RPT No: CGL/RT/324/24

SOIL INVESTIGATION REPORT

CLIENT
THE SECRETARY
KERALA CRICKET ASSOCIATION
K.C.A COMPLEX, T.C 28/152
SASTHAMKOVIL ROAD
THYCADU
THIRUVANANTHAPURAM

PROJECT
COMMERCIAL BUILDING & FLOOD LIGHT AT CRICKET STADIUM

SITE
KRISHNAGIRI, WAYANAD

Period of Investigation: 06/01/2025 to 28/02/2025

CGL GEOINFORMATICS
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REPORT ON SUB SOIL EXPLORATION FOR THE PROPOSED COMMERCIAL BUILDING (G+2) & FLOOD LIGHT FOR THE SECRETARY, KERALA CRICKET ASSOCIATION AT KRISHNAGIRI, WAYANAD

1. INTRODUCTION

There is a proposal to construct a commercial building (G+2) & flood light at Krishnagiri Cricket ground, Wayanad forThe Secretary, Kerala Cricket Association. It is decided to carry out a detailed sub soil investigation for finding the Safe bearing capacity and for the selection of appropriate foundations.

The work was awarded to M/s. CGL Geoinformatics, 53/1252, Paradise Road, Vyttila P.O, Ernakulam 682019. A detailed investigation and laboratory studies were carried out from 06/01/2025 to 20/01/2025.

This report summarizes the subsoil investigations and furnishes the recommendation on the type of the foundation to be provided.

2. SCOPE OF WORK

The scope of work at this site, entrusted with us comprised of

a) Mobilization of boring rigs with all necessary equipments and skilled/unskilled personnel for the field work.
b) Boring four bore holes of diameter 150 mm, with drilling equipment in sand, silt, clay and gravel to a maximum depth as recommended by the geotechnical consultant or till the spoon rebound whichever is earlier at the selected location fixed by the client.
c) Conduction of Standard Penetration tests in the bore holes at every 1.0 m interval up to 6 m depth, at every 1.5 m intervals till 15 m depth and after that at every 3.0 m intervals, for determining the change of strata and to prepare bore log showing the details.
d) Collection of disturbed samples in airtight polythene bags with proper labeling and transportation to laboratory.

e) Conducting the laboratory tests on the disturbed samples as per Indian Standards and furnishing the results.
f) Preparation and submission of the detailed report with field and laboratory results.

3. SITE LOCATION AND OBSERVATIONS

The proposed site for the construction is located at Krishnagiri in Wayanad District of the state of Kerala. The coordinates of the location are recorded as (11.66453194, 76.18937548). The location map and position of the bore holes are presented as Annexure C of the report.

4. PROGRAMME OF INVESTIGATION

Field Investigation

a) One boring unit with all necessary equipment along with a team of technical personnel with skilled labours was mobilized at the work site.
b) Four bore holes of 150 mm were bored to a depth suggested by client, below the existing ground level. Bore holes were made as per IS: 1892-1979, using rotary drilling.
c) Representative samples were collected at every 1.0 m / 1.5 m/ 3.0 m depth interval or change of strata, whichever is earlier.
d) The samples collected were carefully sealed and transported to laboratory for tests.
e) Standard Penetration Tests were conducted at every 1.0 m interval till 6 m depth, at every 1.5 m intervals till 15 m depth and after that at every 3.0 m depth intervals, as per IS: 2131-1981. Before testing, the boreholes were cleaned properly and Split Spoon Sampler is placed centrally in the bore holes. A standard hammer of 63.5 kg is dropped from a height of 75 cm and the number of blows required for the penetration of sampler form 0-15 cm, 15-30 cm and 30-45 cm were noted. Number of blows required for 15-45 cm penetration is reported as N value.
f) The bore holes were terminated after the investigation.

5. LABORATORY INVESTIGATION

The following laboratory tests were conducted on the selected samples as per the relevant IS codes.

a) Particle size Analysis (IS .2720-Part 4-1985)
b) Water content (IS .2720-Part 2-1973)
c) Bulk density (IS .2720-Part 9-1992)
d) Specific Gravity (IS .2720-Part 3-1980)
e) Direct Shear Test (IS .2720-Part 13-1986)
f) Triaxial Test (IS .2720-Part 11-1993)
g) Liquid Limit & Plastic Limit (IS .2720-Part 5-1985)
h) Unconfined Compression Test of Rock (IS .9143 -1979)

6. REPORTING OF WATER TABLE

The water table at this site was encountered during the boring operation. Depth of water table was recorded as per IS 6935-1973. Recorded depth of water table in the bore holes are as per mentioned below:

BORE HOLE	DEPTH OF WATER TABLE (metre)
BH-I & BH-II	13.0m below GL obtained from well
BH-III & BH-IV	Not met with

7. RECOMMENDATIONS

INTRODUCTION

M/s. CGL Geoinformatics, located at 53/1252, Paradise Road, Vyttila P.O, Ernakulam 682019, conducted a site investigation for a **commercial building (G+2)** and **flood light** at Krishnagiri Cricket ground, Wayanad for The Secretary, Kerala Cricket Association. The investigation involved drilling **four boreholes** up to a maximum depth of **20.9 meters** using rotary drilling. Standard Penetration Tests were performed at regular intervals, and the samples collected were tested in the laboratory.

DATA AND DISCUSSIONS

The soil profile at BH-I location shows that the top layer consists of filled laterite up to 0.50 m depth. This is underlain by a yellowish red silty sand layer up to 1.6 m with an N value of 20. Below this, a light brownish white silty sand layer extends to 4.4 m with N values ranging from 24 to 29. This is followed by a whitish brownish grey silty sand layer up to 7.5 m with N values ranging from 30 to 40. Below this, a light brownish white, grey silty sand layer extends to 14.8 m with N values exceeding 50. SPT rebounded at 14.8 m, it may be rock. Ground water table is located at 13.0 m below the existing ground level as observed in the nearby well.

The soil profile at the BH-II location shows that the top layer consists of filled laterite and big stones up to 1.8 m depth. This is followed by a purple brown clayey silty sand layer with gravel up to 2.6 m with an N value of 9. Below this, a dark red clayey silty sand layer extends to 3.6 m with an N value of 17. A layer of hard rock boulders is found below this up to 5.8 m with core recovery as nil. This is underlain by a dark purple brown clayey sandy silt layer up to 7.5 m with an N value of 24. Below this, a pink, white clayey silty sand layer extends to 9.0 m with an N value of 31. A dark brown clayey silty sand layer is found below this up to 10.0 m with an N value of 39. This is followed by a red clayey silty sand layer with gravel up to 11.0 m with an N value of 29. A layer of hard boulders is found below this up to 11.8 m with core recovery as 4%. This is followed by a yellow, brown clay layer with silty sand up to 12.9 m with an N value of 31. Finally, the profile is underlain by a soft rock layer with core recovery as 7%, RQD as nil up to 13.9 m, core

recovery as 6%, RQD as nil up to 14.9 m, core recovery as 5%, RQD as nil up to 15.9 m, core recovery as 12%, RQD as nil up to 16.9 m, core recovery as 24%, RQD as 15% up to 17.9 m, core recovery as 3%, RQD as nil up to 18.9 m, core recovery as 10%, RQD as nil up to 19.9 m and core recovery as nil up to 20.9 m. Ground water table is located at 13.0 m below the existing ground level as observed in the nearby well.

The soil profile at the BH-III location shows that the top layer consists of dark purple brown clayey sandy silt up to 6.0 m depth with N values ranging from 11 to 17. This is followed by a dark brown clayey sandy silt up to 7.1 m with an N value of 8. Below this, a dark yellowish brown clayey silty sand layer extends to 9.0 m with an N value of 22. A pink, yellow, white clayey sandy silt layer is found below this up to 10.0 m with an N value of 18. This is underlain by a greyish yellow clayey sandy silt layer up to 12.0 m with an N value of 40. Below this, a yellowish grey silty sand layer extends to 15.0 m with N values exceeding 50. Finally, the profile is underlain by a whitish grey silty sand layer up to 15.26 m with an N value over 50. Ground water table is not met till bored depth.

The soil profile at the BH-IV location shows that the top layer consists of filled laterite up to 0.60 m depth. This is followed by a pinkish brown clayey silty sand layer up to 3.0 m with N values ranging from 10 to 18. A whitish yellow, pink clayey silty sand layer is found below this up to 3.3 m with an N value of 21. Below this, a pinkish red clayey silty sand layer is found up to 4.6 m with an N value of 18. This is underlain by a pinkish red silty sand layer up to 6.0 m with an N value of 32. A Pinkish yellow clayey silty sand layer is found below this up to 7.5 m with an N value of 23. Below this, a whitish pink clayey silty sand layer is found up to 9.0 m with an N value of 25. This is followed by a pinkish brown clayey silty sand layer up to 10.5 m with an N value of 27. A pinkish yellow clayey silty sand layer extends below this up to 12.0 m with an N value of 30. Beneath this, a pinkish brown, yellow clayey silty sand layer is found up to 13.5 m with an N value of 36. This is underlain by a brown clayey silty sand layer up to 17.5 m with N values exceeding 50. Finally, the profile is underlain by a pinkish white grey silty sand layer up to 18.32 m with an N value exceeding 50. Ground water table is not met till bored depth.

The proposed structures are **G+2 commercial building** at BH-I, BH-II locations and **flood light** at BH-III, BH-IV locations.

BH-I and BH-II are located at 11.0 m below the road level, where commercial building is proposed. Soil profiles from the bore hole locations show slight variations. Top soil is of filled soil up to 0.50 m, 1.80 m depth in BH-I, BH-II locations respectively. Below filled soil, soil is stiff and has reasonable shear strength. So shallow foundation can be provided. SPT rebounded at 14.8 m depth in BH-I location. It may be rock. Soft rock is found at

around 12.9 m in BH-II location. For higher loads, foundation can be rested on rock layer with sufficient embedment length.

BH-III is located at 3.0 m below the road level and BH-IV is located at the road level. Flood lights are proposed at these bore hole locations. Soil profiles from the bore hole locations show slight variations only. In BH-IV location, top soil is of filled soil up to 0.6 m depth. Top soil is stiff and has reasonable shear strength in both bore hole locations. So shallow foundation can be provided. Soil gets stiffer below 12.0 m, 13.5 m in BH-III, BH-IV locations respectively. For higher loads, foundation can be rested on these stiff layers.

RECOMMENDATIONS

BH-I and BH-II locations

i) It is recommended to provide isolated column footings resting at around 2.6 m depth on silty sand layer or clayey silty sand layer with gravel having N value>17 to support vertical column loads. The following allowable bearing capacity values can be taken for design. Maximum Allowable settlement is taken as 40 mm.

SL. No	Footing size (m x m)	Allowable bearing capacity recommended. (kN/m^2)
1	1.0 x 1.0	150
2	2.0 x 2.0	160
3	3.0 x 3.0	170

ii) Alternately, it is recommended to provide DMC/drilling concrete **pile** foundation to support vertical column loads. Each pile should have a depth of around **16.0 m to 18.0 m** from the EGL, depending on the availability of **Soft rock** layer. Pile should be rested in soft rock layer with sufficient embedment length (*Minimum four times diameter into soft rock layer*). Based on the above, the following recommendations are made.

Sl no	Pile Diameter (mm)	Tip resistance (kN)	Side friction (kN)	**Safe axial Compressive load** (kN)	Safe Uplift load (kN)	Lateral load (kN)
1	500	430	140	570	140	30
2	600	640	170	810	180	40
3	700	880	200	1080	220	55

BH-III and BH-IV locations

iii) It is recommended to provide isolated column footings resting at around 2.0 m depth from existing ground level on clayey sandy silt or clayey silty sand layer having N value>17 to support vertical column loads. The following allowable bearing capacity values can be taken for design. Maximum Allowable settlement is taken as 40 mm.

SL. No	Footing size (m x m)	Allowable bearing capacity recommended. (kN/m^2)
1	1.0 x 1.0	120
2	2.0 x 2.0	125
3	3.0 x 3.0	130

iv) Alternately, it is recommended to provide DMC/drilling concrete **pile** foundation to support vertical column loads. Each pile should have a depth of around **14.0 m to 16.0 m** , depending on the availability of Silty sand layer with N value **>50**. Pile should be rested on Silty sand layer with N value **>50** with sufficient embedment length (2.0 m into it). Based on the above, the following recommendations are made.

Sl no	Pile Diameter (mm)	Tip resistance (kN)	Side friction (kN)	**Safe axial Compressive load** (kN)	Safe Uplift load (kN)	Lateral load (kN)
1	500	210	140	350	130	30
2	600	360	170	530	170	40
3	700	570	200	770	210	55

Notes:

i) Factor of safety of 3.0 for bearing on rock, 2.5 for side friction, and 1.0 for submerged weight of pile for uplift are taken for the design. For calculating side friction, the top 2.0 m of soil discarded. Piles are considered as **long**, and pile heads are considered as fixed heads. Lateral load is taken as the load corresponding to deflection of 5.0 mm at ground level.

ii) The load-carrying capacity of the pile should be ensured by conducting an initial pile load test as per IS.2911 (Part IV) or by conducting a High strain rate dynamic pile load test. Routine pile load tests should also be conducted as per I.S Specifications.

iii) Quality of piling like concreting, the diameter of pile, depth of pile, etc. should be ensured by the sonic pile integrity test.

iv) The sub structure has to be constructed, as per the latest IS code. It should be certified by a qualified engineer.

v) These recommendations are based on the data obtained from four boreholes. If any variation in the soil profile is observed during the construction, it should be referred to a Geotechnical Engineer.

Ernakulam
28/02/2025

Prof (Dr.). Hari G., *MTech, Ph.D., MIE, FIGS*
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ANNEXURE A – BORE LOG DATA SHEET

CLIENT:	THE SECRETARY, KERALA CRICKET ASSOCIATION
PROJECT:	PROPOSED COMMERCIAL BUILDING (G+2)
SITE:	KRISHNAGIRI, WAYANAD

BORE HOLE NO. : **BH-I**	Date of start: 10/01/2025
EGL -11.0m from road level	Date of completion: 10/01/2025
Coordinates (11.66453194, 76.18937548)	
TYPE OF BORING: Rotary Drilling	Ground water table: 13.0m below EGL obtained from well

Description of soil	Thickness of layer m	Depth in m below GL	Bore log	Standard Penetration Test					Graph of 'N' value						Remarks
				depth (m)	15 cm	30 cm	45 cm	N Value	10	20	30	40	50	>50	
Filling Laterite	0.50	0.50													
Lateritic Silty Sand (Yellowish Red)	1.10	1.60		1.00	9	10	10	20							
Silty Sand (Light Brownish White)	2.80	4.40		2.00	8	11	18	29							
				3.00	4	11	13	24							
				4.00	7	11	16	27							
Silty Sand (Whitish Brownish Grey)	3.10	7.50		5.00	9	22	18	40							
				6.00	8	14	16	30							
Silty Sand (Light Brownish White,Grey)	7.30	14.80		7.50	13	39	11	>50							13cm balance
				9.00	15	23	27	>50							3cm balance
				10.50	9	16	34	>50							2cm balance
				12.00	8	23	27	>50							3cm balance
				13.50	31	35	15	>50							12cm balance
Hard Strata				14.80											SPT Rebound

Bore hole terminated at 14.80m depth

Basil E J, B.Tech
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CLIENT:	THE SECRETARY, KERALA CRICKET ASSOCIATION
PROJECT:	PROPOSED COMMERCIAL BUILDING (G+2)
SITE:	KRISHNAGIRI, WAYANAD
BORE HOLE NO. : **BH-II**	Date of start: 07/01/2025
EGL -11.0m from road level	Date of completion: 08/01/2025
Coordinates (11.6642901, 76.18952332)	
TYPE OF BORING: Rotary Drilling	Ground water table: 13.0m below EGL obtained from well

Description of soil	Thickness of layer m	Depth in m below GL	Bore log	Standard Penetration Test					Graph of 'N' value						Remarks
				depth (m)	15 cm	30 cm	45 cm	N Value	10	20	30	40	50	>50	
Filling Laterite & Big Stone	1.80	1.80		1.00	2	4	6	10							
Lateritic Clayey Silty Sand with Gravel (Purple Brown)	0.80	2.60		2.00	2	4	5	9							
Lateritic Clayey Silty Sand with Gravel (Dark Red)	1.00	3.60		3.00	5	7	10	17							
Hard Rock Boulders	2.20	5.80													Recovery-Nil
Lateritic Clayey Sandy Silt (Dark Purple Brown)	1.70	7.50		6.00	8	11	13	24							
Lateritic Clayey Silty Sand (Pink,White)	1.50	9.00		7.50	8	15	16	31							
Lateritic Clayey Silty Sand (Dark Brown)	1.00	10.00		9.00	13	18	21	39							
Lateritic Clayey Silty Sand with Gravel (Red)	1.00	11.00		10.50	3	13	16	29							
Hard Boulders	0.80	11.80		11.00											Recovery-4%
Lateritic Clay with Silty Sand (Yellow, Coffee Brown)	1.10	12.90		12.00	8	13	18	31							
Soft Rock	1.00	13.90		12.90											Recovery-7% RQD- Nil

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Description of soil	Thickness of layer m	Depth in m below GL	Bore log	Standard Penetration Test					Graph of 'N' value						Remarks
				depth (m)	15 cm	30 cm	45 cm	N Value	10	20	30	40	50	>50	
Soft Rock	1.00	14.90		13.90											Recovery-6% RQD - Nil
Soft Rock	1.00	15.90		14.90											Recovery-5% RQD - Nil
Soft Rock	1.00	16.90		15.90											Recovery-12% RQD-Nil
Soft Rock	1.00	17.90		16.90											Recovery-24% RQD-15%
Soft Rock	1.00	18.90		17.90											Recovery-3% RQD-Nil
Soft Rock	1.00	19.90		18.90											Recovery-10% RQD-Nil
Soft Rock	1.00	20.90		19.90											Recovery-Nil
Bore hole terminated at 20.90m depth															

Basil E J, B.Tech
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CLIENT:	THE SECRETARY, KERALA CRICKET ASSOCIATION
PROJECT:	PROPOSED FLOOD LIGHT
SITE:	KRISHNAGIRI, WAYANAD

BORE HOLE NO. : **BH-III**	Date of start: 06/01/2025
EGL -3.0m from road level	Date of completion: 06/01/2025
Coordinates (11.66521323, 76.1898599)	
TYPE OF BORING: Rotary Drilling	Ground water table: Not met with

Description of soil	Thickness of layer m	Depth in m below GL	Bore log	Standard Penetration Test					Graph of 'N' value						Remarks
				depth (m)	15 cm	30 cm	45 cm	N Value	10	20	30	40	50	>50	
Lateritic Clayey Sandy Silt (Dark Purple Brown)		6.00		1.00	3	5	6	11							
				2.00	6	7	10	17							
				3.00	3	6	7	13							
				4.00	4	6	10	16							
				5.00	5	6	9	15							
Lateritic Clayey Sandy Silt (Dark Brown)	1.10	7.10		6.00	3	3	5	8							
Lateritic Clayey Silty Sand (Dark Yellowish Brown)	1.90	9.00		7.50	4	6	16	22							
Lateritic Clayey Sandy Silt (Pink Yellow White)	1.00	10.00		9.00	6	9	9	18							
Clayey Sandy Silt (Greyish Yellow)	2.00	12.00		10.50	7	15	25	40							
Silty Sand (Yellowish Grey)	3.00	15.00		12.00	16	50	-	>50							18cm balance
				13.50	14	20	30	>50							1cm balance
Silty Sand (Whitish Grey)	0.26	15.26		15.00	12	50	-	>50							19cm balance

Bore hole terminated at 15.26m depth

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CLIENT:	THE SECRETARY, KERALA CRICKET ASSOCIATION
PROJECT:	PROPOSED FLOOD LIGHT
SITE:	KRISHNAGIRI, WAYANAD
BORE HOLE NO. : **BH-IV**	Date of start: 07/01/2025
EGL same as road level	Date of completion: 07/01/2025
Coordinates (11.66514357, 76.19089642)	
TYPE OF BORING: Rotary Drilling	Ground water table: Not met with

Description of soil	Thickness of layer m	Depth in m below GL	Bore log	Standard Penetration Test					Graph of 'N' value						Remarks
				depth (m)	15 cm	30 cm	45 cm	N Value	10	20	30	40	50	>50	
Filling Laterite	0.60	0.60													
Lateritic Clayey Silty Sand (Pinkish Brown)	2.40			1.00	2	4	6	10							
		3.00		2.00	5	8	10	18							
Lateritic Clayey Silty Sand (Whitish YellowPink)	0.30	3.30		3.00	3	9	12	21							
Lateritic Clayey Silty Sand (Pinkish Red)	1.30	4.60		4.00	4	8	10	18							
Lateritic Silty Sand (Pinkish Red)	1.40	6.00		5.00	2	12	20	32							
Lateritic Clayey Silty Sand (Pinkish Yellow)	1.50	7.50		6.00	5	11	12	23							
Lateritic Clayey Silty Sand (Whitish Pink)	1.50	9.00		7.50	6	10	15	25							
Lateritic Clayey Silty Sand (Pinkish Brown)	1.50	10.50		9.00	6	12	15	27							
Lateritic Clayey Silty Sand (Pinkish Yellow)	1.50	12.00		10.50	6	13	17	30							
Lateritic Clayey Silty Sand (Pinkish Brown,Yellow)	1.50	13.50		12.00	8	15	21	36							
Lateriti Clayey Silty Sand (Brown)	4.00			13.50	7	30	20	>50							6cm balance
		17.50		15.00	30	50	-	>50							17cm balance
Silty Sand (Pinkish White Grey)	0.82	18.32		18.00	20	35	15	>50							13cm balance

Bore hole terminated at 18.32m depth

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ANNEXURE B – LABORATORY TEST RESULT

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LAB TEST REPORT

Client:	The Secretary, Kerala Cricket Association		Report No:CGL/C/1016/24
Project:	Proposed Commercial building (G+2) & Flood Light		Test Date: 22/01/2025
Site:	Krishnagiri, Wayanad		

Bore hole No.	Depth (m)	Description of soil	Natural water content (%)	Bulk density (g/cc)	LL (%)	PL (%)	Grain size distribution (%)					Type of Sample	Type of test	Specific gravity	Cohesion c (kg/cm²)	Angle of internal friction (ø °)
							Silt & Clay	Sand			Gravel					
								Fine	Medium	Coarse						
I	1.0	Silty Sand (SM)	16.13	1.74	-	-	35	33	31	1	0	ds	Direct Shear	2.65	0.07	30
I	2.0	Silty Sand (SM)	17.12	1.78	-	-	29	34	35	2	0	ds	Direct Shear	-	0.06	30
I	4.0	Silty Sand (SM)	20.25	1.77	-	-	24	35	41	0	0	ds	Direct Shear	2.66	0.06	31
I	5.0	Silty Sand (SM)	18.74	1.79	-	-	16	35	48	1	0	ds	Direct Shear	-	0.05	31
I	7.5	Silty Sand (SM)	16.86	1.82	-	-	21	27	52	0	0	ds	Direct Shear	2.67	0.04	33
I	10.5	Silty Sand (SM)	18.50	1.83	-	-	26	27	45	2	0	ds	Direct Shear	-	0.06	33
I	13.5	Silty Sand (SM)	13.60	1.84	-	-	23	29	45	2	1	ds	Direct Shear	2.67	0.04	34

(All the tests are done on remoulded sample collected from SPT spoon)

Lab in Charge — Jayaraj A.R.

Engineer in Charge — Thamanna Jagadeesh,B.Tech

Report prepared by — Nayana Sam,M.Tech

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Bore hole No.	Depth (m)	Description of soil	Natural water content (%)	Bulk density (g/cc)	LL (%)	PL (%)	Grain size distribution (%)					Type of Sample	Type of test	Specific Gravity	Cohesion c (kg/cm²)	Angle of internal friction (ϕ °)
							Silt & Clay	Sand			Gravel					
								Fine	Medium	Coarse						
II	2.0	Clayey Silty Sand (SM-SC)	32.02	1.73	-	-	36	43	10	3	8	ds	Direct Shear	2.65	0.05	24
II	3.0	Clayey Silty Gravelly Sand (SM-GM)	15.30	1.76	-	-	27	14	17	16	26	Sufficient sample not retrieved				
II	6.0	Clayey Sandy Silt (MH-SP)	44.97	1.79	-	-	72	26	2	0	0	ds	Triaxial	2.66	0.12	24
II	9.0	Clayey Silty Sand (SM-SC)	33.07	1.81	-	-	48	33	17	0	2	ds	Direct Shear	-	0.11	28
II	10.5	Clayey Gravelly Silty Sand (SM-GM)	35.73	1.80	-	-	45	27	13	3	12	ds	Direct Shear	2.66	0.12	26
II	11.0-11.8	Hard Rock Boulder		2.69								Sufficient sample not retrieved				
II	12.0	Silty Sandy Clay (CH-SP)	40.56	1.66	61.9	31.1	51	26	17	5	1	ds	Triaxial	2.63	0.14	22

(All the tests are done on remoulded sample collected from SPT spoon)

Lab in Charge

Jayaraj A.R.

Engineer in Charge

Thamanna Jagadeesh,B.Tech

Report prepared by

Nayana Sam,M.Tech

COCHIN GEOTECHNICAL LABORATORY

CENTER FOR ULTIMATE GEOTECHNICAL SOLUTIONS

CGL Complex, 53/1251, Paradise Road, Vyttila P.O,Ernakulam 682019
Tel: 974 674 5473, 974 674 5472
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www.cochingeotech.com

Bore hole No.	Depth (m)	Description of soil	Natural water content (%)	Bulk density (g/cc)	LL (%)	PL (%)	Grain size distribution (%)					Type of Sample	Type of test	Specific gravity	Cohesion c (kg/cm²)	Angle of internal friction (ø °)
							Silt & Clay	Sand			Gravel					
								Fine	Medium	Coarse						
II	12.9-13.9	Very Poor Soft Rock (Rock Mass Rating no.=34)		2.67								Sufficient sample not retrieved				
II	13.9-14.9	Very Poor Soft Rock (Rock Mass Rating no.=34)		2.56								Sufficient sample not retrieved				
II	14.9-15.9	Very Poor Soft Rock (Rock Mass Rating no.=34)		2.58								Sufficient sample not retrieved				
II	15.9-16.9	Very Poor Soft Rock (Rock Mass Rating no.=34)		2.69								Sufficient sample not retrieved				
II	16.9-17.9	Very Poor Soft Rock (Rock Mass Rating no.=34)		2.42								uds	Uniaxial compressive strength = 0 N/mm²			
II	17.9-18.9	Very Poor Soft Rock (Rock Mass Rating no.=34)		2.68								Sufficient sample not retrieved				
II	18.9-19.9	Very Poor Soft Rock (Rock Mass Rating no.=34)		2.48								Sufficient sample not retrieved				

(All the tests are done on remoulded sample collected from SPT spoon)

Lab in Charge

Jayaraj A.R.

Engineer in Charge

Thamanna Jagadeesh,B.Tech

Report prepared by

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Bore hole No.	Depth (m)	Description of soil	Natural water content (%)	Bulk density (g/cc)	LL (%)	PL (%)	Grain size distribution (%)					Type of Sample	Type of test	Specific gravity	Cohesion c (kg/cm²)	Angle of internal friction (ø °)
							Silt & Clay	Sand			Gravel					
								Fine	Medium	Coarse						
III	1.0	Clayey Sandy Silt (MH-SP)	42.10	1.67	-	-	68	30	2	0	0	ds	Triaxial	2.64	0.14	12
III	3.0	Clayey Sandy Silt (MH-SP)	48.78	1.72	-	-	55	39	6	0	0	ds	Triaxial	-	0.14	14
III	5.0	Clayey Sandy Silt (MH-SP)	48.00	1.73	-	-	66	34	0	0	0	ds	Triaxial	2.65	0.14	15
III	6.0	Clayey Sandy Silt (MH-SP)	44.92	1.64	-	-	61	37	2	0	0	ds	Triaxial	-	0.13	10
III	7.5	Clayey Silty Sand (SM-SC)	30.43	1.77	-	-	35	40	22	1	2	ds	Direct Shear	2.66	0.05	29
III	10.5	Clayey Sandy Silt (MH-SP)	35.83	1.78	-	-	60	31	7	2	0	ds	Triaxial	-	0.15	26
III	12.0	Silty Sand (SM)	25.09	1.82	-	-	29	67	4	0	0	ds	Direct Shear	2.67	0.03	33
III	15.0	Silty Sand (SM)	14.22	1.81	-	-	28	46	26	0	0	ds	Direct Shear	-	0.04	34

(All the tests are done on remoulded sample collected from SPT spoon)

Lab in Charge

Jayaraj A.R.

Engineer in Charge

Thamanna Jagadeesh,B.Tech

Report prepared by

Nayana Sam,M.Tech

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Bore hole No.	Depth (m)	Description of soil	Natural water content (%)	Bulk density (g/cc)	LL (%)	PL (%)	Grain size distribution (%)					Type of Sample	Type of test	Specific gravity	Cohesion c (kg/cm²)	Angle of internal friction (ø °)
							Silt & Clay	Sand			Gravel					
								Fine	Medium	Coarse						
IV	1.0	Clayey Silty Sand (SM-SC)	14.80	1.68	-	-	39	12	33	11	5	ds	Direct Shear	2.64	0.09	26
IV	2.0	Clayey Silty Sand (SM-SC)	20.28	1.72	-	-	43	25	30	2	0	ds	Direct Shear	-	0.10	29
IV	4.0	Clayey Silty Sand (SM-SC)	21.53	1.69	-	-	50	31	16	3	0	ds	Direct Shear	2.64	0.14	27
IV	5.0	Silty Sand (SM)	21.50	1.76	-	-	35	43	22	0	0	ds	Direct Shear	-	0.07	31
IV	7.5	Clayey Silty Sand (SM-SC)	22.98	1.75	-	-	46	29	25	0	0	ds	Direct Shear	2.65	0.13	29
IV	10.5	Clayey Silty Sand (SM-SC)	22.19	1.78	-	-	44	32	24	0	0	ds	Direct Shear	-	0.10	30
IV	13.5	Clayey Silty Sand (SM-SC)	27.21	1.82	-	-	46	36	18	0	0	ds	Direct Shear	2.67	0.14	31
IV	18.0	Silty Sand (SM)	20.87	1.81	-	-	35	38	27	0	0	ds	Direct Shear	-	0.04	34

(All the tests are done on remoulded sample collected from SPT spoon)

Lab in Charge

Jayaraj A.R.

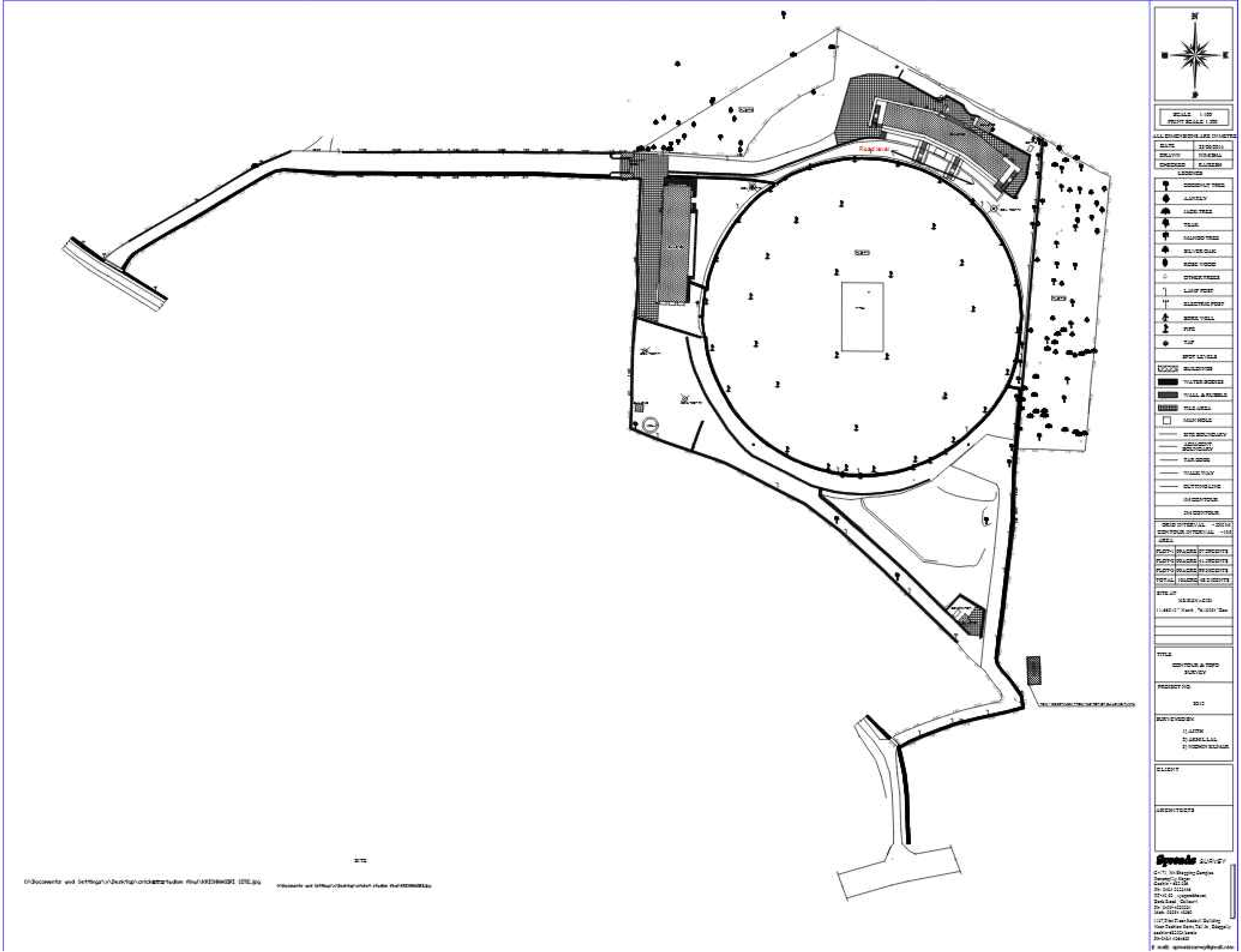
Engineer in Charge

Thamanna Jagadeesh,B.Tech

Report prepared by

Nayana Sam,M.Tech

ANNEXURE C – BORE HOLE LOCATION PLAN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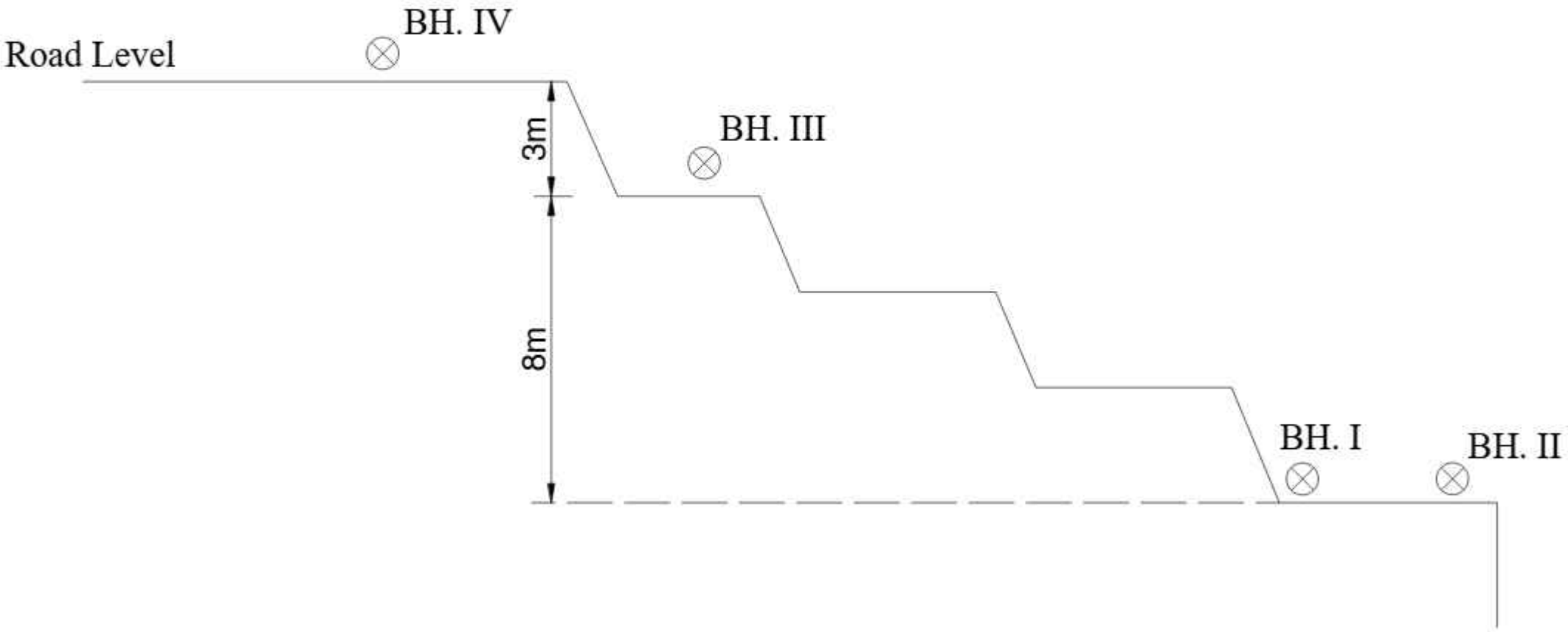
DATE
DRAWN
CHECKED
LEGENDS
COCONUT TREE
TEAK
MANGO TREE
LAMP POST
ELECTRIC POST
BORE WELL
PIPE
TAP
SPOT LEVELS
BUILDINGS
WATER BODIES
WALL & RUBBLE
TILE AREA
MAN HOLE
SITE BOUNDARY
ADJACENT BOUNDARY
TAR ROAD
WALK WAY
CUTTING LINE
GRID INTERVAL
CONTOUR INTERVAL
AREA
TOTAL
SITE AT
TITLE
CONTOUR & TOPO SURVEY
PROJECT NO.
SURVEYED BY
CLIENT
ARCHITECTS
SURVEY


Road Level
BH. IV
3m
BH. III
8m
BH. I
BH. II


GPS Map
Camera Lite
M57R+R34, Krishnagiri, Kerala 673591, India
Latitude
11.66453194°
Longitude
76.18937548°
Local 09:27:12 AM
GMT 03:57:12 AM
Altitude 831 meters
Friday, 10.01.2025

BH. I


M57R+R34, Krishnagiri, Kerala 673591, India
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76.18937112°
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Friday, 10.01.2025


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Longitude
76.18942575°
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GMT 03:59:57 AM
Altitude 831 meters
Friday, 10.01.2025


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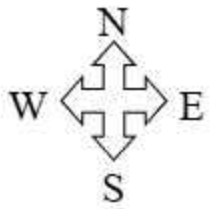
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M57R+R34, Krishnagiri, Kerala 673591, India
Latitude
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Longitude
76.18937005°
Local 02:33:17 PM
GMT 09:03:17 AM
Altitude 831 meters
Friday, 10.01.2025

BH. I


GPS Map
Camera Lite
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Longitude
76.18952332°
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GMT 03:35:50 AM
Altitude 831 meters
Wednesday, 08.01.2025

BH. II


M57R+R34, Krishnagiri, Kerala 673591, India
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Longitude
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Altitude 831 meters
Friday, 10.01.2025


M57R+R34, Krishnagiri, Kerala 673591, India
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Longitude
76.18942575°
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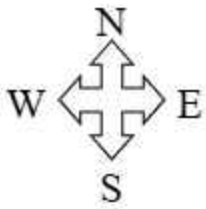
Altitude 831 meters
Friday, 10.01.2025


N
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E
S


M57R+R34, Krishnagiri, Kerala 673591, India
Latitude
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Longitude
76.18942572°
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GMT 03:58:53 AM
Altitude 831 meters
Friday, 10.01.2025


M57R+R34, Krishnagiri, Kerala 673591, India
Latitude
11.66449611°
Longitude
76.18941714°
Local 09:28:21 AM
GMT 03:58:21 AM
Altitude 831 meters
Friday, 10.01.2025

BH. II


GPS Map
Camera Lite
M57R+R34, Krishnagiri, Kerala 673591, India
Latitude
11.66521323°
Longitude
76.1898599°
Local 09:38:36 AM
GMT 04:08:36 AM
Altitude 829 meters
Monday, 06.01.2025

BH. III


M57R+R34, Krishnagiri, Kerala 673591, India
Latitude
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Longitude
76.18981253°
Local 05:06:04 PM
GMT 11:36:04 AM
Altitude 829 meters
Monday, 06.01.2025


M57R+R34, Krishnagiri, Kerala 673591, India
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Longitude
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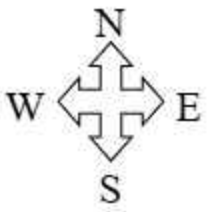
GMT 11:38:37 AM
Altitude 829 meters
Monday, 06.01.2025


N
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S


M57R+R34, Krishnagiri, Kerala 673591, India
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Longitude
76.18982977°
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GMT 11:37:47 AM
Altitude 829 meters
Monday, 06.01.2025


M57R+R34, Krishnagiri, Kerala 673591, India
Latitude
11.66516645°
Longitude
76.18982572°
Local 05:07:02 PM
GMT 11:37:02 AM
Altitude 829 meters
Monday, 06.01.2025

BH. III


GPS Map
Camera Lite
M57R+R34, Krishnagiri, Kerala 673591, India
Latitude
11.66514357°
Longitude
76.19089642°
Local 09:52:34 AM
GMT 04:22:34 AM
Altitude 834 meters
Tuesday, 07.01.2025

BH. IV


M57R+R34, Krishnagiri, Kerala 673591, India
Latitude
11.6651586°
Longitude
76.19088982°
Local 09:53:54 AM
GMT 04:23:54 AM
Altitude 834 meters
Tuesday, 07.01.2025


M57R+R34, Krishnagiri, Kerala 673591, India
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Longitude
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Local 09:55:50 AM
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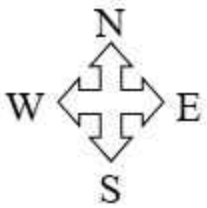
Altitude 834 meters
Tuesday, 07.01.2025


N
W
E
S


M57R+R34, Krishnagiri, Kerala 673591, India
Latitude
11.66516106°
Longitude
76.19089967°
Local 09:54:28 AM
GMT 04:24:28 AM
Altitude 834 meters
Tuesday, 07.01.2025


M57R+R34, Krishnagiri, Kerala 673591, India
Latitude
11.66515863°
Longitude
76.19090578°
Local 09:55:12 AM
GMT 04:25:12 AM
Altitude 784 meters
Tuesday, 07.01.2025

BH. IV