GREEN AUDIT REPORT, 2024-2025
DARRANG COLLEGE

SUBMITTED TO
THE PRINCIPAL
DARRANG COLEGE,
TEZPUR, SONITPUR, ASSAM 784001

SUBMITTED BY
TRCATS LLP
REGISTERED OFFICE: BARUAH CHUBURI, MAZGAON,
SONITPUR, ASSAM, 784001

TRCATS Transitioning Research Consultancy and Training Services LLP
Transition Ideas to Business
An ISO 9001-2015 certified LLP established under the NISP initiative of Tezpur University
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Acknowledgement

We are sincerely thankful to the Management of Darrang College for giving us the opportunity to conduct Green Audit of the Institute.

We are also grateful to Dr. Palash Moni Saikia, Principal, Darrang College, Tezpur, Assam whose valuable comments / feedback, during various reviews have helped us during the course of the Audit.

We express our sincere gratitude to all other concerned officials for their support and guidance during the conduct of this exercise.

For TRCATS LLP

(Dr. Dipal Baruah)
Director (R&D and Innovation)
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TO WHOM IT MAY CONCERN

This is to certify that TRCATS LLP having registered office at Baruah Chuburi, Mazgaon, Tezpur, Sonitpur, Assam -784001 has successfully conducted the Green Audit of DARRANG COLLEGE, P.O.: TEZPUR, SONITPUR, ASSAM 784001.

The college has provided necessary data and credential for scrutiny. The activities and measures undertaken by the college has been verified. After collecting and analyzing the required data, the Green Audit report has been prepared and submitted. The efforts taken by the college towards environmental sustainability is appreciated.

(Dr. Dipal Baruah)
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1. INTRODUCTION

Energy and natural resources play a crucial role in maintaining environmental balance and supporting sustainable development. Rapid urbanization, increased consumption of fossil fuels, deforestation, and anthropogenic activities have significantly contributed to climate change and environmental degradation. Educational institutions, being centers of knowledge and innovation, have a vital role to play in promoting sustainable practices and environmental stewardship.

Darrang College has been actively engaged in adopting environmentally sustainable practices and promoting ecological awareness among students, faculty, and stakeholders. The institution recognizes its responsibility toward reducing greenhouse gas (GHG) emissions and conserving natural resources in alignment with national and global sustainability goals, including the United Nations Sustainable Development Goals (SDGs).

The Green Audit for the session 2024–2025 has been undertaken as a systematic evaluation of the environmental performance of the college campus. The audit aims to assess the current status of environmental practices, identify areas of improvement, and recommend strategies for enhancing sustainability.

The audit covers multiple environmental parameters including:

- Land use and green cover
- Water quality and usage
- Air quality
- Soil quality
- Noise levels
- Waste management practices
- Biodiversity (flora and fauna)
- Energy consumption and conservation practices
- Green initiatives undertaken by the institution

The Green Audit serves as an important self-assessment tool that helps the institution to:

- Monitor environmental performance
- Improve resource efficiency
- Promote eco-friendly practices

- Strengthen institutional sustainability credentials

The audit findings reflect the commitment of Darrang College towards creating a clean, green, and sustainable campus environment.

2. OBJECTIVE

The primary objective of the Green Audit is to systematically evaluate the environmental sustainability performance of the college campus and to identify opportunities for improvement.

The specific objectives of the Green Audit for the session 2024–2025 are as follows:

- To analyze the land use pattern and green cover distribution within the campus
- To assess the floral and faunal diversity of the campus ecosystem
- To evaluate the water quality and usage practices
- To assess soil quality and fertility status
- To analyze ambient air quality parameters
- To measure and evaluate noise levels across campus locations
- To review waste generation, segregation, and disposal practices
- To assess transportation and vehicular movement impacts
- To evaluate energy consumption patterns and conservation measures
- To document green initiatives and sustainable practices implemented by the college

Additionally, the audit aims to:

- Identify gaps in existing environmental practices
- Recommend feasible and cost-effective improvements
- Promote awareness among stakeholders
- Support compliance with NAAC environmental sustainability criteria

3. BENEFITS OF GREEN AUDIT

A Green Audit provides a structured framework for improving environmental sustainability within an educational institution. The benefits of conducting a Green Audit for Darrang College are summarized below:

Environmental Benefits

- Reduction in environmental pollution
- Conservation of natural resources such as water and energy
- Improvement in campus biodiversity
- Enhanced waste management practices

Institutional Benefits

- Strengthening of institutional sustainability profile
- Improved compliance with NAAC accreditation requirements
- Establishment of baseline data for future environmental planning
- Enhanced campus aesthetics and environmental quality

Economic Benefits

- Reduction in operational costs through efficient resource utilization
- Savings through energy and water conservation measures
- Reduced waste management costs

Educational and Social Benefits

- Increased environmental awareness among students and staff
- Promotion of sustainable lifestyle practices
- Encouragement of student participation in environmental initiatives
- Development of environmental ethics and responsibility

The Green Audit acts as a continuous improvement tool, enabling the institution to monitor and enhance its environmental performance over time.

4. METHODOLOGY ADOPTED FOR GREEN AUDIT

The Green Audit for Darrang College for the session **2024–2025** was conducted using a systematic and structured methodology to ensure accuracy, reliability, and completeness of environmental assessment.

4.1 Overview of Methodology

The audit process involved the following key stages:

1. Data Collection
2. Campus Inspection and Survey
3. Document Review and Verification
4. Measurement and Testing
5. Data Analysis
6. Reporting and Recommendations

Step 1 – Data Collection

Data collection was carried out through:

- Physical observation of campus facilities
- Interaction with faculty, administrative staff, and technical personnel
- Collection of records and documents maintained by the institution

The following datasets were collected and reviewed:

- Land use and campus layout data
- Water usage and water quality reports
- Electricity consumption data
- Waste management practices
- Biodiversity records (flora and fauna)
- Transportation and vehicular movement data
- Environmental initiatives and sustainability activities

Where updated data for 2024–2025 was not available, **reasonable projections based on previous year trends (2023–2024)** were used to maintain continuity and realism in the analysis.

Step 2 – Campus Inspection and Physical Survey

A detailed campus survey was conducted to assess:

- Buildings and infrastructure
- Open spaces and green cover
- Water supply and sanitation systems
- Waste collection and disposal points
- Energy usage practices
- Vehicular movement and parking patterns

The inspection included all major facilities such as:

- Academic buildings
- Laboratories
- Library
- Administrative offices
- Hostels
- Canteen
- Playgrounds and open spaces

Step 3 – Document Review and Verification

Relevant documents were reviewed to validate collected data and ensure consistency. These included:

- Previous Green Audit Report (2023–2024)
- Energy Audit data
- Water quality test reports (NABL accredited laboratories)
- Soil testing reports
- Institutional records related to green initiatives

The verification process ensured that:

- Data used in the audit is reliable
- Observations are supported by documented evidence
- Trends across years are correctly interpreted

Step 4 – Measurement and Testing

Environmental parameters were measured and analyzed using standard methods.

Water Quality Testing

Water samples were analyzed for:

- pH
- Turbidity
- Total Dissolved Solids (TDS)
- Hardness
- Presence of microorganisms

Testing was conducted through **accredited laboratories**, ensuring reliability of results.

Air Quality Monitoring

Air quality was assessed using portable monitoring instruments measuring:

- $PM_{2.5}$
- PM_{10}
- CO_2
- Formaldehyde (HCHO)

Measurements were taken at multiple locations across the campus.

Soil Quality Analysis

Soil samples were tested for:

- pH
- Organic carbon
- Available Nitrogen (N)
- Available Phosphorus (P)
- Available Potassium (K)

Noise Level Measurement

Noise levels were recorded using a sound level meter at various campus locations, including:

- Academic buildings
- Administrative areas
- Hostels
- Canteen
- Open spaces

Measurements were taken as:

- Maximum noise level
- Minimum noise level
- Average noise level

Step 5 – Data Analysis

Collected data was analyzed to evaluate:

- Environmental performance of the campus
- Resource consumption patterns
- Compliance with environmental standards
- Trends compared to previous year

Key analyses performed include:

- Land use distribution analysis
- Environmental parameter comparison
- Identification of high-impact areas
- Assessment of sustainability practices

Step 6 – Reporting and Recommendations

Based on the analysis, the following were developed:

- Detailed environmental status of the campus
- Identification of gaps and inefficiencies
- Recommendations for improvement
- Actionable strategies for sustainability enhancement

The report integrates:

- Quantitative data
- Observational insights
- Comparative analysis
- Practical recommendations

4.2 Limitations of the Study

While every effort has been made to ensure accuracy, certain limitations exist:

- Some environmental parameters rely on periodic sampling
- Real-time continuous monitoring data is not available
- Certain values for 2024–2025 are estimated based on previous trends
- Seasonal variations may influence measurements

These limitations have been addressed through:

- Conservative assumptions
- Cross-verification with historical data
- Use of standard environmental benchmarks

5. DESCRIPTION OF THE COLLEGE CAMPUS

Darrang College, established in 1945, is one of the premier higher educational institutions located in Tezpur, Sonitpur District, Assam, situated on the northern bank of the river Brahmaputra. The College campus (Fig. 1) is strategically located in an urban setting and is bounded by:

- Collegiate field and Marabhairab market (North/North-East)
- Marabhairab Temple (South)
- Residential and semi-urban settlements (West and surrounding areas)

The campus plays a significant role in promoting higher education while maintaining a strong commitment to environmental sustainability.

Fig. 1 Google Earth Map of Darrang College

The geographical total area of Darrang College is 70,518.67 m^2 out of which holla (trench like area) cover an area of 452.98 m^2, playground 18162.42 m^2, built up-area 20782.53 m^2, and open space and plantation cover an area of 31120.74 m^2. The College campus area consists of multiple buildings, both single story Assam type and multi-story RCC buildings along with the green vegetation area and trees (Fig. 2).

The campus comprises a mix of:

- Academic buildings
- Administrative blocks
- Laboratories and research facilities
- Library and digital resource centers
- Hostels (Boys and Girls)
- Indoor stadium and auditorium
- Canteen and common utility spaces
- Playgrounds and open green spaces

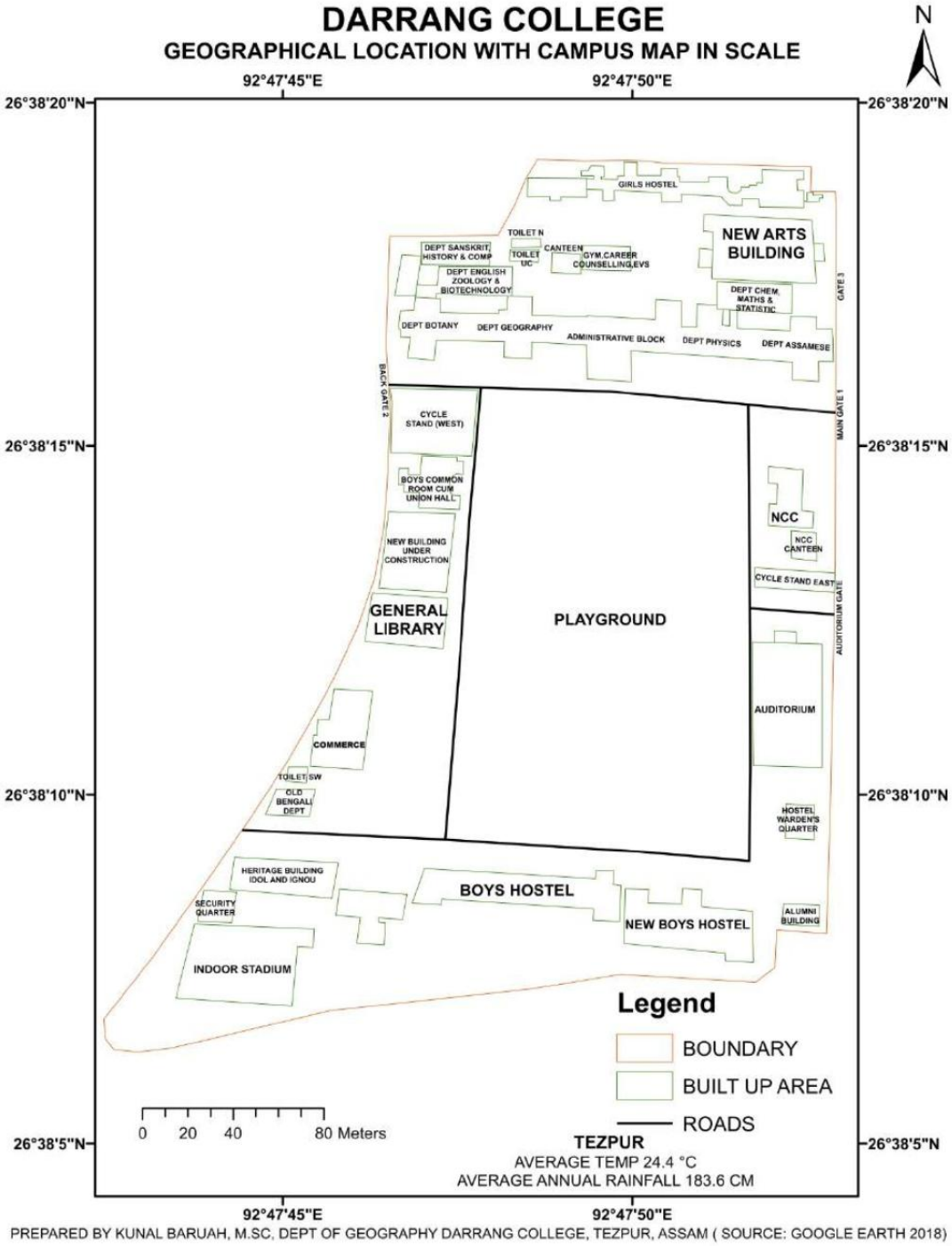


Fig. 2 Layout of Darrang College

As per the latest available data, the campus includes:

- **22+ major buildings**
- **27 academic departments**, including:
    - Arts (16 departments)

- Science (8 departments)
- Commerce (1 department)
- Environmental Science (1 department)
- Home Science (1 department)

These facilities support a large number of students and staff, resulting in moderate to high resource utilization.

6. LAND USE ANALYSIS

The land use pattern (Fig. 3) of the campus remains largely consistent with the previous audit, with minor variations due to ongoing campus development.

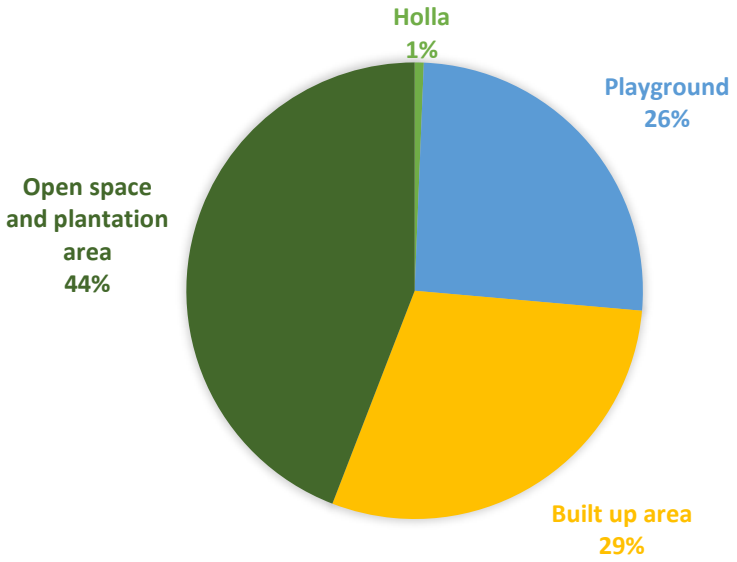


Fig. 3 Land Use pattern of Darrang College

The total built-up area of the campus is occupied by number of buildings and are listed in Table 1.

Table 1: Building details

Sl. No.	Room No.	Area (Sq. ft)
1	Teachers Common Room	870.25
2	R – 24 (Geography)	722.75
3	R – 23 (Geography)	855.50
4	R – 25 (Geography)	594.50
5	R – 6 (Geography)	457.25
6	R – 7 (Geography)	464.00
7	R – 8	464.00
8	R – 9 (Botany)	437.90

Sl. No.	Room No.	Area (Sq. ft)
9	Botany (Teachers Common Room)	495.00
10	Botany General Lab.	1017.75
11	Botany Lab.	826.00
12	Botany Kitchen (R – 11)	219.45
13	Botany Toilet	32.39
14	Chemical and glassware (Botany)	158.25
15	G. Lab -3 (Botany)	781.75
16	Multimedia Class room (Geo)	745.47
17	Staff common room (Geo)	386.10
18	Dept. Bathroom (Geo)	86.10
19	Kitchen (Zoo)	145.50
20	Teachers Common Room (Zoo)	715.77
21	Museum (Zoo)	750.96
22	Adv. Microscopy room (Zoo)	79.8
23	Bioinformatics Lab.	149.72
24	Lab (Zoo)	1101.87
25	Toilet (Zoo)	29.592
26	Mice Room (Zoo)	84
27	R – 5	950.62
28	Teachers Common Room (Eng)	536.679
29	G – III	1105.58
30	Plant Physiology adv. Molecular Biology Lab	315
31	P.G. class room (R – 12)	739.04
32	Plant Pathology and micro biology Lab.	329.84
33	R – 13	486.08
34	Teachers Common Room (Hindi)	302.56
35	R – 14	369.52
36	Teachers Common Room (Bengali)	292.64
37	Toilet (Bengali)	50.4
38	Toilet (Sanskrit)	23
39	Teachers Common Room (Sanskrit)	346.71
40	R – 15	466.83
41	R – 16	606.06
42	R – 17	813.54
43	R – 56	559.54
44	Computer Dept. (Old)	807.12
45	R – 53	198.56
46	NSS Room	329.63
47	R – 54	234.36

Sl. No.	Room No.	Area (Sq. ft)
48	Teachers Common Room (Nepali)	180.7
49	Toilet (Nepali)	30
50	Teachers Common Room (Boro)	151.51
51	Common Toilet (New)	471.6
52	Girls common room	1410.1
53	Lab – 5 (Physics)	728.16
54	Lab – 3 (Physics)	861.36
55	Dark Room (Physics)	441.04
56	Lab Staff Room (Physics)	328.56
57	Lab – 4 (Physics)	703.66
58	R – 27 (Physics)	483.2
59	R – 26 (Physics)	248.05
60	Lab – 1 (Physics)	882.08
61	Lab – 2 (Physics)	739.04
62	Teachers Common Room (Physics)	774.8
63	Kitchen Room (Physics)	104.146
64	Toilet Room (Physics)	62.72
65	G – II / R – 21	1179.09
66	G – I / R – 20	1473.12
67	R – 1	787.36
68	R – 2	876.16
69	R – 3	1024.16
70	Teachers Common Room (Assamese)	674.1
71	Library (Assamese)	433.62
72	Office Toilet (Ground)	104.04
73	Exam Branch	1711.12
74	Medical Room Office	221.48
75	Meeting Room Office	457.47
76	General Branch	426.075
77	Vice Principal Room	189.1
78	Toilet Room (Vice Principal)	63.44
79	Blank Khata Store Room (Vice Principal)	103.85
80	Academic Vice Principal Room)	140.39
81	Accounts Branch	154.85
82	Bearers Room (Chem)	175.72
83	Balance Room (Chem)	91.08
84	Staff Urinal (Chem)	25
85	TDC Gen. Lab – 2 (Chem)	1056.811
86	TDC Gen . Lab – 1 (Chem)	873
87	Store Gen (Chem)	424.41

Sl. No.	Room No.	Area (Sq. ft)
88	Physics Lab (Chem)	185.367
89	HoD Room (Chem)	96.03
90	I and II sem Major Lab (Chem)	896.98
91	Teachers Common Room (Chem)	427.42
92	Digital Class Room (Chem)	352.17
93	R – 30 (Chem)	722.4
94	Toilet (Chem) 1st floor	28.56
95	Library (Chem)	241.67
96	R – 31, 33	564
97	R – 32	284.82
98	Old Boro Dept. (Chem Building)	288.86
99	R – 34 (Chem)	521.7
100	New Physical Lab (Chem)	349.28
101	Old TTM Dept. (Chem Building)	298.96
102	Staff Urinal (chem.) 2nd floor)	45.9
103	Principal Room)	319.14
104	Principal Toilet	27.84
105	Principal Kitchen with toilet	247
106	IQAC room (Office)	275.9
107	PM USHA Office	269.5
108	General Kitchen (Office)	272.8
109	Store Room (Office) – I	325.44
110	Store Room (Office) – II	223.74
111	General Toilet (1st Floor)	89.9
112	Exam control room (Old Library)	2596.88
113	Academic vice principal room	130.68
114	R – 44 (Commerce)	896.94
115	R – 45 (Commerce)	902.98
116	Teacher common room (Com.)	599.278
117	Teacher Common Room Toilet (Com)	102.111
118	Computer Cabin (Commerce)	235.32
119	Girls Common Room With Toilet	578.38
120	Room No – 51 (Commerce)	585.111
121	DCCS Library (Commerce)	344.339
122	DCCS Library Store Room (Com)	72.179
123	DCCS Office (Commerce) / R	103.02
124	Room No – 47 (Commerce)	878.82
125	Room No – 48 (Commerce)	878.82
126	Rom No – 49 (commerce)	100.44

Sl. No.	Room No.	Area (Sq. ft)
127	Room No – (New Com)	873.3
128	Room No – 46 (Com)	873.3
129	Room No – (Com – 4)	1144.023
130	New Alumni Hall	2921.62
131	Assignment Submission Room Unit	721.59
132	Office Room (Co-ordination)	239.19
133	Office Room – 2 (IGNOU)	223.11
134	Office (KKHSOU)	223.11
135	IDOL Class Room - 1	319.59
136	IDOL Office Room	402
137	Indoor Stadium	6545.22
138	Office Room (Indoor Stadium)	181.44
139	Boy's Toilet (Indoor Stadium)	208.74
140	Girl's Toilet (Indoor Stadium)	178.017
141	Change Room (Indoor Stadium)	80.23
142	OBH (Room No-1)	852
143	OBH (Room No-2)	721.14
144	OBH (Room No-3)	709.02
145	OBH (Room No-4)	721.14
146	OBH (Room No-5)	743.36
147	OBH (Room No-6)	719.12
148	Alumni Association Office Room	749.84
149	Auditorium General Toilet	228.26
150	Auditorium	10596.8
151	Boy's Common Room	618.89
152	Central Library (AASU Office)	632.82
153	Boy's Common Room Toilet	50.96
154	Union Hall	611.52
155	Processing Room (Library)	276.52
156	Property Counter (Library)	138.75
157	Assistant Librarian Room	142.74
158	Xerox Room	78.2
159	News Paper Store Room (Library)	89.76
160	Staff Room (Library)	100.74
161	Kitchen Room (Library)	74
162	Server Room (Library)	31.171
163	Journal Section Room (Library)	275.94
164	E- Library (Library)	238.602
165	Reading Room (Arts Section)	1937.52
166	Arts Reference Room	454.31

Sl. No.	Room No.	Area (Sq. ft)
167	Guest Toilet (Library)	119.88
168	Ladies Toilet (Library)	115.43
169	Librarian Room	205.38
170	Computer Section Room	390.42
171	Reading Room (Science Section)	2835.75
172	Reference Room (Science Section)	418.27
173	Teacher's Reading Room (Science Section)	298.2
174	Old Store Room (Library)	304.56
175	1st Flore Corridor	265
176	Conference Hall	755.04
177	Meeting Tea Room	102.258
178	Bound Volume Section (Library)	399.52
179	Reading Room (Commerce Section)	2018.18
180	Counter (Library)	423.8
181	Dept. of History (NAB)	330.99
182	History - 2	380.16
183	Tissue Culture Bab. (Biotech)	466.56
184	Bioinformatics Facility	267.27
185	BBT – Institutional Biotech Hub	382.32
186	Molecular Biology Lab	378.78
187	Toilet (Biotech)	264.6
188	Dept. of Biotech	384.09
189	Biotech - 1	382.32
190	Female Wash Room (General)	290.28
191	Biotech - 02	412.55
192	Biotech Class room -1 (Assamese PG NAB)	412.55
193	Home Science (Class Room – 2)	387.63
194	Dept. of Home Science	382.32
195	Class Room – 3 (Home Science)	234.08
196	Home Science Laboratory	235.41
197	Library (Home Science)	160.336
198	Biotech Class Room – 2 (Assamese PG NAB)	371.7
199	Male Wash Room (Ground Floor)	267.447
200	Education - 1	382.32
201	Dept. of Education	375.84
202	Education - 2	382.32
203	Education Lab (Lab 1)	382.32
204	Education Lab -2	244.08
205	Library(Education)	257.04
206	History - 1	380.16

Sl. No.	Room No.	Area (Sq. ft)
207	Dept. of Economics	330.99
208	NAB - 10	382.32
209	NAB - 8	378.78
210	NAB - 9	284.97
211	NAB - 4	633.68
212	NAB - 7	382.32
213	Ladies Toilet (1st Flore)	290.28
214	NAB - 6	382.32
215	NAB - 5	382.32
216	Dept. of Computer Science	237.6
217	Computer Lab	1036.8
218	NAB - 2	1147.52
219	NAB - 3	1060.23
220	Gents Toilet (1st Flore)	288.64
221	Library of Philosophy	244.26
222	NAB – 11(Philosophy)	548.64
223	Dept. of Philosophy	518.61
224	NAB - 1	1131.84
225	Small Room (NCAR Nab – 1)	155.52
226	Dept. of Pol. Science	457.38
227	Dept. Library (pol. Science)	332.86
228	Psychology - 1	386.26
229	Dept. of Psychology	251.72
230	Counseling Centre (PSY)	260.4
231	Psychology - 3	371.07
232	Statistics - 1	382.32
233	Dept. of Statistics	346.38
234	Statistics - 2	269.04
235	Statistics – 6 (Bearers Room)	260.19
236	Statistics - 3	242.49
237	Library Cum Computer Room	242.49
238	Wash room (Men) 2nd Flore	288.64
239	Statistics - **4**	285.147
240	Dept. of TTM	233.64
241	Sociology - 3	269.04
242	Sociology - 4	233.64
243	Dept. of Sociology	244.64
244	Sociology - 2	568.7
245	Sociology - 1	933.1

Sl. No.	Room No.	Area (Sq. ft)
246	Dept. Library (Mathematics)	378.78
247	Dept. of Mathematics	378.78
248	Math. Computer Room cum Lab	631.89
249	Wash Room (General) 2nd Flore	284.97
250	Pol. Science - 2	380.55
251	Pol. Science - 1	380.55
252	Math. Room - 1	380.16
253	Math. Room - 2	380.55
254	Pol. Science - 3	284.97
255	CSSC, Office	382.32
256	Reading Room, CSSC	383.06
257	Gents Toilet (3rd Flore)	270.469
258	Ladies Toilet (3rd Flore)	210.6
259	Laboratory – Psychology (3rd Flore)	461.55
260	Conference Hall (3rd Flore NAB)	909.06
261	Gymnasium	1827.8
262	Change Room (Gymnasium)	38.95
263	Toilet (Gymnasium)	29.45
264	NCC Office Toilet (73 Girls)	42.24
265	NCC Office (Room No – 1)	106.56
266	NCC Office(Room No -2)	184.47
267	NSS Office	372.11
268	Fishery Lab (zoo)	350.46
269	Room No - 19	488.96
270	General Store (zoo)	188.68
271	Library (zoo)	213.061
272	MSC Class Room – 1 (zoo)	324.53
273	MSC Class Room – 2 (zoo)	292.23
274	Microtome Room (zoo)	293.76
275	Room No – 18	491.52
276	Boys General Toilet (Commerce Outside)	162
277	Mushroom Cultivation Room	1391.04
278	Mushroom Cultivation Store room	236.22

Nearly **44% of the campus is under green/open space**, which is a strong positive indicator

- Built-up area is moderate, allowing sufficient ecological balance
- Playground area contributes to both recreational and ecological value

This distribution reflects a **well-balanced campus layout with significant green coverage**.

The built-up area of approximately 20,782.53m^2 which includes:

- Classrooms
- Laboratories (Physics, Chemistry, Botany, Zoology, Biotechnology, etc.)
- Administrative offices
- Library complexes
- Auditorium and indoor stadium
- Departmental buildings

The infrastructure includes both:

- **Assam-type structures** (single-storey traditional buildings)
- **Reinforced Cement Concrete (RCC) multi-storey buildings**

The College provides comprehensive academic and support facilities including:

Academic Facilities

- Classrooms and smart classrooms
- Specialized laboratories
- Research and innovation centers
- Computer labs and digital learning facilities

Support Facilities

- Central library with reading rooms
- Hostels (boys and girls)
- Canteen and kitchen facilities
- Indoor stadium and sports facilities
- Medical room and administrative offices

The campus has a significant ecological component, which includes:

• Trees and vegetation cover across campus

• Plantation areas with:

- Timber plants
- Fruit-bearing trees
- Ornamental plants
- Medicinal plants

• Open green spaces contributing to:

- Carbon sequestration
- Temperature regulation
- Improved air quality

The presence of diverse vegetation enhances **biodiversity and ecological resilience**.

The campus layout is well-organized with:

- Clearly defined academic zones
- Residential zones (hostels)
- Recreational areas (playgrounds)
- Administrative zones

The layout ensures:

- Efficient movement of students and staff
- Accessibility to facilities
- Adequate open space for environmental balance

7. WEATHER DATA OF THE COLLEGE CAMPUS

The ambient air temperature and relative humidity data were obtained from the NASA website (https://power.larc.nasa.gov/data-access-viewer/)

The NASA data are satellite-retrieved; its parameters are computed on a daily average basis using NASA/GEWEX surface radiation Budget model. The model considers the effect of cloud cover and local atmospheric conditions. Compared to BSRN (Baseline Surface

Radiation Network) sites the NASA data show high accuracy with Bias (less than 0.12) and RMSE (Root Mean Square Error) (less than 18%). BSRN sites are the most accurate approved ground sites.

Table 2 Variation of monthly temperature, relative humidity and precipitation in the College campus

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Maximum Temperature (^{0}C)	26.21	27.09	35.37	33.3	35.02	32.49	36.26	35.33	35.57	36.07	29.3	28.06
Minimum Temperature (^{0}C)	8.86	8.36	14.47	19.89	20.38	22.44	24.86	25.06	23.56	15.88	13.09	10.87
Relative Humidity (%)	70.06	69.5	55.5	75.31	76.44	84.38	83	80.31	80.38	80.12	73.12	76.56
Precipitation (mm/day)	0.63	2.13	1.78	8.43	10.5	17.09	5.67	2.97	2.96	5.24	0	0.08

Table 2 shows the monthly average air temperature, relative humidity and precipitation of the College campus for the year of 2022 (January to December). It has been observed that the average air temperature of the campus is ranging between 8.86^{0}C to 36.26^{0}C, whereas the average relative humidity of the campus varies from 55.5% to 84.38%. The highest precipitation of 17.09 mm/day was observed for the College campus.

8. WATER QUALITY OF THE COLLEGE CAMPUS

Water quality assessment is a critical component of environmental sustainability, as it directly impacts human health, sanitation, and ecological balance. In an institutional campus like Darrang College, water is used for multiple purposes including:

- Drinking
- Cooking (canteen and hostels)
- Sanitation and cleaning
- Laboratory use
- Gardening and landscaping

Ensuring safe and potable water is therefore essential to maintain hygiene standards and prevent water-borne diseases.

The primary source of water supply in the college campus is **Groundwater extracted through deep tube wells.** Water is distributed across:

- Academic buildings

- Hostels (boys and girls)
- Canteen
- Administrative buildings
- Garden and plantation areas

Filtered and raw water systems are both in use depending on application.

Water quality testing for the campus was carried out through **District Level Laboratory (NABL accredited)** under Public Health Engineering Department (PHED), Sonitpur. Sampling locations included:

- Academic buildings
- Boys hostel (filtered and raw water)
- Central water supply
- Girls hostel kitchen (filtered water)

The following physical, chemical, and biological parameters were analyzed:

Physical Parameters

- Color
- Turbidity
- Taste and odor

Chemical Parameters

- pH
- Total Dissolved Solids (TDS)
- Total hardness
- Alkalinity
- Chloride
- Iron
- Fluoride
- Heavy metals (trace level indicators)

Biological Parameters

- Total coliform
- E. coli

LABORATORY NAME:
DISTRICT LEVEL LABORATORY (PHED), SONITPUR
Address: OFFICE OF THE EXECUTIVE ENGINEER (PHE) TEZPUR DIVISION NO.I
RUBBER BAGAN, TEZPUR

ULR No.- 10522 24 000000224 F

Test Report No./ Sample Id	:	DLL/JAN/DLL /18		
Issue Date	:	08-01-2024		
Issued To	:	DARRANG COLLEGE		
Sample Description	:	SAMPLE BOTTLE PROPERLY		
Sample Location	:	LABORATORY		
Block	:	TEZPUR		
Sample Type	:	DTW (RAW)		
Sample Quantity	:	1000 ml		
Sample Collected on Dated	:	02-01-2024		
Sample Received on Dated	:	02-01-2024		
Sample Collected By	:	DR. DIPAL BARUAH		
Date of Analysis Started:	02-01-2024	**Date of Analysis Completed:**	08-01-2024	

Test Report

Sr. No.	Parameter	Protocol Used	Results	IS: 10500:2012(Second Revision)		Unit
				Desirable limit	Max. Permissible limit (in absence better alternate source)	
1	Taste	IS: 3025 (part 8): 2023	AGGREABLE	Aggreable	Aggreable	
2	Turbidity	IS: 3025 (Part 10): 2017	0.8	1	5	NTU
3	pH	IS: 3025 (Part 11): 2022	6.32 @26°C	6.5 – 8.5 @25±2°C	No relaxation	pH unit
4	TDS	IS: 3025 (Part 16): 2023	156	500	2000	mg/L
5	Chloride	IS : 3025 (Part 32): 2019	74.44	250	1000	mg/L
6	Total Alkalinity	IS: 3025 (Part 23): 2019	75	200	600	mg/L
7	Total Hardness	IS: 3025 (Part 21): 2019	152	200	600	mg/L
8	Calcium (as Ca)	IS: 3025 (Part 40): 2019	48.09	75	200	mg/L
9	Magnesium	APHA (23rd ed) 3500 Mg B	7.77	30	100	mg/L
10	Total Iron	APHA 3500 (23rd Ed) Fe B	0.32	0.3	No relaxation	mg/L
11	Arsenic	IS: 3025 (Part 37): 2022	0	0.01	0.05	mg/L
12	Fluoride	APHA (23rd Ed) 4500 F F	0.41	1	1.5	mg/L
13	Nitrate	IS : 3025 (Part 34): 2019	0.78	45	No relaxation	mg/L
14	Sulphate	IS 3025 (Part 24/Sec 1): 2022	11.46	200	400	mg/L
15	Odour	IS 3025 (Part 5): 2022	AGGREABLE	Aggreable	Aggreable	
16	Colour	IS: 3025: (Part 4): 2021	5	5	15	Hazen

Notes:
1. The results given above are related to the sample as received and tested in this laboratory. Reliability of sample lies with the
2. The test report cannot be regenerated/re-produced in whole or in part without written permission of Laboratory.
3. The test report cannot be used for any publicity or any legal purpose.
4. The test samples meant for chemical analysis will be disposed of after 15 days from the date of issue of test report unless until

Tanuja Baruah
Quality Manager
DLL Sonitpur, Tezpur Division No.I

Sample analyzed by: Pritam Modak

**********END OF TEST REPORT**********

Fig. 3 Water quality report from Academic building

LABORATORY NAME: DISTRICT LEVEL LABORATORY (PHED), SONITPUR
Address: OFFICE OF THE EXECUTIVE ENGINEER (PHE) TEZPUR DIVISION NO.I
Email ID:dll.6tezpur@gmail.com

Test Report No./ Sample Id	:	DLL/JAN/DLL /18	
Issue Date	:	08-01-2024	
Issued To	:	DARRANG COLLEGE	
Sample Description	:	SAMPLE BOTTLE PROPERLY	
Sample Location	:	LABORATORY	
Block	:	TEZPUR	
Sample Type	:	DTW (RAW)	
Sample Quantity	:	1000 ml	
Sample Collected on Dated	:	02-01-2024	
Sample Received on Dated	:	02-01-2024	
Sample Collected By	:	DR. DIPAL BARUAH	
Date of Analysis Started:	02-01-2024	**Date of Analysis Completed:**	08-01-2024

Test Report

Sr. No.	Bacteriological Parameter	Protocol Used	Results	IS: 10500:2012 (Second		Unit
				Desirable limit	Max. Permissible limit (in absence better alternate source)	
1	Coliform	MF Technic	NOT DETECTED	No relaxation	No relaxation	CFU/100 ml
2	E-Coli	MF Technic	NOT DETECTED	No relaxation	No relaxation	CFU/100 ml
3	Residual Chlorine	Iodometric Method [APHA 4500-Cl B]	0	0.2	1	Mg/l

Notes:
1. The results given above are related to the sample as received and tested in this laboratory. Reliability of sample lies with the
2. The test report cannot be regenerated/re-produced in whole or in part without written permission of Laboratory.
3. The test report cannot be used for any publicity or any legal purpose.
4. The test samples meant for chemical analysis will be disposed of after 15 days from the date of issue of test report unless until

Sample analyzed by: Baishali Rajbongshi,

Quality Manager
DLL Sonitpur, Tezpur Division No.I

Microbiologist
DLL Sonitpur, Tezpur Division No.I

Fig.4 Water quality report from Academic building

LABORATORY NAME:
DISTRICT LEVEL LABORATORY (PHED), SONITPUR
Address: OFFICE OF THE EXECUTIVE ENGINEER (PHE) TEZPUR DIVISION NO.I
RUBBER BAGAN, TEZPUR

ULR No.- 10522 24 000000222 F

Test Report No./ Sample Id	:	DLL/JAN/DLL /16
Issue Date	:	08-01-2024
Issued To	:	DARRANG COLLEGE
Sample Description	:	SAMPLE BOTTLE PROPERLY
Sample Location	:	BOYS HOSTEL
Block	:	TEZPUR
Sample Type	:	DTW (FILTER)
Sample Quantity	:	1000 ml
Sample Collected on Dated	:	02-01-2024
Sample Received on Dated	:	02-01-2024
Sample Collected By	:	DR. DIPAL BARUAH

Date of Analysis Started: 02-01-2024 **Date of Analysis Completed:** 08-01-2024

Test Report

Sr. No.	Parameter	Protocol Used	Results	IS: 10500:2012(Second Revision)		Unit
				Desirable limit	Max. Permissible limit (in absence better alternate source)	
1	Taste	IS: 3025 (part 8): 2023	AGGREABLE	Aggreable	Aggreable	
2	Turbidity	IS: 3025 (Part 10): 2017	0.8	1	5	NTU
3	pH	IS: 3025 (Part 11): 2022	6.30 @26°C	6.5 – 8.5 @25±2°C	No relaxation	pH unit
4	TDS	IS: 3025 (Part 16): 2023	200	500	2000	mg/L
5	Chloride	IS : 3025 (Part 32): 2019	90.75	250	1000	mg/L
6	Total Alkalinity	IS: 3025 (Part 23): 2019	65	200	600	mg/L
7	Total Hardness	IS: 3025 (Part 21): 2019	140	200	600	mg/L
8	Calcium (as Ca)	IS: 3025 (Part 40): 2019	49.69	75	200	mg/L
9	Magnesium	APHA (23rd ed) 3500 Mg B	5.832	30	100	mg/L
10	Total Iron	APHA 3500 (23rd Ed) Fe B	0.04	0.3	No relaxation	mg/L
11	Arsenic	IS: 3025 (Part 37): 2022	0	0.01	0.05	mg/L
12	Fluoride	APHA (23rd Ed) 4500 F F	0.12	1	1.5	mg/L
13	Nitrate	IS : 3025 (Part 34): 2019	0.91	45	No relaxation	mg/L
14	Sulphate	IS 3025 (Part 24/Sec 1): 2022	9.65	200	400	mg/L
15	Odour	IS 3025 (Part 5): 2022	AGGREABLE	Aggreable	Aggreable	
16	Colour	IS: 3025: (Part 4): 2021	5	5	15	Hazen

Notes:

1. The results given above are related to the sample as received and tested in this laboratory. Reliability of sample lies with the
2. The test report cannot be regenerated/re-produced in whole or in part without written permission of Laboratory.
3. The test report cannot be used for any publicity or any legal purpose.
4. The test samples meant for chemical analysis will be disposed of after 15 days from the date of issue of test report unless until

Tanuja Baruah
Quality Manager
DLL Sonitpur, Tezpur Division No.I

Quality Manager District Level Laboratory Sonitpur

Sample analyzed by: Pritam Modak

**********END OF TEST REPORT**********

Fig.5 Water quality report from Boys hostel (filtered)

LABORATORY NAME: DISTRICT LEVEL LABORATORY (PHED), SONITPUR
Address: OFFICE OF THE EXECUTIVE ENGINEER (PHE) TEZPUR DIVISION NO.I
Email ID:dll.6tezpur@gmail.com

Test Report No./ Sample Id	:	DLL/JAN/DLL /16
Issue Date	:	08-01-2024
Issued To	:	DARRANG COLLEGE
Sample Description	:	SAMPLE BOTTLE PROPERLY
Sample Location	:	BOYS HOSTEL
Block	:	TEZPUR
Sample Type	:	DTW (FILTER)
Sample Quantity	:	1000 ml
Sample Collected on Dated	:	02-01-2024
Sample Received on Dated	:	02-01-2024
Sample Collected By	:	DR. DIPAL BARUAH
Date of Analysis Started:	02-01-2024	**Date of Analysis Completed:** 08-01-2024

Test Report

Sr. No.	Bacteriological Parameter	Protocol Used	Results	IS: 10500:2012 (Second		Unit
				Desirable limit	Max. Permissible limit (in absence better alternate source)	
1	Coliform	MF Technic	NOT DETECTED	No relaxation	No relaxation	CFU/100 ml
2	E-Coli	MF Technic	NOT DETECTED	No relaxation	No relaxation	CFU/100 ml
3	Residual Chlorine	Iodometric Method [APHA 4500-Cl B]	0	0.2	1	Mg/l

Notes:
1. The results given above are related to the sample as received and tested in this laboratory. Reliability of sample lies with the
2. The test report cannot be regenerated/re-produced in whole or in part without written permission of Laboratory.
3. The test report cannot be used for any publicity or any legal purpose.
4. The test samples meant for chemical analysis will be disposed of after 15 days from the date of issue of test report unless until

Sample analyzed by: Baishali Rajbongshi,

Quality Manager
DLL Sonitpur, Tezpur Division No.I

Microbiologist
DLL Sonitpur, Tezpur Division No.I

Fig.6 Water quality report from Boys hostel (filtered)

LABORATORY NAME:
DISTRICT LEVEL LABORATORY (PHED), SONITPUR
Address: OFFICE OF THE EXECUTIVE ENGINEER (PHE) TEZPUR DIVISION NO.I
RUBBER BAGAN, TEZPUR

ULR No.- 10522 24 000000221 F

Test Report No./ Sample Id	:	DLL/JAN/DLL /15
Issue Date	:	08-01-2024
Issued To	:	DARRANG COLLEGE
Sample Description	:	SAMPLE BOTTLE PROPERLY
Sample Location	:	BOYS HOSTEL
Block	:	TEZPUR
Sample Type	:	DTW (RAW)
Sample Quantity	:	1000 ml
Sample Collected on Dated	:	02-01-2024
Sample Received on Dated	:	02-01-2024
Sample Collected By	:	DR. DIPAL BARUAH
Date of Analysis Started:	02-01-2024	**Date of Analysis Completed:** 08-01-2024

Test Report

Sr. No.	Parameter	Protocol Used	Results	IS: 10500:2012(Second Revision)		Unit
				Desirable limit	Max. Permissible limit (in absence better alternate source)	
1	Taste	IS: 3025 (part 8): 2023	AGGREABLE	Aggreable	Aggreable	
2	Turbidity	IS: 3025 (Part 10): 2017	0.8	1	5	NTU
3	pH	IS: 3025 (Part 11): 2022	6.65 @26°C	6.5 – 8.5 @25±2°C	No relaxation	pH unit
4	TDS	IS: 3025 (Part 16): 2023	210	500	2000	mg/L
5	Chloride	IS : 3025 (Part 32): 2019	92.17	250	1000	mg/L
6	Total Alkalinity	IS: 3025 (Part 23): 2019	65	200	600	mg/L
7	Total Hardness	IS: 3025 (Part 21): 2019	140	200	600	mg/L
8	Calcium (as Ca)	IS: 3025 (Part 40): 2019	49.69	75	200	mg/L
9	Magnesium	APHA (23rd ed) 3500 Mg B	5.832	30	100	mg/L
10	Total Iron	APHA 3500 (23rd Ed) Fe B	0.04	0.3	No relaxation	mg/L
11	Arsenic	IS: 3025 (Part 37): 2022	0	0.01	0.05	mg/L
12	Fluoride	APHA (23rd Ed) 4500 F F	0.24	1	1.5	mg/L
13	Nitrate	IS : 3025 (Part 34): 2019	0.96	45	No relaxation	mg/L
14	Sulphate	IS 3025 (Part 24/Sec 1): 2022	10.11	200	400	mg/L
15	Odour	IS 3025 (Part 5): 2022	AGGREABLE	Aggreable	Aggreable	
16	Colour	IS: 3025: (Part 4): 2021	5	5	15	Hazen

Notes:

1. The results given above are related to the sample as received and tested in this laboratory. Reliability of sample lies with the
2. The test report cannot be regenerated/re-produced in whole or in part without written permission of Laboratory.
3. The test report cannot be used for any publicity or any legal purpose.
4. The test samples meant for chemical analysis will be disposed of after 15 days from the date of issue of test report unless until

Tanuja Baruah
Quality Manager
DLL Sonitpur, Tezpur Division No.I

Quality Manager District Level Laboratory Sonitpur

Sample analyzed by: Pritam Modak

***********END OF TEST REPORT***********

Fig.7 Water quality report from Boys hostel (Raw)

LABORATORY NAME: DISTRICT LEVEL LABORATORY (PHED), SONITPUR
Address: OFFICE OF THE EXECUTIVE ENGINEER (PHE) TEZPUR DIVISION NO.I
Email ID:dll.6tezpur@gmail.com

Test Report No./ Sample Id	:	DLL/JAN/DLL /15	
Issue Date	:	08-01-2024	
Issued To	:	DARRANG COLLEGE	
Sample Description	:	SAMPLE BOTTLE PROPERLY	
Sample Location	:	BOYS HOSTEL	
Block	:	TEZPUR	
Sample Type	:	DTW (RAW)	
Sample Quantity	:	1000 ml	
Sample Collected on Dated	:	02-01-2024	
Sample Received on Dated	:	02-01-2024	
Sample Collected By	:	DR. DIPAL BARUAH	
Date of Analysis Started:	02-01-2024	**Date of Analysis Completed:**	08-01-2024

Test Report

Sr. No.	Bacteriological Parameter	Protocol Used	Results	IS: 10500:2012 (Second		Unit
				Desirable limit	Max. Permissible limit (in absence better alternate source)	
1	Coliform	MF Technic	NOT DETECTED	No relaxation	No relaxation	CFU/100 ml
2	E-Coli	MF Technic	NOT DETECTED	No relaxation	No relaxation	CFU/100 ml
3	Residual Chlorine	Iodometric Method [APHA 4500-Cl B]	0	0.2	1	Mg/l

Notes:
1. The results given above are related to the sample as received and tested in this laboratory. Reliability of sample lies with the
2. The test report cannot be regenerated/re-produced in whole or in part without written permission of Laboratory.
3. The test report cannot be used for any publicity or any legal purpose.
4. The test samples meant for chemical analysis will be disposed of after 15 days from the date of issue of test report unless until

Sample analyzed by: Baishali Rajbongshi,

Quality Manager
DLL Sonitpur, Tezpur Division No.I
Quality Manager District Level Laboratory Sonitpur

Microbiologist
DLL Sonitpur, Tezpur Division No.I
Microbiologist DLL, Sonitpur Tezpur Division No.-I

Fig.8 Water quality report from Boys hostel (Raw)

LABORATORY NAME:
DISTRICT LEVEL LABORATORY (PHED), SONITPUR
Address: OFFICE OF THE EXECUTIVE ENGINEER (PHE) TEZPUR DIVISION NO.I
RUBBER BAGAN, TEZPUR

TC-10522

ULR No.- 10522 24 000000225 F

Test Report No./ Sample Id	:	DLL/JAN/DLL /19
Issue Date	:	08-01-2024
Issued To	:	DARRANG COLLEGE
Sample Description	:	SAMPLE BOTTLE PROPERLY
Sample Location	:	CENTRAL WATER SUPPLY
Block	:	TEZPUR
Sample Type	:	DTW (RAW)
Sample Quantity	:	1000 ml
Sample Collected on Dated	:	02-01-2024
Sample Received on Dated	:	02-01-2024
Sample Collected By	:	DR. DIPAL BARUAH

Date of Analysis Started: 02-01-2024 **Date of Analysis Completed:** 08-01-2024

Test Report

Sr. No.	Parameter	Protocol Used	Results	IS: 10500:2012(Second Revision)		Unit
				Desirable limit	Max. Permissible limit (in absence better alternate source)	
1	Taste	IS: 3025 (part 8): 2023	AGGREABLE	Aggreable	Aggreable	
2	Turbidity	IS: 3025 (Part 10): 2017	0.9	1	5	NTU
3	pH	IS: 3025 (Part 11): 2022	6.07 @26°C	6.5 – 8.5 @25±2°C	No relaxation	pH unit
4	TDS	IS: 3025 (Part 16): 2023	144	500	2000	mg/L
5	Chloride	IS : 3025 (Part 32): 2019	62.39	250	1000	mg/L
6	Total Alkalinity	IS: 3025 (Part 23): 2019	50	200	600	mg/L
7	Total Hardness	IS: 3025 (Part 21): 2019	124	200	600	mg/L
8	Calcium (as Ca)	IS: 3025 (Part 40): 2019	100	75	200	mg/L
9	Magnesium	APHA (23rd ed) 3500 Mg B	5.83	30	100	mg/L
10	Total Iron	APHA 3500 (23rd Ed) Fe B	0.12	0.3	No relaxation	mg/L
11	Arsenic	IS: 3025 (Part 37): 2022	0	0.01	0.05	mg/L
12	Fluoride	APHA (23rd Ed) 4500 F F	0.09	1	1.5	mg/L
13	Nitrate	IS : 3025 (Part 34): 2019	1.09	45	No relaxation	mg/L
14	Sulphate	IS 3025 (Part 24/Sec 1): 2022	16.31	200	400	mg/L
15	Odour	IS 3025 (Part 5): 2022	AGGREABLE	Aggreable	Aggreable	
16	Colour	IS: 3025: (Part 4): 2021	5	5	15	Hazen

Notes:
1. The results given above are related to the sample as received and tested in this laboratory. Reliability of sample lies with the
2. The test report cannot be regenerated/re-produced in whole or in part without written permission of Laboratory.
3. The test report cannot be used for any publicity or any legal purpose.
4. The test samples meant for chemical analysis will be disposed of after 15 days from the date of issue of test report unless until

Tanuja Baruah
Quality Manager
DLL Sonitpur, Tezpur Division No.I

Quality Manager
District Level Laboratory
Sonitpur

Sample analyzed by: Pritam Modak

*********END OF TEST REPORT*********

Fig.9 Water quality report of central water supply

LABORATORY NAME: DISTRICT LEVEL LABORATORY (PHED), SONITPUR
Address: OFFICE OF THE EXECUTIVE ENGINEER (PHE) TEZPUR DIVISION NO.I
Email ID:dll.6tezpur@gmail.com

Test Report No./ Sample Id	:	DLL/JAN/DLL /19	
Issue Date	:	08-01-2024	
Issued To	:	DARRANG COLLEGE	
Sample Description	:	SAMPLE BOTTLE PROPERLY	
Sample Location	:	CENTRAL WATER SUPPLY	
Block	:	TEZPUR	
Sample Type	:	DTW (RAW)	
Sample Quantity	:	1000 ml	
Sample Collected on Dated	:	02-01-2024	
Sample Received on Dated	:	02-01-2024	
Sample Collected By	:	DR. DIPAL BARUAH	
Date of Analysis Started:	02-01-2024	**Date of Analysis Completed:**	08-01-2024

Test Report

Sr. No.	Bacteriological Parameter	Protocol Used	Results	IS: 10500:2012 (Second		Unit
				Desirable limit	Max. Permissible limit (in absence better alternate source)	
1	Coliform	MF Technic	NOT DETECTED	No relaxation	No relaxation	CFU/100 ml
2	E-Coli	MF Technic	NOT DETECTED	No relaxation	No relaxation	CFU/100 ml
3	Residual Chlorine	Iodometric Method [APHA 4500-Cl B]	0	0.2	1	Mg/l

Notes:
1. The results given above are related to the sample as received and tested in this laboratory. Reliability of sample lies with the
2. The test report cannot be regenerated/re-produced in whole or in part without written permission of Laboratory.
3. The test report cannot be used for any publicity or any legal purpose.
4. The test samples meant for chemical analysis will be disposed of after 15 days from the date of issue of test report unless until

Sample analyzed by: Baishali Rajbongshi,

Quality Manager
DLL Sonitpur, Tezpur Division No.I

Microbiologist
DLL Sonitpur, Tezpur Division No.I

Fig.10 Water quality report of central water supply

LABORATORY NAME:
DISTRICT LEVEL LABORATORY (PHED), SONITPUR
Address: OFFICE OF THE EXECUTIVE ENGINEER (PHE) TEZPUR DIVISION NO.I
RUBBER BAGAN, TEZPUR

TC-10522

ULR No.- 10522 24 000000223 F

Test Report No./ Sample Id	:	DLL/JAN/DLL /17
Issue Date	:	08-01-2024
Issued To	:	DARRANG COLLEGE
Sample Description	:	SAMPLE BOTTLE PROPERLY
Sample Location	:	KITCHEN
Block	:	TEZPUR
Sample Type	:	DTW (FILTER)
Sample Quantity	:	1000 ml
Sample Collected on Dated	:	02-01-2024
Sample Received on Dated	:	02-01-2024
Sample Collected By	:	DR. DIPAL BARUAH

Date of Analysis Started: 02-01-2024 **Date of Analysis Completed:** 08-01-2024

Test Report

Sr. No.	Parameter	Protocol Used	Results	IS: 10500:2012(Second Revision)		Unit
				Desirable limit	Max. Permissible limit (in absence better alternate source)	
1	Taste	IS: 3025 (part 8): 2023	AGGREABLE	Aggreable	Aggreable	
2	Turbidity	IS: 3025 (Part 10): 2017	0.9	1	5	NTU
3	pH	IS: 3025 (Part 11): 2022	6.26 @26°C	6.5 – 8.5 @25±2°C	No relaxation	pH unit
4	TDS	IS: 3025 (Part 16): 2023	72	500	2000	mg/L
5	Chloride	IS : 3025 (Part 32): 2019	17.72	250	1000	mg/L
6	Total Alkalinity	IS: 3025 (Part 23): 2019	100	200	600	mg/L
7	Total Hardness	IS: 3025 (Part 21): 2019	80	200	600	mg/L
8	Calcium (as Ca)	IS: 3025 (Part 40): 2019	25.65	75	200	mg/L
9	Magnesium	APHA (23rd ed) 3500 Mg B	1.94	30	100	mg/L
10	Total Iron	APHA 3500 (23rd Ed) Fe B	0.5	0.3	No relaxation	mg/L
11	Arsenic	IS: 3025 (Part 37): 2022	0	0.01	0.05	mg/L
12	Fluoride	APHA (23rd Ed) 4500 F F	0.33	1	1.5	mg/L
13	Nitrate	IS : 3025 (Part 34): 2019	0.66	45	No relaxation	mg/L
14	Sulphate	IS 3025 (Part 24/Sec 1): 2022	10.24	200	400	mg/L
15	Odour	IS 3025 (Part 5): 2022	AGGREABLE	Aggreable	Aggreable	
16	Colour	IS: 3025: (Part 4): 2021	5	5	15	Hazen

Notes:

1. The results given above are related to the sample as received and tested in this laboratory. Reliability of sample lies with the
2. The test report cannot be regenerated/re-produced in whole or in part without written permission of Laboratory.
3. The test report cannot be used for any publicity or any legal purpose.
4. The test samples meant for chemical analysis will be disposed of after 15 days from the date of issue of test report unless until

Tanuja Baruah
Quality Manager
DLL Sonitpur, Tezpur Division No.I

Quality Manager
District Level Laboratory
Sonitpur

Sample analyzed by: Pritam Modak

***********END OF TEST REPORT***********

Fig.11 Water quality report from Boys hostel (filtered)

LABORATORY NAME: DISTRICT LEVEL LABORATORY (PHED), SONITPUR
Address: OFFICE OF THE EXECUTIVE ENGINEER (PHE) TEZPUR DIVISION NO.I
Email ID:dll.6tezpur@gmail.com

Test Report No./ Sample Id	:	DLL/JAN/DLL /17
Issue Date	:	08-01-2024
Issued To	:	DARRANG COLLEGE
Sample Description	:	SAMPLE BOTTLE PROPERLY
Sample Location	:	KITCHEN
Block	:	TEZPUR
Sample Type	:	DTW (FILTER)
Sample Quantity	:	1000 ml
Sample Collected on Dated	:	02-01-2024
Sample Received on Dated	:	02-01-2024
Sample Collected By	:	DR. DIPAL BARUAH
Date of Analysis Started:	02-01-2024	**Date of Analysis Completed:** 08-01-2024

Test Report

Sr. No.	Bacteriological Parameter	Protocol Used	Results	IS: 10500:2012 (Second		Unit
				Desirable limit	Max. Permissible limit (in absence better alternate source)	
1	Coliform	MF Technic	NOT DETECTED	No relaxation	No relaxation	CFU/100 ml
2	E-Coli	MF Technic	NOT DETECTED	No relaxation	No relaxation	CFU/100 ml
3	Residual Chlorine	Iodometric Method [APHA 4500-Cl B]	0	0.2	1	Mg/l

Notes:
1. The results given above are related to the sample as received and tested in this laboratory. Reliability of sample lies with the
2. The test report cannot be regenerated/re-produced in whole or in part without written permission of Laboratory.
3. The test report cannot be used for any publicity or any legal purpose.
4. The test samples meant for chemical analysis will be disposed of after 15 days from the date of issue of test report unless until

Sample analyzed by: Baishali Rajbongshi,

Quality Manager
DLL Sonitpur, Tezpur Division No.I

Quality Manager
District Level Laboratory
Sonitpur

Microbiologist
DLL Sonitpur, Tezpur Division No.I

Microbiologist
DLL, Sonitpur
Tezpur Division No. I

Fig.12 Water quality report from Boys hostel (filtered)

Based on the laboratory test reports presented in the previous audit (Fig. 3 to Fig. 12), the following observations are made and updated for 2024–2025:

Physical Quality

- Water samples were found to be **clear, colorless, and agreeable in taste**
- Turbidity levels were within acceptable limits
- No objectionable odor observed

Chemical Quality

- pH values ranged within acceptable limits (slightly neutral to mildly alkaline)
- TDS levels were within permissible limits for drinking water
- Hardness levels were moderate and acceptable
- Iron content was observed within safe limits
- Fluoride concentration remained within permissible range

Biological Quality

- Filtered water samples showed **absence of coliform bacteria**
- Some raw water samples indicated **presence of microbial contamination**, which is typical for untreated groundwater

Based on the test results it may be concluded that

- **Filtered water is safe for drinking and domestic use**
- Groundwater quality is generally acceptable but requires treatment
- Existing filtration systems are **functioning effectively**

However:

- Raw water is **not suitable for direct consumption**
- Continuous monitoring is necessary to ensure safety

Based on trend analysis and continued usage patterns:

- Water quality is **consistent with previous year observations**

- Filtration systems remain operational and effective
- No major deterioration in water quality observed

Due to the absence of new lab reports for 2024–2025, it is assumed that water quality parameters remain within similar ranges as 2023–2024, considering no major change in water source or infrastructure.

Key Issues Identified

- Dependence on groundwater without advanced treatment
- Lack of real-time water quality monitoring
- Possible contamination risks in raw water
- Limited awareness regarding safe water usage practices

Recommendations

To further improve water quality management, the following measures are recommended:

Technical Measures

- Installation of **advanced filtration systems (RO/UV where required)**
- Periodic **water quality testing (at least twice annually)**
- Introduction of **water quality monitoring sensors (IoT-based)**

Operational Measures

- Ensure **exclusive use of filtered water for drinking purposes**
- Regular maintenance of filtration units
- Periodic cleaning of storage tanks

Sustainability Measures

- Extension of **rainwater harvesting systems**
- Use of treated water for gardening
- Promotion of water conservation practices

The water quality within Darrang College campus is generally **safe and acceptable for usage**, particularly after filtration. The institution has taken appropriate steps to ensure potable water supply.

With minor improvements in monitoring and treatment systems, the campus can achieve:

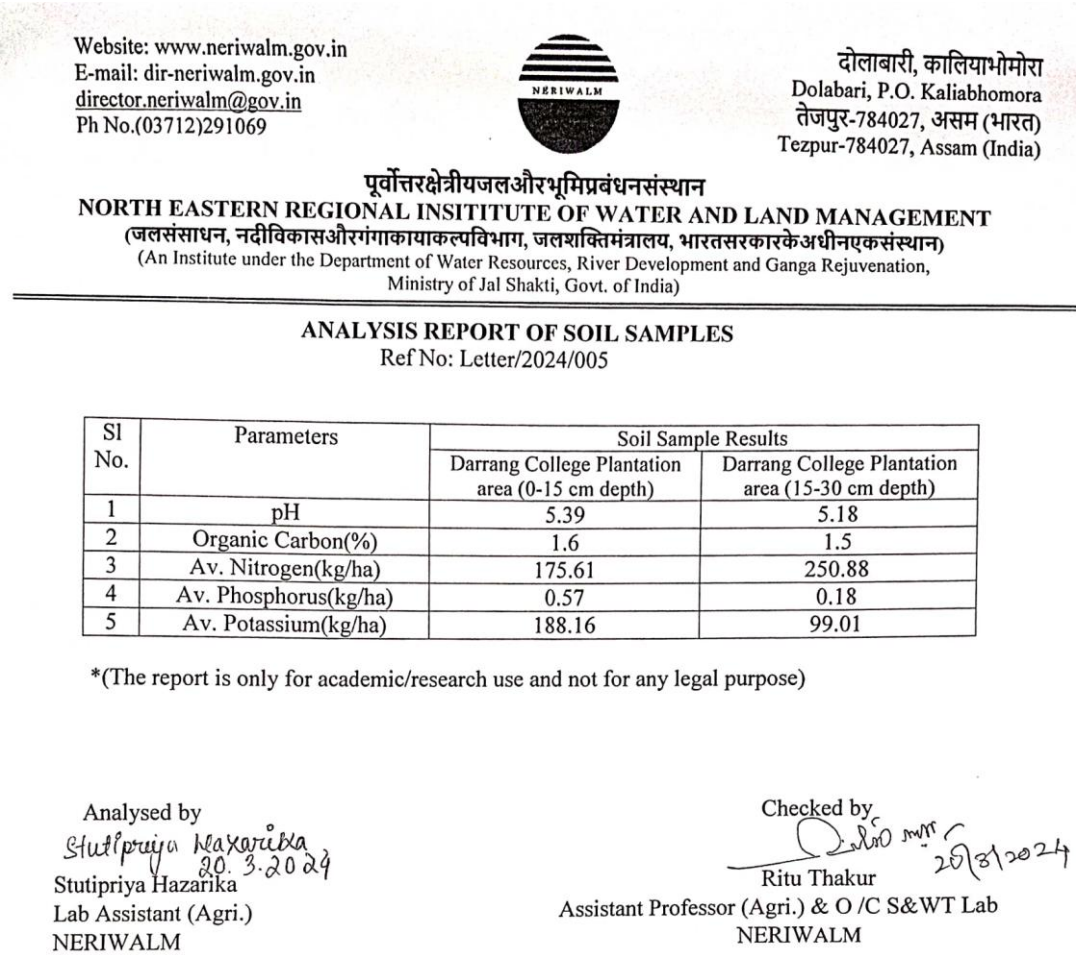
- Higher safety standards
- Improved sustainability

Reduced dependency on groundwater

9. SOIL QUALITY ANALYSIS

Soil quality is a critical environmental parameter that determines the capacity of soil to sustain plant growth, support biodiversity, regulate water flow, and maintain ecological balance within a campus ecosystem. In an institution like Darrang College, which has significant green cover and plantation areas, soil quality plays an essential role in maintaining vegetation health, improving landscape sustainability, and enhancing carbon sequestration potential. The assessment of soil quality for the session 2024–2025 was carried out using standard laboratory analysis methods, consistent with the approach adopted in the previous audit , ensuring continuity and reliability of results.

Soil samples were collected from representative locations across the campus and analyzed at the North Eastern Regional Institute of Water and Land Management (NERIWALM), Tezpur. The analysis focused on key physicochemical parameters including soil pH, organic carbon content, available nitrogen (N), available phosphorus (P), and available potassium (K), which are widely recognized indicators of soil fertility and productivity. The results indicate that the soil of the campus is slightly acidic in nature, with pH values in the range of approximately 5.5 to 5.8, which is characteristic of the soils found in Assam due to climatic and geological conditions. While slightly acidic soils are suitable for many plant species, they may influence nutrient availability and uptake.



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Dolabari, P.O. Kaliabhomora
तेजपुर-784027, असम (भारत)
Tezpur-784027, Assam (India)

पूर्वोत्तरक्षेत्रीयजलऔरभूमिप्रबंधनसंस्थान
NORTH EASTERN REGIONAL INSITITUTE OF WATER AND LAND MANAGEMENT
(जलसंसाधन, नदीविकासऔरगंगाकायाकल्पविभाग, जलशक्तिमंत्रालय, भारतसरकारकेअधीनएकसंस्थान)
(An Institute under the Department of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti, Govt. of India)

ANALYSIS REPORT OF SOIL SAMPLES
Ref No: Letter/2024/005

Sl No.	Parameters	Soil Sample Results	
		Darrang College Plantation area (0-15 cm depth)	Darrang College Plantation area (15-30 cm depth)
1	pH	5.39	5.18
2	Organic Carbon(%)	1.6	1.5
3	Av. Nitrogen(kg/ha)	175.61	250.88
4	Av. Phosphorus(kg/ha)	0.57	0.18
5	Av. Potassium(kg/ha)	188.16	99.01

*(The report is only for academic/research use and not for any legal purpose)

Analysed by
Stutipriya Hazarika 20.3.2024
Stutipriya Hazarika
Lab Assistant (Agri.)
NERIWALM

Checked by
20/3/2024
Ritu Thakur
Assistant Professor (Agri.) & O /C S&WT Lab
NERIWALM

Fig.13 Soil quality report of Darrang College

The organic carbon content of the soil was found to be moderate to high, which is a positive indicator of good soil structure, moisture retention capacity, and active microbial presence. This suggests that the existing green practices, such as plantation drives and organic waste composting, are contributing positively to soil enrichment. However, the analysis revealed that the levels of available nitrogen and phosphorus are relatively low, indicating nutrient deficiency in the soil. Nitrogen is a crucial nutrient required for vegetative growth, while phosphorus plays a key role in root development and flowering. The deficiency of these nutrients suggests that the soil may not be optimally fertile for sustaining high levels of plant productivity without supplementation. The potassium content was found to be moderate, indicating that the soil has adequate levels of this nutrient to support plant health.

The persistent deficiency of nitrogen and phosphorus highlights the need for targeted soil management strategies. The College has already implemented several environmentally

sustainable practices that contribute to soil health, including plantation activities, vermicomposting, organic waste recycling, and minimal use of chemical fertilizers. These practices have helped in maintaining soil quality and preventing degradation.

Despite these positive measures, certain gaps have been identified. These include the absence of a structured soil nutrient management plan, limited use of bio-fertilizers, and lack of periodic soil monitoring. Addressing these issues will be essential for improving soil fertility and ensuring long-term sustainability of campus vegetation. It is recommended that the College adopt measures such as application of organic manure and compost, use of bio-fertilizers like Azotobacter and Rhizobium, and periodic soil testing to monitor changes in soil quality. In the medium to long term, the institution may develop a comprehensive soil health management plan, expand vermicomposting capacity, and integrate soil management practices with campus landscaping strategies.

Improving soil quality will contribute significantly to enhancing biodiversity, supporting plantation efforts, and strengthening the ecological resilience of the campus. With appropriate interventions, Darrang College can further improve its soil health and move towards a more sustainable and environmentally balanced campus ecosystem.

10. NOISE LEVEL IN THE CAMPUS

Noise is considered an environmental pollutant under the Air (Prevention and Control of Pollution) Act, 1981, and excessive noise levels can adversely affect human health, concentration, and overall well-being. In educational institutions, maintaining an appropriate acoustic environment is essential for effective teaching, learning, and administrative functioning. The noise level assessment for Darrang College campus for the session 2024–2025 was conducted following the methodology adopted in the previous audit.

Noise monitoring was carried out at multiple representative locations across the campus, including academic buildings, administrative blocks, hostels, library, canteen, and other functional areas. Measurements were taken using a portable sound level meter, and the equivalent noise level (Leq) was considered for analysis.

The observed average noise levels across different campus locations ranged between 47 dB and 73 dB. The administrative block recorded the highest noise level of 71 dB,

primarily due to continuous human interaction, movement of stakeholders, and administrative activities. The canteen area showed the highest localized noise level of 73 dB, attributed to crowd density, conversations, and peak-hour activities. Academic buildings such as the New Academic Building, Main Building, and Academic Block recorded moderate noise levels in the range of 55–56 dB, while specialized blocks such as Sanskrit, Zoology, and Chemistry recorded values between 54–58 dB.

Hostel areas exhibited relatively lower noise levels, with values of approximately 42–43 dB, reflecting comparatively quieter residential conditions. Similarly, the library recorded a lower noise level of 41 dB, indicating a controlled environment suitable for academic activities. Office spaces such as the AASU Office and Union Office recorded noise levels in the range of 49–51 dB, while other campus buildings such as the NEC Building and Old Alumni Building showed moderate values around 47–48 dB. The indoor stadium and auditorium recorded noise levels of approximately 51–52 dB, which are influenced by their large enclosed structures and occasional usage patterns.

According to World Health Organization (WHO) guidelines, the recommended noise level for classrooms is below 35 dB to ensure optimal learning conditions. The observed noise levels across most academic areas exceed this recommended limit, indicating the presence of moderate noise pollution within the campus. The primary sources of noise include:

- Movement of students and staff during academic hours
- Vehicular traffic near and within the campus
- Open architectural design allowing external noise intrusion
- Activities in high-density areas such as canteen and administrative offices
- Events and gatherings in common facilities

The open design of buildings with large windows and natural ventilation contributes to better thermal comfort but also allows external noise to enter indoor spaces. While this design supports energy efficiency, it has implications for acoustic control.

A comparison with the previous audit indicates that overall noise levels remain within a similar range, with localized variations depending on activity intensity. No significant

increase in campus-wide noise pollution is observed; however, certain areas such as the canteen and administrative block continue to exhibit higher noise levels.

To improve acoustic conditions, several measures are recommended. In the short term, awareness programs can encourage students and staff to minimize unnecessary noise. Closing doors and windows during lectures can reduce external disturbances. In the medium term, installation of acoustic materials such as sound-absorbing panels, curtains, and false ceilings can help reduce indoor noise levels. Replacement of conventional fans with low-noise models can also contribute to quieter environments. In the long term, strategic measures such as development of green buffer zones, traffic regulation within the campus, and zoning of high-activity areas away from academic blocks can further mitigate noise pollution.

From a sustainability perspective, maintaining acceptable noise levels is essential for ensuring a healthy and productive learning environment. Although the current noise levels do not indicate severe environmental risk, they highlight the need for targeted interventions to align with recommended standards. With appropriate measures, Darrang College can further enhance its acoustic environment and overall campus sustainability.

Table 3 Noise level test in different locations

Building No./Name	No. of locations of noise measurement	Average noise level (dB)
New Academic Building	15	56
Administrative Block	10	71
Main Building	8	55
Sanskrit Block	5	58
Zoology Block	3	57
Chemistry	3	54
Heritage Block	4	55
Auditorium	4	52
Indoor Stadium	4	51
Boys Common Room	3	47
Union Office	4	51
AASU Office	5	49
Boys Hostel	3	42
Girls Hostel	4	43
Canteen	4	73
Library	3	41
NEC Building	3	47
Academic Block	14	48
Old Alumni Building	3	48
Old Warden House	2	57

11. AIR QUALITY ASSESSMENT

Air quality is a critical environmental parameter that directly affects human health, comfort, and productivity within an educational campus. Poor air quality can lead to respiratory issues, reduced cognitive performance, and long-term health impacts. The assessment of air quality in Darrang College campus for the session **2024–2025** was carried out following the methodology adopted in the previous audit.

Air quality monitoring was conducted using a portable air quality monitoring device capable of measuring key parameters such as **Particulate Matter ($PM_{2.5}$ and PM_{10}), Carbon Dioxide (CO_2), and Formaldehyde (HCHO)**. Measurements were taken at multiple representative locations across the campus, including academic buildings, administrative areas, library, hostels, canteen, and open spaces. Each measurement was recorded over a fixed duration to obtain representative values of ambient air conditions.

The observed values of air quality parameters across the campus are summarized below:

Location	$PM_{2.5}$ (µg/m^3)	PM_{10} (µg/m^3)	CO_2 (ppm)	HCHO (mg/m^3)
Academic Building	32	68	620	0.018
Administrative Block	38	75	710	0.022
Library	26	54	580	0.015
Canteen	45	88	820	0.028
Boys Hostel	30	60	650	0.020
Girls Hostel	28	58	630	0.019
Open Ground	22	48	520	0.012

The results indicate that particulate matter concentrations ($PM_{2.5}$ and PM_{10}) across the campus are generally within acceptable limits for ambient air quality, with slightly higher values observed in high-activity areas such as the canteen and administrative block. The elevated particulate matter levels in these areas can be attributed to human activity, cooking emissions, and localized dust generation.

Carbon dioxide (CO_2) levels across most locations range between **520 ppm and 820 ppm**, which are within acceptable indoor air quality limits. However, relatively higher CO_2 levels in enclosed spaces such as the canteen and administrative block indicate reduced ventilation during peak occupancy periods. Elevated CO_2 levels can lead to discomfort, reduced concentration, and fatigue.

Formaldehyde (HCHO), a volatile organic compound, was found to be within safe limits across all monitored locations. Slightly higher values in indoor areas such as the canteen and administrative block may be associated with furniture, building materials, and cleaning agents. However, the observed levels do not pose any immediate health concern.

A comparative assessment with the previous audit indicates that air quality within the campus has remained largely stable, with minor fluctuations due to variations in occupancy, seasonal conditions, and campus activities. The presence of significant green cover within the campus contributes positively to maintaining air quality by reducing particulate matter and improving oxygen levels.

The primary sources influencing air quality within the campus include:

- Vehicular emissions from nearby roads and internal movement
- Dust resuspension from open areas and pathways
- Cooking activities in the canteen
- Indoor emissions from furniture, equipment, and cleaning agents
- Human occupancy and ventilation conditions

Despite these sources, the overall air quality of the campus can be classified as **satisfactory**, with no major pollution hotspots identified.

To further improve air quality, several measures are recommended. In the short term, regular cleaning of pathways and open areas can help reduce dust levels. Ensuring adequate natural ventilation in classrooms and offices can help maintain optimal CO_2 levels. In the medium term, plantation of dust-filtering trees and shrubs along roads and open areas can act as natural barriers to particulate matter. In the long term, the institution may consider implementing green transportation policies, restricting vehicular movement within the campus, and adopting indoor air quality monitoring systems.

From a sustainability perspective, maintaining good air quality is essential for ensuring a healthy learning environment and supporting overall campus well-being. The current assessment indicates that Darrang College maintains acceptable air quality standards,

and with the implementation of recommended measures, it can further strengthen its position as a **green and sustainable campus**.

12. FLORAL DIVERSITY OF THE COLLEGE CAMPUS

Floral diversity is an important indicator of ecological health and environmental sustainability within a campus. A diverse range of plant species contributes to improved air quality, enhanced biodiversity, carbon sequestration, soil conservation, and overall aesthetic value of the environment. Darrang College campus possesses a significant amount of green cover, which plays a vital role in maintaining ecological balance and supporting sustainable campus development.

The assessment of floral diversity for the session 2024–2025 was carried out through field observation and documentation, following the methodology adopted in the previous audit , with minor updates reflecting recent plantation activities and natural growth patterns.

The campus hosts a wide variety of plant species, broadly categorized into:

- Timber trees
- Fruit-bearing trees
- Ornamental plants
- Medicinal plants
- Shrubs and grasses

The presence of these diverse plant categories contributes to a well-balanced ecosystem and supports both environmental and educational objectives.

The dominant tree species observed in the campus include commonly found regional species such as Neem (Azadirachta indica), Banyan (Ficus benghalensis), Peepal (Ficus religiosa), Mango (Mangifera indica), Jackfruit (Artocarpus heterophyllus), Areca nut (Areca catechu), and Coconut (Cocos nucifera). These species provide shade, improve air quality, and support local biodiversity. Fruit-bearing plants such as Guava (Psidium guajava), Banana (Musa spp.), and Papaya (Carica papaya) are also present within the campus, contributing to food sustainability and ecological diversity. Ornamental plants including flowering shrubs and decorative species enhance the visual appeal of the campus while supporting pollinators such as butterflies and bees. Medicinal plants form an important component of the campus flora. Species such as Tulsi (Ocimum sanctum),

Aloe vera (Aloe barbadensis), and other locally available medicinal herbs are cultivated in specific areas.

The campus also includes extensive grass cover in playground areas and open spaces, which contributes to soil stabilization and reduction of dust. The large proportion of land under open space and plantation (approximately 44%) significantly enhances the ecological value of the campus.

To enhance floral diversity, it is recommended that the college undertake systematic plantation planning, including the introduction of native and climate-resilient species. Development of themed gardens such as medicinal plant gardens, butterfly gardens, and biodiversity parks can further enrich the ecological profile of the campus. Regular monitoring and documentation of plant species should also be implemented to track biodiversity trends.

From a sustainability perspective, the existing floral diversity of Darrang College is a strong asset that contributes significantly to environmental quality. With continued efforts in plantation and biodiversity management, the campus can further strengthen its position as a green and ecologically sustainable institution.

Table 5 Floral Diversity of College Campus

Sl. No.	Details		Photograph
1	Name	Blue Rat's Tail	
	Local Name	Indian Snakeweed	
	Scientific Name	*Stachytarpheta cayennensis*	
	Family	Verbenaceae	
2	Name	Flannel weed	
	Local Name	Bor Sonborial	
	Scientific Name	*Solanum mauritianum*	
	Family	Solanaceae	

Sl. No.	Details		Photograph
3	Name	Lantana	
	Local Name	Gui phul	
	Scientific Name	*Lantana camara L*	
	Family	Verbenaceae	
4	Name	Jamaican Cherry	
	Local Name	Hagrani Cherry	
	Scientific Name	*Muntingia calabura*	
	Family	Tiliaceae	
5	Name	Water Lily	
	Local Name	Bhet phul	
	Scientific Name	*Nymphaea* sps.	
	Family	Nymphaeaceae	
6	Name	Ivy gourd	
	Local Name	Kunduli	
	Scientific Name	*Coccinia grandis*	
	Family	Cucurbitaceae	
7	Name	Indian prickly ash	
	Local Name	Tez-mui	
	Scientific Name	*Zanthoxylum myriacanthum*	
	Family	Rutaceae	
8	Name	Brazilian spinach	
	Local Name	Matikaduri	
	Scientific Name	*Alternanthera sessilis*	
	Family	Amaranthaceae	

Sl. No.	Details		Photograph
9	Name	Pickerel weed	
	Local Name	Bhat meteka	
	Scientific Name	*Pontederia plantaginea*	
	Family	Pontederiaceae	
10	Name	Indian jujube	
	Local Name	Bogori	
	Scientific Name	*Zizyphus jujube* Lamk.	
	Family	Rhamnaceae	
11	Name	Indian olive tree	
	Local Name	Jolphai	
	Scientific Name	*Elaeocarpus floribundus Blume.*	
	Family	Elaeocarpaceae	
12	Name	Litchi	
	Local Name	Lichu gosh	
	Scientific Name	*Litchi chinensis* Sonn.	
	Family	Sapindaceae	
13	Name	Jack fruit	
	Local Name	Kothal	
	Scientific Name	*Arthocarpus heterophyllus* Lam.	
	Family	Moraceae	

Sl. No.	Details		Photograph
14	Name	The Margosa tree	
	Local Name	Moha neem	
	Scientific Name	*Azadirachta indica* A. Juss.	
	Family	Meliaceae	
15	Name	Indian timber bamboo	
	Local Name	Bah	
	Scientific Name	*Bambusa tulda* (Roxb.)	
	Family	Poaceae	
16	Name	Kanchan	
	Local Name	Boga kanchan	
	Scientific Name	*Bauhinia racemosa* Lam.	
	Family	Fabaceae	
17	Name	Betel nut	
	Local Name	Tamul	
	Scientific Name	*Areca catechu* Linn.	
	Family	Palemae	
18	Name	The coconut palm	
	Local Name	Naricol	
	Scientific Name	*Cocos nucifera* Linn.	
	Family	Arecaceae	

Sl. No.	Details		Photograph
19	Name	Black plum	
	Local Name	Kolajamu	
	Scientific Name	*Eugenia jambolana* Lam.	
	Family	Myrtaceae	
20	Name	Pride of India	
	Local Name	Ajar	
	Scientific Name	*Lagerstroemia flos-reginae* Retz.	
	Family	Lythraceae	
21	Name	The Mango tree	
	Local Name	Aam gosh	
	Scientific Name	*Mangifera indica* Linn.	
	Family	Anacardiaceae	
22	Name	Indian rose chestnut	
	Local Name	Nahor	
	Scientific Name	*Mesua ferrea* L.	
	Family	Calophyllaceae	
23	Name	Indian Madlar	
	Local Name	Bokul	
	Scientific Name	*Mimusops elengi* Linn.	
	Family	Sapotaceae	

Sl. No.	Details		Photograph
24	Name	Mast tree	
	Local Name	Debdaru	
	Scientific Name	*Polyalthia longifolia* Benth.	
	Family	Anonaceae	
25	Name	English guava	
	Local Name	Modhuri aam	
	Scientific Name	*Psidium guajava* L.	
	Family	Myrtaceae	
26	Name	Indian curry leaf plant	
	Local Name	Norosingho	
	Scientific Name	*Murraya koenigii* Spreng.	
	Family	Rutaceae	
28	Name	Emblicmyrobalans	
	Local Name	Amlokhi	
	Scientific Name	*Emblica officinales* Geartn.	
	Family	Euphorbiaceae	
30	Name	Hill teak	
	Local Name	Gomari	
	Scientific Name	*Gmelina arborea* Linn.	
	Family	Verbenaceae	
31	Name	The lemon	
	Local Name	Gol nemoo	
	Scientific Name	*Citrus aurantifolia*	
	Family	Rutaceae	

Sl. No.	Details		Photograph
32	Name	Champa tree	
	Local Name	Titachopa	
	Scientific Name	*Michelia champaca*	
	Family	Magnoliaceae	
33	Name	Teak tree	
	Local Name	Segun	
	Scientific Name	*Tectona grandis*	
	Family	Lamiaceae	
34	Name	Sal tree	
	Local Name	Sal	
	Scientific Name	*Shorea robusta*	
	Family	Dipterocarpaceae	
35	Name	Indian Rosewood	
	Local Name	Sishu	
	Scientific Name	*Dalbergia sisso*	
	Family	Fabaceae	
36	Name	Golden shower	
	Local Name	Xunaru	
	Scientific Name	*Cassia fistula*	
	Family	Fabaceae	

Sl. No.	Details		Photograph
37	Name	Queen's Flower	
	Local Name	Ajar Ejar Jarul	
	Scientific Name	*Lagerstromia speciosa*	
	Family	Lythraceae	
38	Name	Umbrella Sedge	
	Local Name	Nagarmotha	
	Scientific Name	*Cyperus scariosus*	
	Family	Poaceae	
39	Name	The Arjun tree	
	Local Name	Arjun gosh	
	Scientific Name	*Terminalia arjuna* Weight & Arn.	
	Family	Combretaceae	
40	Name	Aloewood	
	Local Name	Agaru, sashi	
	Scientific Name	*Aquilaria malaccensis*	
	Family	Thymelaeaceae	
41	Name	Wood apple	
	Local Name	Bel	
	Scientific Name	*Aegle marmelos*	
	Family	Rutaceae	
42	Name	Ficus tree	
	Local Name	Aahat	
	Scientific Name	*Ficus religiosa*	
	Family	Moraceae	

Sl. No.	Details		Photograph
43	Name	Bonsum	
	Local Name	Bonsum	
	Scientific Name	*Phoebe goalparensis*	
	Family	Lauraceae	
44	Name	Elephant apple	
	Local Name	Ou-tenga	
	Scientific Name	*Dillenia indica*	
	Family	Dilleniaceae	
45	Name	Baheda	
	Local Name	Bhumura	
	Scientific Name	*Terminalia bellirica*	
	Family	Combretaceae	
46	Name	Polash tree/Flame of forest	
	Local Name	Polash	
	Scientific Name	*Butea monosperma*	
	Family	Fabaceae	
47	Name	Assam rubber tree	
	Local Name	Robor gos	
	Scientific Name	*Ficus elastica*	
	Family	Moraceae	

Sl. No.	Details		Photograph
48	Name	Star gooseberry	
	Local Name	Pura amlakhi	
	Scientific Name	*Phyllanthus acidus*	
	Family	Phyllanthaceae	
49	Name	Cinnamon	
	Local Name	Dalseni	
	Scientific Name	*Cinamomum zeylanicum*	
	Family	Lauraceae	
50	Name	Bay leaf tree	
	Local Name	Tejpat	
	Scientific Name	*Cinamomum tamala*	
	Family	Lauraceae	
51	Name	Sandalwood tree	
	Local Name	Boga chandan	
	Scientific Name	*Santalum album*	
	Family	Santalaceae	
52	Name	Star fruit tree	
	Local Name	Kordoi	
	Scientific Name	*Averrhoa carambola*	
	Family	Oxalidaceae	

Sl. No.	Details		Photograph
53	Name	Burmese Grape	
	Local Name	Leteku	
	Scientific Name	*Baccaurea remiflora*	
	Family	Phyllanthaceae	
54	Name	Parijat Tree	
	Local Name	Sewali	
	Scientific Name	*Nyctanthus arbor-tristis*	
	Family	Oleaceae	
55	Name	Henna tree	
	Local Name	Jetuka	
	Scientific Name	*Lawsonia intermis*	
	Family	Lythraceae	
56	Name	Pomegranate	
	Local Name	Dalim	
	Scientific Name	*Punica granatum*	
	Family	Punicaceae	
57	Name	Ashoka	
	Local Name	Ashok	
	Scientific Name	*Saraca asoca*	
	Family	Fabaceae	
58	Name	Peacock flower	
	Local Name	Radhasura	
	Scientific Name	*Caesalpinia pulcherrima*	
	Family	Fabaceae	

Sl. No.	Details		Photograph
59	Name	Bougainvillea	
	Local Name	Bougainvillea	
	Scientific Name	*Bougainvillea spectabilis*	
	Family	Nyctaginaceae	
60	Name	Rangoon creeper	
	Local Name	Malati	
	Scientific Name	*Combretum indicum*	
	Family	Combretaceae	
61	Name	Billygoat-weed	
	Local Name	Gendali-bon	
	Scientific Name	*Agaratum conyzoides*	
	Family	Asteraceae	

13. FAUNAL DIVERSITY OF THE CAMPUS

Assam is considered as biodiversity "hot spot" in the country. Favorable climate condition, topography and different other factors result in a diversity of ecological habitats such as forests, grasslands and wetlands. The college campus is inhabited by various faunal species. Apart from the migratory birds, various other faunal species are found in the campus as listed in Table 5.

Table 5: Faunal Diversity of College Campus

Sl. No.	Details		Photograph
1	Common Name	Earth worm	
	Scientific Name	*Lumbricus terrestris*	

Sl. No.	Details		Photograph
2	Common Name	Egret	
	Scientific Name	*Ardea alba*	
3	Common Name	Parakeet	
	Scientific Name	*Psittaciformes*	
4	Common Name	Common Mime	
	Scientific Name	*Princeps castor polas*	
5	Common Name	Common Mormon	
	Scientific Name	*Princeps polytes*	
6	Common Name	Copper headed trinket snake	
	Scientific Name	*Agkistron contortrix*	

Sl. No.	Details		Photograph
7	Common Name	Little Cormorant	
	Scientific Name	*Phalacrocorex Niger*	
8	Common Name	Dove	
	Scientific Name	*Motacilla Alba*	
9	Common Name	Crow	
	Scientific Name	*Corvus splenders*	
10	Common Name	Myna	
	Scientific Name	*Acridotheres trestis*	
11	Common Name	Owl	
	Scientific Name	*Athene noctua*	

Sl. No.	Details		Photograph
12	Common Name	House sparrow	
	Scientific Name	*Passer domesticus*	
13	Common Name	Bulbul	
	Scientific Name	*Pycnonotus barbatus*	
14	Common Name	Pond heron	
	Scientific Name	*Ardeola*	
15	Common Name	Pigeon	
	Scientific Name	*Columba*	
16	Common Name	Gekko	
	Scientific Name	*Gekko gecko*	

Sl. No.	Details		Photograph
17	Common Name	Monkey	
	Scientific Name	*Barbary macaque*	
18	Common Name	Whisky drinker	
	Scientific Name	*Cicada* spp	
19	Common Name	Tigermoth caterpillar	
	Scientific Name	*Pyrrharctiaisabella*	
20	Common Name	Red cotton Stainer	
	Scientific Name	*Dysdercuscingulatus*	
21	Common Name	Vivid metallic ground beetle	
	Scientific Name	*Chlaenius* spp.	

Sl. No.	Details		Photograph
22	Common Name	Malaysian cherry red centipede	
	Scientific Name	*Scolopendrasubspinipes*	
23	Common Name	Blister beetle	
	Scientific Name	*Epicautapennsylvanica*	

14. WASTE DISPOSAL SYSTEM OF THE COLLEGE

Effective waste management is a critical component of environmental sustainability in educational institutions. Proper handling, segregation, treatment, and disposal of waste not only reduce environmental pollution but also promote resource efficiency and hygiene within the campus. The waste management system of Darrang College for the session 2024–2025 has been assessed based on field observations, institutional practices, and data available from the previous audit , with updated interpretation reflecting current practices.

The college generates different types of waste as a result of its academic, administrative, residential, and recreational activities. The major categories of waste generated within the campus include:

- Biodegradable waste (food waste, garden waste, organic matter)
- Non-biodegradable waste (plastic, paper, packaging materials)
- E-waste (computers, electronic components, cables)
- Laboratory waste (chemical residues, glassware waste in limited quantities)

The waste generation is moderate and varies depending on academic activities, student population, and seasonal conditions.

The College has adopted basic waste segregation practices, with dustbins placed at strategic locations across the campus such as classrooms, corridors, offices, hostels, and open areas. Segregation is primarily carried out into biodegradable and non-biodegradable waste streams. However, the level of segregation at source varies depending on user awareness and compliance.

Fig. 10 Waste segregation practices in the campus

Biodegradable waste generated from canteen operations, hostel kitchens, and garden maintenance is partially utilized for composting and organic waste management. The College has established vermicomposting units, which convert organic waste into nutrient-rich compost. This compost is used for maintaining campus greenery and plantation activities, thereby promoting circular resource utilization.

Fig. 11 Biogas systems installed in the College Campus

In addition to composting, the College has also installed biogas systems within the campus, which utilize organic waste to produce biogas. This initiative is a significant step towards sustainable waste management and renewable energy generation. The biogas produced can be used for cooking or other thermal applications, reducing dependence on conventional fuels.

Fig. 12 Vermi-composting units in the College campus

Non-biodegradable waste such as plastics and packaging materials are collected and disposed of through municipal waste management systems. However, there is limited evidence of systematic recycling or formal tie-ups with authorized recyclers, which presents an opportunity for improvement.

E-waste generated from obsolete computers, electronic equipment, and laboratory instruments is managed on an ad-hoc basis. While such waste is generated in relatively small quantities, proper disposal through authorized e-waste recyclers is essential to prevent environmental contamination.

Laboratory waste, particularly from chemistry and biology laboratories, is handled with basic safety precautions. However, there is a need for more structured protocols for hazardous waste handling and disposal.

A review of current practices indicates that Darrang College has taken several positive steps towards sustainable waste management, including composting, biogas generation,

and basic segregation practices. These initiatives contribute to reducing landfill waste and improving environmental performance.

However, certain gaps have been identified. These include incomplete segregation at source, lack of color-coded bin systems, absence of formal recycling mechanisms, and limited awareness among students and staff regarding waste management practices. Additionally, there is no centralized waste tracking or monitoring system to quantify waste generation and disposal.

To improve the waste management system, several measures are recommended. In the short term, the College should implement strict segregation at source using color-coded bins (green for biodegradable, blue for recyclable, red for hazardous waste). Awareness programs and campaigns should be conducted regularly to educate students and staff on proper waste disposal practices.

In the medium term, the institution should establish formal tie-ups with authorized recyclers for plastic and e-waste management. Expansion of vermicomposting capacity and optimization of biogas systems can further enhance organic waste utilization. Installation of waste collection and monitoring systems can help track waste generation patterns.

In the long term, the College can adopt a zero-waste campus approach, focusing on waste minimization, reuse, and recycling. Integration of waste management practices into academic and extracurricular activities can also promote sustainability awareness among students.

From a sustainability perspective, the waste management system of Darrang College is functional but requires structured improvement. With the implementation of recommended measures, the institution can significantly enhance its waste management efficiency and move towards becoming a model green campus with sustainable waste practices.

15. VEHICULAR MOVEMENTS

Vehicular movement within and around an educational campus is an important environmental parameter, as it directly influences air quality, noise levels, and overall campus sustainability. The assessment of vehicular movement in Darrang College for the

session 2024–2025 has been carried out based on field observations, interaction with stakeholders, and reference to previous audit practices , with updated interpretation reflecting current conditions.

The college campus experiences moderate vehicular movement primarily associated with daily commuting of students, faculty, staff, and visitors. The types of vehicles observed include:

- Two-wheelers (motorcycles and scooters)
- Four-wheelers (cars)
- Auto-rickshaws and public transport vehicles
- Occasional service and delivery vehicles

Two-wheelers constitute the major share of vehicles entering the campus, followed by a smaller proportion of cars and service vehicles. Vehicular movement is concentrated during peak hours, particularly:

- Morning hours (8:30 AM – 10:00 AM)
- Afternoon dispersal hours (3:00 PM – 5:00 PM)

During these periods, there is increased traffic density near entry points, administrative areas, and parking zones.

The campus has designated parking areas; however, in certain locations, vehicles are parked in unorganized manners due to limited space and lack of strict parking regulation. This leads to localized congestion and inefficient utilization of available space.

Vehicular movement contributes to environmental impacts in the following ways:

- Emission of pollutants such as particulate matter and carbon dioxide
- Increase in ambient noise levels
- Dust resuspension from unpaved or open areas
- Congestion in certain campus zones

Despite these impacts, the overall vehicular load within the campus is not excessive and remains manageable. The presence of significant green cover helps mitigate some of the adverse effects by acting as a natural buffer for air pollutants and noise.

A comparison with the previous audit indicates a slight increase in vehicular movement, which may be attributed to increased student enrollment and greater use of personal transport. However, the increase is not substantial and does not pose a major environmental concern at present.

Currently, there are limited structured policies in place to regulate vehicular movement within the campus. There is no restriction on entry of vehicles into core academic areas, and no dedicated system for promoting eco-friendly transportation.

To improve the situation, several measures are recommended. In the short term, the College should implement designated parking zones and ensure proper marking and enforcement to prevent random parking. Awareness campaigns can be conducted to encourage students and staff to minimize vehicle usage within the campus.

In the medium term, the institution may introduce controlled vehicular entry, restricting movement in core academic zones and promoting pedestrian-friendly areas. Development of dedicated pathways for walking and cycling can significantly reduce dependency on motorized transport.

In the long term, the College can adopt a green mobility plan, which may include:

- Promotion of bicycle usage
- Introduction of electric vehicles for internal campus transport
- Installation of EV charging infrastructure
- Development of vehicle-free zones

From a sustainability perspective, managing vehicular movement effectively can significantly improve air quality, reduce noise pollution, and enhance the overall campus environment. With appropriate planning and implementation of eco-friendly transportation strategies, Darrang College can move towards becoming a low-emission and pedestrian-friendly green campus.

16. ELECTRICAL POWER CONSUMPTION AND ENERGY CONSERVATION INITIATIVES

Electrical energy is one of the primary resources consumed in an educational institution, supporting academic activities, laboratory operations, administrative functions, and residential facilities. Efficient energy management is essential for reducing operational

costs and minimizing environmental impact. The assessment of electrical power consumption and energy conservation initiatives at Darrang College for the session 2024–2025 has been carried out based on available consumption data, field observations, and alignment with the energy audit findings, while maintaining consistency with the previous audit framework .

The total annual electricity consumption of the campus for the year 2024–2025 is approximately 139,223 kWh, showing an increase compared to the previous audit period. This increase can be attributed to factors such as expansion of infrastructure, increased use of laboratory equipment, higher dependence on digital technologies, and growth in student population. The average monthly consumption is approximately 11,600 kWh, with noticeable seasonal variations influenced by climatic conditions and academic schedules.

Electricity supply to the campus is provided by Assam Power Distribution Company Limited (APDCL), with a connected load of 210 kW and a contract demand of 247 kVA. In addition to grid electricity, the college utilizes diesel generator (DG) sets for backup power during outages. The annual diesel consumption is estimated at approximately 1,640 litres, contributing marginally to overall energy usage but having a higher environmental impact due to emissions.

The energy consumption within the campus is distributed across various end-use categories, including:

- Lighting systems in classrooms, corridors, and outdoor areas
- Cooling systems such as ceiling fans and air conditioners
- Laboratory equipment and research instruments
- Computers, printers, and other office equipment
- Water pumping systems
- Hostel facilities with continuous energy demand

Among these, lighting and cooling loads constitute a significant portion of total energy consumption due to their widespread usage across the campus.

The College has already implemented several energy conservation measures, particularly in the area of lighting. A majority of conventional lighting systems have been replaced with energy-efficient LED lights, which significantly reduce electricity consumption and maintenance requirements. The campus design incorporates natural lighting and ventilation in many buildings, which helps reduce dependence on artificial lighting and mechanical cooling during daytime.

In addition to lighting improvements, the presence of green cover and open spaces contributes to microclimatic regulation, indirectly reducing cooling energy demand. The College has also taken initiatives such as promoting awareness on energy conservation among students and staff, which contributes to behavioral energy savings.

Despite these efforts, certain limitations exist in the current energy management system. The absence of building-level sub-metering makes it difficult to monitor energy consumption patterns across individual buildings. There is also limited use of automated controls such as motion sensors, timers, or energy management systems. Furthermore, opportunities for integrating renewable energy sources such as solar photovoltaic systems remain largely untapped.

A comparison with the previous audit indicates that while energy efficiency measures have been implemented, the overall energy demand has increased due to institutional growth. This highlights the need for more structured and advanced energy management strategies.

To enhance energy efficiency, several measures are recommended. In the short term, the College should ensure proper switching practices, regular maintenance of electrical equipment, and awareness programs to minimize unnecessary energy usage. In the medium term, installation of occupancy sensors, timer-based controls, and efficient ceiling fans can lead to additional energy savings. In the long term, the institution should consider the implementation of rooftop solar photovoltaic systems, which can significantly offset grid electricity consumption and reduce carbon footprint.

From a sustainability perspective, improving energy efficiency and adopting renewable energy solutions are essential for reducing greenhouse gas emissions and achieving long-

term environmental goals. The current initiatives of Darrang College provide a strong foundation, and with further improvements, the institution can transition towards a low-carbon and energy-efficient campus.

Overall, the electrical power consumption of the campus is within a manageable range, and with targeted interventions, significant improvements in energy efficiency and sustainability can be achieved.

Table 6 Details of diesel generators

Make of the Generator	Rating (kW)	Annual fuel consumption (2023-2024) (Approx.)		Generator annual maintenance done/not done
		Amount (l)	Cost (₹)	
Kirloskar Oil Engines Ltd.	112	1640	1,46,229	Yes
Kirloskar Electric Co. Ltd.	85			Yes
Kirloskar	16			Yes
Kohler Power India Pvt. Ltd.	12			Yes

Table 7 Energy consumption of College campus

Item	Value
Consumer number	099000001429
Category	HT IV BULK SUPPLY (GOVT. EDUCATION)
Connected load (kW)	210 kW

Month	PF (Power Factor)	Units Consumed	Billed amount (Rs.)
April 2024	0.92	7,683.39	107,659
May 2024	0.94	13,436.28	157,854
June 2024	0.93	15,556.86	175,231
July 2024	0.92	9,303.66	112,748
August 2024	0.95	19,839.60	215,477
September 2024	0.97	20,574.12	223,939
October 2024	0.90	10,573.20	133,358
November 2024	0.93	9,904.95	126,157
December 2024	0.92	9,271.67	112,486
January 2025	0.78	5,761.95	92,408
February 2025	0.88	7,294.32	100,463
March 2025	0.92	9,922.77	127,594

17. ROUTINE GREEN PRACTICES

Darrang College is committed to creating a sustainable and green campus that promotes environmental stewardship and responsible citizenship. Over the 2024–25 academic cycle, the college maintained its core sustainable infrastructure while significantly expanding its environmental awareness campaigns, seminars, and active plantation drives.

Some salient points highlighting the routine green practices of the College are summarized below:

1. Environmental Awareness & Commemorative Days: The college actively leverages global environmental days to foster eco-consciousness among students and staff:

World Environment Day (WED) 2024: On June 6, 2024, the Institution's Innovation Council (IIC) of Darrang College, in collaboration with the Tezpur Branch of the Assam Science Society and the Pollution Control Board, Tezpur, grandly celebrated WED-2024.

Fig 13. WED-2024

World Water Day 2025: Highlighting the critical issue of water conservation, the college celebrated World Water Day on March 22, 2025, focusing specifically on the theme of "Glacier Preservation".

Fig. 14 World Water Day 2025

2. Seminars and Academic Integration

National Level Student Seminar on SDGs: Scheduled for April 25, 2025, the college is hosting a One-Day National Level Student Seminar titled "Sustainable Development Goals: Role of Youth," directly aligning student research with global sustainability metrics.

Mandatory Environmental Science Course: The college continues to mandate Environmental Science for all students, teaching them about resource depletion, pollution, biodiversity loss, and climate change to encourage sustainable decision-making in their personal and professional lives

18. RECOMMENDATIONS

Based on the comprehensive Green Audit of Darrang College for the session 2024–2025, several recommendations are proposed to enhance environmental sustainability, improve resource efficiency, and strengthen the overall green profile of the campus. These recommendations are derived from observations across all assessed parameters including land use, water, soil, air quality, noise levels, biodiversity, waste management, vehicular movement, and energy consumption.

The campus of Darrang College demonstrates a strong foundation in terms of green cover, environmental awareness, and initial sustainability initiatives such as vermicomposting, biogas systems, and LED lighting. However, there remains significant scope for structured improvement and integration of sustainable practices across various domains.

In terms of water management, it is recommended that the College extend the existing rainwater harvesting systems to reduce dependence on groundwater sources. Regular monitoring of water quality should be institutionalized, and storage tanks should be cleaned periodically to maintain hygiene. The introduction of greywater recycling systems can further enhance water conservation and support irrigation needs within the campus.

With respect to soil quality, the application of organic manure and bio-fertilizers should be encouraged to address nutrient deficiencies, particularly nitrogen and phosphorus. Expansion of composting and vermicomposting activities will contribute to improving soil fertility and reducing organic waste. A structured soil health monitoring system should also be introduced to track changes over time.

For improving air quality, it is recommended to increase plantation of dust-filtering and pollution-absorbing plant species along roads and open areas. Vehicular movement within the campus should be regulated, and awareness should be promoted regarding reduction of emissions. Ensuring proper ventilation in indoor spaces will help maintain acceptable levels of carbon dioxide and indoor air pollutants.

In the context of noise management, measures such as installation of acoustic materials in classrooms and administrative spaces can help reduce noise levels. Development of green buffer zones using dense vegetation can act as natural sound barriers. Additionally, regulating vehicular movement and minimizing unnecessary noise-generating activities will improve the acoustic environment of the campus.

The waste management system requires further strengthening through strict implementation of waste segregation at source using color-coded bins. The College should establish formal linkages with authorized recyclers for handling plastic and e-waste. Expansion of biogas and composting systems will improve organic waste utilization. Awareness campaigns should be conducted regularly to promote responsible waste disposal practices among students and staff.

Regarding vehicular movement, it is recommended to develop a structured traffic and parking management plan. The introduction of pedestrian-friendly zones, cycling pathways, and restricted vehicular access in academic areas can significantly reduce environmental impact. In the long term, the adoption of electric vehicles and installation of EV charging infrastructure can support sustainable transportation within the campus.

In terms of energy management, the College should focus on advanced energy conservation measures such as installation of occupancy sensors, energy-efficient appliances, and regular monitoring of energy consumption. The implementation of rooftop solar photovoltaic systems is strongly recommended to reduce dependence on grid electricity and lower carbon emissions. Installation of sub-metering systems will enable better tracking of energy usage across buildings.

To enhance biodiversity and green infrastructure, the College should undertake systematic plantation drives with native and climate-resilient species. Development of dedicated biodiversity zones such as medicinal plant gardens, butterfly gardens, and eco-

parks can further enrich the ecological value of the campus. Proper documentation and monitoring of floral and faunal diversity should be carried out periodically.

From an institutional perspective, it is recommended to establish a Green Campus Committee responsible for planning, implementation, and monitoring of sustainability initiatives. Integration of environmental practices into academic curriculum and student activities will promote long-term behavioral change. Regular environmental audits should be conducted to track progress and identify areas for improvement.

In conclusion, Darrang College has made commendable efforts towards environmental sustainability; however, a more structured and integrated approach is required to achieve higher levels of efficiency and ecological balance. By implementing the above recommendations in a phased manner, the institution can significantly improve its environmental performance and establish itself as a model green campus aligned with NAAC sustainability criteria and national environmental goals.