m Long Rcc Psc Girder Bridge

Client: *LGED*

Location: *Upazila: Pirganj, Distr:Rangpur.*

BORE - LOG OF BORE - HOLE NO : BH - 01

(Bore - Hole locations are to be shown in a Sketch-Map, mentioning elevation)

Depth of Boring : (-) 42.0m/ 140ft

Dia of Boring : (-) 0'-4"

Date: 14-01-2026

EGL=19.587M

Depth from	Sample Depth	N value	LOG	DIA OF BORING	SPT(N-value) in Graph	Soil Type
(m)	(ft)		#		0 5 10 15 20 25 30 35 40 45 50	
1.50m	5'-0"	02		100 mm		Gray/ Very Loose/ Fine Sand
3.00m	10'-0"	06				
4.50m	15'-0"	03				Gray/ Very Loose Clay
6.00m	20'-0"	11				
7.50m	25'-0"	13				Gray/ Medium Fine to Medium Sand
9.00m	30'-0"	15				
10.5m	35'-0"	18				
12.0m	40'-0"	21				
13.5m	45'-0"	04				
15.0m	50'-0"	06				Gray/ Very Loose Clay
16.5m	55'-0"	10				
18.0m	60'-0"	20				Gray/ Very Danse/ Medium Sand
19.5m	65'-0"	22				
21.0m	70'-0"	28				
22.5m	75'-0"	50 (4"Over)				
24.0m	80'-0"	50 (4"Over)				
25.5m	85'-0"	50 (2"Over)				
27.0m	90'-0"	50 (3"Over)				
28.5m	95'-0"	50 (4"Over)				
30.0m	100'-0"	50 (5"Over)				
31.5m	105'-0"	50 (5"Over)				Gray/ Medium Fine to Medium Sand
33.0m	110'-0"	50 (6"Over)				
34.5m	115'-0"	50 (6"Over)				
26.0m	120'-0"	50 (6"Over)				
37.5m	125'-0"	50 (7"Over)				
39.0m	130'-0"	50 (7"Over)				
40.5m	135'-0"	50 (8"Over)				
42.0m	140'-0"	50 (9"Over)				

Tanmur Reza Rahat
Assistant Field Engineer
08.02.26

8.02.26

08.02.26

RECDC SUB-SOIL INVESTIGATION

HAMIDUR SUB-SOIL INVESTIGATION Date.....

Project: Consruction of 301.30m Long Rcc Psc Girder Bridge
Client: *LGED*
Location: *Upazila: Pirganj, Distr:Rangpur.*

BORE - LOG OF BORE - HOLE NO : BH - 02

(Bore - Hole locations are to be shown in a Sketch-Map, mentioning elevation)

Depth of Boring : (-) 42.0m/ 140ft
Dia of Boring : (-) 0'-4"
EGL=19.587M

Date: 15-01-2026
TO 16-01-2026

Depth from	Sample Depth	N value	LOG	DIA OF BORING	SPT(N-value) in Graph	Soil Type
(m)	(ft)		#		0 5 10 15 20 25 30 35 40 45 50	
1.50m	5'-0"	04		100 mm		Gray/ Very Loose/ Fine Sand
3.00m	10'-0"	05				
4.50m	15'-0"	07				Gray/ Very Loose Clay
6.00m	20'-0"	04				
7.50m	25'-0"	09				Gray/ Medium Fine to Medium Sand
9.00m	30'-0"	11				
10.5m	35'-0"	14				
12.0m	40'-0"	15				
13.5m	45'-0"	05				Gray/ Very Loose Clay
15.0m	50'-0"	05				
16.5m	55'-0"	16				Gray/ Very Danse/ Medium Sand
18.0m	60'-0"	13				
19.5m	65'-0"	31				
21.0m	70'-0"	33				
22.5m	75'-0"	32				
24.0m	80'-0"	50 (1.5"Over)				
25.5m	85'-0"	50 (4"Over)				
27.0m	90'-0"	50 (5"Over)				
28.5m	95'-0"	50 (4"Over)				
30.0m	100'-0"	50 (5"Over)				
31.5m	105'-0"	50 (8"Over)				Gray/ Medium Fine to Medium Sand
33.0m	110'-0"	50 (8"Over)				
34.5m	115'-0"	50 (7"Over)				
36.0m	120'-0"	50 (8"Over)				
37.5m	125'-0"	50 (9"Over)				
39.0m	130'-0"	50 (9"Over)				
40.5m	135'-0"	50 (9"Over)				
42.0m	140'-0"	50 (10"Over)				

LEGEND

CLAY Silty Clay Fine Sand Medium Sand Coarse Sand Gravel

08.02.26
Nimai Chandra Barmahat
Assistant Field Engineer

8.02.26

মো: [illegible]
উপজেলা প্রকৌশলী

Meyerhof's Correlation Between S.P.T.-N and Allowable bearing capacity for 25 mm Settlement

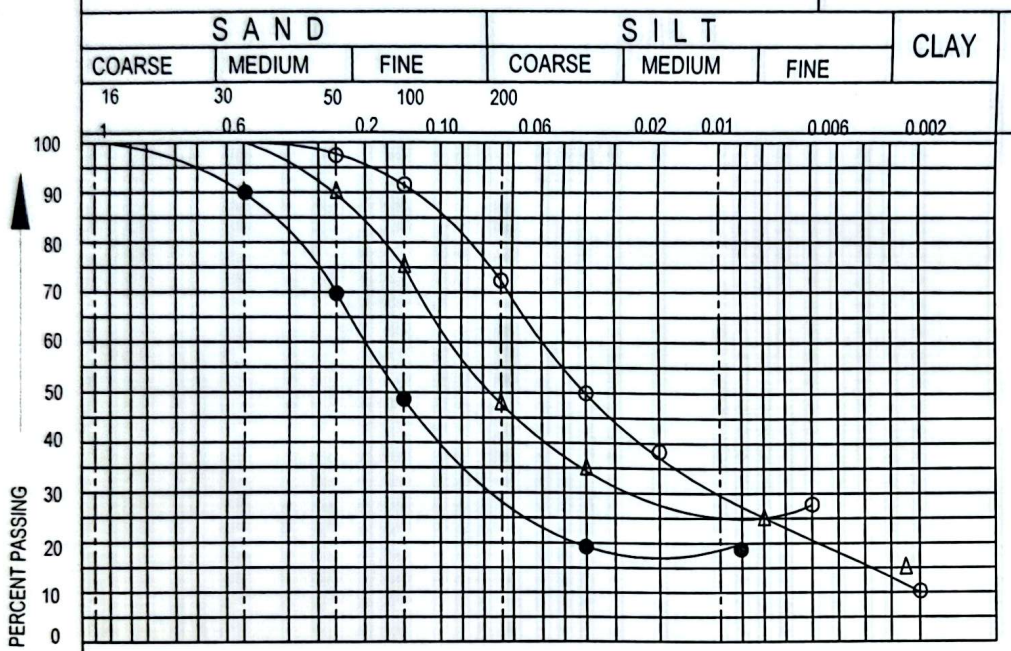
(Ref:Principales of Foundation Engineering,4th edition,page-259)

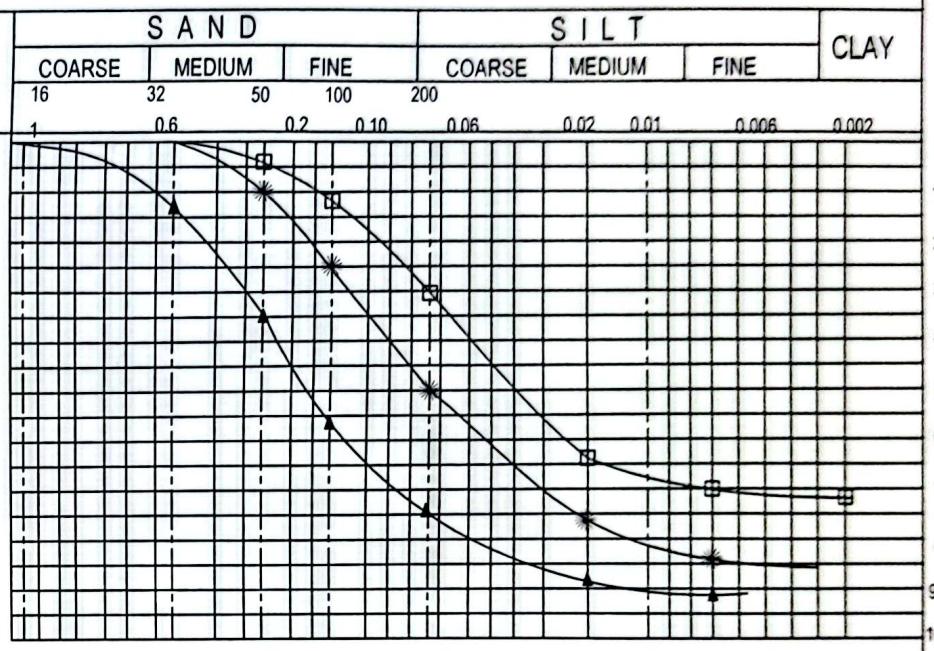
BRAJA.M.DAS

Bore Hole No	Depth in feet	Field SPT Values	Correct SPT Values	Allowable bearing capacity in TSF with FS=3
				Square Footing B ≤4 feet
BH - 1	5	2	2	0.25
	10	6	6	0.75
	15	3	3	0.38
	20	11	11	1.38
	25	13	13	1.63
	30	15	15	1.88
	35	18	17	2.06
	40	21	18	2.25
	45	4	4	0.50
	50	6	6	0.75
	55	10	10	1.25
	60	20	18	2.19
	65	22	19	2.31
	70	28	22	2.69
	75	50	33	4.06
	80	50	33	4.06
2	5	4	4	0.50
	10	5	5	0.63
	15	7	7	0.88
	20	4	4	0.50
	25	9	9	1.13
	30	11	11	1.38
	35	14	14	1.75
	40	15	15	1.88
	45	5	5	0.63
	50	5	5	0.63
	55	16	16	1.94
	60	13	13	1.63
	65	31	23	2.88
	70	33	24	3.00
	75	32	24	2.94
	80	50	33	4.06

GRAIN SIZE DISTRIBUTION

Project: Consruction of 301.30m Long Rcc Psc Girder Bridge
Client: *LGED*
Location: *Upazila: Pirganj, Distr:Rangpur.*





SYMBOL	BORI	SAMPLE	DEPTH IN FT	N.M.C	ATER BEKG LIMIT LL	PL	PI	SPECIFIC GRAVITY	SOIL CLASSFICATION	SAND %	SILT %	CLAY %
○—○—○	01	10	50.00						Fine Sand	10	15	75
◁—◁—◁		15	75.00						Fine to Medium Sand Sand	80	10	10
●—●—●		18	90.00						Fine to Medium Sand Sand	85	10	05
—◂—◂—	02	20	100.00						Medium to Coarse Sand	70	15	15
✳—✳—✳		16	80.00						Medium Sand	75	13	12
□—□—□		12	60.00						Fine to Medium Sand	80	10	10

RANGPUR SUB-SOIL INVESTIGATION Date:

RECDC SUB - SOIL INVESTIGATION		SUMMARY OF LABORATORY TEST RESULTS					Project: Consruction of 301.30m Long Rcc Psc Girder Bridge. Client: *LGED* Location: *Upazila: Pirganj, Distr:Rangpur.*						
Bore Hole No.		BH-01						BH-02					
Sample No.		D-03	D-05	D-10	D-14	D-18	D-22	D-04	D-08	D-12	D-16	D-20	D-24
Depth In Feet.		15'-0"	25'-0"	50'-0"	70'-0"	90'-0"	110'-0"	20'-0"	40'-0"	60'-0"	80'-0"	100'	120'
Moisture Content (Natural).		24.0	22.0	26.0	23.0	25.0	23.0	25.0	26.0	24.0	26.0	24.0	26.0
Specific Gravity.		2.68	2.69	2.67	2.60	2.60	2.62	2.65	2.60	2.79	2.62	2.59	2.62
Atterberg Limits	*Liquid Limit. Law%*	35.0	30.0	33.0	34.0	28.0	33.0	35.0	32.0	36.0	32.0	30.0	35.0
	Plastic Limit Pw%	25.0	25.0	25.0	20.0	20.0	15.0	20.0	22.0	20.0	18.0	15.0	12.0
Density in gm/c.c	*Wet Density*	112.0	115.0	110.0	112.0	117.0	110.0	114.0	115.0	118.0	117.0	115.0	120.0
	Dry Density	85.0	82.0	84.0	83.0	82.0	82.0	84.0	83.0	82.0	85.0	80.0	70.0
Grain Size Analysis	*Sand (%)*	12.0	60.0	13.0	70.0	83.0	95.0	55.0	70.0	80.0	85.0	90.0	95.0
	Silt & Clay (%)	88.0	40.0	67.0	30.0	17.0	05.0	45.0	30.0	20.0	15.0	10.0	05.0
Consolidation Test	*Natural Void Ration*	-	-	-	-	-	-	-	-	-	-	-	-
	Compression Index	-	-	-	-	-	-	-	-	-	-	-	-
	Stress (T.S.F)	-	-	-	-	-	-	-	-	-	-	-	-
Unconfined Compression Test	*Strain at Failure (%)*	-	-	-	-	-	-	-	-	-	-	-	-
	Stress T.S.F)	-	-	-	-	-	-	-	-	-	-	-	-
	Stress (Ibs./sq inc)	-	-	-	-	-	-	-	-	-	-	-	-
Tri-Axial Compression ØC Tests	*Sensitivity*	-	-	-	-	-	-	-	-	-	-	-	-
	C (P.S.I)	-	-	-	-	-	-	-	-	-	-	-	-
Direct Shear Tests	*Ø (Degree)*	16	11	12	13	15	16	15	14	14	113	14	15
	CohesionØ(Degree)	0.14	0.12	0.13	0.14	0.12	0.14	0.15	0.16	0.15	0.13	0.1	0.16

RANGPUR SUB SOIL INVESTIGATION Date