

Initial Environmental Examination

August 2022

Sri Lanka: Science and Technology Human
Resource Development Project:
Sabaragamuwa University of Sri Lanka
—Proposed Sewage Treatment Plant 1 (STP 1)

CURRENCY EQUIVALENTS

(As of 14 July 2022)

Currency Unit	-	Sri Lanka Rupee/s (SLRe/SLRs)
SLRe1.00	=	\$0.0028
\$1.00	=	SLRs358.94

LIST OF ABBREVIATIONS

ADB	-	Asian Development Bank
AET	-	Aqua Equipment Technology
BOD	-	Biochemical Oxygen Demand
CEA	-	Central Environmental Authority
CEB	-	Ceylon Electricity Board
CIDA	-	Construction Industry Development Authority
COD	-	Chemical Oxygen Demand
CON	-	Contractor
DEM	-	Digital Elevation Model
DS	-	Divisional Secretariat
DSD	-	Divisional Secretariat Division
EIA	-	Environmental Impact Assessment
EO	-	Environmental Officer
EPL	-	Environmental Protection License
EQ	-	Equalization
FFPO	-	Fauna and Flora Protection Ordinance
FT	-	Faculty of Technology
GND	-	Grama Niladhari Division
GRC	-	Grievance Redress Committee
HRT	-	Hourly Rate
ICC	-	International Consolidation Company
IEE	-	Initial Environmental Examination
IP	-	Indigenous Peoples
IR	-	Involuntary Resettlement
IUCN	-	International Union for Conservation of Nature
MHECA	-	Ministry of Higher Education and Cultural Affairs
MLSS	-	MLSS Mixed liquor suspended solids
MOH	-	Medical Officer of Health
MSL	-	Mean Sea Level
NBRO	-	National Building Research Organization
NE	-	Not Evaluated

NEA	-	National Environmental Act
NWS&DB	-	National Water Supply and Drainage Board
PAA	-	Project Approving Authority /Agency
PHI	-	Public Health Inspector
PIU	-	Project Implementation Unit
PMC	-	Project Management Consultant
PMU	-	Project Management Unit
PP	-	Project Proponent
PS	-	Pradeshiya Sabha
RAM	-	Risk Assessment Matrix
RC	-	Reinforced Concrete
RDC	-	Resources Development Consultants (Pvt) Ltd.
SPS	-	Safeguard Policy Statement
STP	-	Sewage Treatment Plant
SUSL	-	Sabaragamuwa University of Sri Lanka
TOR	-	Terms of Reference
VEC	-	Valued Environmental Component

NOTE

In this report, "\$" refers to US dollars unless otherwise stated.

This initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature. Your attention is directed to the "**terms of use**" section on ADB's website.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

CONTENTS

EXECUTIVE SUMMARY	9
I. INTRODUCTION	17
A. General Information	18
A.1 Name of the Subproject.....	18
A.2 Name of the Developer.....	18
A.3 Nature of the Subproject.....	18
A.3.1 Nature of the Subproject.....	18
A.3.2 Scale of the Subproject.....	18
A.3.3 Main Objective of the Subproject.....	18
A.3.4 Justification in Terms of Economic, Social and Environment.....	18
A.4 Investment / Funding Sources	19
A.5 Location of the Subproject.....	19
A.6 Extent of the Subproject Area	19
A.7 Does the Subproject Wholly or Partly Fall within the Following Areas?	23
A.8 Present Ownership of the Subproject Site	23
A.9 Present Use of the Land.....	24
A.10 Subproject Timing, Schedule and Phased Development.....	24
B. Objectives of the IEE	25
C. Approach and Methodology.....	25
D. Structure of IEE Report	27
II. SUBPROJECT DETAILS	29
A. Brief Description of the Subproject	29
B. Construction Stage	30
C. Subproject Layout Plan	33
D. Infrastructure Facilities Required/ Provided	33
D.1 Energy Requirement	33
D.2 Sewer and Wastewater Management	33
D.2.1 Wastewater Generation.....	33
D.2.2 STP 1 Operational Procedure	34
D.2.3 STP 1 Process Description.....	35
D.2.4 STP 1 Tank Design	36
D.2.5 Treatment Process Flowchart	37
D.2.6 Quality of the Treated Water	38
D.2.7 Final Discharge Point	38
D.2.8 Existing Water Quality of the Nearby Natural Water Pond.....	41
D.2.9 Location of the Nearby Natural Water Pond.....	42
D.2.10 Sludge.....	46

D.3 Solid Waste Management Facilities	47
D.3.1 Data Used for the Calculation: Construction Stage.....	47
D.3.2 Computation of Probable Waste Generation and Source Segregation of Waste: Construction Stage.....	48
D.3.3 Total Waste Storage Requirements	49
D.4 Water Requirement	49
III. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK	50
A. Applicable Local Environmental Legislations, Regulations and Standards.....	50
B. Administrative Framework	54
C. International Agreements	55
D. ADB Safeguard Policy Statement, 2009	56
IV. DESCRIPTION OF THE EXISTING ENVIRONMENT.....	61
A. Study Area	61
B. Methodology used for Baseline Study	62
C. Physical Environment	63
C.1 Topography	63
C.2 Hydrology	65
C.2.1 Surface Water Bodies.....	65
C.2.2 Drainage Pattern	65
C.2.3 Presence of Flood Plains.....	66
C.2.4 Surface Water, Ground Water Quality and Present Use.....	66
C.3 Geology and Soil	67
C. 4 Land Cover	67
C. 5 Disaster Prone Area	68
D. Biological Environment	71
E. Historical & Archaeological Importance	71
F. Socio- Economic Environment.....	71
G. Human Settlement.....	72
V. ANALYSIS OF ALTERNATIVES	74
VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES	77
A. Constructional Impacts	77
A.1 Impacts on Land Clearing, Cutting, Levelling and Residual Disposal.....	77
A.2 Impacts Due to Removal of Trees / Loss of Green Cover	78
A.3 Noise, Vibration and Dust due to Construction Activities	78
A.3.1 Noise.....	78
A.3.2 Vibration.....	82
A.3.3 Dust.....	84
A.4 Air Quality Impact from Traffic During Construction	87
A.5 Proposed Mitigatory Measures for construction impacts	87
B. Soil Erosion and Surface Drainage	88

C. Solid Waste Disposal.....	90
D. Impacts on Ecological Resources of the Area.....	91
E. Land Use Impacts.....	91
E.1 Impacts due to Land Use Changes	91
E.2 Loss of Agricultural Lands	92
F. Other Impacts	92
F.1 Mitigation Methods for Visual Pollution.....	92
F.2 Methods for Greenery Build Up	92
F.3 Wastewater and Sludge Disposal.....	92
F.4 Risk of Fire and Emergency Preparedness.....	92
F.5 Occupational Health and Safety and General Public	92
F.6 Contingency Management Plan	94
VII. PUBLIC CONSULTATION	95
VIII. GRIEVANCE REDRESS MECHANISM (GRM)	98
IX. ENVIRONMENTAL MANAGEMENT PLAN.....	100
A. Environmental Management Plan	100
B. Implementing Arrangement	101
C. Environmental Monitoring and Reporting	103
D. Consultation and Information Disclosure.....	104
X. CONCLUSION AND RECOMMENDATION	118
A. Conclusion	118
B. Recommendation.....	119
ANNEXURES.....	121

LIST OF FIGURES

Figure 1: Site Location in the Survey Plan.....	19
Figure 2: Proposed STP 1 Site	20
Figure 3: Location of the STP 1	21
Figure 4: Main Access to the Site	22
Figure 5: Subproject Plan.....	29
Figure 6: Site Location - Before and after the land clearing	30
Figure 7: Contour Pattern.....	30
Figure 8: Section of Soil Excavated Area	32
Figure 9: Sludge Sand Drying Bed	35
Figure 10: STP 1 Tank Model	36
Figure 11: STP 1 Process Flowchart	37
Figure 12: Final Discharge Point Design	38
Figure 13: Treated Water Tank	39
Figure 14: Schematic of Proposed Cascade Aerator	40
Figure 15: Water Stream near the University boundary	41
Figure 16: Nearby Natural Water Pond.....	41
Figure 17: Natural Water Pond and STP 1 Location	43
Figure 18: Proposed Retaining Wall	43
Figure 19: Natural Water flow From the Pond	44
Figure 20: Point A of Figure 5 - Water flow in the Downstream.....	44
Figure 21: Point B of Figure 5 - Water flowing through Cultivated Lands.....	45
Figure 22: Point C of Figure 5 - Water flowing through Cultivated Lands	45
Figure 23: Study Area	61
Figure 24: Site Location	62
Figure 25: Topography	63
Figure 26: Topography - Cross Section	64
Figure 27: Topography - Cross Section	64
Figure 28: Area Map of the Surface Water Bodies	65
Figure 29: Nearest water Body	65
Figure 30: Hirikattu Oya	65
Figure 31: Drainage Map of Proposed Site.....	65
Figure 32: Elevation of Imbulpe DSD.....	66
Figure 33: Land Use Pattern in the Muththettuwegama GND	68
Figure 34: Land Use within 5 km	70
Figure 35: Downstream Settlements.....	72
Figure 36: Noise Measuring Results from Noise Level Report.....	79
Figure 37: Dam Details	82
Figure 38: Dam Details - Water Level.....	82
Figure 39: Dam Details - Sections	83
Figure 40: Concentration of Each Parameter for Ambient Air Quality from Air Quality Report	85
Figure 41: At Public Consultation Meeting.....	96
Figure 42: At Public Perception Survey	97
Figure 43: Grievance Redress Mechanism of SUSL	99
Figure 44: Risk Assessment Matrix	105

LIST OF TABLES

Table 1: Environment Sensitivity as per the NEA Scoping Process	23
Table 2: Site Ownership	23
Table 3: Proposed Subproject Schedule	24
Table 4: Soil Excavation Details of Pumping Pits	32
Table 5: Energy Requirement	33
Table 6: Treated Water Quality and Effluent Discharge Standards.....	38
Table 7: Existing Water Quality of the Pond	42
Table 8: Composition of Typical Solid Waste	48
Table 9: Calculation of Solid Waste Generation	48
Table 10: Clearance / Permits Required / Obtained	54
Table 11: SPS Policy Principle.....	57
Table 12: Land Use Pattern in the Muththettuwegama GND	68
Table 13: Project Scenario.....	74
Table 14: Noise Level of Construction Activity.....	79
Table 15: Relative Range of Noise Levels for Some Common Types of Heavy Construction Machinery	80
Table 16: Typical Noise Levels of Construction Equipment	80
Table 17: Exposure Levels and Time Limit in UK	81
Table 18: Proposed Environmental Management and Monitoring Plan (EMMP)	106
Table 19: Discharge Standards for Effluent.....	119

LIST OF ANNEXURES

ANNEXURE A : GENERAL TERM OF REFERENCE (TOR).....	122
ANNEXURE B : SURVEY PLAN AND DEED.....	128
ANNEXURE C : LAYOUT PLAN.....	134
ANNEXURE D : STP 1 PROPOSAL.....	139
ANNEXURE E : CEA STANDARDS FOR TOLERANCE LIMITS OF DISCHARGE THE WASTEWATER: GAZETTE NO: 2264/17 DATED 27.01.2022.....	208
ANNEXURE F : SEWAGE EFFLUENT TO IFC-WB EHS GUIDELINES.....	221
ANNEXURE G : ENVIRONMENTAL RECOMMENDATIONS APPROVAL FROM CEA.....	229
ANNEXURE H : PROPOSED RETAINING WALL DETAILS FOR STP 1 AREA.....	232
ANNEXURE I : SUMMARY OF STAKEHOLDER CONSULTATION MEETING.....	234
ANNEXURE J : WATER DEMAND.....	259
ANNEXURE K : NOISE REPORT.....	260
ANNEXURE L : AIR QUALITY REPORT.....	266
ANNEXURE M : SITE REPORT.....	273
ANNEXURE N : COMPLAINS FORM.....	280
ANNEXURE O : DAM DETAILS.....	281
ANNEXURE P : CONTOUR PLAN.....	285
ANNEXURE Q : WATER QUALITY TEST REPORT OF THE NEARBY EXISTING POND.....	286
ANNEXURE R : BOQ OF THE STP 1.....	287
ANNEXURE S : CASCADE DETAILS.....	288
ANNEXURE T : PUMPING PIT DETAILS.....	291

EXECUTIVE SUMMARY

The government of Sri Lanka with loan funding from the Asian Development Bank (ADB) has proposed to implement the Science and Technology and Human Resource Development Project (STHRDP). This project aims to increase the technology-oriented workforce to transform Sri Lanka's growing economy by supporting a series of universities across the country. The objectives of the overall project are:

- A. Determine the category of the subproject depending on the improvement proposal, environmental sensitivity, and magnitude of impacts, i.e., screening as per the Government of Sri Lanka's regulations and ADB's Safeguard Policy Statement 2009;
- B. Determine the requirement of statutory clearances;
- C. Baseline environmental monitoring and survey; and
- D. Predict impacts on relevant environmental attributes and mitigation measures to minimize the impacts.

This Initial Environmental Examination (IEE) report is a supplemental IEE for the proposed Sewage Treatment Plant 1 (STP 1) project for Sabaragamuwa University of Sri Lanka (SUSL). This IEE report was prepared based on recommendations (Section X. B. 166 & 167) mentioned in the original IEE report for the proposed Faculty of Technology building complex for SUSL (2018).

Description of the subproject: The establishment of the wastewater treatment facility and sewage management has been planned to give special attention and priority to the SUSL. Accordingly, two Sewage Treatment Plants (STPs) have been identified for SUSL as STP 1 and STP 2. STP 1 is proposed for the current SUSL operation and STP 2 is for the FT building complex, SUSL.

The proposed subproject is STP 1, located in Sabaragamuwa University of Sri Lanka. The subproject aims to provide a proper method to dispose of sewage and wastewater of the increasing student and staff population within the university. The proposed STP 1 facilitates 6000 students and staff population. The STP 1 treats wastewater collected from the university's Student Cafeteria premises, Faculty of Agriculture, Faculty of Applied Science, Walawa Hostel Complex, and Sinharaja Hostel Complex.

With the new development of the Faculty of Technology, SUSL, a proper wastewater management system has become a mandatory construction. Currently, the SUSL provides accommodation for all of its students, in around 44 hostels owned by the University or rented private houses. The generated wastewater was discharged into septic tanks, but with the increasing student population with the new faculty developments, and the future expansion plans of the university, the need for a proper wastewater management system rather than relying on the fixed capacities of the current septic tanks is necessary. Accordingly, the major objective of this subproject is to manage the daily wastewater generation of the SUSL.

Policy, legal and administrative framework, and subproject categorization: The screening, scoping, formulation of initial environmental examination (IEE), environmental management

plan (EMP), and procedures for IEE and EMP disclosure and public comments will be governed by the National Environmental Act (NEA) of 1980 and its subsequent amendments of 1988 and 2000, and by environmental regulations. Accordingly, the current subproject of the STP 1 does not require an IEE report, because it is not within a designated protected area. As per the ADB's Safeguard Policy Statement, the proposed FT subproject of SUSL was classified as Category 'B' for an environment requiring an IEE. In order to meet Environmental Policy Principles, additional activities and mitigations have been identified where necessary. All other Policy Principles have been met. Accordingly, this proposed STP 1 of SUSL is prepared as per the recommendations in the IEE of the proposed FT subproject of SUSL. Therefore, as per the ADB's Safeguards Policy Statement of 2009 and based on the REA Checklist of ADB classification, STP 1 is categorized under environment Category B.

Description of the Existing Environment: The proposed subproject site is situated within the existing SUSL complex. This site is a vacant land at present status. The proposed site was fully occupied with natural vegetation with a slopy terrain. The clearance of scrubs and leveling of the land have been undertaken at this phase. Approximately 250m² has been cleared for the STP tank 1 installation. No significant environmentally sensitive receptors exist in the subproject site's immediate surroundings. The only possible such receptors would be the SUSL community, the closest functional building is located 500 m from the site. None of the species identified in the subproject area are listed under the global International Union for Conservation of Nature (IUCN) Red List.

Analysis of Alternatives: When compared to the No project scenario, which will deteriorate the existing environment and quality of life, the proposed subproject will not only provide the much required solution for the disposal of wastewater but also will greatly enhance and improve the environment. Alternatives to the location were not considered as the subproject site is strategically located within the SUSL complex. As per the locational attributes and treated water disposal purpose, there is no other more suitable location in the vicinity that can be developed as an alternative to the proposed subproject within the university land premises. Design alternative which could be considered is conventional activated wastewater treatment and sludge process.

Public Consultations: A stakeholder consultation was held on 3rd June 2022 attended by 24 people including government officers, members of the nearby villages, students, and staff of the SUSL. The main concern that was highlighted at the meeting was the management of sewerage and wastewater effluent. No major concerns were raised at the meeting. The public participation processes are undertaken during the subproject detailed design to ensure that stakeholders and affected people are engaged during the preparation/finalization of the IEE. Ensuring the disposal of treated water quality as per the CEA standards, reusing the sludge as a byproduct (fertilizer) and the importance of STP 1 maintenance during the implementation phase are the special concerns pointed out during the meeting.

Monitoring and Reporting: The contractor will prepare monthly environmental monitoring reports which will be submitted to the Project Management Consultant (PMC) / Project Implementation Unit (PIU) / Project Management Unit (PMU) and monitoring progress will be included in the monitoring

report during construction and post-construction which will be prepared by the PMU and submitted to ADB. Social monitoring reports will not be required as IR is Category C and Indigenous Peoples (IP) safeguards are not applicable.

Grievance Redress Mechanism: The subproject will follow the GRM process identified in the IEE. Assessment of the existing GRM shows that it has provided citizens with an effective platform for redressing of their grievances. This IEE describes the existing GRM including informal and formal channels, time frame, and mechanisms for resolving complaints about environmental performance.

Anticipated Impacts and Mitigation Measures: A summary of the potential environmental impacts during the construction and operation phases along with recommended mitigation measures are provided in the IEE in the form of an EMP. Significant impacts were quantified based on the Risk Assessment Matrix (RAM). The STP 1 subproject is unlikely to cause significant adverse impacts as most predicted impacts are localized and likely to be associated with the construction process which is temporary. Also, the subproject will adopt mitigation measures, especially against sewer and wastewater generation and management which are the main concerns associated with the subproject. Below summary table indicates the key issues observed and mitigation measures suggested for this proposed subproject.

Key Anticipated Environmental Impact/s	Suggested Mitigation Measure/s
Noise generation during Construction	<ul style="list-style-type: none"> -As per the CEA and NBRO standards, the Maximum permissible noise level at the boundary shall be maintained at or below 75dB during the daytime from 6.00 am to 9.00 pm and 50dB during the nighttime from 9.00 pm to 6.00 am at the construction stage. -Maintain the noise levels at the boundaries of the subproject site during the construction as stipulated in the National Environment (Noise Control) regulations. -Any work that may cause noise and vibration from 9 pm to 6 am shall be avoided. Noise generation activities shall be carried out only from 6.00 am to 9.00 pm. -Any nighttime activities shall be carried out using noise-reducing means or low noise technologies. -During the construction period, temporary covers shall be constructed to adequate height to reduce the spread of the noise. -Servicing of all construction vehicles and machinery shall be carried out regularly and during routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found defective shall be replaced. -Maintenance of vehicles, equipment, and machinery shall be regular and to the satisfaction of the engineer to keep noise levels to the minimum. -Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01) and IFC General Environmental, Health and Safety Guidelines (Section No: 1.7 Noise).

<p>Community / Stakeholder complaints on construction and operation of the development</p>	<ul style="list-style-type: none"> -Adopt the mitigation measures appropriately the expert advice. -Mitigate the coming effects without disturbing the community lifestyle as immediately. -Wastewater generated from the subproject activities shall be treated and the treated wastewater shall comply with the disposal standards for “Tolerance limits for the discharge of industrial wastewater into inland surface waters” as prescribed in Gazette Notification No. 1534/18 dated 01.02.2008 amended by Gazette Notification No. 2264/17 dated 27.01.2022 standard treated effluent parameters and SLSI standards for wastewater and sewage effluent to IFC-WB EHS guidelines. -Adhere to the proposed tolerance limits for the discharge of treated water in table 20 and frequently monitor the quality of effluent discharged from the STP 1. -Proper drainage management plan.
<p>Soil Erosion during construction</p>	<ul style="list-style-type: none"> -Minimum clearance of the existing vegetation cover (shrubs) on the soil surface. -Temporary earth drains should be provided during the construction activities. -Construction activities should be scheduled to cope with the weather condition as much as possible. -Adopt measures suggested by CEA and NBRO. -Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01).
<p>Soil Erosion during operation</p>	<ul style="list-style-type: none"> -Maintain the existing vegetation cover (Shrubs) on the soil surface. -Placing crushed stone and planting vegetation covers around the bank of the tank. -Providing adequate drainage facilities. -The treated water should be discharged under the 1:8 dilutions. -Discharging the treated water to the pond and surface water drainage via cascade aerator and stepped drain. -Construction and maintenance of spill, spill gates, intake structure, and tail canal without change in surface hydrology including downstream flow regime. -Turving downstream slope and providing rip-rap protection on the upstream section of earth bund. -Provision of suitable retaining walls near the STP 1. -Adopt measures suggested by CEA and NBRO. - A proper drainage management plan should be developed for the site to ensure protection from heavy runoff and erosion if unmanageable soil erosion.
<p>Surface Drainage</p>	<ul style="list-style-type: none"> -Maintain the existing vegetation cover (shrubs) and stones in the existing natural drainage. -Maintain the water flow rate of the natural drainage. -Placing crushed stone and planting vegetation covers in and around the drainage. -Providing adequate drainage facilities and a proper drainage management plan. -Temporary earth drains should be provided during the construction activities.

	<ul style="list-style-type: none"> -Construction and maintenance of the spill, spill gates, intake structure, and tail canal without change in surface hydrology including downstream flow regime. -Adopt measures suggested by CEA and NBRO. -Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01).
Solid Waste generated by workers (Garbage)	<ul style="list-style-type: none"> -Bio degradable (food waste) and non-biodegradable wastes such as plastic, polythene, and glass generated on-site should be separated, stored, and discharged to the final disposal point which will be continued with the assistance of the Imbulpe Pradeshiya Sabha. -Continued monitoring should be at the collection point properly. -Work sites shall be cleared of residual solid waste before work commences. -Temporary storage of solid wastes shall be carried out with appropriate containment to avoid the spreading of waste and dust. -Disposal sites for solid debris shall be identified by the contractor and approved by the engineer. If directed by the engineer, the contractor shall obtain approval from PS for the disposal of waste at a specified location. -The contractor shall maintain a waste register in the site office which shall keep records of types and quantities of waste removed from the site and places of disposal. -No solid waste shall be burned on site. -Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01).
Disposal of Wastewater and Sewage	<ul style="list-style-type: none"> -All wastewater generated from the subproject activities shall be treated and the treated wastewater shall comply with the disposal standards for "Tolerance limits for the discharge of industrial wastewater into inland surface waters" as prescribed in Gazette Notification No. 1534/18 dated 01.02.2008 amended by Gazette Notification No. 2264/17 dated 27.01.2022 standard treated effluent parameters and SLSI standards for wastewater and sewage effluent to IFC-WB EHS guidelines. -Adhere to the proposed tolerance limits for the discharge of treated water in table 20 and frequently monitor the quality of effluent discharged from STP 1. -Introduction of proper functioning of Wastewater Management System. - Connect to the existing generator power supply or to a backup power system during any power failure and STP 1 breakdowns during maintenance/operation. - Regular verification of the STP 1 system and process. - 04 basin solution of the STP 1 meaning if one basin needs to be taken out of operation there is no significant loss of performance. - Airflow of the STP 1 can be adjusted depending on the incoming load. - The FBBR system of the STP 1 is modular meaning individual FBBR frames can be removed or added to the basin. - Regular checks and follow-ups with correct actions. -The sludge tank is maintained under anaerobic conditions where the sludge is continuously reduced where the holding tank has enough capability to store sludge for 4-6 months. The digested sludge is inert and has no smell. This will need to be taken out and transported by gully

	<p>bowser to a suitable place for disposal. If it is dried it could be used as organic fertilizer.</p> <ul style="list-style-type: none"> -The overflow, leaks, and immediate repairs should be carried out for STP 1. - Establish and collaborate with the Local Authority under such circumstances. - The water quality shall be monitored to understand the effectiveness and further improvement in designs in reducing the concentration of pollutants. -The monitoring plan shall be functional in construction as well as in operation stages. -Once the detail pans are available, monitoring points and the intervals will be decided by the Environmental Officer.
<p>Dust Emission during Construction</p>	<ul style="list-style-type: none"> -There shall be regular watering of construction sites at all times and especially during dry windy periods when dust levels are elevated. -Vehicle/s carrying dusty materials should be covered entirely with dust barriers to ensure material are not leaked from the vehicle/s. -Construction material stocks should be covered properly. -Stockpiles of construction material shall be kept covered at all times in order to reduce dust emissions. -Washing the vehicles (tires) when going out. Facilities should be provided for the washing of vehicles moving out. -Traffic controls, traffic volume restrictions, the imposition of speed limits, and erosion reduction techniques. -Drivers transporting materials shall be informed to use speed controls within the town area. -Proper maintenance of machinery, equipment, and vehicles. -Surface treatment with penetration chemicals. -Soil from site clearance temporarily stored on site shall be covered by re-usable polythene sheets, thatched coconut leaves, or a similar alternative. -There shall be daily cleaning of streets and pathways in the vicinity of the construction site. -There shall be no burning of wastes on site. -Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01) and IFC General Environmental, Health and Safety Guidelines (Section No: 1.1 Air Emissions and Ambient Air Quality).
<p>Vibration Effect during Construction</p>	<ul style="list-style-type: none"> -Minimize unreasonable vibration impacts on sensitive receivers. -Avoid structural damage to the dam as a result of construction vibration. -Standard vibration mitigation measures are to be implemented throughout the construction and operational periods to reduce and control potential vibration impacts. -Minimize obstructions between the vibration source and the sensitive receiver. Servicing of all construction vehicles and machinery shall be carried out regularly and during routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found defective shall be replaced. -Maintenance of vehicles, equipment, and machinery shall be regular and to the satisfaction of the engineer to keep noise levels to the minimum. -If having a vibration effect from STP 1 during the operational phase, installation of vibrational cleaning of media is recommended to be established in STP 1.

	<ul style="list-style-type: none"> -Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01). -Follow the CEA and NBRO standards. -If construction vibration is found to be significantly below construction vibration criteria, no subsequent monitoring of that activity is required. -If monitored vibration levels are considered to be high-risk or close to the vibration criteria, vibration monitoring tests will be carried out continuously at the nearest vibration-sensitive receiver during the construction and operational stages. - If having a considerable effect on the dam or externals, it is often suggested that vibrations can be interrupted using the wave barriers concept.
Impacts on Safety and Occupational Health	<ul style="list-style-type: none"> -The contractor shall comply with requirements for the safety of the workmen as per the International Labor Organization (ILO) Convention No. 62 and the Safety and Health Regulations of the Factory Ordinance of Sri Lanka. - ICTAD guidelines for health and safety provided by the Construction Industry Development Authority (CIDA), guidelines of the Department of Labour, and IFC General Health and Safety Guidelines shall be followed. -High priority to prevent accidents at the site by giving high priority to health and safety measures. -Workmen should be provided with safety equipment such as dust masks, gloves, etc. for use at required times. -Signage will be installed at the main road turn of the site and in front of the site during the construction. - All necessary safety precautions shall be taken by the contractor to prevent any risks to workers and the public due to accidents by providing adequate warning signs, barricades, flagman, and lighting as appropriate. -A safety inspection checklist shall be prepared to take into consideration what the workers are supposed to be wearing which shall be monitored during specific construction activities. -The contractor shall maintain two registers to keep records of complaints received concerning environmental matters and for recording incidents/ accidents. -All drivers should have valid licenses for the category of vehicles they drive and follow the speed limits of roads. -Construction materials should not exceed the carrying capacity of trucks and the local road.
Construction waste generation	<ul style="list-style-type: none"> -Excess excavated materials should be removed to dumping or disposal locations on a well-planned program approved by the Pradeshiya Sabha -Adhere to the ICTAD Guidelines. -All discarded and used oil, grease, and empty paint buckets will be collected, stored, and disposed in a sanitary way. -Any hazardous waste will be disposed of by two CEA licensed waste collectors. -Proper waste management practices should be adopted. -Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01) and IFC General Environmental, Health and Safety Guidelines (Section No: 1.6 Waste Management). -Close supervision and use of an experienced contractor.

	-The construction site shall be cleaned of any solid wastes before the site is handed over.
Noise due to STP 1	-STP 1 should be operated at high noise free. -Noise levels at the boundary of the STP 1 land during the operational stage should be maintained at or below 55dB during the daytime from 6 am to 6 pm and 45dB during the nighttime from 6 pm to 6 am.

Recommendations: The EMP and associated LA, NBRO, CEA, and UDA guidelines should be followed during construction and optional activities. As indicated by the MOH office, the proposed STP 1 is the best management option to resolve wastewater/sewerage leachate of polluting waterways due to the current SUSL operation. For the STP 1 development subproject, the GRM and EMP provide appropriate guidance for suitable environmental and social safeguards. Accordingly, the proposed subproject can be recommended for implementation with strict adherence to EMP and GRM provided in this IEE ensuring that it does not contribute to the aggravation of any existing issues.

Conclusion: The proposed subproject may cause temporary impacts during the construction stage. Most of the adverse impacts of STP 1 during the construction period are short-term and temporary in nature. The negative environmental impacts are mostly construction-related and short term such as noise, vibration, and dust. The anticipated adverse environmental impacts during the operational phase are related to the disposal of wastewater and sewage. The IEE study did not find any adversely significant incompatibility with the surrounding physical, biological, socio-economic, or cultural environment and does not pose any significant long-term environmental threat if managed properly during construction and implementation.

I. INTRODUCTION

1. The domestic wastewater and sewage of the Sabaragamuwa University of Sri Lanka (SUSL) is collected and disposed of in an open waste sludge tank within the university premises in the current situation. The unregulated disposal of sludge has caused the leachate to pollute the groundwater table and the surface water in the adjoining villages. The Medical Officer of Health (MOH) office has indicated that wastewater/sewerage leachate polluting waterways due to the current SUSL operation should be addressed immediately and resolved. Therefore, the establishment of the wastewater treatment facility and sewage management has been planned to give special attention and priority to the SUSL. Two Sewage Treatment Plants (STPs) have been identified for SUSL as STP 1 and STP 2. STP 1 is proposed for the current SUSL operation and STP 2 is proposed for the FT building complex, SUSL.

2. Of these two STPs, STP 2 has been cleared along with the original IEE (2018), hence construction works have commenced. The proposed STP 1 intends to obtain the funds under the STHRDP project of new development of the Faculty of Technology, SUSL funded by ADB. This IEE is a supplemental IEE for the proposed STP 1 subproject and the report is prepared based on the recommendations (Section X. B. 166 & 167) mentioned in the original IEE report for the proposed Faculty of Technology building complex for SUSL (2018).

3. As per the recommendations (Section X. B. 166 & 167) made in the original IEE report (2018) for the proposed Faculty of Technology (FT) building complex and ADB format to fulfill the environmental adherence for the proposed STP 1, this Supplemental Initial Environmental Examination (IEE) report is prepared for the proposed Sewage Treatment Plant 1 (STP 1) project for Sabaragamuwa University of Sri Lanka.

4. With the new development of the Faculty of Technology, SUSL, a proper wastewater management system for the University has become a mandatory construction. Currently, the SUSL provides accommodation for all of its students, in around 44 hostels owned by the University or rented private houses. The generated wastewater is discharged into septic tanks. However, with the increasing student population with the new faculty developments, and the future expansion plans of the university, the need for a proper wastewater management system rather than relying on the fixed capacities of the current septic tanks is necessary. Accordingly, the major objective of this subproject is to manage the daily wastewater generation of the SUSL. Accordingly, the subproject aims to provide a proper method to dispose sewage and wastewater of the increasing student and staff population within the university. The proposed STP 1 facilitates 6,000 students and staff population. The STP tank 1 treats wastewater collected from the university's Student Cafeteria premises, Faculty of Agriculture, Faculty of Applied Science, Walawa Hostel Complex, and Sinharaja Hostel Complex.

A. General Information

A.1 Name of the Subproject	:	Sewage Treatment Plant 1 (STP 1)
A.2 Name of the Developer	:	International Construction Consortium (Pvt) Ltd.
Postal Address	:	70 S. De S. Jayasinghe Mawatha, Nugegoda 10250
Phone/ Fax No	:	0114 400 600
Contact Person	:	
Name	:	Mr. Sampath Narasinghe
Designation	:	Site Engineer
Phone No	:	076 307 1503

A.3 Nature of the Subproject

A.3.1 Nature of the Subproject

5. The proposed subproject is a Sewage Treatment Plant, located at the Sabaragamuwa University of Sri Lanka. The subproject aims to provide a proper method to dispose of sewage and wastewater of the increasing student and staff population within the university.

A.3.2 Scale of the Subproject

6. The proposed STP 1 facilitates 6,000 students and staff population. The design volume of the STP 1 is 950 m³/day. The area required for the subproject is 250 m². The STP 1 treats wastewater collected from the university's Student Cafeteria premises, Faculty of Agriculture, Faculty of Applied Science, Walawa Hostel Complex, and Sinharaja Hostel Complex. The estimated capital cost of the STP 1 is approximately 109.6 Mn LKR (183,735 USD). A summary of the BOQ of the STP 1 is given in Annexure R. The estimated operational cost per month for the proposed STP 1 is approx. LKR 289,210.71 (as estimated on 2021/08/18).

A.3.3 Main Objective of the Subproject

7. The main objective of the subproject is to manage the daily wastewater generation within the university. Other than that, the subproject aims to utilize the treatment plant as a students' training and research facility and to support the university to obtain the Green Building certificate.

A.3.4 Justification in Terms of Economic, Social and Environment

8. With the new development of the Faculty of Technology, SUSL, a proper wastewater management system has become a mandatory construction as per the request of the local authorities. Currently, the SUSL provides accommodation for all of its students, in around 44 hostels owned by the University or rented private houses. The generated wastewater is discharged into septic tanks, but with the increasing student population with the new faculty developments, and the future expansion plans of the university, the need for a proper wastewater management system rather than relying on the fixed

capacities of the current septic tanks is necessary. Accordingly, the major objective of this subproject is to manage the daily wastewater generation of the SUSL. The other benefits of this subproject are the utilization as a students' training and research facility and to support the SUSL to gain Green Building Certificate.

A.4 Investment / Funding Sources

9. The estimated cost of the STP 1 subproject is approx. 109,605,118.98 LKR and 183,735.00 USD (Attached: Annexure R - BOQ of STP 1). Asian Development Bank (ADB) acts as the funding source.

A.5 Location of the Subproject

10. The proposed site is located in Imbulpe in Rathnapura District within the current SUSL premises.

- | | | | |
|-------|---------------------------|---|---|
| I. | Pradeshiya Saba | : | Imbulpe Pradeshiya Saba |
| II. | Divisional Secretariat | : | Imbulpe Divisional Secretariat |
| III. | GN Division | : | Muttettuwegama Grama Niladhari Division (GND) |
| IV. | District Secretariat: | : | Ratnapura District Secretariat |
| V. | Provincial Council | : | Sabaragamuwa Provincial Council |
| VI. | Location Map | : | See: Figure 1 & 2 |
| VII. | Copy of the Survey Plan : | : | See: Annexure B - Survey Plan and Deed |
| VIII. | GPS Point | : | 6°42'46.3"N 80°47'20.6"E |

A.6 Extent of the Subproject Area

The extent of the land is 0.025 Ha.



FIGURE 1: SITE LOCATION IN THE SURVEY PLAN



FIGURE 2: PROPOSED STP 1 SITE

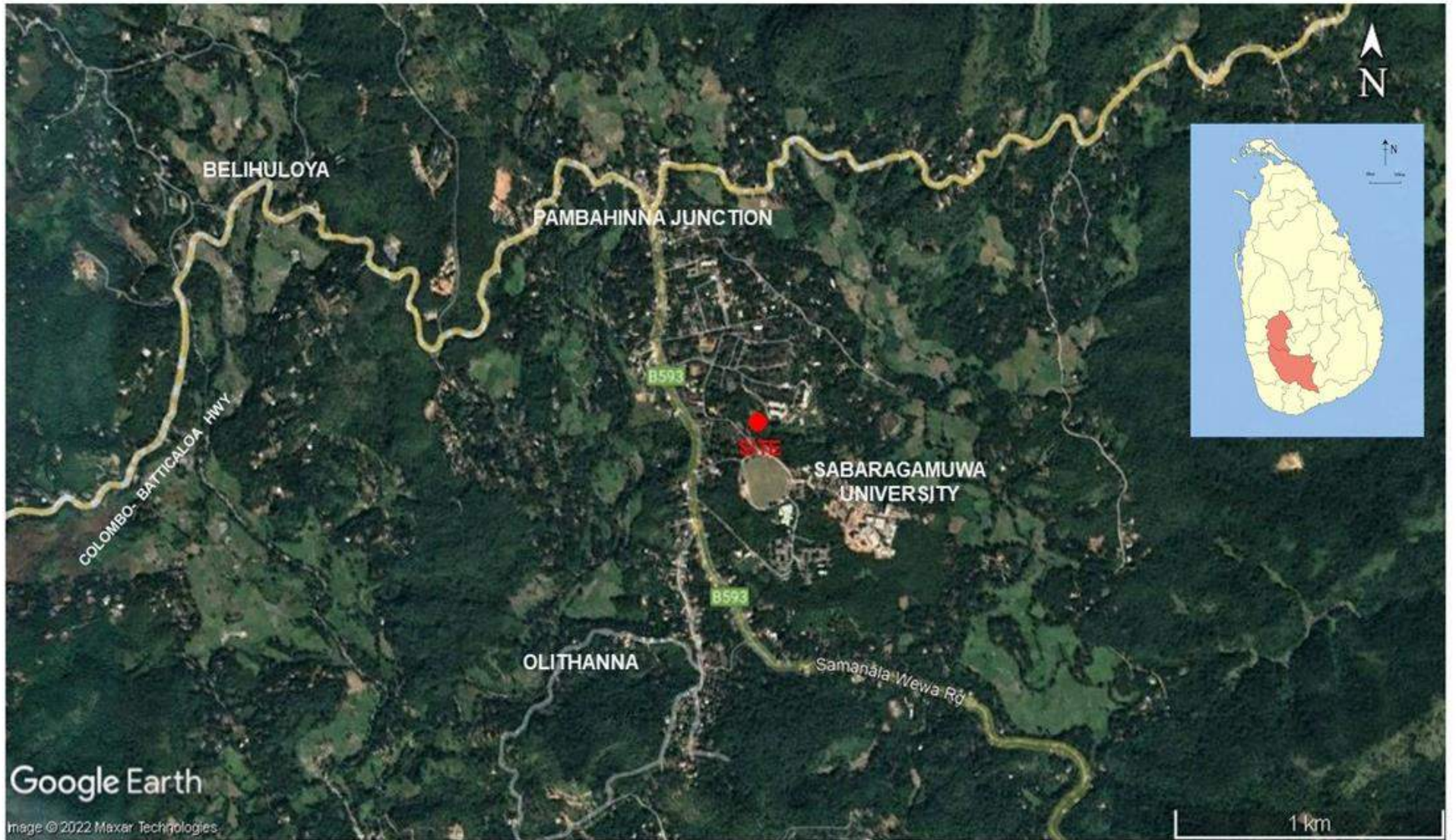


FIGURE 3: LOCATION OF THE STP 1

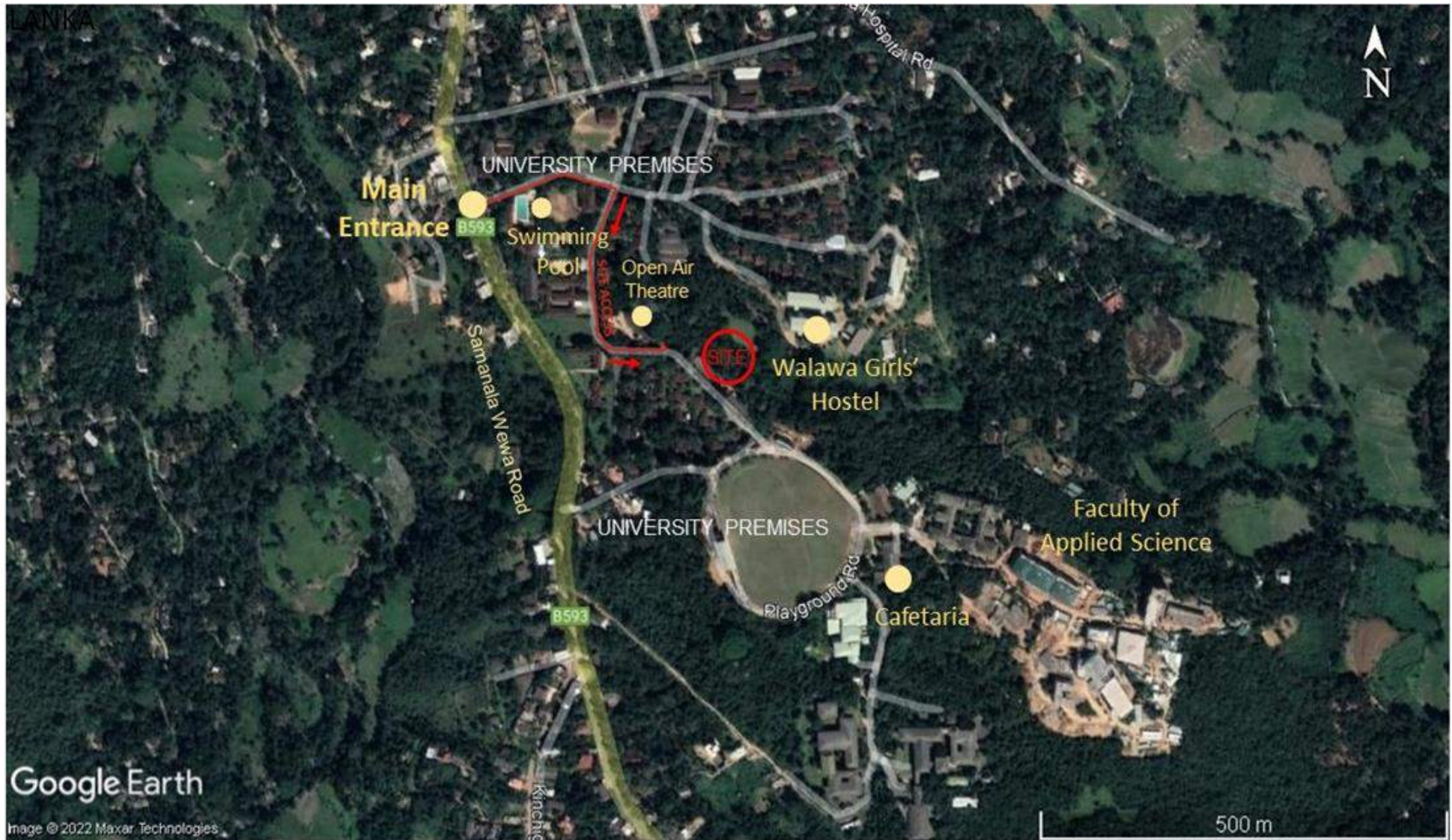


FIGURE 4: MAIN ACCESS TO THE SITE

A.7 Does the Subproject Wholly or Partly Fall within the Following Areas?

TABLE 1: ENVIRONMENT SENSITIVITY AS PER THE NEA SCOPING PROCESS

Area	Yes	No	Unaware
100m from the boundaries of or within any area declared under the National Heritage Wilderness Act No 4 of 1988		√	
100m from the boundaries of or within any area declared under the Forest Ordinance (chapter 451)		√	
Coastal zone as defined in the Coast Conservation Act 57 of 1981		√	
Any erodible area declared under the Soil Conservation Act (Chapter 450)		√	
Any flood areas declared under the Flood Protection Ordinance (Chapter 449)		√	
Any flood protection area declared under the Sri Lanka Land Reclamation and Development Cooperation Act 15 of 1968 as amended by Act No 52 of 1982		√	
60m from the bank of a public stream as defined in the Crown Lands Ordinance (Chapter 454) and having width of more than 25m at any point of its course.		√	
Any reservation beyond the full supply level of a reservoir.		√	
Any archaeological reserve, ancient or protected monument as defined or declared under the Antiquities Ordinance (chapter 188)		√	
Any area declared under the Botanic Gardens Ordinance (Chapter 446)		√	
Within 100m from the boundaries of, or within any area declared as a Sanctuary under the fauna and flora protection ordinance (chapter 469)		√	
100m from the high flood level contour of within a public lake as defined in the Crown Lands Ordinance (Chapter 454) including those declared under section 71 of the said ordinance.		√	
Within a distance of one mile of the boundary of a National Reserve declared under the Fauna and Flora protection Ordinance.		√	

A.8 Present Ownership of the Subproject Site

11. The subproject land is owned by the Sabaragamuwa University of Sri Lanka (**Annexure B: Survey Plan and Deed**)

TABLE 2: SITE OWNERSHIP

State	Private	Other- Specific
√	-	-

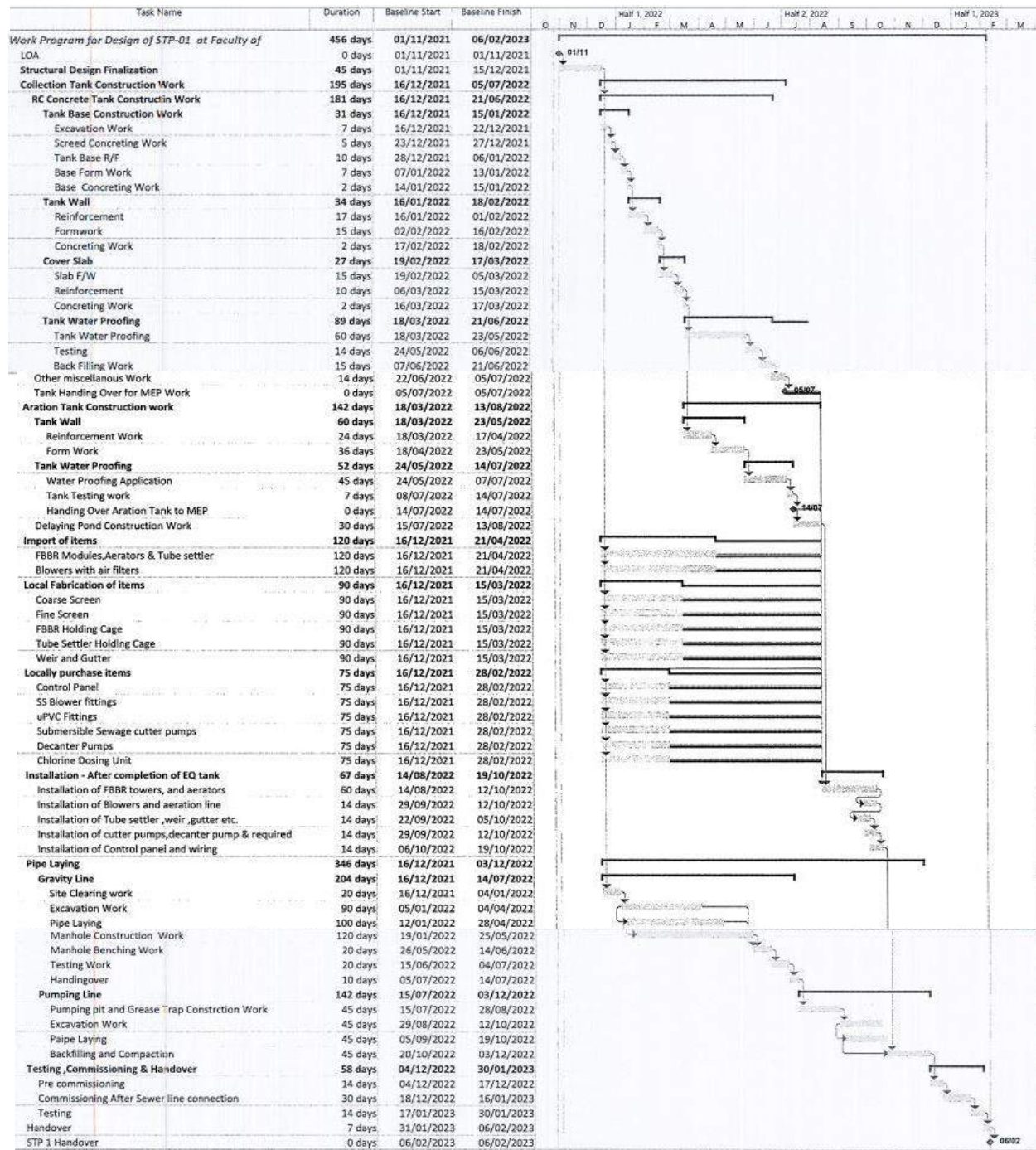
A.9 Present Use of the Land

12. Vacant land within the University Premises. It was an abandoned land with a shrub forest and a natural water pond.

A.10 Subproject Timing, Schedule and Phased Development

13. This subproject is planned to be completed within approximately in 15 months from November 2021 to February 2023 (nearly 456 days). The proposed schedule of the STP 1 shows in Table 3.

TABLE 3: PROPOSED SUBPROJECT SCHEDULE



B. Objectives of the IEE

14. The objectives of the Environmental Study are to:

- Determine the category of the subproject depending on proposal, environmental sensitivity, and magnitude of impacts, i.e. screening as per Government of Sri Lanka's regulations and ADB's Safeguard Policy Statement 2009;
- Determine the appropriate scoping required
- Determine the requirement of statutory clearances;
- Provide a baseline environmental monitoring and survey; on biodiversity, biophysical resources
- Predict impacts on relevant environmental attributes and mitigation measures to minimize the impacts.

15. This Initial Environmental Examination (IEE) Report was prepared as per the ADB format to fulfill the environmental adherence for the development of the proposed STP 1 at Sabaragamuwa University of Sri Lanka. However, Central Environmental Authority (CEA) functions as a key project approving agency (PAA) under the process of the sustainable management of natural resources and controlling and preventing environmental pollution in Sri Lanka. Therefore, CEA general TOR (**Annexure A - General Term of Reference**) and CEA approval of environmental recommendations for STP 1 (**Annexure G - Environmental Recommendations Approval from CEA**) were applied in preparing this IEE report as a guide.

16. Recommendations will be provided for mitigating any negative impacts wherever possible through the EMP. The EMP will include the recommended institutional arrangements for monitoring activities for identified environmental issues. The IEE will address the current physical, ecological, economic, and social background of the subproject, anticipated environmental impacts that will arise due to subproject activities, necessary measures that have to be adopted to mitigate them, and public views and suggestions regarding the subproject. Accordingly, a single IEE report will be submitted to ADB and also be made available to the PP to facilitate their decision-making.

C. Approach and Methodology

17. The IEE has been carried out within the existing policy, legal and administrative framework considering the applicable environmental legislation, regulations and guidelines of ADB.

Reconnaissance Survey:

18. Reconnaissance survey was carried out to identify the value of environmental components surrounding the STP 1 subproject. Location of environmentally protected areas; surface water bodies; environmentally sensitive receptors (educational institutions, religious structures, medical facilities etc.) at the subproject site were identified during the survey. The Consultant conducted a preliminary analysis of the nature, scale, and magnitude of the impacts that the subproject is likely to cause on the environment, especially on the identified Valued Environment Components (VECs). Site inspection of

the proposed subproject was carried out on 23rd March 2022 and 26th April 2022 (Refer to **Annexure M - Site Report**).

19. During the inspection, activities such as assessment of the existing location and the surrounding environment identification of sensitive areas, consultation with the local officers, key informant interviews were carried out. Other reliable information was collected from villagers and respective authorities during public consultation meetings. Secondary information for the report was gathered from printed materials and other sources of the relevant Government Departments, Authorities, the Divisional Secretariat, and relevant websites.

Data Collection & Review:

20. Secondary data such as Survey of Sri Lanka Topo Sheets, District Planning Maps, etc. have been collected from various secondary sources. Further, secondary data, which are relevant to understanding the baseline of physical and biological environments has been collected and reviewed. Applicable environmental legislation, regulations, and guidelines of ADB have also been reviewed.

Environmental Screening & Scoping:

21. Screening has been conducted with specific considerations such as the location of the subprojects concerning close proximity to highly biodiversity regions and the waste management issue prevalent. It will help to modify the designs at locations where impacts can be avoided and incorporate mitigation measures wherever the impacts were unavoidable due to other constraints.

Baseline Environmental Monitoring:

22. To establish the baseline environmental status, it is recommended that monitoring would have to be carried out for various environmental parameters such as meteorology, ambient air quality, ambient noise level, ground & surface water quality, and soil quality at the subproject site. Secondary data was referred from numerous reports for the current IEE and exiting IEE of FT. Thus, previous rapid biodiversity assessment was studied as it has been recommended and carried out to assess the importance of the biodiversity surrounding the subproject FT site by SUSL.

Stakeholder Consultation:

23. Stakeholders' meeting was organized on the 3rd June 2022 and held in the Board Room of the Vice Chancellor's office. Consultations on environmental and social issues were carried out with relevant stakeholders identified through stakeholder analysis. Affected communities and potential stakeholders such as officers from PHI (MOH), PHI (SUSL), RDC, students (SUSL), academic and non-academic staff (SUSL), and villagers from Muththettuwagama (Farmer, Teacher, Businessman, Carpenter, Driver etc.), Hon. head Monk of the Temple, ICC (Contractor) etc. were invited to attend the meeting. The effort was made to make the gathering a representation of the local population in diverse fields directly or indirectly affected by the potential impacts. There were 24 stakeholders at the meeting.

D. Structure of IEE Report

24. In order to fully meet all requirements, the IEE report generally follows the ADB Safeguard Policy Statement 2009 and EA Guidelines 2003. The structure of the IEE report is organized as follows:

- Executive Summary
- Chapter I - Introduction
- Chapter II - Subproject Details
- Chapter III - Policy, Legal, and Administrative Framework
- Chapter IV - Description of The Existing Environment
- Chapter V - Analysis of Alternatives
- Chapter VI - Anticipated Environmental Impacts and Mitigation Measures
- Chapter VII - Public Consultation
- Chapter VIII - Grievance Redress Mechanism
- Chapter IX - Environmental Management Plan
- Chapter X - Conclusion and Recommendation
- Annexure

CHAPTER I: INTRODUCTION

25. Chapter I describes the nature and scale of the subproject, main objectives, subproject justification in terms of environment, society and economy, and the approvals needed for the proposed development.

CHAPTER II: SUBPROJECT DETAILS

26. Chapter II gives a brief description of the subproject including major components, pre-construction and construction activities, infrastructure facilities required including energy and water, sources of the infrastructure and subproject development schedule

CHAPTER III: POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

27. Chapter III gives a brief description of the policy, legal, and administrative framework relevant to the subproject.

CHAPTER IV: DESCRIPTION OF THE EXISTING ENVIRONMENT

28. This chapter provides information on the existing environment of the subproject site and area within 500m from the site, its physical features, ecological resources, socio – economic conditions, archaeological and cultural considerations likely to be affected by any aspect of the proposal during the construction or operational phases.

CHAPTER V: ANALYSIS OF ALTERNATIVES

CHAPTER VI: ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

29. This chapter evaluates the anticipated environmental impacts due to the proposed subproject at all stages of site development and operation on the component of the environment and proposed measures to avoid, reduce, mitigate or compensate the impacts identified. Further, public consultations and grievance redress mechanisms are also identified. The proceeding section of this IEE report has identified the potential environmental impacts associated with the construction and operation of 'Sewage Treatment Plant' at SUSL. This chapter presents the mitigation and best practices that should be developed to avoid and minimize the impacts. The "Mitigation through Design" concept is widely used to minimize potential impacts due to the construction and operation of the subproject.

CHAPTER VII: PUBLIC CONSULTATION

CHAPTER VIII: GRIEVANCE REDRESS MECHANISM

CHAPTER IX: ENVIRONMENTAL MANAGEMENT PLAN

30. Chapter IX outlines the monitoring to be carried out during the construction and operation of the proposed Sewage Treatment Plant. A Monitoring Plan shall be developed based on these recommendations. Further studies to analyze long-term impacts are also recommended.

CHAPTER X: CONCLUSION AND RECOMMENDATION

II. SUBPROJECT DETAILS

A. Brief Description of the Subproject

30. The proposed STP 1 subproject is located within the current SUSL premises in Imbulpe in Rathnapura District. The location coordinates are 6°42'46.3"N 80°47'20.6"E. The university is located alongside Pambahinna-Kumbalgama-Rajawaka-Kapugala Road (B593) which connects to the main Colombo – Batticaloa Highway (A4).

31. The current SUSL domestic wastewater and sewage is collected and disposed to an open waste sludge tank within the university premises. The unregulated disposal of sludge has caused the leachate to pollute the groundwater table and the surface water in the adjoining villages. Therefore, special attention and priority were given to the establishment of the wastewater treatment facility and sewage management. The proposed STP 1 facilitates 6,000 students and staff population. The land earmarked for the proposed subproject is 250 m² within the University. The STP 1 tank treats wastewater collected from the university's Student Cafeteria premises, Faculty of Agriculture, Faculty of Applied Science, Walawa Hostel Complex, and Sinharaja Hostel Complex.

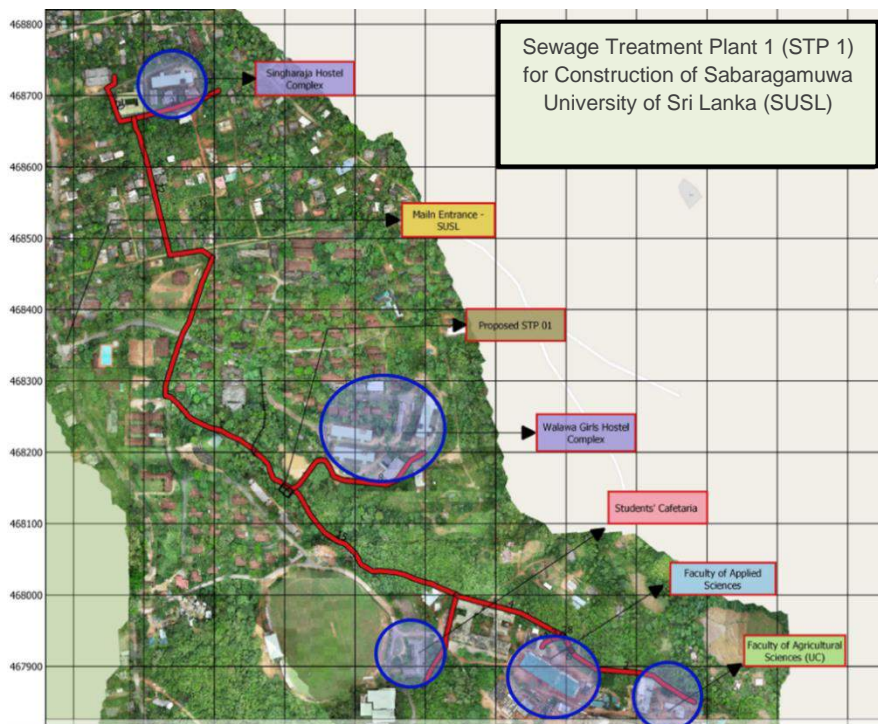


FIGURE 5: SUBPROJECT PLAN

32. The wastewater Generation is 950m³/day at an Organic load of 267.5 kgs/day. Hence, the design volume of the proposed STP 1 is 950 m³/day. **Fixed Bed Bio Reactor (FBBR) sewerage treatment system using Aqua Equipment Technology (AET) patented fixed film bio media and high-efficiency tube settler units** use for this proposed STP 1 subproject. This STP 1 consists of 16 AET fixed film bio modules installed in specially fabricated RC (Reinforced Concrete) tanks and a tube settler installed alongside a control room consisting of blowers, and a disinfection system. The daily

load of wastewater will be first collected in a balancing tank for coarse screen and processed over 24 hours to always give an even flow across the treatment plant. This STP 1 consists of three pumping pits.

Pipe Network Details:

- Pipe diameter: 90mm, 110mm
- Pipe length: 1.5 km
- Pipe materials: HDPE pipes for pumping lines and PVC pipes for gravity lines
- Soil Type: Reddish Brown Silty CLAY with some Gravels and Reddish Brown LATERITE

B. Construction Stage

- **Clearing of Land**

33. The site is located in a slopy terrain with some scrubs on the land previously. This site is a cleared land at present. The clearing of scrubs and leveling of the land of approximately 250m² has been done for the STP 1 installation. (See **Annexure P: Contour Plan**).



FIGURE 7: CONTOUR PATTERN

- **Removal of Trees**

34. The proposed site has been selected so as not to damage the existing trees. Therefore, no mature plants had to be removed during the construction stage. The proposed site is a cleared land at present. Weeds and shrubs found only on the construction site were removed. The selected pipeline areas are proposed through clear spaces to make sure it does not affect any tree/s or structure/s. Therefore, the removal of trees is not anticipated.

- **Method of Transportation of Construction Materials**

35. During the STP tank 1 installation, tippers, lorries, and a few container trucks will be deployed for the transportation of construction materials.

- **Labour Force Requirement, Storage Requirements, and Yards for Construction Works**

36. Approximately 20 labourers on average are required for STP 1 subproject as the labour force. The labour force of the FOT subproject will be utilized for the construction works of STP 1. As this is a small-scale development, it does not require a large storage space for construction material, and they will be temporarily stored in an on-site space. Thus, the current storage yard for construction material, labour camp and the project office of the proposed FT building complex will be utilized for STP 1.

- **Machinery and Equipment Requirements for Construction Activities**

37. The construction procedures are planned to meet the subproject quality and environmental objectives. Standard construction techniques will be employed for the STP 1 project. Most of the construction work does not require to be undertaken using heavy machinery or equipment. The main construction work will include STP 1 tank implementation and construction of the collecting tanks. A detailed construction program will be prepared based on the subproject layout plan (**See Annexure C - Layout Plan**). Tables 15, 16, and 17 include the list of machinery & equipment and activities during the construction stage. Grading & clearing, excavation, foundations, erection, and finishing are the main construction activities under this project works. Compactors (rollers), backhoes/excavators, tractors, scrapers, graders, pavers, trucks, concrete mixers, concrete pumps, concrete vibrators, jackhammers, and drills are the required machinery during the construction. Thus, compressor, drivers (drop hammer type), truck, scraper or grader, pneumatic drill, excavator, loader, roller vibrator, poke vibrator, bulldozer, sound reduced jackhammers and lock drills are the required equipment for construction activities.

- **Excavation and Filling**

38. There is no huge earth exaction under this small-scale subproject. Earth excavation will be for this subproject up to a maximum of 4.2 m in depth (4.2m -3.7m) to construct the underground EQ tank (Equalization Tank) and the sludge tank. Accordingly, the soil excavated volume for the EQ tank is 450 m³ and the sludge tank is 150 m³. Altogether, the total soil volume to be excavated of this STP 1 tank is nearly 600 m³. The level of filling of the STP 1 tank is nearly 584.630 MSL and the filling depth is nearly 2.5 m. The soil quantity for filling the STP 1 tank is nearly 330.0 m³(for more details refer to **Figure 37: Dam Details**). The excess soil (600 m³ - 330 m³ = 270 m³) from the STP 1 tank will be used for the proposed road development near STP 1 within university Premises (See **Annexure S - Cascade Details** to find the proposed road next to STP 1).

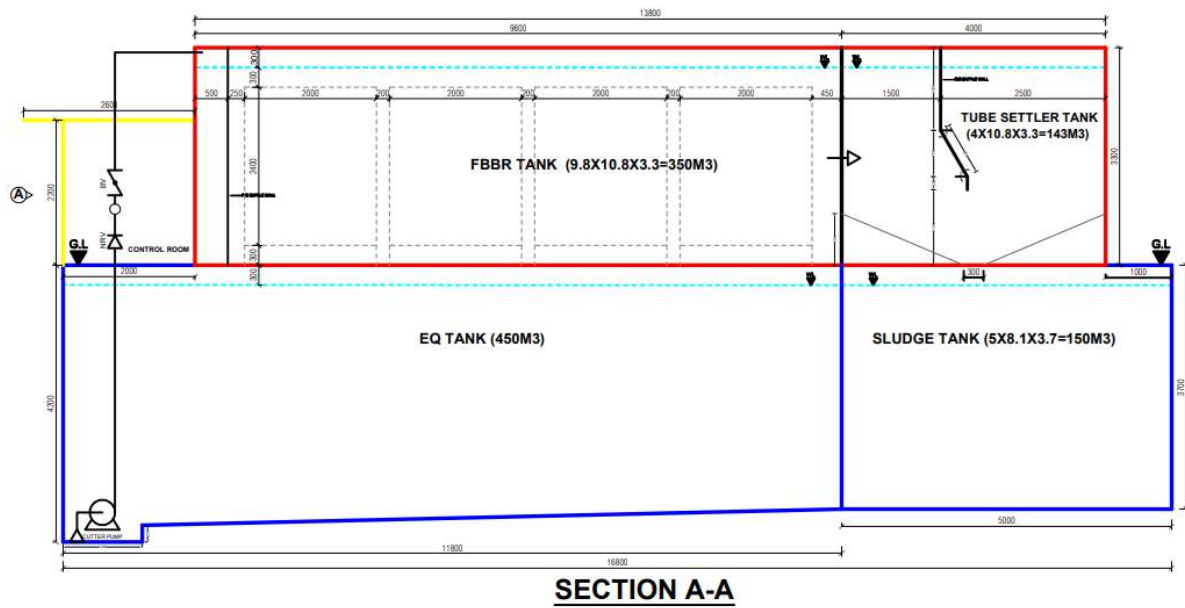


FIGURE 8: SECTION OF SOIL EXCAVATED AREA

39. The length of the pipe network is nearly 1.5 km. Pipe diameters of the pipe network consist of 90 mm and 110 mm. Thus, the soil type along the pipe network is “Reddish Brown Silty CLAY with some Gravels and Reddish Brown LATERITE”. In addition, HDPE pipes for pumping lines and PVC pipes for gravity lines are used as the materials of the pipe network (**See Annexure C - Layout Plan for piping arrangement and Annexure T - Pumping Pit Details**).

40. This STP 1 project has proposed three pumping pits. Soil excavation amount and depth are as below in **Table 4**. The total soil volume to be excavated from pumping pits is nearly 120 m³ (50+40+30). Accordingly, the maximum excavated soil amount is 1000 m³ including the STP tank 1 and three pumping pits. Pipeline excavated soil will be used to fill the same trench and to prepare the surrounding areas. Excavation will be carried out by a backhoe loader, skid loader, or manual means. Accordingly, all excavated earth will be used for backfilling works, leveling, and road development. The excavated soil will be stockpiled up in the allotted area of the FOT Sabaragamuwa site under the approval of the University.

TABLE 4: SOIL EXCAVATION DETAILS OF PUMPING PITS

Area	Volume (m ³)	Depth (m)
Pumping Pit 1	50	2.5
Pumping Pit 2	40	2.5
Pumping Pit 3	30	2.5

C. Subproject Layout Plan

41. Attached: See **Annexure C- Layout Plan**.

D. Infrastructure Facilities Required/ Provided

D.1 Energy Requirement

42. The requirement of energy for the proposed subproject is for submersible pumps, channel blowers, dosing pumps, and transfer pumps. During the construction, SUSL electrical supply through National grid electricity will be used for operating electrical appliances mentioned below. The required electrical supply for the implementation stage of the subproject is 446.25 kWh.

TABLE 5: ENERGY REQUIREMENT

Equipment	Rated Power	Operational time per day/hr	No. of Units	Total Units per day/ kWh
Tsurumi 80C21.5 1.5 kW Submersible sewer Cutter pump (2 Duty/ 1 Standby)	1.5	18	2	54
Dereike DHB 920C 16D5 16.5 kW Side Channel Blower (2 Duty/ 1 Standby) -65% Capacity	16.5	18	2	386.1
FWT Chlorine Dosing Pump	0.3	18	1	5.4
Evergush Sludge Transfer Pump	1.5	0.5	1	0.75
Total Power Consumption per day/ kWh			446.25	

hr – Hour, kWh - kilowatt hour

D.2 Sewer and Wastewater Management

43. Attached: See **Annexure D - STP 1 Tank Proposal**

D.2.1 Wastewater Generation

STP 1	Population	L/P/D	BOD/P/D	H Load	Org Load	mg/l
	6000	158	45	950,000	267,500	282

L/P/D – Liters per person per day, BOD/P/D - Biochemical Oxygen Demand per person per day, H Load - Hydraulic Load, Org Load - Organic Load, mg/l - milligrams per liter

- **Influent:** Black and Grey Water
- **Design Volume:** 950 m³/d (cubic meters per day)
- **Operation Time:** 24 h/d (hours per day)
- **Wastewater Generation:** 950m³/d at an Organic Load of 267.5 kg/Day

44. Fixed Bed Bio Reactor (FBBR) sewerage treatment system using Aqua Equipment Technologies patented fixed film bio media and high-efficiency tube settler units use for this proposed STP 1 subproject.

D.2.2 STP 1 Operational Procedure

- Influent (wastewater) from buildings will be first made to pass through a coarse screen to separate unwanted large items that would interfere with downstream activities and collected in a “**Balancing Tank**”. The EQ tank (equalization tank) is called “Buffer Tank” and “Balancing Tank”. Therefore, the same tank is used for water flow stabilization works. This will balance out variations offload throughout the day. From here influent will be pumped over 24 hours at a steady rate using stainless steel cutter pumps via a fine screen into the treatment tank 1 of the STP 1.
- The first tank in the STP 1 will consist of media towers where the bacteria grow. These towers will be well aerated to facilitate oxygen transfer to the water for bacteria growth. Here, BOD (Biochemical Oxygen Demand), Chemical Oxygen Demand (COD) and Ammonia in wastewater will be reduced. After a short retention time off 5-8 hours, the influent will flow into a quiescent section of the Clarifier.
- The influent will then flow under and into the angled tube settlers. The influent will flow out from the top of the tubes and the solid matter will fall to the clarifier bottom. This way liquid solid separation will take place.
- The effluent coming out of the clarifier will be disinfected using chlorine. The effluent will meet the CEA standards for discharge to a waterway (nearby natural water pond).
- The sludge collected at the bottom of the clarifier will be pumped out to a sludge holding tank at regular intervals. The sludge tank will be maintained under **anaerobic conditions** which will help the sludge to be further digested and reduced. The tank will have a holding capacity for about **6 months**. Thereafter the sludge will have to be removed and dried which could be used as fertilizer. **As the contingency plan during any breakdown of the treatment plant**, sludge will be sent out by gully bowser (Imbulpe PS or University as facility provider) for disposal at a suitable location. A **screw press** could also be provided to continuously dewater the sludge.
- Sludge compress unit will be fixed for the sludge removal. The effluent drained out from the sludge drying bed will be directed to the equalization tank for undergoing the treatment process.
- **Pressed Sludge from sludge screw press** will be directed to sludge sand drying bed for further moisture removal and use as plant fertilizer. The required length for the sand bed will be 6m & width 3m including the 300mm sand layer on top of the gravel layer. There should be a pipe to remove separated water from sludge dewatering on the bottom of the gravel layer.

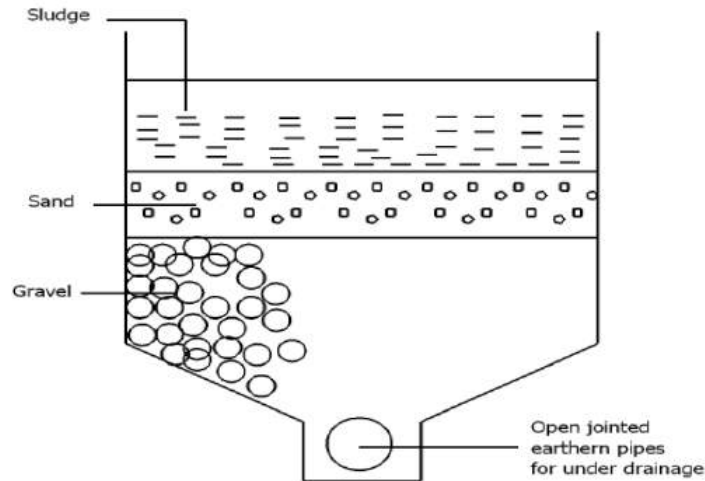


FIGURE 9: SLUDGE SAND DRYING BED

D.2.3 STP 1 Process Description

- The biological treatment process of the STP 1 use the FBBR (Fixed Bed Biofilm Reactor) technology. The FBBR technology consists of FBBR media and aeration diffusers which are combined within individual stainless steel frame units. Compared to the conventional activated sludge process, the FBBR technology is superior, because the activated sludge for removal of BOD and ammonia in wastewater is attached as a biofilm to the surface of the FBBR media.
- The biofilm is self-regulating meaning, it automatically generates the right amount and type of aerobic bacteria for effective removal of wastewater pollutants. Because of this, the FBBR technology doesn't require large secondary clarifiers.
- Usually in activated sludge treatment, sludge age in secondary and primary clarifiers for biological processes needs to be adjusted which requires long retention times, so large primary and secondary clarifiers are needed. For **FBBR technology**, does not require manual sludge age adjustment and can therefore be operated without primary clarifiers. The enhanced small-scale secondary clarifiers with tube settler modules are sufficient.
- For the Sabaragamuwa University subproject, the FBBR units will be split between 4 basin compartments. This allows the operator to adjust the airflow to each tank depending on the incoming loading. This setup also provides 4 levels of redundancy meaning that one basin could be dewatered, if ever required for maintenance while the other 3 basins are still in operation.
- FBBR operates as a single pass system, meaning wastewater does not have to be recycled, after biological treatment in the FBBR tank and settling in the lamella settler tank. On the other hand, recycling wastewater does not harm the process but will improve the treatment plant capacity additionally.
- Overall, the FBBR technology has a larger number of active aerobic bacteria compared to activated sludge processes and does therefore result in a lower footprint, fewer power costs,

easier maintenance, and operation. FBBR system is a good and advantageous alternative to activated sludge processes.

- If any sudden inflow to STP 1, it will be held by the EQ tank, as it acts as a buffer tank of the system. The buffer tank capacity is 450 m³. Therefore, STP 1 has a sufficient buffering capacity.

D.2.4 STP 1 Tank Design

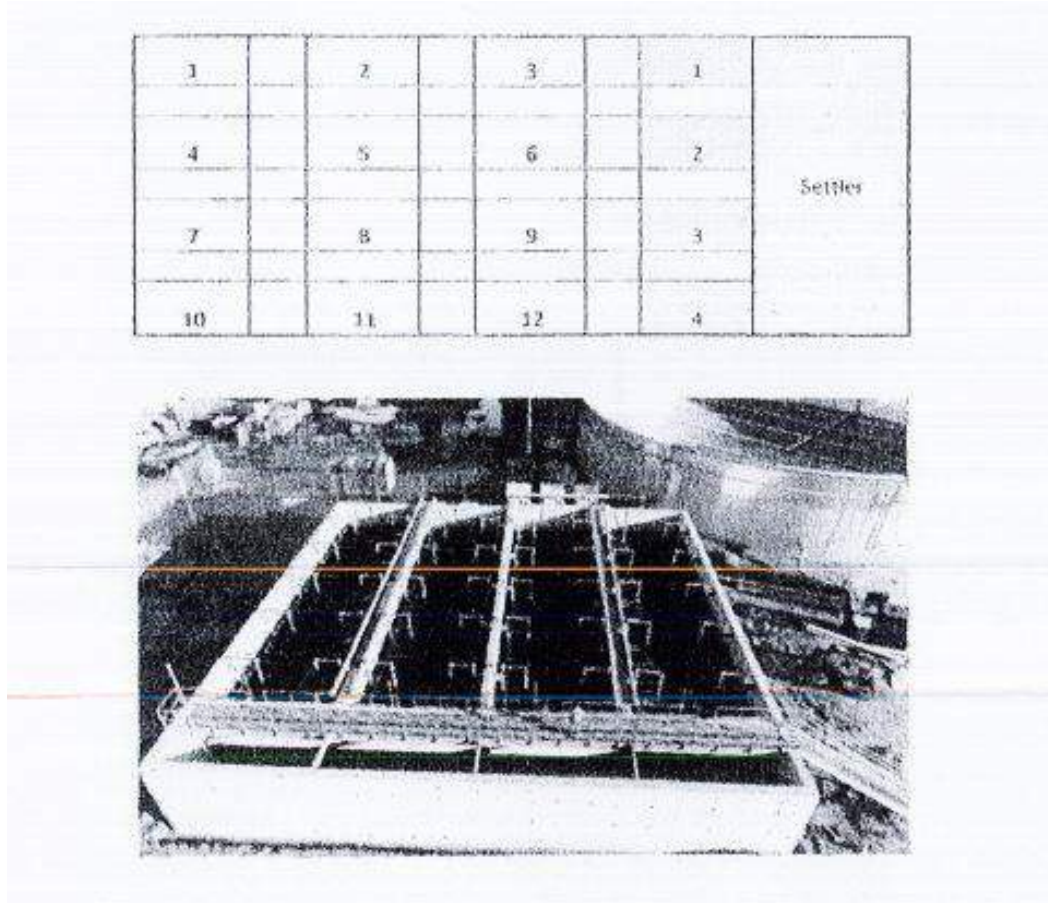


FIGURE 10: STP 1 TANK MODEL

- **Maximum Hydraulic Load:** 950 m³/day
- **Maximum Organic Load:** 267,500 g/d - 268 mg/l
- **Required Media at 11g/m³ BOD Reduction/m²:** 24,328m³ surface area

45. This STP 1 will consist of 16 AET fixed film bio modules installed in specially fabricated RC tanks and a tube settler installed alongside a control room consisting of blowers, and a disinfection system. The daily load of wastewater will be first collected in a balancing tank (EQ tank) for coarse screen and equalization and processed over 24 hours to always give an even flow across the treatment plant. The sludge collected will need to be disposed of periodically.

D.2.5 Treatment Process Flowchart

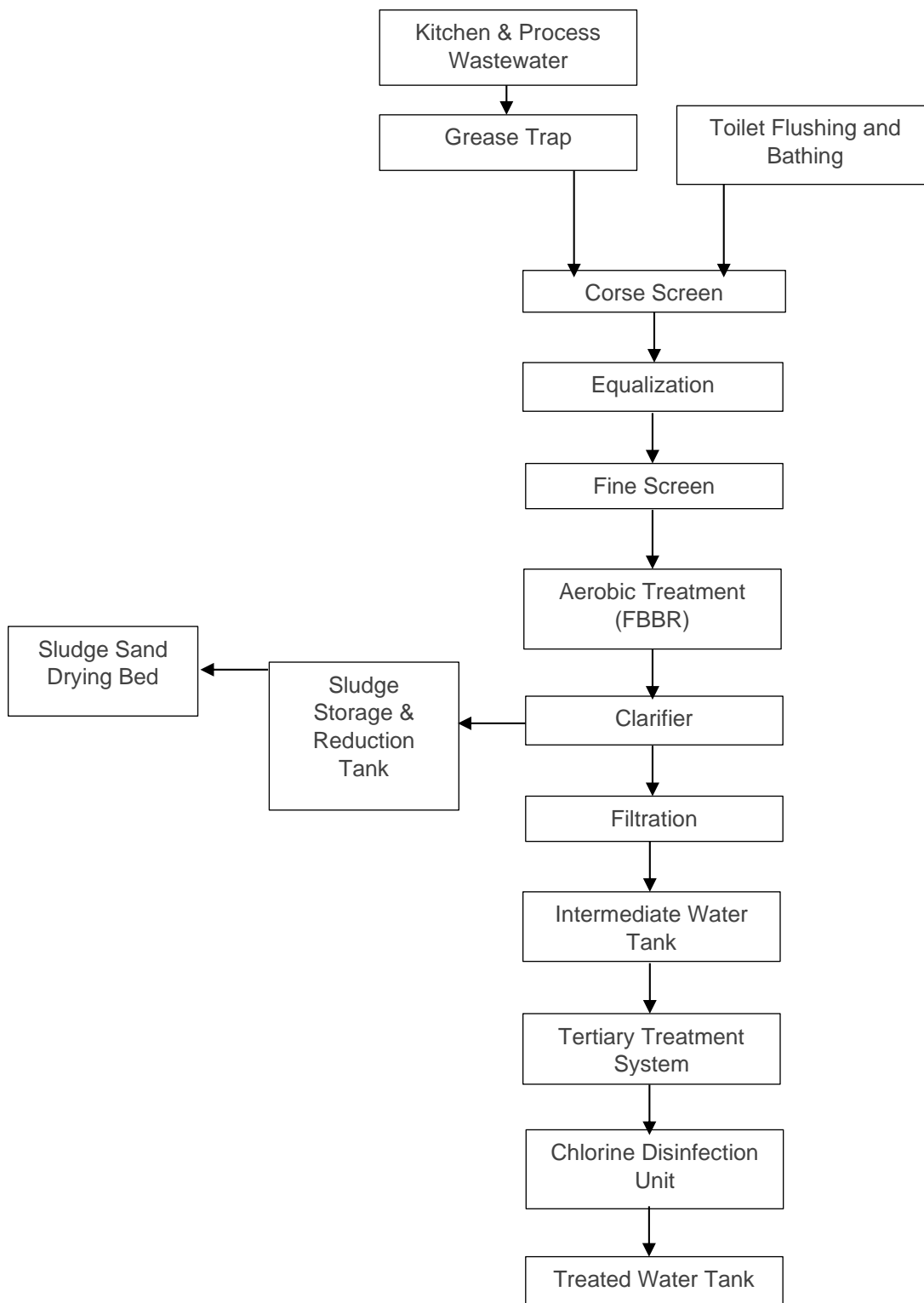


FIGURE 11: STP 1 PROCESS FLOWCHART

D.2.6 Quality of the Treated Water

46. All wastewater generated from the subproject activities shall be **treated and the treated wastewater shall comply with the disposal standards for “Tolerance limits for the discharge of industrial wastewater into inland surface waters” as prescribed in Gazette Notification No. 1534/18 dated 01.02.2008 amended by Gazette Notification No. 2264/17 dated 27.01.2022 standard treated effluent parameters and SLSI standards (Ref. No: 614:2013) for wastewater and sewage effluent to IFC-WB EHS guidelines.** The quality of treated water to be achieved to adhere to the above local and international standards are shown in Table 6. The values are based on previous STP tank 1 installations and test results. It was also observed that the expected quality of the treated water is better than the existing water quality condition of the nearby natural water pond (See **Table 7** for the existing water quality level of the nearby water pond).

TABLE 6: TREATED WATER QUALITY AND EFFLUENT DISCHARGE STANDARDS

Parameter	Treated Water Quality	Local and International Standards		
		CEA - gazette No: 1534/18 dated 01.02.2008	CEA - gazette No: 2264/17 dated 27.01.2022	IFC- WB-EHS
pH Value	6.0 to 8.5	6.0 - 8.5	6.0 - 8.5	6.0-9.0
Biochemical Oxygen Demand at 20°C (BOD ₅) mg/l	< 15	30	30	30
Chemical Oxygen Demand (COD) mg/l	< 100	250	250	125
Total Suspended Solids (TSS) mg/l	< 15	50	50	50
Oil & Grease mg/l	< 1	10	10	10
Ammoniacal Nitrogen (as N) mg/l	< 50	50	50	-
Dissolved phosphates (as P) mg/l	< 5	5	5	-
Faecal Coliform MPN/100ml	< 40	40	150	400

D.2.7 Final Discharge Point

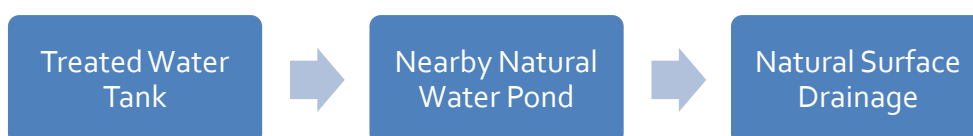


FIGURE 12: FINAL DISCHARGE POINT DESIGN

47. After the water is treated, it will be discharge to the treated water tank. The capacity of the treated water tank is 50.0m³. The purpose of the treated water tank is to provide hydraulic retention time for the chlorine disinfection process whereas the optimum HRT will be 30 minutes. According to the daily capacity of the system, the required capacity for 30 minutes of HRT is only 39.5 m³ (950m³/24), as this is a 24-hour automatic treatment system. Thus, the capacity of the buffer tank is 450 m³, as the EQ tank act as a buffer tank. The capacity calculation is including the sudden peak wastewater loading of the system of 950 m³ per day. So, the buffer tank can cater to 24 Hrs of daily flow and the capacity is more than sufficient for the equalization process.

- Existing water pond holding capacity = 5000 - 6000 m³
- Daily discharge of treated water = 950 m³
- Discharge Dilution = 1:8

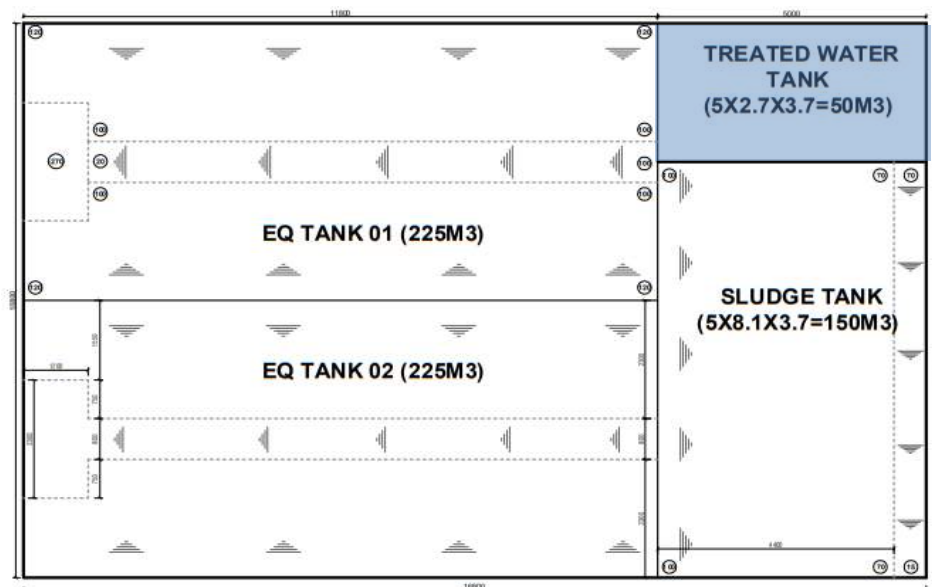
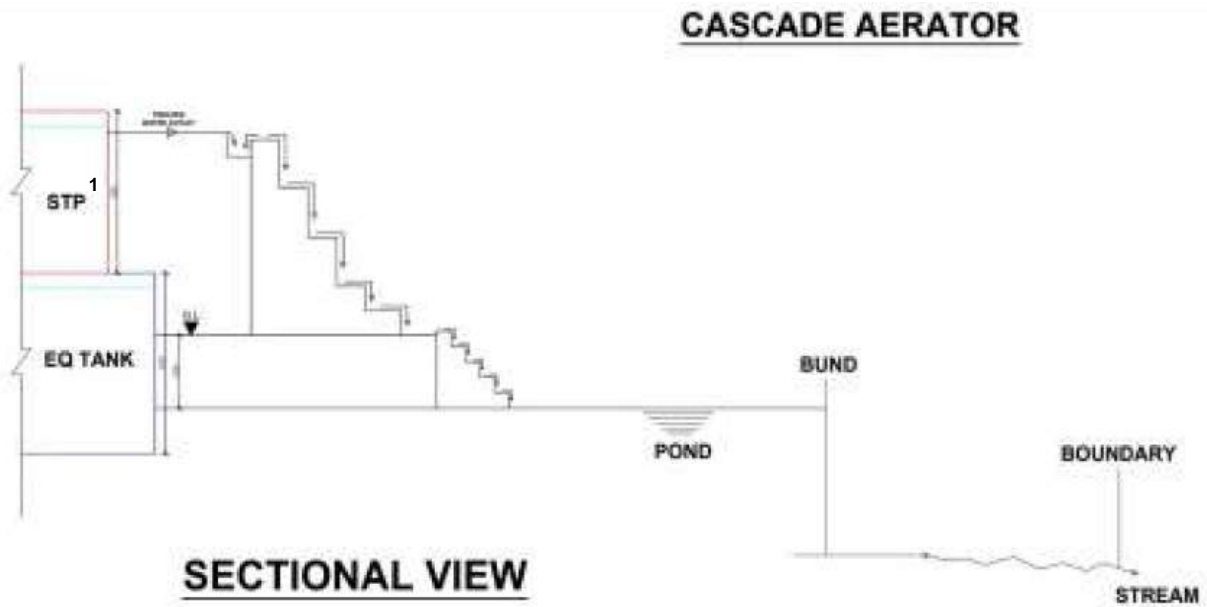


FIGURE 13: TREATED WATER TANK

48. The existing water pond is a flowing water body. As per the CEA recommendations, due to ambiguity, the standard for discharge of industrial effluent into inland waterways will be adopted where BOD needs to be less than 30 mg/l when released to a waterway with a dilution factor of 8 times. The location of STP1 was changed to allow gravity flow of effluent to the available collection pond at the current situation. Then, water will be discharged continuously from the water pond to the natural surface drainage. The current performance of the pond is rainwater harvesting in the university during the rainy season. The treated total water volume (950 m³) will not be discharged to the natural water pond at once and it will be discharged continuously and automatically. The 1:8 dilutions will be achieved by discharging the treated water into the pond via a cascade aerator (See More Details: **Annexure S – Cascade Details**). It will further reduce the discharge parameters and the natural pond will have the capacity for the required dilution. CEA was recommended to achieve a 1:8 discharge dilution rate under the Biochemical Oxygen Demand (BOD) 30 mg/l level. Only 39.5 m³ per hour (950 m³/24) treated volume will be released to the natural flowing body continuously with a BOD level of 15 mg/l. Therefore,

a 158 m³/hour (39.5 m³×4) water capacity is required in the natural flowing water body (a 316.0 m³/hour (39.5 m³×8) water capacity is not required). Therefore, the existing flowing capacity is more than 158 m³/hour and it is more than enough to discharge final 1:8 dilutions.

49. The discharge from STP1 with an effluent discharge capability of 950 m³/day at maximum will be first directed to a “Cascade Aerator” and thereon to the existing pond via a stepped drain (See **Figure 14**). The cascade aerator and the stepped drain will help to further reduce BOD to less than 10mg/l. The water pond is currently having a holding capacity of 5000 - 6000 m³. The discharge from the pond falls into a water stream right at the boundary of the campus property (See **Figure 15**). At the time of inspection, there was sufficient water flow in the stream for dilution to take place. The natural pond will act as a treated water storage facility for the system. During the dry season, the access quantity of treated wastewater can be stored and managed through the sluice in the pond for recycling or gardening purposes. Therefore, the sluice gate is designed at 2.2 m x 2.5 m x 4.2 m (Length X Width X Depth).



Cascade Aerator



Stepped Drain

FIGURE 14: SCHEMATIC OF PROPOSED CASCADE AERATOR



FIGURE 15: WATER STREAM NEAR THE UNIVERSITY BOUNDARY

D.2.8 Existing Water Quality of the Nearby Natural Water Pond



FIGURE 16: NEARBY NATURAL WATER POND

50. Water samples of the nearby natural water pond was collected on 2nd March 2022 at around 7.00 a.m. to measure the existing water quality level (See More Details: **Annexure Q - Water Quality Test Report of the Nearby Existing Pond**). High turbidity of the water at the pond can be observed due to rainy days. (See Figure 16). Furthermore, the water quality of the stream flowing from the natural pond is currently the same as shown in table 7.

TABLE 7: EXISTING WATER QUALITY OF THE POND

Test Parameter	Test Method	Test Result
pH at 25 ^o C \pm 2 ^o C	APHA (23 rd edition) 4500-H Electrometric method	7.2
Total Suspended Solids (TSS) mg/l,max	APHA (23 rd edition) 2540 D. Total suspended solids at 103-105 ^o C , MDL-01	14
Biochemical Oxygen Demand (BOD) ₅ , mg/l, max	APHA (23 rd Edition) 5210 B, 5 day BOD test, MDL 05	15
Chemical Oxygen Demand (COD), mg/l, max	APHA (23 rd edition) 5220 D, Closed refluxed colorimetric, MDL 05	40
Oil and grease, mg/l, max	APHA (23 rd edition) 5520 B, Liquid-liquid partition gravimetric, MDL-01	Less than 01

D.2.9 Location of the Nearby Natural Water Pond

51. The existing water pond is located nearly 12.0m from the proposed STP 1 site. The overflow of the pond discharges as a stream to the below lands during the rainy season. Currently, the stream water during the rainy season is used by the nearby settlements for paddy and other crop cultivations. Therefore, treated water discharge standards for effluent are proposed as in Table 6.

52. Furthermore, placing crushed stone and planting vegetation covers around the bank of the tank is proposed to mitigate the anticipated soil erosion. 1.0m and 2.0m height retaining walls have been proposed at the STP 1 to reduce the impact on soil erosion. Accordingly, proposed retaining wall areas and typical sections with structural drawings have been designed as shown in **Annexure H - Proposed Retaining Wall Details for STP 1 Area**.

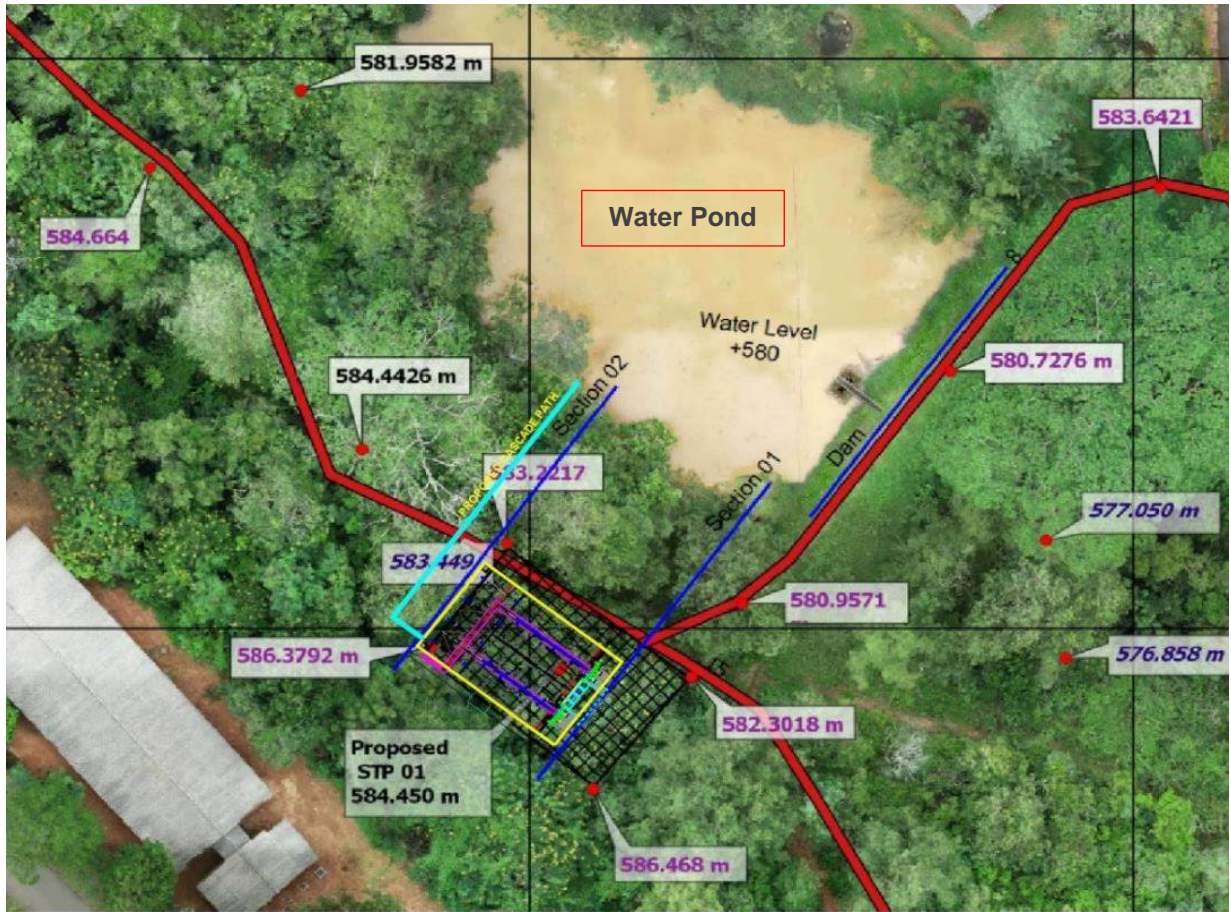


FIGURE 17: NATURAL WATER POND AND STP 1 LOCATION

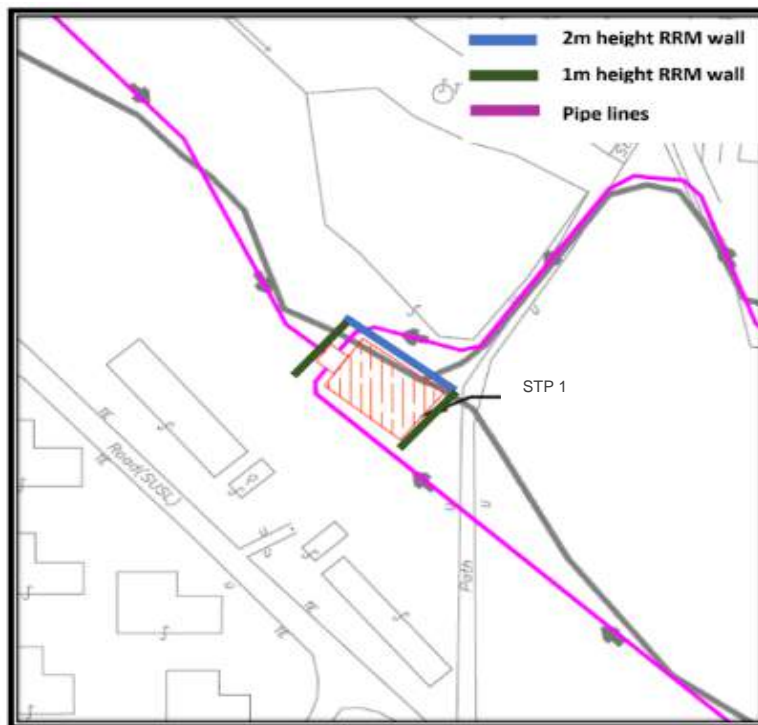


FIGURE 18: PROPOSED RETAINING WALL

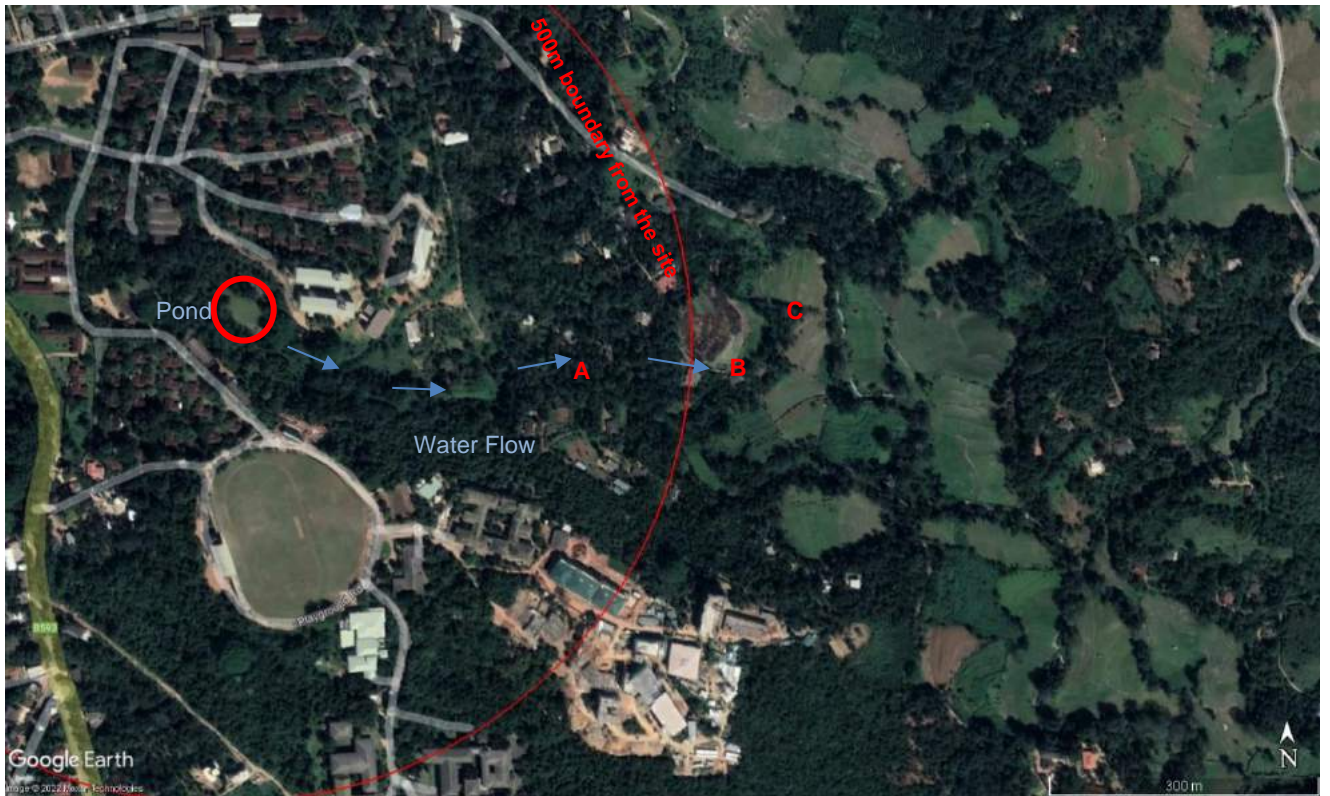


FIGURE 19: NATURAL WATER FLOW FROM THE POND



FIGURE 20: POINT A OF FIGURE 5 - WATER FLOW IN THE DOWNSTREAM



FIGURE 21: POINT B OF FIGURE 5 - WATER FLOWING THROUGH CULTIVATED LANDS



FIGURE 22: POINT C OF FIGURE 5 - WATER FLOWING THROUGH CULTIVATED LANDS

Dam Stabilization

- The dam is located 12.0 m away from the natural water pond.
- Average excavation depth of the dam is 3.2 - 4.0 m for the STP tank 1.
- As per the recommendation and clarification of the structural engineer, the dam was designed.
- The excavation will happen carefully with the proper monitoring.
- As per the recommendations of the design engineer and structural engineer, the foundation bearing capacity testing will be conducted.

Sluice / Spillway Details

- Length of the dam: 44.1 m
- Sluice gate dimension: 2.2m x 2.5m, Depth - 4.2m
- Top level of the dam: 580.800 MSL
- Spill level: 580.000 MSL

D.2.10 Sludge

Mechanism of Sludge Removal:

53. Compared to the conventional activated sludge process, the FBBR technology is superior because the activated sludge for removal of BOD and ammonia in wastewater is attached as a biofilm to the surface of the FBBR media. Usually, in activated sludge treatment, sludge age in secondary and primary clarifiers for biological processes needs to be adjusted which requires long retention times, so large primary and secondary clarifiers are needed. FBBR technology does not require manual sludge age adjustment and can therefore be operated without primary clarifiers. The enhanced small-scale secondary clarifiers with tube settler modules are sufficient.

54. At regular intervals, the sludge collected at the bottom of the Clarifier will be pumped to a sludge holding tank. The sludge tank will be maintained under anaerobic conditions, enabling the sludge to be digested and reduced further. The tank has a 6 month holding capacity. Pressed Sludge from the sludge screw press will be directed to the sludge sand drying bed for further moisture removal and use as plant fertilizer. **Sludge compress unit will be fixed for the sludge removal. The effluent drained out from the sludge drying bed will be directed to the equalization tank for undergoing the treatment process.**

Sludge Disposal:

55. Sludge separated from the tube settler will be transferred to the sludge storage and reduction reactor tank by solenoid valve which operates using pre-determined time intervals from the control panel. Sludge storage, thickening and reduction will take place inside the sludge tank whereas the anaerobic conditions are maintained to achieve optimum sludge reduction.

56. The dried sludge will be used as plant fertilizer. The required length for the sand bed will be 6m & width 3m including the 300mm sand layer on the top of the gravel layer. There should be a pipe to remove separated water from sludge dewatering on the bottom of the gravel layer (See Figure 9: Sludge Sand Drying Bed).

- a. Estimated flow generated per day = 950m³
- b. Estimated BOD per day = 267.5 kg
- c. Estimated TSS per day = 93.0 kg

57. Estimated sludge generated FBBR system taken at 50% of BOD (Low for FBBR systems in comparison to Activated Sludge Systems)

- a. Estimated sludge generated from FBBR system = 133.75 kg per day
- b. Total dry solids (133.75+93.0) = 226.75 kg per day
- c. At 4% MLSS volume generated = 5,668.75 L/d

58. This volume will be taken out from the Clarifier basin into a sludge holding tank. On retention of the slurry in the tank under anaerobic conditions it will thicken by 30% due to further digestion giving a;

- Sludge volume of $(226.75/0.3)$ = 755.83 L/d
- Sludge volume per month $(755.83 \times 30)/1000$ = 22.68m³/month
- Sludge volume per six months (22.68×6) = **136 m³/ 6 months**
- **Sludge tank size including free board = 150m³**

Final discharge point of sludge:

59. The fully digested and pathogens free sludge will be used as a fertilizer in the university premises; Faculty of Applied Science, Faculty of Geomatics, University front and gardens, etc. Or else, sludge could be sent out by gully bowsers for disposal at a suitable location. So, it is an opportunity as the garden area is more than 4,500 m² in the university premises. Furthermore, it is highly recommended to locate a dry pit near STP 1 to use sludge as the fertilizer (a byproduct).

D.3 Solid Waste Management Facilities

60. Due to the minimum solid waste expected from the site (only during the construction stage), the possibility of total on-site treatment of the waste will be minimal. However, on site waste management will be introduced and it is expected to utilize the services of the Solid Waste Management section of the Imbulp Pradeshiya Sabha for final removal of the generated waste from the premises.

61. Following key considerations were secured concerning solid waste disposal (for the construction stage) during the creation of the Solid Waste Management Plan under the National Solid Waste Management Policy.

- Source separation of garbage at the site of origin as well as sanitary interim storage until the Pradeshiya Sabha (PS) collects the waste.
- Site will be provided with waste bins with lids for collection according to color code and to avoid ground contact.
 - Biodegradable Waste - Green
 - Paper and Card Board - Blue
 - Polythene - Orange
 - Glass and Bottle - Red
- Parking for PS vehicles during loading and provisions to facilitate easy manual loading into such vehicles.

D.3.1 Data Used for the Calculation: Construction Stage

62. Considering the required labour/ employee number and the daily activities in the proposed subproject, the Solid Waste Generation in the relevant Pradeshiya Sabha has been calculated as given below.

Solid waste generations in Pradeshiya Saba= 0.3 kg/person/day
--

TABLE 8: COMPOSITION OF TYPICAL SOLID WASTE

Floor	Type of Use	Relevant Population / Area (Sq. M.)	Applicable kg/person/day kg/500 m2/day	Rate, OR	Total Quantity, kg/day
Ground Floor	Office	20	100% of 0.3 kg/p/d		6.0

Waste Category	Percentage (%) by weight	Degradability	Color Code	Source Separated
Organic Waste	63	Biodegradable	Green	Yes, HDPE Bags
Paper & Cardboard	20	Non-Biodegradable	Blue	Yes, Bundles & PP Woven Sacks
Plastic & Polythene	5.5	Non-Biodegradable	Orange	Yes, HDPE Bags & PP Woven Sacks
Metal	0.5	Non-Biodegradable	Brown	Yes, PP Woven Sacks
Glass	1	Non-Biodegradable	Red	Yes, PP Woven Sacks
Others	10	Mixed	Green	No, with Organic matter

D.3.2 Computation of Probable Waste Generation and Source Segregation of Waste: Construction Stage

20 Employees

TABLE 9: CALCULATION OF SOLID WASTE GENERATION

MSW type	Percentage by composition (%)	Segregated Weight of the waste /kg/d	Seven days Weight/kg	Volume / m ³
Organic Waste	63%	0.57	26.46	0.0882
Plastic & Polythene	5.50%	0.05	2.31	0.0077
Paper & Cardboard	20%	0.18	8.4	0.028
Metal	0.50%	0.45	0.21	0.0007
Glass	1%	0.009	0.42	0.0014
Others	10%	0.09	4.2	0.014
TOTAL	100	6	42	0.14

Total quantity of Solid waste generation per day	= 6 kg/day
To allow for 7 days' disruption of collection	= 42 kg
Volume of Solid Waste generation per day @300kg/m ³	= 0.02 m ³
Volume of Solid Waste generation for 7 day @300kg/m ³	= 0.14 m ³
Total volume of biodegradable waste generation	= 0.08 m ³
7 days @ 300 kg/m ³ (63%)	
Total volume of non-biodegradable waste generation	= 0.04m ³
7 days @ 200 kg/m ³ (27%)	
Total volume of non – descript waste generation	= 0.01 m ³
7 days @ 300 kg/m ³ (10%)	
Total volume of waste generation in proposed subproject (7 days)	= 0.14 m ³

D.3.3 Total Waste Storage Requirements

63. With capacity of 80liter wheeled bins are proposed for the proposed subproject.

a) Required No. of bins for bio degradable waste

$$\begin{aligned} \text{No. of bins required} &= 0.08 / 0.08 \\ &= \underline{1 \text{ bin (Bin Size = 80-liter Green color)}} \end{aligned}$$

b) Required No. of bins for segregated non-biodegradable waste

$$\begin{aligned} \text{No. of bins required} &= 0.04/0.08 \\ &= \underline{1 \text{ bin (Bin Size = 80-liter Orange, blue, brown, red color)}} \end{aligned}$$

c) Required No. of bins for segregated non – descriptive waste

$$\begin{aligned} \text{No. of bins required} &= 0.01 /0.08 \\ &= \underline{1 \text{ bin (Bin Size = 80 liter Green)}} \end{aligned}$$

D.4 Water Requirement

Amount of Water Required for the Subproject (Annexure J - Water Demand)

64. Daily water demand of the subproject is 2800 l per day during the construction stage.

CONSTRUCTION STAGE

Number of Employees	=	20	
Domestic Usage	=	135	l/person/per day
Total Domestic Usage	=	2700	l/per day
Construction Usage	=	100	l/per day
Total Water Requirement	=	2800	l/per day

Source of Water: Current Connection of University Premises

III. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

A. Applicable Local Environmental Legislations, Regulations and Standards

65. In Sri Lanka, there are over 70 laws that directly or indirectly relate to protecting and conserving the natural environment and human health. While most of these laws address specific issues pertaining to environment in the respective sector, it was the introduction and enactment of the National Environmental Act (NEA) that provided the overarching legal basis for regulation of pollution and protection of the environment in a comprehensive manner.

66. The following section outlines the broad legal and institutional framework in Sri Lanka for environmental management, relevant to the proposed subproject. The legislations relevant to the subproject are listed below. This subproject comes under the purview of the following sector level Acts. The EPL procedure under the CEA and along with the rest of the laws that are listed below:

- The Constitution of Sri Lanka (Articles 18, 27(14), Articles 154 (A), 9, 19 and (III)17). Covers environmental governance at the provincial level. In the event of public nuisance / grievance this becomes applicable to address the court of law.
- National Environmental Act No. 47 of 1980 (and its amendments of 1988) EIA is covered under this Act. This is discussed separately below since this is the main environment regulatory enactment.
- Forest Ordinance, No 17 of 1907 (and amendments).
- Fauna and Flora Protection Ordinance, Act No. 49 of 1983.
- Botanic Gardens (Amendment) Law. No. 32 of 1973 - Amendment of section 3 of Chapter 446 for the management, administration, and control of any botanic garden.
- Disaster Management Act No. 13 of 2005. Comes into force in case of a national or regional level disaster. This is relevant due to potential landslide risk.
- Pradeshiya Saba Act No. 15 of 1987. Regulates the planning and zonation of the region. This will be relevant for obtaining planning approval for the subproject.
- Flood Protection Ordinance, Act No. 22 of 1955. Controls and protects the water shed area of a catchment.
- State Land Ordinance, Act No. 13 of 1949 and Land Acquisition Act No. 09 in 1950 and subsequent amendments in 1983 and 1986, and Land Acquisition regulation of 2008- Relevant for land transfer from state to state agency.
- Soil Conservation Act, No. 25 of 1951. Relevant for the soil conservation in agricultural lands associated with catchment areas. To protect from further degradation.
- Mines and Minerals Act No. 33 of 1992 – Relevant for the extraction of building material from the natural environment,
- National Water Supply and Drainage Board Law of No. 2 of 1974 – supply of water for the subproject.
- Prevention of Mosquito Breeding, Act No. 11 of 2007 – to ensure that the site is free of mosquitoes related habitats as this is an area identified for dengue epidemics.
- The Urban Development Authority, Law, No. 41 of 1978- regulates the zonation of the Sabaragamuwa Urban development. Provides guidelines for the preliminary planning clearances, development permits and green building certification.

- **National Environmental (Amendment) Act 47 of 1980 amended by Act No. 56 of 1988**

67. The National Environmental Act (NEA) No. 47 of 1980 amended by Act No. 56 of 1988 is the basic national charter for protection and management of the environment. This is the law that incorporates and covers all aspects of the environment in Sri Lanka. It is implemented by the Central Environmental Authority (CEA), which functions under the Ministry of Environment. The NEA has gone through several amendments in the past in a bid to continually improve and to respond to the challenging conditions. There are two main regulatory provisions under the NEA which is implemented by the Central Environmental Authority (CEA). The emission standards for air, water and noise are prescribed in the relevant regulations made under the NEA. The applicable emission standards are discussed in the respective section of this report.

68. Tolerance Limits for the Discharge of Wastewater - National Environmental (Protection and Quality) Regulations No: 1 of 2008, published in the gazette No: 1534/18 dated 01.02.2008 amended gazette No: 2264/17 dated 27.01.2022 (**See Annexure E - CEA Standards for Tolerance Limits of Discharge the Wastewater: Gazette No: 2264/17 dated 27.01.2022**).

- Gazette Extraordinary of the democratic Socialist Republic of Sri Lanka, National Environmental Act, No. 47 of 1980, No:1534/18 dated 01.02.2008, Part I: Issue of Environmental Protection License for Emission or Disposal of Waste, Page 7A, Schedule 1: Tolerance Limits for Discharge of Industrial Waste into Inland Surface Water.
- Amended gazette No: 2264/17 dated 27.01.2022, Page 7A, List III A: Tolerance Limits for the Discharge of Wastewater or Effluent into Inland Surface Waters.

- **The Environmental Impact Assessment (EIA) Procedure**

69. The Environmental Impact Assessment (EIA) procedure for major development subprojects has been published in 1993 and is available with the CEA. The EIA process is implemented through designated Project Approving Agencies (PAAs). The screening, scoping, formulation of initial environmental examination (IEE), environmental management plan (EMP) and procedures for IEE and EMP disclosure and public comments will be governed by NEA of 1980 and its subsequent amendments of 1988 and 2000, and by environmental regulations. Under the national regulations, the current development subproject of the STP 1 does not require an IEE because it is not within a designated protected area.

- **The Environmental Protection License (EPL)**

70. The Environmental Protection License (EPL) is a procedure for the control of pollution. The Environmental Protection License is a regulatory/legal requirement under the provisions of the National Environmental Act No 47 Of 1980 (NEA). Section 23A of NEA states that no person shall carry out any prescribed activity except under the authority of an Environmental Protection License. That means it is

a legal authorization under certain conditions, for industries/ activities to discharge effluents, deposit wastes, emit smoke/gases/fumes/vapor or excessive noise /vibration into environment.

71. Regulations pertaining to this process have been published in 1990 and are available with the CEA EPL is issued on the regulations are gazette under Gazette Extraordinary No. 1533/16 dated January 25, 2008 and amended on dated 27.01.2022, for a variety of sectors involving in manufacturing, construction and services. As per the CEA recommendation clearance, one month prior to commencement of the STP 1 operation, an EPL is required to obtain for this subproject (See **Annexure G - Environmental Recommendations Approval from CEA**).

- **Fauna and Flora Protection Ordinance (FFPO) Amended Act No. 49 of 1993**

72. EIA provisions are also included in the Fauna and Flora (Amended) Act No. 49 of 1993. According to this Act, any development activity of any description what so ever proposed to be established within one mile from the boundary of any National Reserve, is required to be subjected to EIA/IEE, and written approval should be obtained from the Director General, Department of Wildlife Conservation prior to implementation of such subprojects. The EIA/IEE process under the FFPO is similar to that described in the NEA.

73. Under the FFPO five categories of protected areas are established viz, Strict nature reserve, National parks, Nature reserve, Jungle Corridors etc. According to the act any development activity of any description what so ever proposed to be established within a national reserve of within one mile of any boundary of any national reserve is required to be subjected to EIA/IEE and written approval should be obtained from the Director General Department of Wild life and Conservation prior to implementation of such subprojects. The FFPO follows a similar process as the NEA in conducting scoping, setting the TOR, preparation of EA, review of EA, public consultation and disclosure.

- **Forest Ordinance, No 17 of 1907 (and amendments)**

74. The Forest Ordinance of Sri Lanka is the law for conservation, protection and management of forest and forest resources. It regulates tree felling, transport of timber, and other forest related matters. The Forest Ordinance was amended by several Acts - Act 34 of 1951, No. 49 of 1954, Act 13 of 1966, Act 56 of 1979, Act 13 of 1982, and Act 84 of 1988. The Act 23 of 1995 replaced the old Ordinance. Under Section 4 of Act 23 of 1995, the Minister who is in charge of forests can declare any specified area of government land or the whole or any specified part of any reserve forest which has unique ecosystems, genetic resources or a habitat or rare and endemic species of flora, fauna, and microorganisms and of threatened species which need to be preserved in order to achieve an ecological balance in the area by preventing landslides and fire hazards. Under Section 5 of the Act, a Forest Officer has powers to stop any public or private watercourse which goes through a reserved forest. It

shall be lawful for the District Secretary to determine the amount of compensation to be paid in case that the water course adversely affects the interests or one or more individuals.

75. Under Section 6 of the Act, the following activities are prohibited:

- I. trespassing or permits cattle to trespass;
- II. damage by negligence in felling any tree, cutting or dragging any timber;
- III. willfully strips off the bark or leaves from, or girdles, lop, taps, burns or otherwise damages any trees;
- IV. poisons water;
- V. mine stone, burns lime or charcoal, or collects any forest produce; and
- VI. extracts coral or shells or digs or mines for gems or other minerals

- **Pradeshiya Sabha Act No. 15 of 1987**

76. Section 12 (2) of the Pradeshiya Sabha Act authorizes the appointment of a committee at the divisional level to advice on environmental matters. Section 105 of the Act prohibits polluting water or any streams, while Section 106 refers to pollution caused by industry and related offences. The Pradeshiya Sabha grants permission for construction activities within its jurisdiction. Such construction will have to comply with environmental requirements stipulated with permits. It also ensures that public health issues are efficiently dealt with and solid waste collection and disposal are appropriately done under this Act.

- **Flood Protection Ordinance, Act No. 22 of 1955**

77. This ordinance provides necessary provisions to acquire land or buildings or part of any land or building for the purpose of flood protection.

- **Irrigation (Amendment) Act (No. 48 of 1968**

78. Part VI section 75 is mentioning about the Liability where irrigation work is damaged, or water is used without authority or is wasted by a person who cannot be identified.

- Where water from any Ela, channel, watercourse or other irrigation work is obtained in any manner not authorized or is allowed to run to waste, and the person who obtained such water or allowed such water to run to waste cannot be identified, then, if any land has derived any benefit from such water, the proprietor of such land shall be liable to pay for such water at such rate as the Government Agent may determine.
- Where any act is committed whereby damage is caused to any irrigation work and the person who committed such act cannot be identified, then, if any land has derived any benefit as a

result of the commission of such act, the proprietor of such land shall be liable to pay to the Government Agent the expenses incurred in repairing such damage.

- If default is made in the payment of any sum due under this section, such sum shall be recoverable in the manner provided in Part VII.

- **Soil Conservation Act, No. 25 of 1951**

79. The Soil Conservation Act provides for the conservation of soil resources, prevention or mitigation of soil erosion, and for the protection of land against damage by floods and droughts. Under the Act, it is possible to declare any area defined as an erodible area and prohibit any physical construction. The following activities are also prohibited under Act:

- Weeding of land or other agricultural practices that cause soil erosion;
- Use of land for agriculture purposes within water sources and banks of streams; and
- Exploitation of forests and grassland resources and setting fire in restricted areas.

Clearance/ Permits Obtained or should be Obtained from the Relevant State Agencies and/ or Local Authorities:

80. Apart from the clearances for the overall subprojects work, the contractor, before starting the construction work, has to obtain required clearances for operating the equipment and carrying out construction work.

TABLE 10: CLEARANCE / PERMITS REQUIRED / OBTAINED

No	Description of the permit	Status (Obtained/ To be obtained/ Pending)	Annexure No.
01	Environmental Recommendation Clearance from CEA	Obtained	G

B. Administrative Framework

- **Central Environmental Authority (CEA)**

81. The CEA basically designs the scheme, procedures and standards to control the water, air & noise pollution, land degradation and hazardous substances and waste management. CEA advise the Ministry of Mahaweli Development and Environment on matters concerning prevention, control and abatement of water and air pollution; coordinate the activities of CEA and provide technical and research assistance; prepare manual, codes, guidelines & standards etc. SUSL is required to obtain an environmental recommendation letter or EPL from CEA. According to the BIQ, the proposed subproject

falls in to the un-prescribed category. According to the BIQ and IEE/EIA Environmental Guidelines of CEA, the proposed subproject falls in to the non-prescribed category.

- **National Building Research Organization (NBRO)**

82. NBRO was first established under the Ministry of Policy Planning & Implementation. In the past 32 years, NBRO served under many ministries, as it was moved from one-line ministry to another, far too frequently. National Building Research Organization is a leading research & development institution in the country and a reputed technical services provider in the fields of geotechnical engineering, landslide risk management, human settlements planning, environmental monitoring, building materials research, and engineering project management. NBRO functions under the purview of Ministry of Disaster Management (For more details: https://www.nbro.gov.lk/index.php?option=com_content&view=article&id=275&Itemid=471&lang=en).

- **Imbulpe Pradeshiysa Sabha**

83. The local authority will be in charge of solid waste disposal. Imbulpe Pradeshya Saba has been declared as a sixth order urban center and is govern by the Pradeshiya Saba Act No. 15 of 1987.

C. International Agreements

84. Sri Lanka is signatory to numerous environmental conventions. The applicable international agreements are provided below.

- Conventions on Wetlands of International Importance especially as waterfowl habitats / Ramsar (entered into force in Sri Lanka in 1990)
- Convention on International Trade in Endangered Species (CITES) of Wild Fauna & Flora (entry into force in Sri Lanka in 1979).
- Convention on the conservation of Migratory Species of Wild Animals (CMS) (1990).
- United Nations Framework Convention on Climate Change (UNFCCC) (Sri Lanka ratified it in November 1993)
- UN Convention on Biological Diversity (CBD) (Sri Lanka ratified in 1994).
- Plant Protection Agreement for Asia and the Pacific region (Sri Lanka ratified in 1994).
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Sri Lanka ratified in 1992).

85. Further, applicable international standards about the tolerance limits for the discharge of wastewater was especially concerned here such as Sri Lanka Standards Institute (SLSI) Standards for Wastewater and Sewage Effluent to International Finance Corporation (IFC) - World Bank (WB)- Environmental, Health, and Safety (EHS) Guidelines (See **Annexure F - Sewage Effluent to IFC-WB EHS Guidelines**).

D. ADB Safeguard Policy Statement, 2009

86. The Asian Development Bank has defined its Safeguard requirements under its 'Safeguard Policy Statement 2009 (SPS 2009). It has three operational policies on the environment, indigenous people, and involuntary resettlement. These three policies involve a structured process of impact assessment, planning, and mitigation to address the adverse effects of the subprojects throughout its cycle. The safeguard policies require that (i) impacts are identified and assessed early in the project cycle; (ii) plans to avoid, minimize, mitigate, or compensate for the potential adverse impacts are developed and implemented; and (iii) affected people are informed and consulted during project preparation and implementation. The policies apply to all ADB-financed projects.

87. The Environment Safeguards Policy ensures environmental soundness and sustainability of projects and supports the integration of environmental considerations into the decision-making process. The subprojects under the project are screened according to type, location, scale, and sensitivity and the magnitude of their potential environmental impacts, including direct, indirect, induced, and cumulative impacts.

88. ADB's SPS 2009 classify a projects depending on following four categories.

- Category A: A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An Environmental Impact Assessment is required.
- Category B: A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, none or very few of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An Initial Environmental Examination is required.
- Category C: A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- Category FI. A proposed project involves the investment of ADB funds to or through a financial intermediary. The financial intermediary must apply and maintain an environmental and social management system, unless all of the financial intermediary's business activities have minimal or no environmental impacts or risks.

89. **Policy Principles:** Ensures that the screening process is used for proposed subproject, as early as possible, to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken and potential impacts and risks assessed. There are **11 guiding Policy Principals for environmental safeguards** to ensure environmental soundness and

sustainability of projects and to support the integration of environmental considerations into the project decision-making process. Environmental safeguards are triggered if the subproject is likely to have potential environmental risks and impacts. Their relevance to the subproject is discussed in below Table 11.

TABLE 11: SPS POLICY PRINCIPLE

No.	Policy Principles	Met	Comments
1	Use a screening process for the proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken commensurate with the significance of Potential impacts and risks.	√	All screening for environmental, IR, IP carried out.
2	Conduct an environmental assessment for the proposed project to identify potential direct, indirect, cumulative, and induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical cultural resources in the context of the project's area of influence. Assess potential trans boundary and global impacts, including climate Change. Use strategic environmental assessment where appropriate.	√	IEE has in cooperated these conditions.
3	Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts and document the rationale for selecting the particular alternative proposed. Also consider the no project alternative.	√	Location alternative was not considered.
4	Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts by means of environmental planning and management. Prepare an environmental management plan (EMP) that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators. Key considerations for EMP preparation include mitigation of potential adverse impacts to the level of no significant harm to third parties, and the polluter pays principle.	√	EMP prepared.

5	Carry out meaningful consultation with affected people and facilitate their informed participation. Ensure women's participation in consultation. Involve stakeholders, including affected people and concerned nongovernment organizations, early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address issues related to environmental assessment. Establish a grievance redress mechanism to receive and facilitate resolution of the affected people's concerns and grievances regarding the project's environmental performance.	√	Stakeholder consultations and grievance redress mechanism were carried out.
6	Disclose a draft environmental assessment (including the EMP) in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. Disclose the final environmental assessment, and its updates if any, to affected people and other stakeholders.	√	Done.
7	Implement the EMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports.	X	EMP prepared for Implementation.
8	Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area. In an area of natural habitats, there must be no significant conversion or degradation, unless (i) alternatives are not available, (ii) the overall benefits from the project substantially outweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources.	X	The location itself is not within a protected area.

9	Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage. Avoid the use of hazardous materials subject to international bans or phase outs. Purchase, use, and manage pesticides based on integrated pest management approaches and reduce reliance on synthetic chemical pesticides.	√	National standards for air, noise and sewage discharge are below the IFC-WB EHS standards. IEE has in cooperated these conditions.
10	Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities	√	IEE has in cooperated these conditions.
11	Conserve physical cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during environmental assessment. Provide for the use of "chance find" procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation.	X	This land is not in an archaeologically sensitive area therefore chance find procedures do not apply under the local context.

90. There are 12 Involuntary Resettlement (IR) Safeguard Policy Principles to avoid involuntary resettlement wherever possible; to minimize involuntary resettlement by exploring subproject and design alternatives; to enhance, or at least restore, the livelihoods of all displaced persons in real terms relative to pre-project levels; and to improve the standards of living of the displaced poor and other vulnerable groups. IR safeguards are triggered under physical displacement (relocation, loss of residential land, or loss of shelter) and economic displacement (loss of land, assets, access to assets, income sources, or means of livelihoods) as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. It covers them whether such losses and involuntary restrictions are full or partial, permanent or temporary. Therefore, this subproject was classified as **Category C** for IR safeguards.

91. IP Safeguards have 9 guiding Policy Principals to design and implement projects in a way that fosters full respect for Indigenous Peoples' identity, dignity human rights, livelihood systems, and cultural uniqueness as defined by the Indigenous Peoples. **IP safeguards do not get triggered** under this subproject or the overall project.

92. Conclusion: The proposed subproject environmental impacts are not adverse in nature and few of them are reversible and mitigation measures can be designed more readily for the identified impacts. As per the ADB's Safeguard Policy Statement the proposed FT subproject of SUSL was classified as **Category 'B'** for environment requiring an IEE. In order to meet Environmental Policy Principles, additional activities and mitigations have been identified where necessary. All other Policy Principles have been met. Accordingly, this proposed STP 1 of SUSL is prepared under recommendations to the IEE of the proposed FT subproject of SUSL.

IV. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. Study Area

93. As per the guidelines of Term of Reference (TOR) for IEE, a 500m radius area from the edge of boundary of the site was taken as the study area. The study area drawn on the Google Image is given in the Figure 23.

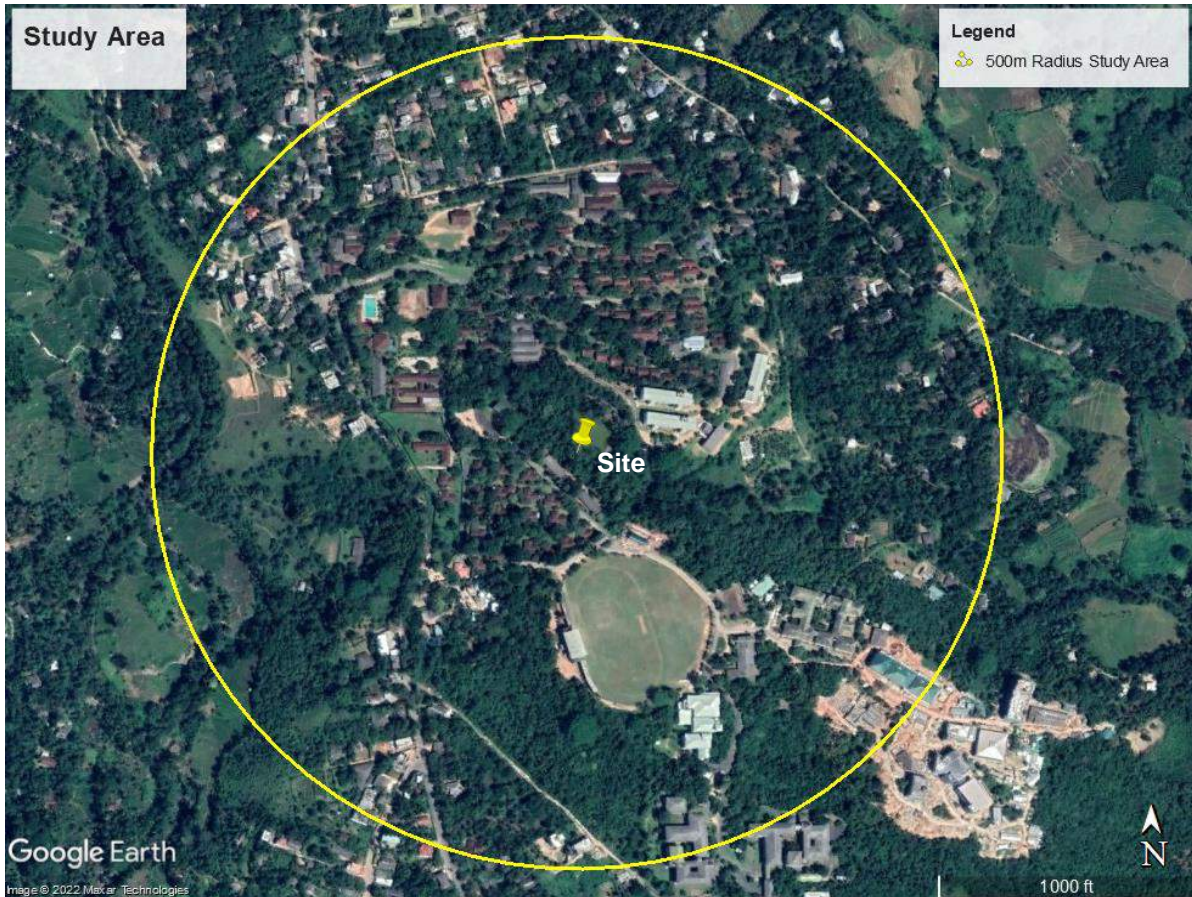


FIGURE 23: STUDY AREA

Site Location

94. The proposed STP 1 site is located in Imbulpe Divisional Secretariat Division (DSD), Ratnapura District in the Sabaragamuwa Province, Sri Lanka. The proposed subproject site is situated within the existing SUSL complex. The land location points are 6°42'46.3"N 80°47'20.6"E. The subproject site is located close to the Colombo-Batticaloa highway (A4) and is 1.1 km from the Pambahinna Junction.

95. The proposed land is fully occupied with natural vegetation. No significant environmentally sensitive receptors exist in the subproject site's immediate surroundings. The only possible such receptors would be the SUSL community, the closest functional building 500 m from the site.

B. Methodology used for Baseline Study

96. Data for this study has been primarily collected through a comprehensive literature survey, discussion with stakeholder agencies, and field visits to the proposed subproject site. The literature survey broadly covered the following:

- Subproject details, reports, maps, and other documents prepared by technical experts of the ADB team and discussions with technical experts of the PIU of SUSL team, PMU team of project contractor, relevant government agencies like CEA, Imbulpe Divisional Secretariat, MOH office Imbulpe and Imbulpe Pradeshya Sabha etc.
- Secondary data from previous project reports, IEE report and published articles, and literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and other planning documents collected from government agencies (including the resource profile for the area) and websites.
- Activities such as assessment of the existing location and the surrounding environment identification of sensitive areas, and key informant interviews were carried out.

Location Area and Connectivity

97. Pambahinna-Kumbalgama-Rajawaka-Kapugala Road (B593) connects SUSL to the main road which is Colombo-Batticaloa Highway (A4). Pambahinna-Kumbalgama-Rajawaka-Kapugala Road (B593) also connects SUSL to the Samanala Wewa dam and the power station. The A4 road cuts across Belihuloya - Pambahinna area to destinations like Beragala, Haputale, Badulla, Nuwara Eliya. The site is 3.3 km from Belihul Oya Town. It is 10.1km to the Imbulpe DS Office, 9.5km to Imbulpe sub-post office, 3.4km to the Belihul Oya post office and 800m to the Pambahinna People's Bank. The subproject is 1.1km from the Pambahinna Junction.

Area of Influence

98. Imbulpe Division is one of the key residential areas in proximity. The subproject site is 27.1 km to Sri Lanka Samanala Wewa Metro Electric Power Project, 800m to the Buddhist Temple of Sabaragamuwa University of Sri Lanka and 2.0km to the Karagasthalawa Sri Syila Gangarama Rajamaha Viharaya. And, 10.7km to Hindu temple (Aluth Nuwara Katharagama Dewalaya).

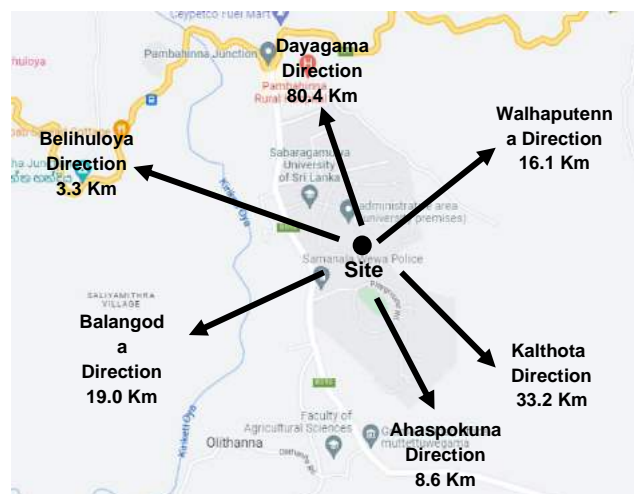


FIGURE 24: SITE LOCATION

C. Physical Environment

C.1 Topography

99. The topography of an area includes the surface shape and features. In general, the topography is concerned with local details, including not only relief but also natural and artificial features. Thus, the topography of the proposed site of the STP 1 can be described using Topographic Maps which are delineated in Figures 7, 25,26,27 and 32.

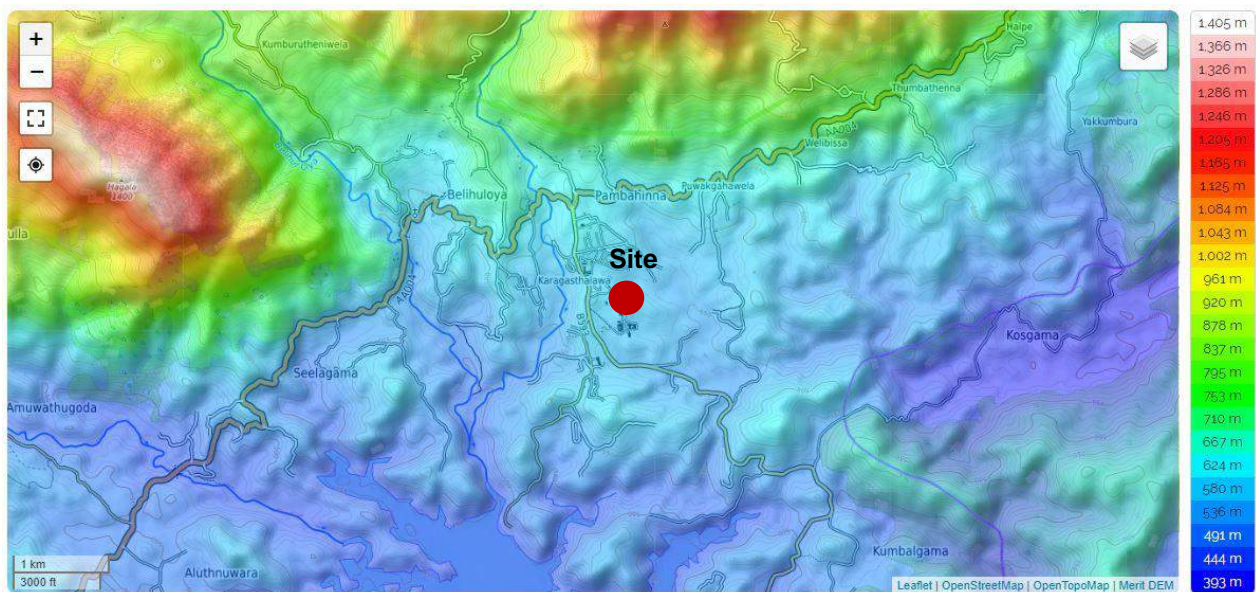


FIGURE 25: TOPOGRAPHY

100. Study area of the site is located in a low elevated area within the Imbulpe DSD. Further, the land site is found within the 487 – 730 m elevation category (See figure 32). The elevation of the subproject site is comparably different from the neighboring lands. The elevation of the subproject site area is marked as approx. 624.0 MSL, the surrounding area shows an elevation ranges between 550-667.0 MSL. It shows through the Digital Elevation Model (DEM) in Figure 25.

101. The cross-section formations Point A, Point B, and Point C reflect the surface fluctuation. The site is located (point B) in between the slope from point A to C, which directs towards the downstream region C (paddy lands). There is around an 8 m elevation difference from the apex of the elevated land (595m) to point B (587m) and a 15m elevation difference from Point B to Point C (572 m) (See figure 26).

102. Figure 27 shows the topo features of the site from the Pambahinna town side (A) to Southern side of the SUSL (C). The ground slope difference from points A to B is around 30m, sloping towards the subproject site B. University ground (G) is located in between points B and C which marks 594 m of elevation. The subproject site is located on the low land or downstream (valley) between point A to point G.

103. As per the detailed investigation of contour level in the site, a maximum 3m level difference (580m – 583m elevation) in between the pond and the proposed STP 1 land could be observed. In

addition, a maximum 3m level difference (583m – 586m elevation) is in the STP 1 land at present condition (See Figure 7) is observed.

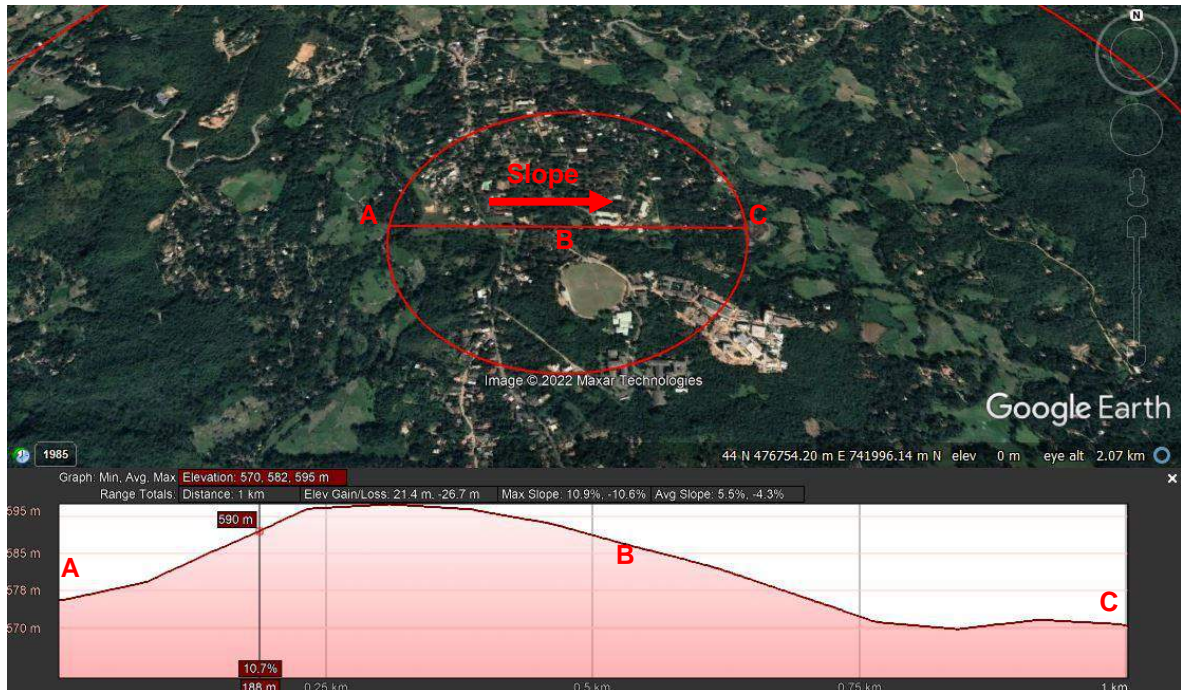


FIGURE 26: TOPOGRAPHY - CROSS SECTION

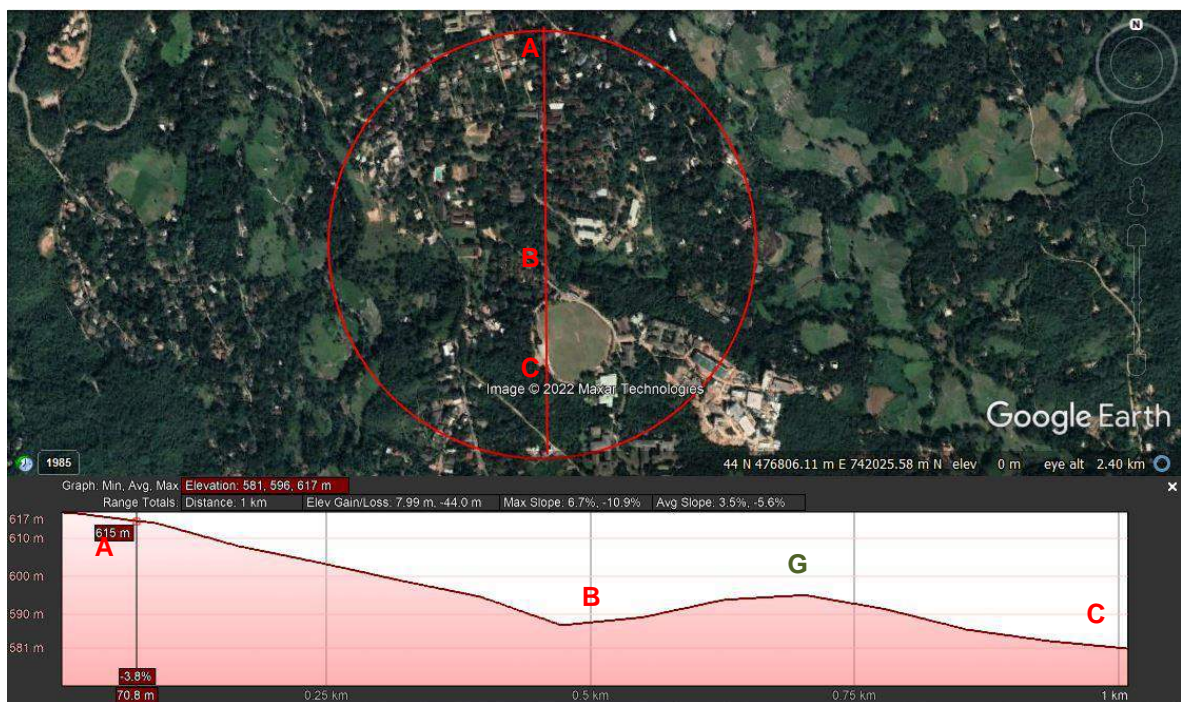


FIGURE 27: TOPOGRAPHY - CROSS SECTION

C.2 Hydrology

C.2.1 Surface Water Bodies

104. Within the 50m boundary, a water pond is located at the site. The pond connects to the nearby basin which consists of paddy lands and other crop cultivated land through a flowing stream.

105. The subproject is located in the Walawe basin and 3.4 km away from Samanala Wewa reservoir. The water supply intake point for the university is located upstream of Hirikatu Oya which is less than 1.0 km from SUSL. The subproject is located in the upper reaches of the Udawalawe tank cascade.



FIGURE 30: NEAREST WATER BODY

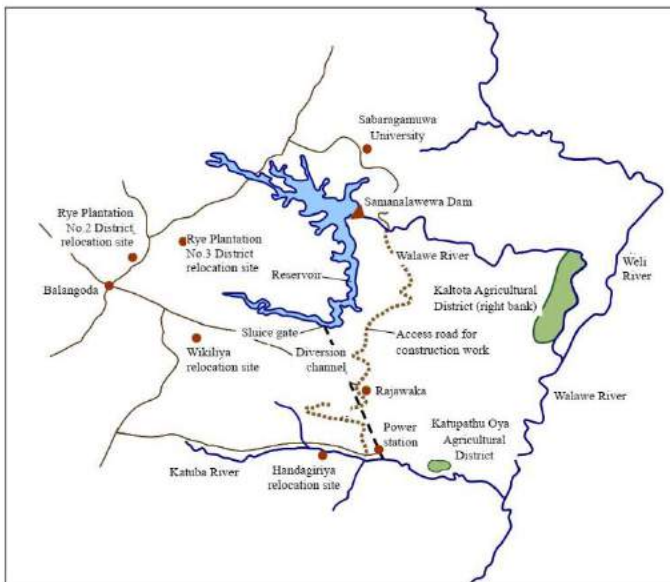


FIGURE 28: AREA MAP OF THE SURFACE WATER BODIES



FIGURE 29: HIRIKATTU OYA

C.2.2 Drainage Pattern

106. The drainage pattern of the study area has adapted to the natural topography features. The lowest elevation lands act as the retention basins, including the paddy fields and other cultivations.

107. Roadside drains shall generally be provided on both sides of the embankment to safely carry the discharge from the embankment without eroding the road.

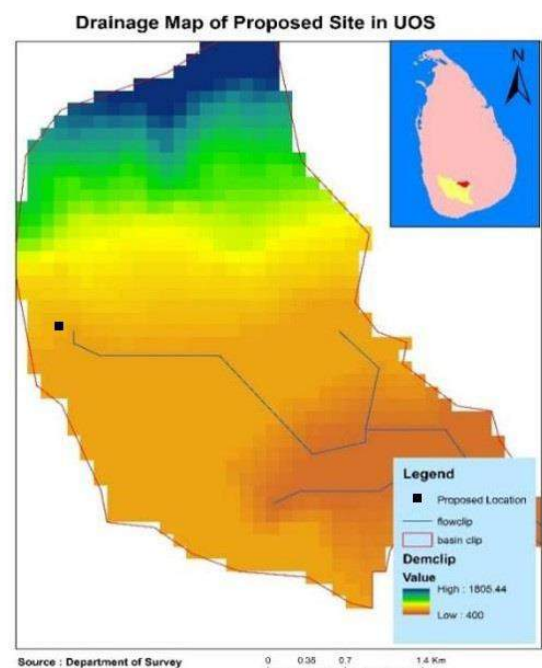


FIGURE 31: DRAINAGE MAP OF PROPOSED SITE

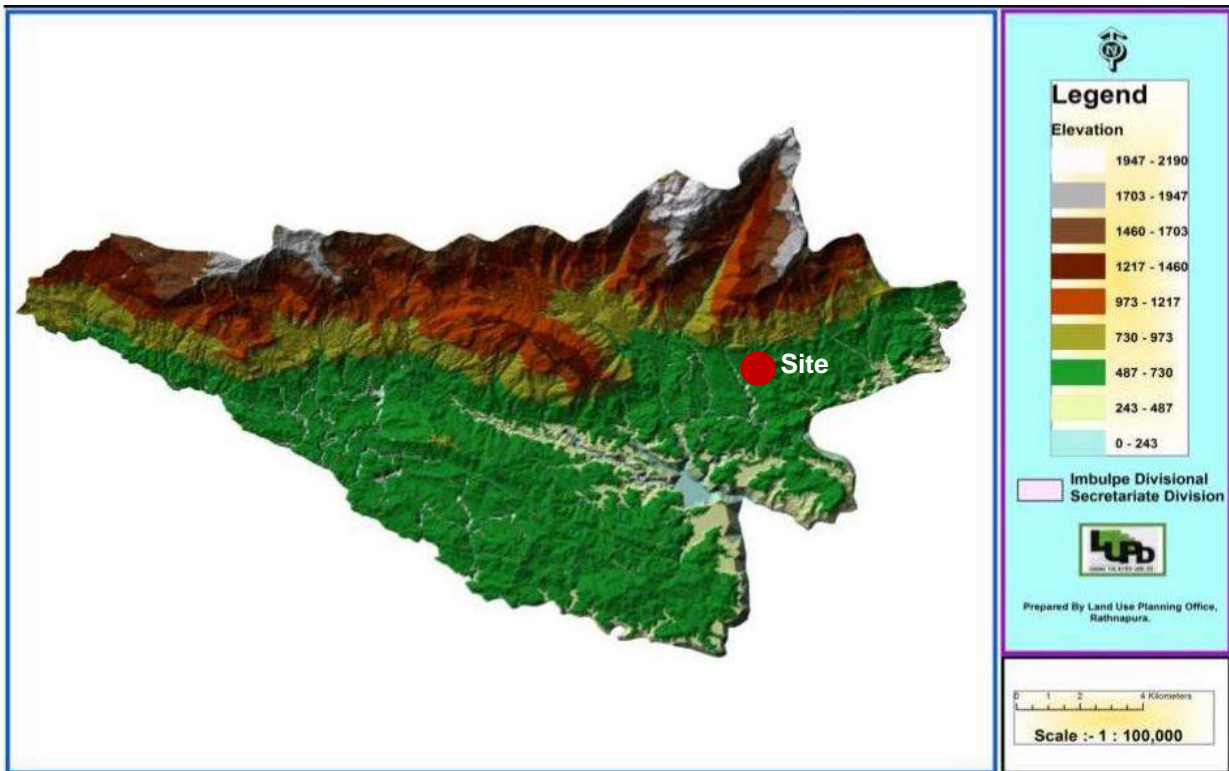


FIGURE 32: ELEVATION OF IMBULPE DSD

C.2.3 Presence of Flood Plains

108. No flood plains are recorded on the subproject site.

C.2.4 Surface Water, Ground Water Quality and Present Use

109. The Belihuloya - Pambahinna area has freshwater resources in the form of waterfalls, reservoirs, rivers and streams. Belihuloya has an abundance of waterfalls including the Bambarakanda Ella which is the highest in the country. Other waterfalls in the area include the Pahanthuda Fall, 1.5km from Belihuloya and the Brampton Fall, 10km from Belihuloya.

110. Water supply in the region has been an issue. Even though SUSL had been using the Water Purification Plant with the capacity for providing the daily needs of water for 1,500 persons constructed in the year 1986 under the Samanala Wewa project, it has been inactive since 2015. Since then, the water from Hirikatu Oya has been obtained directly from the tank and distributed after mixing chlorine to purify the water. However, reports of the monthly tests carried out by the institution showed the presence of bacteria in the water and the water did not conform to the required potable water quality. By May 2017, the construction of the tube well remained partly constructed. The details of water quality of the nearest water pond are in Table 7.

C.3 Geology and Soil

Geology

111. The Imbulpe Divisional Secretariat is geologically composed of gravel (Quiet Sight, Granite Niaz, Janokayit, Marble, and Unclassified highlands). The Layers in the subsurface are identified as the thickness of the different layers at the borehole locations. According to the borehole investigation, it consists of sandy materials up to the level of completely weathered rock which extends to a depth of around 0.00-7.70m from the existing ground level. The completely weathered rock layer extends up to the borehole termination level at the depth of about 28m which can be considered as a residual formation that would have been formed in-situ. Water was not encountered in the borehole investigation. The bearing capacity given in the report is only for the area covered by the two boreholes.

Soil

112. Although a soil investigation report was not conducted to this specific site location, a soil investigation was conducted on 9th December 2017 to the proposed Faculty of Technology (FT) Building Complex within the university premises by Geotechnical Engineering Division of NBRO. After the site visit of subproject structural engineer to check the soil existing ground condition for the proposed STP 1, the structural engineer will select the relevant locations where the Macintosh test should be performed if it is required. The Macintosh test is conducted under the supervision of a Quality assurance (QA) / quality control (QC) engineers and the test results are recommended by the structural design engineer. The Structural Engineer will visit the site for checking the soil condition as well as the existing ground condition for the proposed STP 1.

C. 4 Land Cover

113. Before development occurred in the area, Imbulpe was composed of forest cover. The land use pattern in the subproject area today, is residential with predominately mixed development. It means that the land use pattern in and around the subproject site is rural with predominately agricultural. Subproject surrounding land can be categorized into residential, commercial, industrial and agricultural. The immediate adjoining plots are currently not developed. There are no permanent or temporary structures at the subproject site. The subproject site is surrounded by the SUSL building premises.

114. The study area of the site (5km radius) is consisting build-up lands, forests, paddy, scrub, grassland etc. The land use characteristics of the study area are reflected in Figure 34. Land use within a 500m radius from the site has been used mainly for paddy and build-up structures. Hirikatu Oya flows towards Samanala Wewa which flows inside the 500m boundary of the subproject site. Few residential blocks, institutions, and activities such as 'Pambahinna Pola' are identified along the road network.

115. Subproject surrounding land (Muththetuwegama GND) can be categorized into residential and commercial area (6%), vegetation cover (52%) and streams (3%) plantation (39%). Proposed site is a scrub patch. The majority of the vegetation cover in the Muththetuwegama GN division comprise of grassland, scrub and forest followed by paddy fields. The high percentage of forest cover promotes

recreation such as trekking, camping, bird watching, biological studies etc. The total land use coverage in Imbulpe is 23,140 ha. Table 12 highlights the land use patterns in the Muththettuwegama GND.

TABLE 12: LAND USE PATTERN IN THE MUTHTHETTUWEGAMA GND

Land Use	Percentage (%)
Residential and Commercial Area	6%
Vegetation Cover	52%
Streams	3%
Plantation	39%

Source: Resource Profile

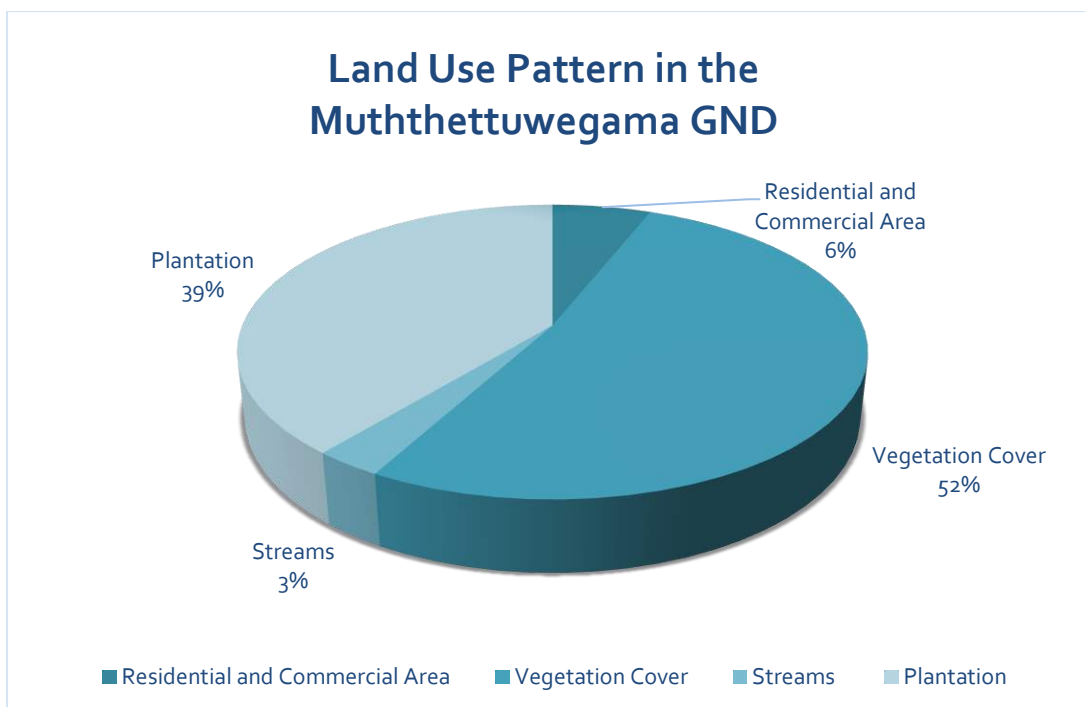


FIGURE 33: LAND USE PATTERN IN THE MUTHTHETTUWEGAMA GND

C. 5 Disaster Prone Area

116. There is no specific disaster experience at the site.

Climate and Meteorology

117. The area lies within the intermediate zone and a narrow band lies between the wet and dry zones with parameters of rainfall, temperature and winds that are well suited for outdoor recreational activities. Imbulpe division lies within the moist semi-evergreen forest belonging to the Eastern Intermediate Zone of Sri Lanka. It experiences heavy rain to the south west to the low land wind ward slopes of the central high lands from South-West Monsoon from May to September, mean rainfall in subproject area is 83mm and optimum rainfall is 303mm. Minimum rainfall is 1400 mm per year and a

maximum of over 2000 mm per year. June, July and August are considered dry with rainfall averaging 96 mm per month.

Temperature:

118. The average annual temperature is 26 °C, with a low of 18 °C during the months of December and January. The hottest months in Belihul Oya are May, June, and July.

Humidity:

119. Low humidity and a non-polluted atmosphere with well tolerated temperature levels is common to this area. The most humid months in Belihul Oya are in July (56.6% relative humidity), and December (82.1%).

Wind speed and direction:

120. An average wind speed of 31 km/h has been recorded during the months of June to September. At times winds may appear somewhat gusty in the area. The wind blows in from the north west of the study area.

121. The windiest month is July, followed by June and August. July's average wind speed is around 6.3 knots (7.2 MPH or 11.6 KPH). Maximum sustained winds (the highest speed for the day lasting more than a few moments) were recorded in mid-July where average top sustained speeds reached 11.3 knots. In 2016 Halpe, Belihuloya, 12 houses were damaged, injuring several children.

Seismicity

122. The subproject is located in the Sabaragamuwa Province of Sri Lanka which is within active seismic region. However, as per the NBRO, the SUSL site location is not under a high-risk zone (See more details:

https://www.nbro.gov.lk/images/content_image/publications/general_publications/resilient_manual.pdf

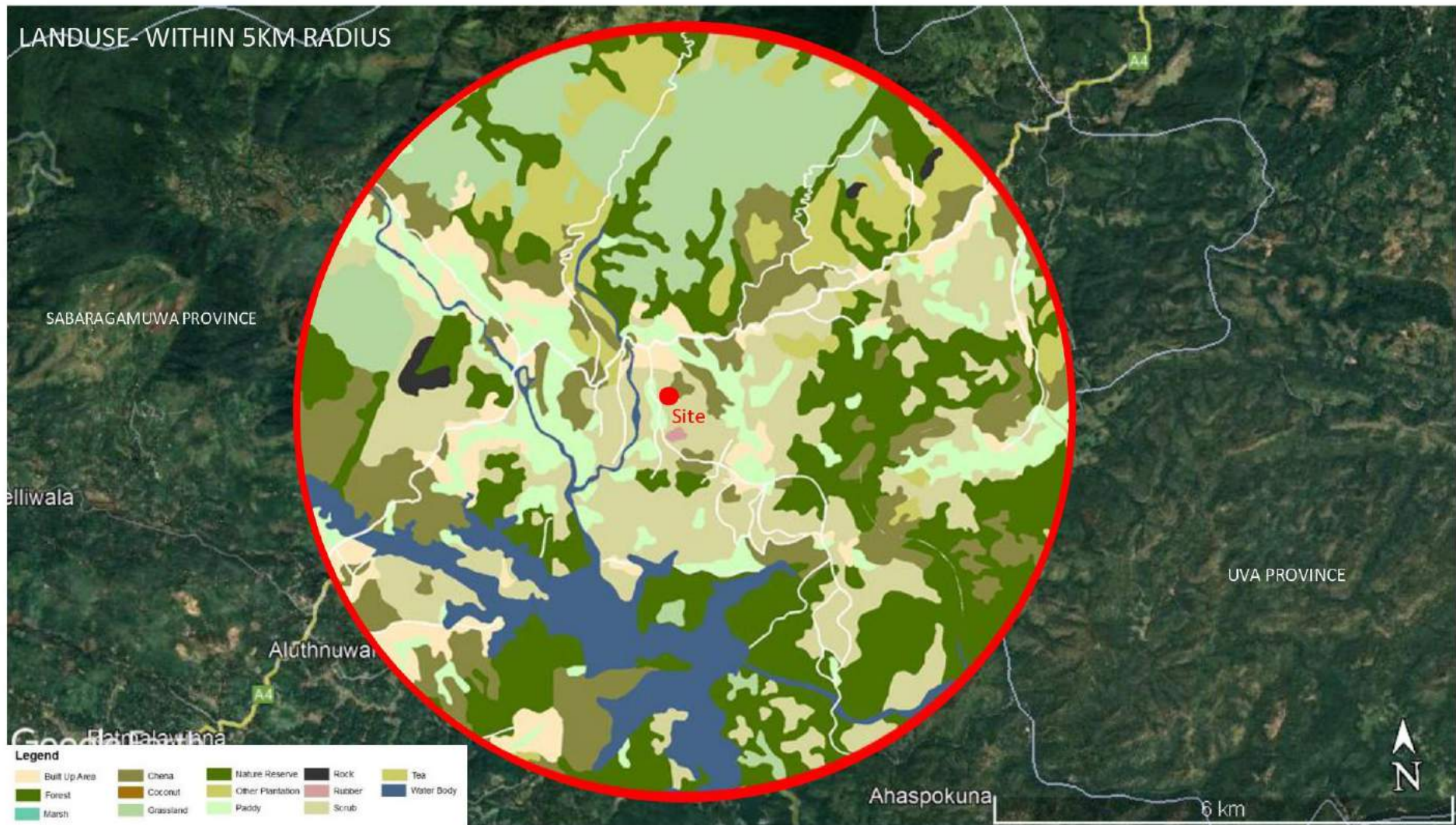


FIGURE 34: LAND USE WITHIN 5 KM

D. Biological Environment

123. The proposed subproject area falls within the Intermediate Zone. Floristically it is classified under the “Eastern intermediate lowlands” floristic zone or Moist Mixed Evergreen Forest Tropical moist semi evergreen forests and savannah forests are the typical vegetation formations present in this zone. The main habitats observed within the proposed subproject site is a low canopy sparse vegetation dominated by “Spicate Eugenia” (*Syzygium zeylanicum*) and with some other shrubs, herbs, orchids and ferns. Further, the surrounding area consists with the same vegetation type. Further, the subproject is located in a region with an ecological importance due to its location in a bio geographical transition between the wet zone to the west and the dry, being located in a thin strip of the intermediate zone. The subproject site is also located on the second pen plain of the country between the World’s End escarpment to the north, ascending to the Horton Plains in the third (highest) pen plain, and the Handagiriya-Kalthota escarpment to the south descending to the first pen plain of the lowland coastal zone.

124. Typical savannah vegetation does not exist in the subproject site as most of the vegetation was highly modified due to climax vegetation. The development location at SUSL harbors low levels of species richness in selected floral and faunal taxa. However, the proportions of endemic and/or threatened species in the subproject site and its periphery are not considered critical levels. Therefore, SUSL currently harbours a natural forest patch with low significance on ecological value in terms of floral and faunal diversity. No mature plants (only small few plant) were recorded on the site land and only weeds and shrubs are found only here (See **Figure 6**). The selected pipeline was proposed through clear spaces so as not to interfere with any tree or structure. As per several field surveys, leech, snails, fish, worms, aquatic plants, frogs, and many types of insects live in this ecosystem. Thus, no special aquatic flora and fauna in the pond were observed.

E. Historical & Archaeological Importance

125. There are no landmarks or evidence of historical, religious, archaeological, or cultural importance known to be in the study area. This land is not in an archaeologically sensitive area therefore chance finds procedures do not apply in the local context. Therefore, the proposed subproject will not cause negative impacts. However, EMP will include a note that in event of a chance find, all work at the site will be stopped and the Department of Archaeology will be informed.

F. Socio- Economic Environment

Demographic details of affected population

126. There is a total of 50 GN Divisions within the Imbulpe DSD. The total Imbulpe DS population is 66,931 of which 48% are male and 52% are female. Majority of the population is Sinhalese in the Imbulpe area and others are Tamil, Muslim, Indian Tamil, Burgher, Malay, Baratha, Lanka Chetty. When considering the religious constitution within the Imbulpe DSD, most of the population is Buddhist.

Hindus, Islam, and Christians are accounted for as another category. There were 17,426 housing units and 826 households who don't have a proper housing unit.

127. The study area is belonging to Muttettuwegama Grama Niladhari Division of Imbulpe Pradeshiya Sabha. All the families in Muttettuwegama GN division fall under the rural category. None recorder under the categories of urban or estate.

Industry and Economy

128. Prehistorically, Imbulpe is famous for the cane, blacksmith industry, pottery and kithul based industry. However, in the modern context, Imbulpe DSD has developed in to a small scale to medium scale and large industries. Within the Imbulpe DSD, there are nearly 3000 people engaged in the industrial sector.

129. The majority of the labor force engages in private sector employment in Muttettuwegama Grama Niladhari Division. The most popular cultivation type of the Muttettuwegama GND is another crop plantation. Vegetable and tea plantation follows respectively. A considerable amount of labour force engages in self-employment.

130. The majority of the families can be considered as lower-middle-income families, where 49% of them have recorded a monthly income ranging between 7,500 < 30,000 LKR. No families were recorded with incomes lower than 1000 LKR. 4% of the families receive a monthly income ranging between 100,000< 200,000. (Source: Imbulpe PS Resource Profile 2020-2021)

Educational, Medical and Religious Properties

131. Within Imbulpe DSD there are 45 Schools, 44 Buddhist Dharma Schools, 3 Christian Sunday Schools, and 4 Vocational Training Centers and one Vidatha Center. Balangoda Base Hospital is the main hospital in the area. Other than that, Belihuloya Rural Hospital, Marathanna Estate Rural Hospital and Pinnawala Central Dispensary are in the area. There are 29 doctors and 117 nurses within the DS. There is one Ayurveda Central Dispensary within the DS. Bodhi Rukkarama Temple, Karagasthalawa Sri Syila Gangarama Rajamaha Viharaya (1.5km), Hindu Temple (Aluth Nuwara Katharagama Dewalaya - 5.5km) are the main important religious places within the Imbulpe DSD.

G. Human Settlement

132. There are no settlements on site or near to the site. The site is located within the Sabaragamuwa University of Sri Lanka.



133. The downstream settlements in the Muttettuwegama can be considered as external impact areas due to treated water disposal. A maximum of 50 settlements downstream can be observed.

134. Many scrubs & green covers, many paddy fields, lots of middle-class residents in Muththettuwegama and Pambahinna villages, many hostels of the Sabaragamuwa University, many food shops and retails, Christian Church - Pambahinna, Grama Niladari Office Muttettuwegama, Samanala Wewa Police Department, Ceylon Electricity Board (CEB) Circuit Bungalow, Bank of Ceylon, Pambahinna Post Office and Buddhist Temple of Sabaragamuwa University are the land uses and special landmarks within 500m study area.

V. ANALYSIS OF ALTERNATIVES

135. Although the proposed STP 1 is located in close proximity to a green cover and a water pond, significant impacts are associated with construction and they are temporary and short term. Any short term or long-term impacts can be managed by adhering to the EMP. Alternatives to location were not considered as the subproject site is strategically located within the SUSL complex. As per the locational attributes and treated water disposal purpose, there is no other more suitable location in the vicinity that can be developed as an alternative to the proposed subproject within the university land premises. However, a detail examination of alternatives to the subproject's location was not done. With regard to the design alternatives, the conventional activated wastewater treatment and sludge process was considered. Compared to the conventional activated sludge process, the selected technology: FBBR system involves a larger number of active aerobic bacteria compared to the conventional activated sludge processes and does therefore result in a lower footprint, fewer power costs, easier maintenance and operation. Therefore, the FBBR system is a good and advantageous alternative to conventional activated sludge processes.

136. When compared to the No project scenario, which will deteriorate the existing environment and quality of life, the proposed subproject will not only provide the much required solution for the disposal of wastewater but also will greatly enhance and improve the environment. Hence the "With" project scenario with some reversible impacts is an acceptable option rather than the "Without" project scenario. The implementation of the subproject therefore will contribute positively to improve the environmental quality in area and the associated surroundings. It will result holistic development of the economy and improve the region and the country. 'With' and 'without' project scenarios have been compared as shown in below Table 13.

TABLE 13: PROJECT SCENARIO

WITH PROJECT		WITHOUT PROJECT	
<i>Impacts</i>		<i>Impacts</i>	
Positive	Negative	Positive	Negative
Provide a proper method to dispose sewage and wastewater of the increasing student and staff population within the university.	Nil	Nil	No Proper sewage and wastewater Management System.
Proper disposal of treated wastewater and sludge.	Nil	Nil	Issues of the available disposal method such as gully bowser transportation and overflows.
Produce fertilizer from sludge as a byproduct.	Nil	Nil	Unavoidable stink due to gully bowser

WITH PROJECT		WITHOUT PROJECT	
<i>Impacts</i>		<i>Impacts</i>	
Positive	Negative	Positive	Negative
			transportation and overflows.
Regulated of wastewater and sludge.	Nil	Amount of waste generated is less.	Unregulated of wastewater and sludge.
Reduce and mitigate the environmental impact associate with sewerage and wastewater.	Nil	Nil	Increase the environmental impact associate with sewerage and wastewater.
Villagers are interested and happy about the STP 1 subproject.	Nil	Nil	Villagers unhappy about the gully bowser transportation and overflows.
<p>Disposal of treated water at the proposed standard influent rates.</p> <p>04 basin solution of the STP 1 meaning if one basin needs to be taken out of operation there is no significant loss of performance.</p> <p>The flow of the STP 1 can be adjusted depending the on incoming load.</p> <p>FBBR system of the STP 1 is modular meaning individual FBBR frames can be removed or added to the basin.</p> <p>Application of backup power system for STP 1 during the power interruption / outage.</p>	Continuous supervision on disposal of treated water at outflows, regular verification of the STP 1 system and process, STP 1 failure due to power interruption / outage and less impact on water quality of the pond and downstream.	Nil	Water quality issues due to the overflows of wastewater from existing sewerage pits and impact on water quality of the downstream and nearby settlements.
Improvement & maintenance the natural drainage and provide mitigation methods for soil erosion such as cascade aerator and stepped drain etc.	Less soil erosion impact.	Nil	Soil erosion impact during rainy season.

WITH PROJECT		WITHOUT PROJECT	
<i>Impacts</i>		<i>Impacts</i>	
Positive	Negative	Positive	Negative
Proper solid waste management plan is proposed.	Increased less pollution due to solid waste disposal	Amount of solid waste generated is less.	Nil
No significant noise impact and it is manageable during the construction and operational phases. Proposed STP 1 is with the sound proof technology.	Short term increase of noise during the construction and operational phases.	Nil	Nil
No significant dust impacts.	Short term increase in dust due to earth work.	Nil	Nil
No significant impact due to the forest cover reduced.	Less forest cover reduced.	Nil	Nil

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

137. The proposed subproject will impact the environment, especially during the construction phase and operation stage. The construction phase may be regarded as temporary or short-term. During the operation stage, it will have long-term effects. Negative impacts can be minimized or lessened only if proper precautions are taken during the design and construction stages. An effective mitigation strategy will use a combination of both options to come up with actions that can be put into practice. Efforts will be made to minimize the adverse effects on various environmental and social components. In cases where the impact on various environmental components is unavoidable, mitigation measures are formulated to reduce the impact. The recommended mitigation measures during the irradiation phase should be included in the contract agreement with the contractor and discussed with them to ensure smooth execution from the outset.

A. Constructional Impacts

A.1 Impacts on Land Clearing, Cutting, Levelling and Residual Disposal

138. The proposed subproject site presently has no permanent structures to be demolished. The first phase of development involves site clearing, and the existing shrubs will be removed. This stage is already done. They have been disposed to nearby green area to lessen the surface runoff and without any impact.

139. 1.0m and 2.0m height retaining walls have been proposed at the STP 1 to reduce the impact on soil erosion. But, not much excavation or filling is anticipated at the current location other than land leveling with the available soil content. No negative impact could be observed.

140. There is not much solid waste generation at this construction site as this is a small-scale construction work. Thus, alteration of current land use & change in the existing profile of the land due to construction activities at the proposed subproject location is a key impact. Other than that, changes in topography due to leveling and tank bank erosion due to the disposing of treated water to the water pond from STP 1 are the further impacts observed. Those are minimal impacts and they will be lessened with the proper mitigation strategies.

Mitigation Measures:

- Solid waste generated during the construction stage will follow partial on site waste management with the collaboration of the Imbulpe Pradeshiya Sabha.
- Adopt measures put forward by CEA and NBRO under their legislations.
- Minimum clearance of the existing vegetation cover (Shrubs) on the soil surface.
- Maintain the existing vegetation cover (Shrubs) on the soil surface.
- Provide temporary covers to reduce the spread of dust at exposed areas as applicable.
- Placing crushed stone and planting vegetation covers around the bank of the tank.

- Provision of suitable retaining walls near the STP 1 and the Pond.
- Excess excavated materials should be removed to dumping or disposal locations on a well-planned programmed approved by the Pradeshiya Sabha
- All discarded and used oil, grease and empty paint buckets will be collected and stored and disposed in sanitary way.
- Any hazardous waste will be disposed of by two CEA's licensed waste collectors.
- **Best Engineering and Management Practices should be adopted.**
- Close supervision and use of experienced contractor.
- Continues monitoring should be at collection point properly.
- Work sites shall be cleared of residual solid waste before work commences.
- No waste shall be burned on site.
- Adhere to the ICTAD Guidelines (Guidelines for Effective Construction Management [1st Edition – August 2005] - Ref. No. ICTAD/CM/01 and Environmental and public Health standards - Ref. No. CIDA/STD/01).

A.2 Impacts Due to Removal of Trees / Loss of Green Cover

141. The scrubland is already cleared. There is such impact at the site, as all land cover consists of small trees or bushes.

Mitigation Measures:

- Minimum clearance of the existing vegetation cover (Shrubs) on the soil surface.
- To mitigate any hazard (erosion) created by the surface drainage following instructions will be followed by the contractor, if any tree removal is to proceed the following instructions are given to consider: *The removal of vegetation in this area will be done maximum only up to 60% and this removal of vegetation will be done without removal of tree roots while cutoff height of tree trunks remained as 1.5 m from existing ground level.*
- Maintain the existing vegetation cover (Shrubs) on the soil surface.
- Provide temporary covers to reduce the spread of dust at exposed areas as applicable.
- Dispose removed trees to nearby green area to lessen the surface runoff.
- Adhere to the ICTAD Guidelines (Guidelines for Effective Construction Management [1st Edition – August 2005] - Ref. No. ICTAD/CM/01 and Environmental and public Health standards - Ref. No. CIDA/STD/01).

A.3 Noise, Vibration and Dust due to Construction Activities

A.3.1 Noise

142. Existing ambient noise levels in the area are consistent with rural residential settings. No traffic noise was recorded on the roads in the nearby areas. Noise levels within and adjacent to the subproject area would increase during the proposed construction activities mostly as a result of transportation. The location is located within the PS area which is considered a low-noise area.

143. The noise levels were measured on 3rd May 2022 at the STP 1 by NBRO. The sound level measurements were carried out in accordance with the methods laid down in National Environmental Noise Control Regulations stipulated under the Extraordinary Gazette No: 924/12-Thursdays, May 13, 1996 of Sri Lanka. During the measuring period, it was observed that noise generated by vehicle movements at the location is the main contribution. Accordingly, the existing day time residual noise level was 48 dB. As per the noise measuring results, background noise level was 44 dB (See **Annexure K - Noise Report**).

4.5 NOISE MEASURING RESULTS:

Table 03: Noise Levels at each measuring location

Location	Time	Run time	Measured Residual Noise Level Leq (dB)	Background Noise level L ₉₀ dB(A)
N1	Day	1 hour	48	44

Where;

- Measured Noise Level (Leq):- The equivalent continuous baseline noise level over the measuring period.
- Background Noise Level (L₉₀):- A weighted sound pressure level of baseline noise level that is exceeded 90% of a measuring period.

FIGURE 36: NOISE MEASURING RESULTS FROM NOISE LEVEL REPORT

144. During the construction period, there could be several high noise levels generated with noise levels exceeding 75 dB(A) (which is the maximum permissible level stipulated in the Sri Lankan legislation for daytime activities defined as 6.00 am to 9.00 pm), though these effects are sporadic and temporary in nature. Noise level at the boundary of land during the construction stage will be maintained at or below 75dB(A) during the day from 6.00 am to 9.00 pm.

145. As per the analysis of construction activities by the contractor, some of the high noise generating activities including land preparation activities together with infrastructure facilities, construction of super structure and other ancillary structures etc., will have a minor impact related to noise pollution and vibration-induced noise as below tables.

TABLE 14: NOISE LEVEL OF CONSTRUCTION ACTIVITY

Construction Activity	Noise Levels
<i>Grading & Clearing</i>	84
<i>Excavation</i>	89
<i>Foundations</i>	88
<i>Erection</i>	79
<i>Finishing</i>	84

TABLE 15: RELATIVE RANGE OF NOISE LEVELS FOR SOME COMMON TYPES OF HEAVY CONSTRUCTION MACHINERY

Machinery	Noise levels at 16m distance in dB (A)
<i>Compactors (rollers)</i>	71-75
<i>Backhoes/excavators</i>	70-85
<i>Tractors</i>	78-95
<i>Scrapers, graders</i>	78-93
<i>Pavers</i>	85-88
<i>Trucks</i>	83-93
<i>Concrete mixers</i>	75-88
<i>Concrete pumps</i>	81-84
<i>Concrete vibrator</i>	76
<i>Jack hammers and drills</i>	82-98

TABLE 16: TYPICAL NOISE LEVELS OF CONSTRUCTION EQUIPMENT

Equipment	Noise levels at 7m distance in dB (A)
<i>Compressor</i>	109
<i>Drivers (drop hammer type)</i>	110
<i>Truck, scraper or grader</i>	94
<i>Pneumatic drill</i>	85
<i>Excavator</i>	112
<i>Loader</i>	72-84
<i>Roller vibrator</i>	108
<i>Poke vibrator</i>	113
<i>Bulldozer</i>	80
<i>Sound reduced jack hammers and lock drills</i>	82

146. Constant exposure to very high noise levels often causes hearing deficiencies. Thus, machine operators who are directly involved in such activities will be at high risk. However, such impact would not happen due to this subproject. Table 17 shows the exposure noise levels and time limits adopted in the United Kingdom and they can be used as guides in Sri Lanka as such a guideline is not yet available in Sri Lanka.

TABLE 17: EXPOSURE LEVELS AND TIME LIMIT IN UK

Levels (dB)	Dose time limits
90	8hr
93	4hr
100	48min
110	4.8min
120	28.8 min
130	2.88 min

Source: Control of Noise at Work Regulations, 2005

147. Equipment used in clearing the site is known to generate moderate noise levels. Most of the machinery and equipment used during construction works (infrastructure facilities or buildings) are known to produce moderate levels of noise levels (apart from the use of several construction vehicles though the effects may be temporary (since the construction phase is confined to a shorter time period). Existing ambient noise and vibration levels in the area correspond to rural and vegetation patches. No traffic noise is reported here.

Mitigation Measures:

- As per the CEA and NBRO standards, the Maximum permissible noise level at the boundary shall be maintained at or below 75dB during the day time from 6.00 am to 9.00 pm and 50dB during the night time from 9.00 pm to 6.00 am at the construction stage.
- Maintain the noise levels at the boundaries of the subproject site during the construction as stipulated in the National Environment (Noise Control) regulations.
- Any work that may cause noise and vibration from 9 pm to 6 am shall be avoided. Noise generation activities shall be carried out only from 6.00 am to 9.00 pm.
- Any night time activities shall be carried out using noise reducing means or low noise technologies.
- During the construction period, temporary covers shall be constructed to adequate height to reduce the spread of the noise.
- Servicing of all construction vehicles and machinery shall be carried out regularly and during routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found defective shall be replaced.
- Maintenance of vehicles, equipment and machinery shall be regular and to the satisfaction of the engineer to keep noise levels to the minimum.
- Adhere to the ICTAD Guidelines (Guidelines for Effective Construction Management [1st Edition – August 2005] - Ref. No. ICTAD/CM/01 and Environmental and Public Health standards - Ref. No. CIDA/STD/01) and IFC General Environmental, Health and Safety

Guidelines (Section No: 1.7 Noise – See <https://www.ifc.org/wps/wcm/connect/4a4db1c5-ee97-43ba-99dd-8b120b22ea32/1-7%2BNoise.pdf?MOD=AJPERES&CVID=nPtgwZY>).

- The STP 1 should be operated at high noise free.
- Noise levels at the boundary of the STP 1 land during the operational stage should be maintained at or below 55dB during the day time from 6 am to 6 pm and 45 dB during the night time from 6 pm to 6 am.

A.3.2 Vibration

148. The Interim Standard on Vibration Pollution Control for Sri Lanka provides guidelines for operation of machinery, construction activities, vehicular movements, and acceptable human exposure to vibrations depending on the length of the vibration period (continuous, intermittent, and impulsive). It should be noted that structures are sensitive to vibration and the ground induced vibrations and shocks can have severe damage to nearby properties when ground vibrations are exceeding well over 2.0 mm/sec (Peak Particle Velocity - PPV) at a frequency of vibration at 0-10 Hz and type of vibration.

149. The dam is located 12.0m away from the outer wall of STP 1.



FIGURE 37: DAM DETAILS

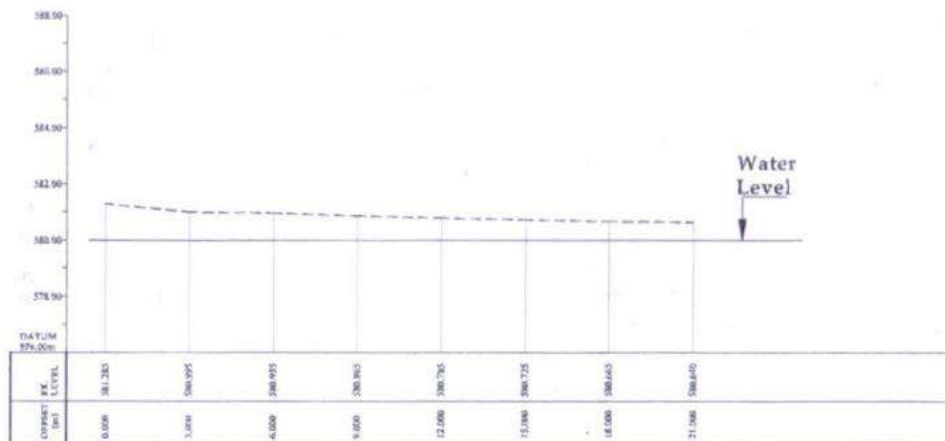


FIGURE 38: DAM DETAILS - WATER LEVEL

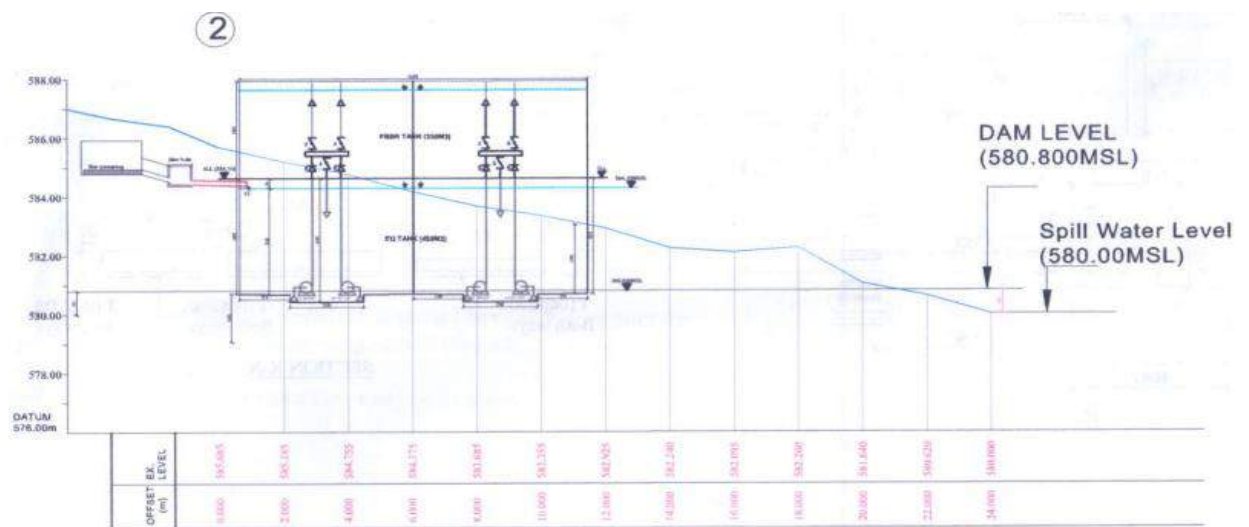
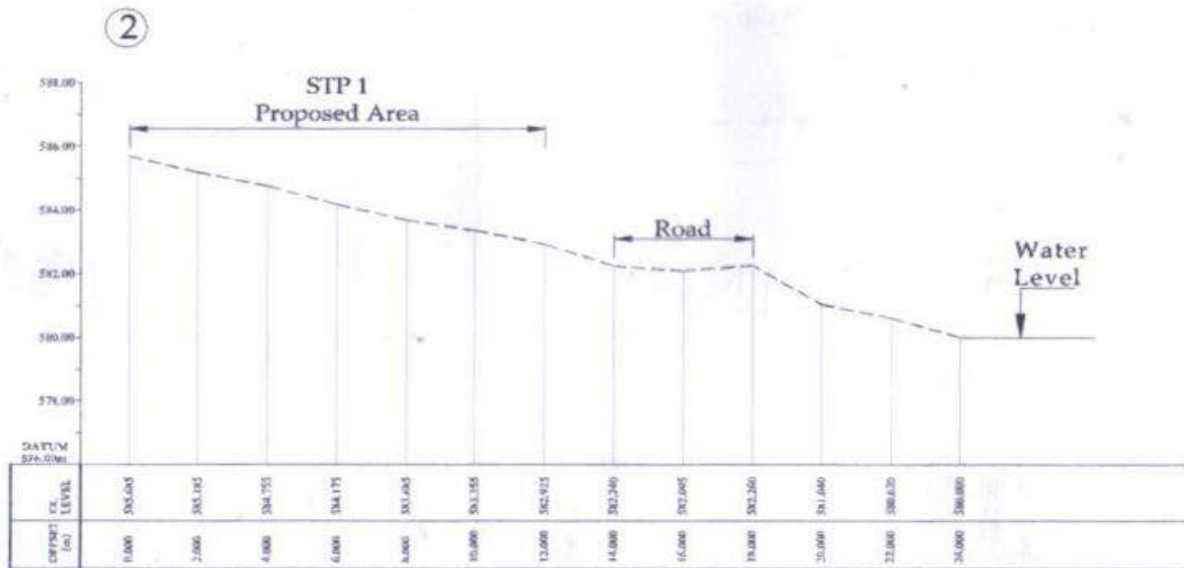
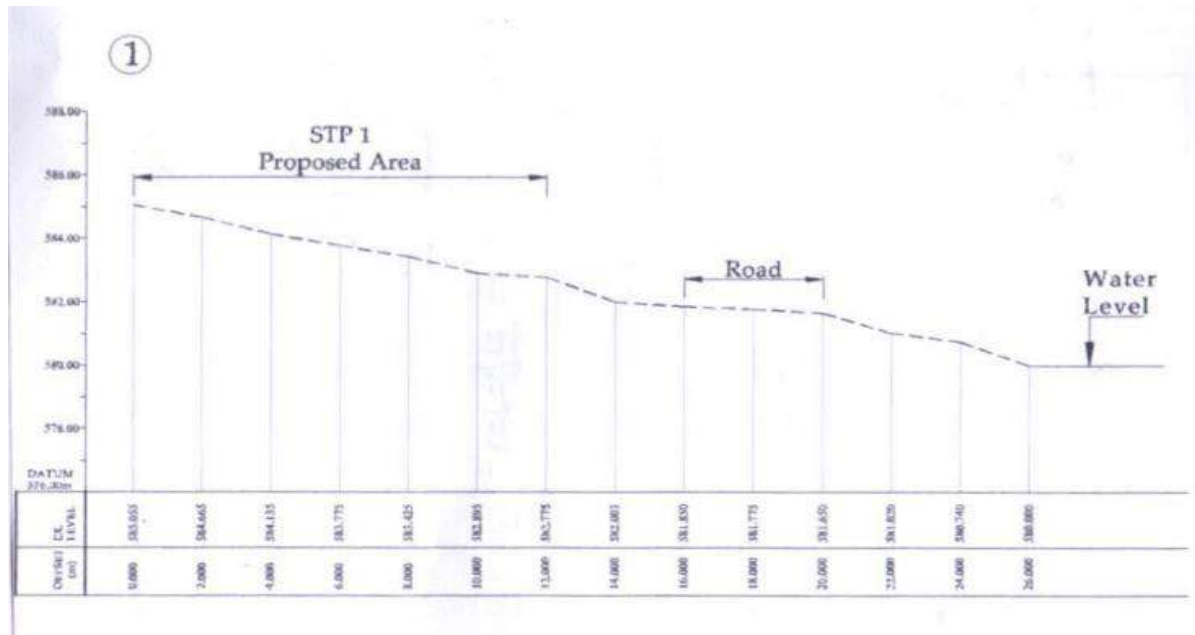


FIGURE 39: DAM DETAILS - SECTIONS

150. If having over 2.0 mm/sec at a frequency of vibration of 0-10 Hz, there is a huge impact on the dam during the construction, as it is located at a 12.0 m distance from the STP 1. Yet the least use of machinery and minor construction activities would not affect the surrounding neighborhood or the nearest dam. No such significant impact would happen at the site during the construction and operational stages, as this is a small-scale construction. Furthermore, according to the orientation of the dam and STP 1 and the distance to the dam from STP 1, there is **no pressure distribution or vibration** towards the dam due to STP 1 (Recommendations of the project structural engineer - See **Annexure O - Dam Details**). Thus, a significant operational vibration impact will not be generated due to this proposed STP 1 system.

Mitigation Measures:

- Minimize unreasonable vibration impacts on sensitive receivers.
- Avoid structural damage to the dam as a result of construction vibration.
- Standard vibration mitigation measures are to be implemented throughout the construction and operational periods to reduce and control potential vibration impacts.
- Minimize obstructions between the vibration source and the sensitive receiver.
- Servicing of all construction vehicles and machinery shall be carried out regularly and during routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found defective shall be replaced.
- Maintenance of vehicles, equipment and machinery shall be regular and to the satisfaction of the engineer to keep noise levels to the minimum.
- If having a vibration effect from the STP 1 during the operational phase, installation of vibrational cleaning of media is recommended to develop in the STP 1.
- Adhere to the ICTAD Guidelines (Guidelines for Effective Construction Management [1st Edition – August 2005] - Ref. No. ICTAD/CM/01 and Environmental and Public Health standards - Ref. No. CIDA/STD/01).
- Follow the CEA and NBRO standards.
- In the event that construction vibration is found to be significantly below construction vibration criteria, no subsequent monitoring of that activity is required.
- If monitored vibration levels are considered to be high-risk or close to the vibration criteria, vibration monitoring tests will be carried out on a continuous basis at the nearest vibration sensitive receiver during the construction and operational stages.
- If having a considerable effect on dam or externals, it is often suggested that vibrations can be interrupted using the wave barriers concept.

A.3.3 Dust

151. The air samples were collected by NBRO on 4th and 5th May 2022 at STP 1. As per the ambient air quality monitoring results, the measured ambient air quality levels with respect to the SO₂, NO₂, CO, PM₁₀ and PM_{2.5} at the location were lower than the ambient air quality standards stipulated under the Extraordinary Gazette, No: 1562/22-August 15,2008 by the Ministry of Environment and Natural

Resources of Sri Lanka. Thus, the total suspended particulate matter levels at the location itself were lower than the stationary course emission control regulations for fugitive dust emission standards levels for TSPM ($450\mu\text{g}/\text{m}^3$) stipulated under the Extraordinary Gazette, no: 2126/36 – June 05, 2019 by the Democratic Socialist Republic of Sri Lanka (See **Annexure L - Air Quality Report**).

Parameter	Date of Sampling	Date of Analysis	Time Average	Units	Concentrations at L1
TSPM	05/05/2022	09/05/2022	3 hrs	$\mu\text{g}/\text{m}^3$	35
SO ₂	05/05/2022	05/05/2022	8 hrs	$\mu\text{g}/\text{m}^3$	15
NO ₂	05/05/2022	05/05/2022	8 hrs	$\mu\text{g}/\text{m}^3$	19
CO	05/05/2022	05/05/2022	8 hrs	$\mu\text{g}/\text{m}^3$	<1000
PM ₁₀	04-05/05/2022	09/05/2022	24 hrs	$\mu\text{g}/\text{m}^3$	21
PM _{2.5}	04-05/05/2022	09/05/2022	24 hrs	$\mu\text{g}/\text{m}^3$	11

FIGURE 40: CONCENTRATION OF EACH PARAMETER FOR AMBIENT AIR QUALITY FROM AIR QUALITY REPORT

152. There are three key potential sources of damage to air quality during construction.

- Emission of dust during land preparation activities
- Emission of dust at the subproject site due to construction activities
- Emission of gaseous pollutants from the exhaust of vehicles servicing the construction activities

153. The site clearing work and construction activities have a potential to generate airborne dust particles in terms of Suspended Particulate Matter (SPM), Particulate matter with aerodynamic diameter less than 10 micron (PM₁₀) and less than 2.5 micron (PM_{2.5}). The gaseous pollutants emission from the exhaust of machinery, vehicles servicing the construction activities could be identified as SO₂, NO_x, O₃, CO, HC etc. The presence of significant fine dust particles along with other gaseous pollutant could affect nearby sensitive recipients in the area.

154. The potential for dust to be emitted during the construction phase is strongly dependent on the type of construction activities taking place, the prevalence of hot, dry weather during the construction period, the strong wind speeds toward potential sensitive receptors (particle size) etc.

155. The type of activities most likely to generate dust and other gaseous pollutants in this type of subproject are as follows,

- Fugitive dust and gaseous pollutant emission from construction activities such as site clearing, land preparation and other construction work, such as construction of offices, contractor's huts and other temporary buildings.
- Dust and gaseous pollutant emissions from vehicles of materials (construction material), machinery, and equipment transportation to the site.

156. Emission of dust and cement particles may occur during construction of office, contractor huts and other buildings. Yet the proposed permanent structures are relatively small compared to the

construction of a usual office building, a fairly low quantity of cement and sand would be required for these constructions. On the other hand, the impact would not be significant since the construction activities are restricted to a shorter period. The excavation area should be well cleared with existing facilities or any object which was identified as an obstruction to the excavation process and should be provided with protection against damage, dust & dirt. The hording around the site perimeter should be stably completed prior to commencement of backfilling to minimize mud and dust emission to the surrounding. The vehicle movements should be pre-planned in accordance with minimal disturbance for transportation of excavated soil.

Mitigation Measures:

- There shall be regular watering of construction sites at all times and especially during dry windy periods when dust levels are elevated.
- During the construction period, temporary covers shall be constructed to adequate height to reduce the spread of dust.
- Vehicle carrying dusty materials should be covered entirely with dust barriers to ensure material which not is leaked from the vehicle.
- Construction material stocks should be covered properly.
- Stockpiles of construction material shall be kept covered at all times in order to reduce dust emissions.
- Washing the vehicles (tires) when going out. Facilities should be provided for washing of vehicles moving out.
- Traffic controls, traffic volume restrictions, the imposition of speed limits, erosion reduction techniques.
- When transporting materials, drivers shall be informed to use speed controls within the town area.
- Proper maintenance of machinery, equipment, and vehicles.
- Surface treatment with penetration chemicals.
- Soil from site clearance temporarily stored on site shall be covered by re-usable polythene sheets, thatched coconut leaves or a similar alternative.
- There shall be daily cleaning of streets and pathways in the vicinity of the construction site.
- There shall be no burning of wastes on site.
- Adhere to the ICTAD Guidelines (Guidelines for Effective Construction Management [1st Edition – August 2005] - Ref. No. ICTAD/CM/01 and Environmental and public Health standards - Ref. No. CIDA/STD/01) and IFC General Environmental, Health and Safety Guidelines (Section No: 1.1 Air Emissions and Ambient Air Quality – See <https://www.ifc.org/wps/wcm/connect/4e01e089-ad1a-4986-b955-e19e1f305ff0/1-1%2BAir%2BEmissions%2Band%2BAmbient%2BAir%2BQuality.pdf?MOD=AJPERES&CVID=nPtgvbS>).

A.4 Air Quality Impact from Traffic During Construction

157. Incidences of air pollution in terms of dust (SPM or PM10) and gaseous pollutants would occur during transportation of construction material, machinery, and equipment to the site and construction vehicle movements over dry, bare areas. Vehicles transporting construction material and other machinery are to make use of existing road network. Since the existing road does not show heavy traffic, the increased air emissions will be minimum.

158. Heavy vehicles used for the transportation of machinery to the site would lead to high emissions of air pollution in terms of unpleasant diesel smoke and gaseous pollutants such as NO_x, SO₂ and CO etc. Though the impacts are sporadic, these impacts will be moderately low since the existing environment consists of rural characteristics and vegetation patches.

A.5 Proposed Mitigatory Measures for construction impacts

159. Noise impact can be identified during the construction phase from vehicle transportation. During the construction phase, fugitive emissions (dust particles) may occur on non-rainy days. However, they should be minimized by applying appropriate practices such as covering with worn tires, and regular wetting for vehicle passing respectively. Moreover, noise, vibration and dust due to construction activities are not significant to the surroundings. In order to avoid such minor disturbances, the university will be watered at given time intervals.

160. During the construction phase, the noise will be generated due to the movement of operation of light & heavy construction machinery that is known to emit sounds with moderate to high decibel values. An increase in noise level due to construction activities and operation of construction equipment will cause disturbance mainly to the SUSL student and staff community which is the main environmentally sensitive receptor. The other main receptors are the fauna associated with the forested areas. Thus, the workers are likely to be exposed to high noise levels that may affect them. Noise generated from sources mentioned above will be intermittent and mostly during the daytime. The construction noise is generally intermittent and depends on the type of operations location and function of the equipment and the equipment usage cycle, it attenuates quickly with an increase in distance. Since the site is fairly rural, sound may appear more. However, it will be a manageable minimum impact, as this proposed site is located far from the impact-able environment.

161. As per the CEA standards, the maximum permissible noise level at the boundary will be maintained at or below 75dB during the day time from 6.00 am to 9.00 pm and 50dB during the night time from 9.00 pm to 6.00 am at the construction stage. Noise generation activities will be carried out only from 6.00 am to 9.00 pm. All the construction operations will be carried out in such a way as not to cause a nuisance to the neighbours. During the construction period, temporary covers shall be constructed to adequate height to reduce the spread of dust and noise. Noise levels at the boundary of the STP 1 land during the operational stage will be maintained at or below 55dB during the day time

from 6 am to 6 pm and 45dB during the night time from 6 pm to 6 am. The STP 1 shall be operated at high noise free. Further, sludge handling operations will be kept odor free.

162. ICTAD guidelines for siting and layout of construction camp guidelines for siting. Storage of construction materials should be located sufficiently away from the road frontage. Sand, rubble, metal, bitumen and cement should be covered. All cement, bitumen (barrels), oil and other chemicals should be stored and handled on an impervious surface above ground level (e.g. concrete slab) and should be enclosed ensuring that no storm water flows into the structures. There should be adequate ventilation to avoid the accumulation of fumes and offensive odour that could be harmful. Transport, loading and unloading of construction materials should not cause nuisance to surrounding by way of noise, vibration and dust. All drivers should have valid license for the category of vehicles they drive and follow the speed limits of roads. Construction materials should not exceed the carrying capacity of trucks and the local road. ICTAD Guidelines for Preparing Comprehensive Waste Management Plan is highly appreciated.

163. Wet down and spray water at the construction site, if required. Use dust screens especially since subproject location is in close proximity to other functional areas of SUSL. Dust emissions during transportation of construction materials should be controlled by enforcing speed limits on the vehicles and ensuring transported material is covered with tarpaulin. Take steps to avoid dust emissions during loading and unloading of construction material. Tarpaulin covering is mandatory on trucks/lorries which are used for transporting materials. All filling works are to be protected or covered in a manner to minimize dust generation. All vehicles, equipment, and machinery used for construction shall conform to the Sri Lankan government vehicle emission test. For equipment emission norms as specified in air emission gazette under NEA. The Contractor shall maintain a record of pollution under control for all vehicles and machinery used during the contract period, which shall be produced for verification whenever required

B. Soil Erosion and Surface Drainage

Soil Erosion

164. Soil erosion is a critical environmental problem throughout the world's terrestrial ecosystems. Erosion inflicts multiple, serious damages in managed ecosystems such as crops, pastures, or forests as well as in natural ecosystems. Thus, erosion due to rain will cause sediment to flow into the pond and even downstream. Soil erosion is a concern not only for that, but also for its impacts on water quality. In particular, erosion reduces the water-holding capacity because of rapid water runoff, and reduces soil organic matter. Sediments that are transported to storm drains and surface waters can choke aquatic life and increase water temperatures. Various pollutants such as bacteria, nutrients and heavy metals may also be attached to these sediments, further degrading water quality. Therefore, bank protection is highly concerned with this subproject.

Mitigation Measures:

- Minimum clearance of the existing vegetation cover (Shrubs) on the soil surface.
- Maintain the existing vegetation cover (Shrubs) on the soil surface
- Placing crushed stone and planting vegetation covers around the bank of the tank
- Providing adequate drainage facilities.
- Temporary earth drains should be provided during the construction activities.
- The treated water should be discharged under the 1:8 dilutions.
- Discharging the treated water to the pond and surface water drainage via cascade aerator and stepped drain.
- Construction and maintain of spill, spill gates, intake structure and tail canal without change in surface hydrology including down stream flow regime.
- Turfing downstream slope and providing rip-rap protection on upstream section of earth bund.
- Provision of suitable retaining walls near the STP 1.
- Construction activities should be scheduled to the weather condition as much as possible.
- Adopt measures suggested by CEA, and NBRO.
- Adhere to the ICTAD Guidelines (Guidelines for Effective Construction Management [1st Edition – August 2005] - Ref. No. ICTAD/CM/01 and Environmental and public Health standards - Ref. No. CIDA/STD/01).
- A proper drainage management plan should be developed for the site to ensure protection from heavy runoff and erosion, if having an unmanageable soil erosion.

Surface Drainage

165. The treated water collection pond is not a stagnated water body whereas the overflow from the pond is continuously discharged to the surface water bodies acting as a floating water body. So, there is no any possibility to develop anaerobic conditions inside the system and odor generation whereas the treated water from the STP 1 system will transfer through cascade aerator whereas the effluent parameters will be further reduced. However, outflow water from the water pond will be flowed through the natural drainage path to the downstream. Therefore, as per the outflow quantity of treated water, adequate drainage system should be developed base on the natural drainage line.

Mitigation Measures:

- Maintain the existing vegetation cover (Shrubs) and stones in the existing natural drainage
- Maintain the water flow rate of the natural drainage
- Placing crushed stone and planting vegetation covers in and around the drainage
- Providing adequate drainage facilities and proper drainage management plan.
- Temporary earth drains should be provided during the construction activities.
- Construction and maintain of spill, spill gates, intake structure and tail canal without change in surface hydrology including down stream flow regime.
- Adopt measures suggested by CEA, and NBRO.

- Adhere to the ICTAD Guidelines (Guidelines for Effective Construction Management [1st Edition – August 2005] - Ref. No. ICTAD/CM/01 and Environmental and public Health standards - Ref. No. CIDA/STD/01)

C. Solid Waste Disposal

Impacts of Residue Disposal During Constructional Period

166. The subproject proponent will not dispose solid waste but will entrust the task to contractors and sub-contractors during construction. All the waste generated during construction stage will be disposed with the prior approval and agreements with the respective local authority.

Impacts due to Demolished Materials, Excavated Materials, Solid Waste and Hazardous Waste Disposal on Surface and Ground Water and/or Soil during the Construction

167. All the waste generated during construction stage will be disposed with prior approval and agreements with the respective local authority. Therefore, disposal of waste will be done in an approved method and impact on surface and ground water and or soil is not expected.

Impacts due to Solid Waste Generated and Mode of Discharge during the Operation

168. During the operational phase solid waste will be disposed properly according to the solid waste management plan. Solid waste will not be discharged into the water bodies. Thus, solid waste will be collected by the respective local authority during the constructional and operational stages.

Impact of the Proposed Method on Ground Water/ or Air

169. There are no impacts anticipated on groundwater or air in the area as no waste is discharged or disposed to ground water table or to the ground.

Mitigation Measures:

- Solid waste generated during the construction stage will follow partial on site waste management with the collaboration of the Imbulpe Pradeshiya Sabha.
- Excess excavated materials should be removed to dumping or disposal locations on a well-planned programmed approved by the Pradeshiya Sabha
- All discarded and used oil, grease and empty paint buckets will be collected and stored and disposed in sanitary way.
- Any hazardous waste will be disposed of two CEA's licensed waste collectors.
- Proper practices should be adopted.
- Close supervision and use of experienced contractor.
- Bio degradable (food waste) and non- bio degradable wastes such as plastic, polythene, glass generated on site should be separated, stored and discharged to the final disposal point which will be continued with the assistance of the Imbulpe Pradeshiya Sabha.
- Continues monitoring should be at collection point properly.

- Work sites shall be cleared of residual solid waste before work commences.
- Temporary storage of solid wastes shall be carried out with appropriate containment to avoid spreading of waste and dust.
- Disposal sites for solid debris shall be identified by the contractor and approved by the engineer. If directed by the engineer, the contractor shall obtain approval from PS for disposal of waste at a specified location.
- The contractor shall maintain a waste register in the site office which shall keep records of types and quantities of waste removed from the site and places of disposal.
- No solid waste shall be burned on site.
- Adhere to the ICTAD Guidelines (Guidelines for Effective Construction Management [1st Edition – August 2005] - Ref. No. ICTAD/CM/01 and Environmental and public Health standards - Ref. No. CIDA/STD/01).

D. Impacts on Ecological Resources of the Area

170. Typical savannah vegetation does not exist in the subproject site as most of the vegetation was highly modified due to climax vegetation. The development location at SUSL harbors low levels of species richness in selected floral and faunal taxa. However, the proportions of endemic and/or threatened species in the subproject site and its periphery are not considered critical levels. SUSL currently harbours a natural forest patch with low significance on ecological value in terms of floral and faunal diversity. No mature plants (only small few plant) were recorded on the site land and only weeds and shrubs are found only here. The selected pipeline was proposed through clear spaces so as not to interfere with any tree or structure. As per several field surveys, no special aquatic flora and fauna in the pond were observed. Therefore, no such impact would be produced due to this STP 1 subproject.

Mitigation Measures:

- Sign boards should be put up declaring the need to protect the natural habitat and indicate that no dumping of garbage will be allowed.
- Signage of flora and fauna present in the forested areas will stimulate and encourage interest in students and staff in conservation and recreation activities related to the resources at hand.
- Land clearing should be done under a special supervision of the PMU, PP and contractor during the construction.

E. Land Use Impacts

E.1 Impacts due to Land Use Changes

171. The subproject site is surrounded with University premises, paddy/ crop plantation and residential areas. Yet the wastewater discharge will be occurring under the given water quality parameters. Therefore, the proposed subproject is not negatively impacted on surrounding land uses.

E.2 Loss of Agricultural Lands

172. Not Applicable.

F. Other Impacts

F.1 Mitigation Methods for Visual Pollution

173. Not Applicable.

F.2 Methods for Greenery Build Up

174. Not Applicable.

F.3 Wastewater and Sludge Disposal

175. All wastewater generated from the subproject activities shall be treated and the treated wastewater shall be complied the disposal standards for “Tolerance limits for the discharge of industrial wastewater into inland surface waters” as prescribed in Gazette Notification No. 1534/18 dated 01.02.2008 amended by Gazette Notification No. 2264/17 dated 27.01.2022 standard treated effluent parameters and SLSI standards for wastewater and sewage effluent to IFC-WB EHS guidelines. Thus, the digested sludge will be used as organic fertilizer or it will be taken out and transported by gully bowser to a suitable place for disposal. Therefore, no impact will be happened. In instance of overflow, leaks, immediate repairs 1 and collaborate with the local authority under such circumstances. Apart from provision of the mitigation measures, water quality shall be monitored to understand the effectiveness and further improvement in designs in reducing the concentration of pollutants. The monitoring plan shall be functional in construction as well as in operation stages. Once the detail plans are available monitoring points and the intervals will be decided by the Environmental Officer.

F.4 Risk of Fire and Emergency Preparedness

176. Several mitigation measures can be adopted and these include adoption of disaster risk reduction strategy and preparedness. Identification of an emergency evacuation point and placing emergency alarm system in the site to warn the student population of any such situations. Emergency evacuation points and plan should be designed and practiced. The site should be adorned with adequate fire extinguishers. The following measures shall be taken

- Installation of fire safety warning system and fire extinguishing system
- Providing evacuation paths for emergency situations
- Landmark emergency assembly point for the subproject site
- Installing sign boards and notices for giving awareness
- Regular verification of installed warning systems
- Maintaining emergency contact details for rapid communication

F.5 Occupational Health and Safety and General Public

177. Absence of an emergency plan and the adoption of occupational safety measures can lead to illness or even death of workers during the construction. Therefore, ICTAD guidelines for health and safety provided by the Construction Industry Development Authority (CIDA) (more details: https://www.cida.gov.lk/pages_e.php?id=47), guidelines of the Department of Labour and IFC General Environmental, Health and Safety Guidelines (more details: https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines) shall be followed. Thus, ADB guidelines for contracted should be included in the contract issued to the contractor with any necessary modifications.

- Contractor should organize awareness programs about personal safety for workers. This should provide briefing and training on safety precautions, their responsibilities towards safety, etc.
- Contractor shall comply with requirements for the safety of the workmen as per the International Labour Organization (ILO) convention No. 62, Safety and Health regulations of the Factory Ordinance of Sri Lanka to the extent that is applicable to his contract. Other than that, the contractor has to comply with regulations regarding safe scaffoldings, ladders, working platforms, gangways, stairwells, excavations, trenches, safe means or entry.
- All workers should be insured including indemnity cover.
- Use of licensed and trained vehicle operators, provision of protective footwear, helmets, goggles, eye-shields and clothes to workers depending on their duty (mixing asphalt, blasting, handling equipment) should be adopted.
- The construction labour camp should be equipped with first aid facilities and a trained personnel onsite in case of an injury.
- Ample lighting around the construction site should be provided during the night.
- Excavated areas for construction should be barricaded using barricading tapes, sign board should be placed. quarry operations, land excavations and blasting should be carried out and supervised by trained personnel.
- Regular safety checks for vehicles and equipment's, allocation of responsibility to relevant personnel, prohibition of alcoholic drinks and other substances which may impair judgment of workers engaged in construction activities, arrangement of proper first aid and transport facilities for injured people, installation of warning signs should be adopted.
- Onsite emergency plan for minor accidents and mishaps will be prepared by the contractor with the consultation of the PMC.
- Develop and implement comprehensive site-specific health and safety plan on Occupational Health and Safety. Include in the health and safety plan measures such as (i) type of hazards in the construction of the Faculty buildings, (ii) corresponding personal protective equipment for each identified hazard, (iii) health and safety training for the site personnel, (iv) procedures to be followed for all site activities, and (v) documentation of work-related accidents.
- Workers engaged in welding works will be provided with welder's protective eye shields.

F.6 Contingency Management Plan

178. When considering the developments, possible emergency situations such as fire, flood, storm, cyclone, explosion, STP 1 breakdown during operation / maintenance, power failure etc., could be happened. While it is important to frequently monitor the quality of effluent discharged from the STP 1 it is equally important to place a contingency plan in case there is a system failure during operation which will allow the untreated effluent to flow in to the pond and downstream causing significant issues at downstream. For such situations, following measures are proposed.

- Regular verification of the STP 1 system and process.
- Frequently monitor the quality of effluent discharged from the STP 1.
- Sludge is taken out and transported by gully bowser to a suitable place for disposal.
- In case of a system failure, treated wastewater discharging to the environment will be stopped immediately and the relevant technical staff will be deployed to attend the issue immediately.
- With the 04 basin approach of the STP 1, if one basin needs to be taken out of operation there is no significant loss of performance.
- Air flow of the STP 1 can be adjusted depending on incoming load.
- FBBR system of the STP 1 is modular meaning individual FBBR frames can be removed or added to the basin.
- STP 1 design capacity is 950 m³ per day. If any sudden inflow to the STP 1, it will be hold by the EQ tank, as it acts as a buffer tank of the system. The buffer tank capacity is 450 m³.
- A generator system should be used as a backup power system for STP 1 during the power failure. As per the recommendation of the electrical engineer, the present capacity of the existing generator system of the university is sufficient to support the STP 1 during a power interruption / outage.

179. The proposed development is not located in a hazard prone area. Therefore, it would have a very low possibility to have flood, storm and cyclone impacts due to climate changes. Thus, proposed subproject will immediately connect to the existing generator power supply or to a backup power system during any power failure and STP 1 breakdowns during maintenance / operation. Accordingly, the proposed development would have a limited risk in this regard.

VII. PUBLIC CONSULTATION

Approach to Public Consultation

180. Public Consultation Meeting (PCM) provides an opportunity for the general public, private and community bodies to know the environmental and social impacts as a result of subproject implementation. Thus, the meeting was held for residents around the subproject areas, public sector and private sector agencies who are concerned with the subproject during the initial stage. The major purpose of the public consultation is to identify the environmental issues in the IEE study and to appraise the stakeholders on potential environmental impacts. This will provide an opportunity to collect their feedback and adequate safeguards can be considered during the planning phases.

181. Stakeholders' workshop was organized on the 3rd June 2022 at 9.00 am and held at the board room of the Vice Chancellor's office. SUSL consultations on environmental and social issues were carried out with relevant stakeholders who are identified through the stakeholder analysis. Affected communities and potential stakeholders such as an officers from PHI (MOH), PHI (SUSL), RDC, students(SUSL), academic and non- academic staff (SUSL), villagers of Muththettuwegama (Farmer, Teacher, Businessman, Carpenter, Driver etc.), Hon. Head Monk of the Temple, ICC (Contractor) etc. were invited to attend the meeting. An effort was made to make the gathering representative of the local population in diverse fields directly or indirectly affected by the potential impacts. There were 28 stakeholders at the meeting (**Annexure I - Summary of Stakeholder Consultation Meeting**). There was less female representation at this meeting.

Methodology

- **Discussions, Questions and Answers:** In the meeting, the participants were informed the potential environmental impacts due to the proposed subproject. Thereafter, time was allowed for questions and answers to facilitate interaction with the stakeholders, exchange of information, collect their opinion on the environmental issues and any other issues that needed addressing.
- **Collection of Feedback:** A feedback questionnaire in the local language (Sinhala) was presented at the common forum and then asked each of the stakeholders to express their views regarding the question. These questions were presented by the consultants conducting the meeting and answers were sourced.
- Participants were encouraged to provide their opinion through the feedback questionnaire, however, it was kept voluntary. Some of the participants could not fill the forms as they could not read or write.
- **Record of the Meeting:** General information of the participants such as name, gender, and name of the organization the participant belongs to along with their signature was recorded during the public consultation meeting and is attached in the report. (**Annexure I - Summary**)

of Stakeholder Consultation Meeting) Registration was kept voluntary. Almost all of the participants registered themselves.

- After the meeting, public comments and options were collected through a public perception survey from the villagers (in different fields) in Muththettuwegama.
- A total of 24 stakeholders participated in public consultation meeting. Information was gathered on following topics. In the public consultations, while females are invited, there was less female participation. Thus, a few female consultations are conducted individually, after the public consultations.
 - Perception of building stability and the layout plan
 - Perception on noise, vibration and dust
 - Perception on the water drainage and soil erosion
 - Perception on STP 1 wastewater and sludge generation
 - Perception of the wastewater management
 - Perception on design and treatment process of the STP 1
 - Perception on treated water quality
 - Perception on treated water and sludge disposal
 - Perception on STP 1 maintenance



FIGURE 41: AT PUBLIC CONSULTATION MEETING

Outcome of the Public Consultative Meeting:

182. The following are the major points of concern of the participants of PCM and the public perception survey in Muththettuwegama and Pambahinna Villages. Details of meeting is provided in **Annexure I - Summary of Stakeholder Consultation Meeting.**

- Provision of suitable retaining walls near the STP 1, provision of suitable drains, placing crushed stone and planting vegetation covers around the bank of the tank to mitigate the soil erosions.
- Managing odor, noise, dust and vibration at the site.

- Establishment of a wastewater treatment plant to solve current overflow issues.
- Ensure the disposal of treated water quality
- Reuse the sludge as a byproduct (fertilizer)
- Importance of STP 1 maintenance



FIGURE 42: AT PUBLIC PERCEPTION SURVEY

VIII. GRIEVANCE REDRESS MECHANISM (GRM)

GRM Process

183. The subproject follows the existing GRM setup identified in the IEE for the STHRDP. Assessment of the existing GRM shows that it has provided citizens with an effective platform for redress of their grievances. The affected person(s)/aggrieved party can give their grievance verbally or in written form to the local site office of FT (Faculty of Technology) site at Belihul Oya. Grievances of affected person will first be brought to the attention of the site in charge, who can resolve the issue at the site level with immediate effect which should be addressed within 7 days. If the matter cannot be resolved at the site level it will be referred to project coordinator of SUSL PIU. In event that it is not solved within 7 days by the PIU (Project Coordinator), it will be brought to the Grievance Redress Committee (GRC) which will be appointed by the PMU of the MHECA. The GRC will comprise of State Secretary of MHECA, Project Director, religious leader from village, Grama Niladari, and community leader from village. Complaints shall be submitted to the Project Director to be presented at GRC.

184. The GRC will take up any issues during its monthly meeting and provide a solution within two weeks. If the matter is not resolved by GRC at PMU level within stipulated time, it shall be referred to Land Use Committee of the region. It will meet at least once a month. The agenda of the meeting will be circulated to all the members and the affected persons/aggrieved party along with venue, date and time at least a week prior to the meeting.

185. Any aggrieved party may access the country's legal system at any stage. Legal redress can run parallel to the GRM and is not dependent on the negative outcome of the GRM.

Registering Complaints

186. The PIU and site office shall keep records of all grievances received including contact details of complainant, date of receiving the complaint, nature of grievance, agreed corrective actions and the date these were affected and final outcome. For this a complaint register will be maintained at each subproject site. The complaint will be registered by the aggrieved party, PIU established a public response center (PRC) helpline specifically addresses the issues arising out of subproject implementation. Complainant can be registered via any of the following means: Through Public Response Center Help Line. The sample grievance registration form is attached in **Annexure N - Complain Form**.

Land Line Number:

Mobile No:

WhatsApp:

E-mail:

187. In the event that the complainant is illiterate, the complaint will be recorded with the assistance of site in charge. The cost for functioning of GRC will be accounted for by PMU of MHECA. The GRC mechanism may need further review once the implementation sets in. Below Figure 43 show the GRM implementation structure.

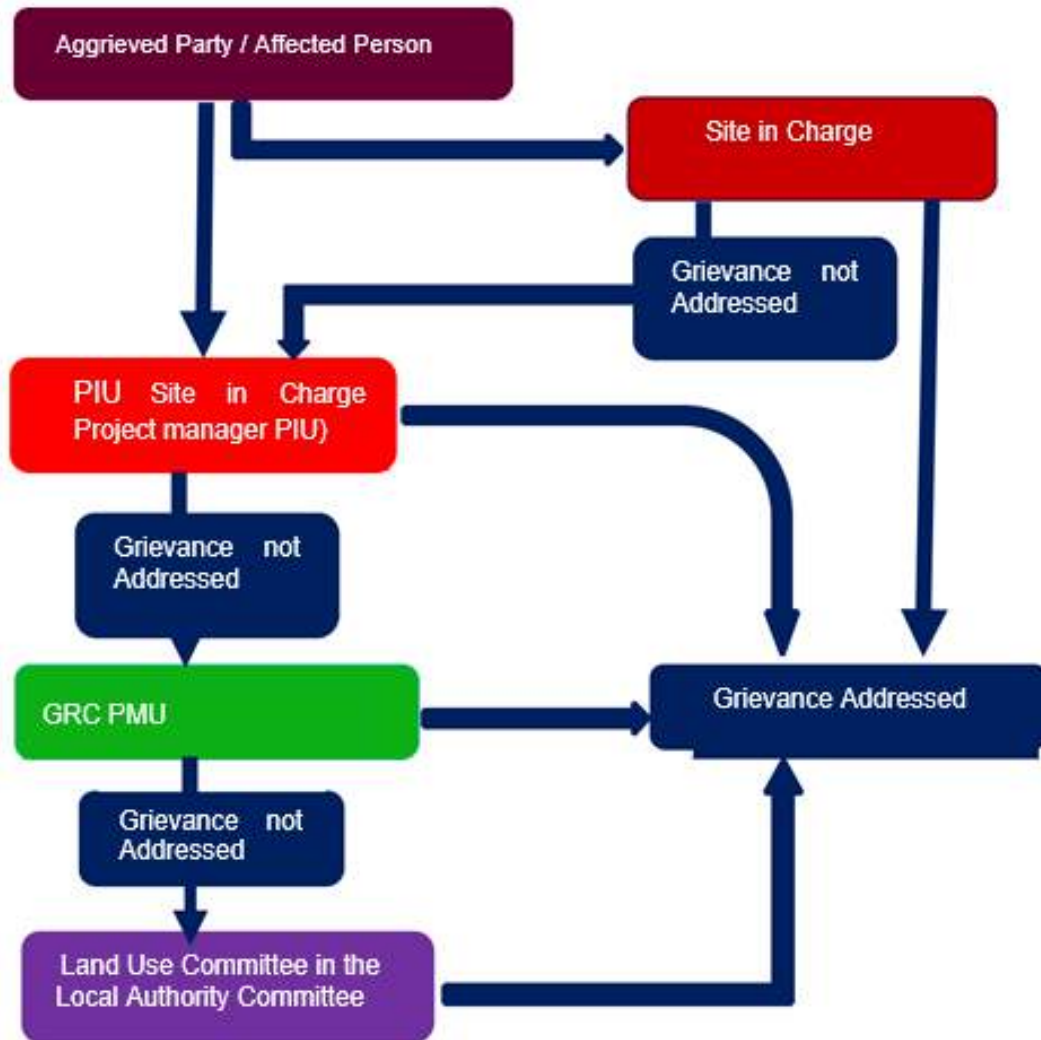


FIGURE 43: GRIEVANCE REDRESS MECHANISM OF SUSL

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

188. An environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels (refer Table 18). The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between MHECA, project management unit (PMU), project implementing unit (PIU), consultants and contractors. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (ii) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (iii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iv) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (v) ensure that safety recommendations are complied with. The EMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

189. The contractor will be required to submit to PMU, for review and approval, a site environmental plan (SEP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) monitoring program as per SEP; and (iv) budget for SEP implementation. No work will commence prior to the approval of SEP. A copy of the EMP/approved SEP will be kept at the site during the construction period at all times. The EMP will be included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

190. For civil works, the contractor will be required to (i) carry out all of the mitigation and monitoring measures set forth in the approved SEP; and (ii) implement any corrective or preventative actions set out in safeguards monitoring reports. The Environmental consultant will carry out quarterly reviews against the EMP. The contractor shall allocate a budget for compliance with these SEP measures, requirements and actions.

191. Two Monitoring Committees are proposed:

- i. Committee to look after technical matters related to Physical and Biological Environment
- ii. Committee to look after socio-cultural matters related to Social Environment

192. The first Monitoring Committee (referred to as 'The Technical Monitoring Committee') will comprise of the Technical Officer of the Local Authority, Environmental Officer of the Divisional Secretariat, One Representative each from the CEA, UDA, RDA, Local Authority and representatives

from the project developer. The Technical Monitoring Committee will make sure that the parameters listed in the Monitoring Plan are within acceptable levels, and if not, inform the project proponent to take corrective action.

193. The second committee will comprise of a representative of the Divisional Secretary, Grama Niladhari, local police and other community leaders (Religious Leaders etc.) and few community leaders from the community and local area may be established in order to oversee the process. This institutional mechanism developed should be informed to the local communities and request them to refer any grievances they have to this committee.

194. The Social Monitoring Committee can meet once in two-three months during construction period and less frequently during operation of the STP 1. The meetings can be held in GN's office. The following issues are summarized that may be monitored at these meetings and seek solutions.

- i. Problems related to land development and construction (dust, noise, vibration, erosion and disposing of construction debris (if any) etc.); transport-related problems.
- ii. Conflicts between the developer, contractors, migrant laborers and the local communities.
- iii. Solid waste and wastewater disposal arrangements in the construction site and during subsequent operation of the STP 1.
- iv. Potential benefits to be expected by the local communities from the project developers.
- v. Any disturbances caused by STP 1 activities on the social harmony of the nearby communities.

B. Implementing Arrangement

195. MHECA of Government of Sri Lanka will be the Executing Agency for the Program, responsible for management, coordination and execution of all activities funded under the loan. A central Project Management Unit (PMU) attached to MHECA will be responsible for implementing the Technology and Human Resource Development Project. The PMU will be supported by Program Implementation Units (PIUs) such as SUSL with flexibility to re-deploy depending upon the implementation requirements. The PMU and PIUs will be supported by several teams of Design Consultants in preparation of preliminary engineering designs.

196. Project Management Consultant (PMC) centrally located at PMU and with field teams located in PIUs shall be responsible for implementation of the Program. All infrastructure contracts will be procured through performance-based contracts (PBCs) and include build operate (BO) framework. Based on the preliminary designs prepared by Design Consultants, the DBO (design-build-operate). The preparation, review, and approval of subproject design and due diligence studies including bidding process are centralized at the PMU. PIU of SUSL will provide necessary support to PMU in preparation, and will play main role in supervising the construction process.

197. The PMU of, MHECA has no capacity to manage the associated environmental impacts. Therefore, they will need to recruit an environmental safeguards consultant to carry out the reporting and monitoring process. MHECA will comply with the requirements of the Government and ADB. PMU of MHECA will prepare a draft TOR for environmental safeguard consultant and send it to ADB for comments before loan negotiations.

198. The PMU will continue to monitor and measure the progress of EMP implementation. The monitoring activities will be corresponding with the subproject's risks and impacts identified in the IEEs for the subprojects. The PMU and PIU will continue to undertake site inspections, document review to verify compliance with the EMP and progress toward the final outcome and recording information of the work, deviation of work components from original scope. PMU will submit environmental safeguard reports to ADB. PMU and PIU will review the environmental safeguard reports and take necessary action to mitigate issues.

199. Safeguards consultant will submit quarterly monitoring and implementation reports to the project director at PMU during the construction phase which will be sent to ADB on a bi-annual basis. For operational phase the reporting requirement to ADB will be annual. Regular monitoring will have to be carried out by the PIU to ensure the compliance with the EMP. The PMU will submit semi-annual monitoring reports to ADB according to a suggested monitoring report format agreed by ADB for subprojects.

200. EMP budgets will reflect the costs of monitoring and reporting requirements. Monitoring reports will be posted in a location accessible to the public. The executing agency will document monitoring results, identify the necessary corrective actions, and reflect them in a corrective action plan. The MHECA, will study the compliance with the action plan developed in the previous review. Compliance with loan covenants will be screened by the executing agency.

201. ADB will review subproject performance against the MHECA's commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the subproject's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the subproject performance management system. ADB will monitor subprojects on an ongoing basis until a subproject completion report is issued. Any changes on the IEE based on the detailed design and/or due to any change in design, location, unanticipated impacts identified during the subproject implementation will be subject to ADB review and disclosure on ADB website. ADB will carry out the following monitoring actions to supervise subproject implementation:

- Conduct periodic site visits for subproject with adverse environmental or social impact;
- Conduct supervision missions with detailed review by ADB's safeguard specialists/officers or consultants for subproject with significant adverse social or environmental impact;

- Review the periodic monitoring reports submitted by executing agency to ensure that adverse impacts and risks are mitigated as planned and as agreed with ADB;
- Work with executing agency to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate;
- Prepare a subproject completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

202. The costs for environmental safeguard activities which are responsibilities of the PMU and PIU are included in respective consultant packages. The cost of mitigation measures during construction stage will be incorporated into the contractor's costs. Thus, remaining costs related to environmental safeguards cover the following activities,

- Preparing and submitting reports and public consultation and disclosure
- EPL applications
- Conduct of environmental monitoring for baseline data and long-term evaluation of the infrastructure
- Replacement and maintenance of trees, as necessary
- Conduct of environmental capacity-building lectures and workshop for improving awareness

C. Environmental Monitoring and Reporting

203. The PMC/PIU/PMU will monitor the progress of EMP implementation while supervising civil construction activities. PMC and PIU will undertake site inspections and document review to verify compliance with the EMP and progress toward the final outcome. The contractor will report the progress of the EMP implementation and monitoring along with the monthly monitoring and reporting schedules according to their principle contract. PIU will submit quarterly EMP monitoring and implementation reports to PMU of the MHECA, who will take follow-up actions, if necessary. The MHECA will review and consolidate the quarterly reports to prepare bi-annual monitoring reports to ADB during construction and thereafter, on an annual basis.

204. ADB will review subproject performance against the executing agency's commitments as agreed in the loan documents. The extent of ADB's monitoring and supervision activities will be commensurate with the subproject's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the subproject performance management system. ADB will monitor subprojects on an ongoing basis until a subproject completion report is submitted.

D. Consultation and Information Disclosure

205. Consultation is to ensure continued public and stakeholder participation in the STP 1 project life cycle, periodic consultations shall be taken up at regular intervals at site during implementation. This participatory process will ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process.

206. Once the IEE is approved by the ADB, an electronic version of the IEE will be placed in the official websites of ADB. Upon written request, any person seeking information can obtain a hard copy of the complete IEE document by paying for its photocopying cost. The PMU will issue notification on the disclosure mechanism in local newspapers, ahead of initiation of implementation of the subproject, providing information on the subproject, start dates, etc. The notice will be issued by the PMU in local newspapers one month ahead of the implementation works. This will create awareness of the subproject implementation among the public. In addition, any revisions to the IEE will be disclosed to the subproject stakeholders.

207. A summary of the potential environmental impacts during the construction and operation phases along with recommended mitigation measures are provided in the Environmental Management and Monitoring Plan (EMMP). Significant impacts were quantified and identified their significance based on the Risk Assessment Matrix (RAM).

208. As per the RAM, disposal of wastewater and sewage, community / stakeholder complaints on construction and operation of the development, soil erosion and surface drainage may have orderly high impacts for risks. Noise generation during construction has a high probability of risk. Below are the identified anticipated environmental impact/s in order of their significance.

1. Noise generation during construction
2. Community / Stakeholder complaints on construction and operation of the development
3. Soil Erosion
4. Surface Drainage
5. Solid Waste generated by workers (Garbage)
6. Disposal of Wastewater and Sewage
7. Dust Emission during construction
8. Vibration Effect during construction
9. Impacts on Safety and Occupational Health
10. Construction waste generation
11. Noise due to the STP 1

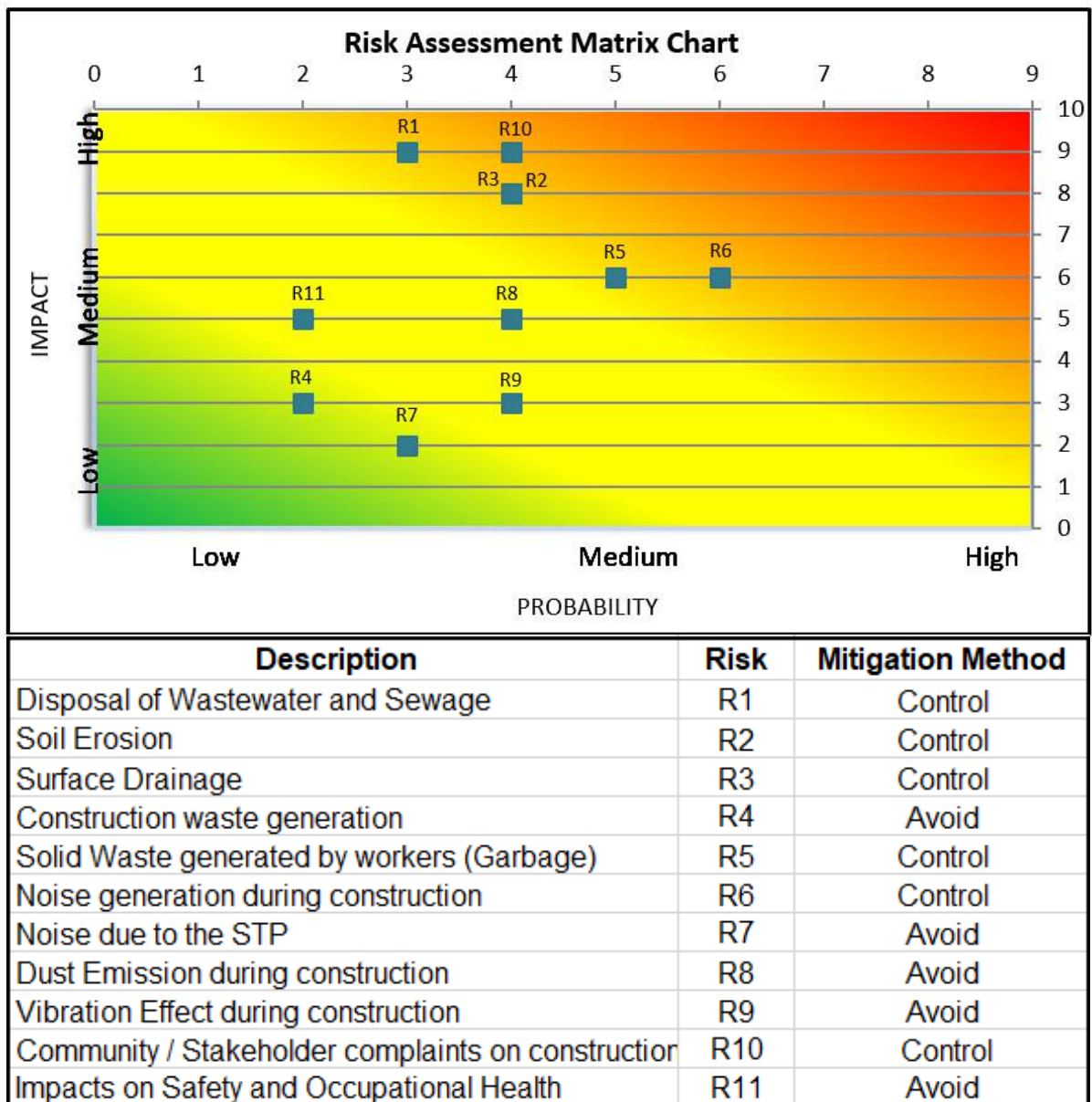


FIGURE 44: RISK ASSESSMENT MATRIX

209. RAM shows that all environmental impacts can avoid or control as the mitigation method. Therefore, transfer risk or accept risk are not required for this subproject as the mitigation method. The Environmental Management and Monitoring Plan (EMMP) in order of their significance is given in Table 18.

TABLE 18: PROPOSED ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN (EMMP)

No	Anticipated Environmental Impact/s	Proposed Mitigation Measure/s	Phase of the subproject	Monitoring Parameter/s	Frequency of Monitoring	Institutional Responsibility	Facilities Available with the mentioned agencies
01	Noise generation during Construction	<p>-As per the CEA and NBRO standards, the Maximum permissible noise level at the boundary shall be maintained at or below 75dB during the daytime from 6.00 am to 9.00 pm and 50dB during the nighttime from 9.00 pm to 6.00 am at the construction stage.</p> <p>-Maintain the noise levels at the boundaries of the subproject site during the construction as stipulated in the National Environment (Noise Control) regulations.</p> <p>-Any work that may cause noise and vibration from 9 pm to 6 am shall be avoided. Noise generation activities shall be carried out only from 6.00 am to 9.00 pm.</p> <p>-Any nighttime activities shall be carried out using noise-reducing means or low noise technologies.</p> <p>-During the construction period, temporary covers shall be constructed to adequate height to reduce the spread of the noise.</p> <p>-Servicing of all construction vehicles and machinery shall be carried out regularly and during routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found defective shall be replaced.</p> <p>-Maintenance of vehicles, equipment, and machinery shall be regular and to the</p>	Construction Phase	Overall level of noise that is transmitted in the immediate environment.	<p>When complaints received / at the beginning and continuous monitoring during construction.</p> <p>Sampling Points: SUSL Premises Construction site</p>	PP/ PIU / PMU / CON/ EO	Contractor

No	Anticipated Environmental Impact/s	Proposed Mitigation Measure/s	Phase of the subproject	Monitoring Parameter/s	Frequency of Monitoring	Institutional Responsibility	Facilities Available with the mentioned agencies
		<p>satisfaction of the engineer to keep noise levels to the minimum.</p> <p>-Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01) and IFC General Environmental, Health and Safety Guidelines (Section No: 1.7 Noise).</p>					
02	Community / Stakeholder complaints on construction and operation of the development	<p>-Adopt the mitigation measures appropriately the expert advice.</p> <p>-Mitigate the coming effects without disturbing the community lifestyle as immediately.</p> <p>-All wastewater generated from the subproject activities shall be treated and the treated wastewater shall comply with the disposal standards for "Tolerance limits for the discharge of industrial wastewater into inland surface waters" as prescribed in Gazette Notification No. 1534/18 dated 01.02.2008 amended by Gazette Notification No. 2264/17 dated 27.01.2022 standard treated effluent parameters and SLSI standards for wastewater and sewage effluent to IFC-WB EHS guidelines.</p> <p>-Adhere to the proposed tolerance limits for the discharge of treated water in table 20 and frequently monitor the quality of effluent discharged from the STP 1.</p> <p>-Proper drainage management plan.</p>	Construction and Operation Phases	Complaints made by the neighboring community	<p>Continuous / When complaints are received by the relevant agencies</p> <p>Sampling Points: Neighborhood</p>	PP/ PIU / PMU / /EO	Project Proponent Contractor

No	Anticipated Environmental Impact/s	Proposed Mitigation Measure/s	Phase of the subproject	Monitoring Parameter/s	Frequency of Monitoring	Institutional Responsibility	Facilities Available with the mentioned agencies
03	Soil Erosion	<ul style="list-style-type: none"> -Minimum clearance of the existing vegetation cover (Shrubs) on the soil surface. -Temporary earth drains should be provided during the construction activities. -Stormwater flow from the construction area should be discharged through sedimentation pits, silt traps etc. as appropriate. -Construction activities should be scheduled according to the weather condition as much as possible. -Adopt measures suggested by CEA and NBRO. -Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01). 	Construction Phase	Suspended sediments and elevated turbidity in surface runoff (Visual Observations)	<p>Continuous monitoring during the rainy seasons/ Weekly</p> <p>Sampling Points: Drainage Line Dam Outlet Silt Traps</p>	PP/ PIU / PMU / CON/ EO	Contractor
		<ul style="list-style-type: none"> -Maintain the existing vegetation cover (Shrubs) on the soil surface. -Placing crushed stone and planting vegetation covers around the bank of the tank. -Providing adequate drainage facilities. -Construction and maintenance of spill, spill gates, intake structure, and tail canal without change in surface hydrology including downstream flow regime. -Turfing downstream slope and providing rip-rap protection on the upstream section of earth bund. -Provision of suitable retaining walls near the STP 1. -Adopt measures suggested by CEA and NBRO. 	Operation Phase	Existence of drainage system, Site activities	<p>Weekly by Project Proponent and Regulatory by EMC</p> <p>Sampling Points: Drainage Line, Dam, Spill, Spill Gates, Intake Structure and Tail Canal, Bank Of The Tank, Cascade Aerator and Retaining Walls</p>	PP/ PIU / PMU / CON/ EO	PP

No	Anticipated Environmental Impact/s	Proposed Mitigation Measure/s	Phase of the subproject	Monitoring Parameter/s	Frequency of Monitoring	Institutional Responsibility	Facilities Available with the mentioned agencies
		- A proper drainage management plan should be developed for the site to ensure protection from heavy runoff and erosion if unmanageable soil erosion.					
04	Surface Drainage	<p>-Maintain the existing vegetation cover (Shrubs) and stones in the existing natural drainage.</p> <p>-Maintain the water flow rate of the natural drainage.</p> <p>-Placing crushed stone and planting vegetation covers in and around the drainage.</p> <p>-Providing adequate drainage facilities and a proper drainage management plan.</p> <p>-Temporary earth drains should be provided during the construction activities.</p> <p>-Construction and maintenance of the spill, spill gates, intake structure, and tail canal without change in surface hydrology including downstream flow regime.</p> <p>-Adopt measures suggested by CEA and NBRO.</p> <p>-Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01).</p>	Construction Phase	Existence of natural drainage system, subproject activities	<p>Weekly by Project Proponent and Regulatory by EMC</p> <p>Sampling Points: Natural drainage Line from water pond to downstream, Spill Gates</p>	PP/ PIU / PMU / CON/ EO	PP
05	Solid Waste generated by workers (Garbage)	-Bio degradable (food waste) and non-biodegradable wastes such as plastic, polythene, and glass generated on-site should be separated, stored, and discharged to the final disposal point which will be continued	Construction Phase	Waste collection bins, Storage facilities.	<p>Daily by the Project Proponent / Disposing days by the PS</p> <p>Sampling Points: Construction Huts</p>	PP/ PIU / PMU / PS/ EO	Contractor

No	Anticipated Environmental Impact/s	Proposed Mitigation Measure/s	Phase of the subproject	Monitoring Parameter/s	Frequency of Monitoring	Institutional Responsibility	Facilities Available with the mentioned agencies
		<p>with the assistance of the Imbulpe Pradeshiya Sabha.</p> <ul style="list-style-type: none"> -Continued monitoring should be at the collection point properly. -Work sites shall be cleared of residual solid waste before work commences. -Temporary storage of solid wastes shall be carried out with appropriate containment to avoid the spreading of waste and dust. -Disposal sites for solid debris shall be identified by the contractor and approved by the engineer. If directed by the engineer, the contractor shall obtain approval from PS for the disposal of waste at a specified location. -The contractor shall maintain a waste register in the site office which shall keep records of types and quantities of waste removed from the site and places of disposal. -No solid waste shall be burned on site. -Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01). 					
06	Disposal of Wastewater and Sewage	<p>-All wastewater generated from the subproject activities shall be treated and the treated wastewater shall comply with the disposal standards for "Tolerance limits for the discharge of industrial wastewater into inland surface waters" as prescribed in Gazette Notification No. 1534/18 dated 01.02.2008 amended by Gazette Notification No. 2264/17 dated 27.01.2022 standard treated effluent parameters and SLSI standards for</p>	Operation Phase	Water quality parameters as stipulated in the Gazette no 1534/18, dated 2008.02.01/ SLSI standards for wastewater and sewage effluent to IFC-WB EHS guidelines (Proposed treated water effluent – Table 20) /Odor	<p>Out let of the treatment facility, water pond and natural drains in the downstream</p> <p>Inspection 04 times per year / When complaints received</p>	Laboratory with necessary equipment of the licensed organization / PP/ PIU / PMU / CON / EO	PP / CON

No	Anticipated Environmental Impact/s	Proposed Mitigation Measure/s	Phase of the subproject	Monitoring Parameter/s	Frequency of Monitoring	Institutional Responsibility	Facilities Available with the mentioned agencies
		<p>wastewater and sewage effluent to IFC-WB EHS guidelines.</p> <ul style="list-style-type: none"> -Adhere to the proposed tolerance limits for the discharge of treated water in table 20 and frequently monitor the quality of effluent discharged from the STP 1. -Introduction of proper functioning of Wastewater Management System. - Connect to the existing generator power supply or to a backup power system during any power failure and STP 1 breakdowns during maintenance/operation. - Regular verification of the STP 1 system and process. - 04 basin solution of the STP 1 meaning if one basin needs to be taken out of operation there is no significant loss of performance. - Airflow of the STP 1 can be adjusted depending on the incoming load. - FBBR system of the STP 1 is modular meaning individual FBBR frames can be removed or added to the basin. - Regular checks and follow-ups with correct actions. -The sludge tank is maintained under anaerobic conditions where the sludge is continuously reduced there by the holding tank has enough capability to store sludge for 4-6 months. The digested sludge is inert and has next to no smell. This will need to be taken out and transported by gully bowser to a 					

No	Anticipated Environmental Impact/s	Proposed Mitigation Measure/s	Phase of the subproject	Monitoring Parameter/s	Frequency of Monitoring	Institutional Responsibility	Facilities Available with the mentioned agencies
		<p>suitable place for disposal. If it is dried it could be used as organic fertilizer.</p> <p>-The overflow, leaks, and immediate repairs should be carried out for the STP 1.</p> <p>- Establish and collaborate with the Local Authority under such circumstances.</p> <p>- The water quality shall be monitored to understand the effectiveness and further improvement in designs in reducing the concentration of pollutants.</p> <p>-The monitoring plan shall be functional in construction as well as in operation stages.</p> <p>-Once the detail plans are available monitoring points and the intervals will be decided by the Environmental Officer.</p>					
07	Dust Emission during Construction	<p>-There shall be regular watering of construction sites at all times and especially during dry windy periods when dust levels are elevated.</p> <p>-Vehicle carrying dusty materials should be covered entirely with dust barriers to ensure material not is leaked from the vehicle.</p> <p>-Construction material stocks should be covered properly.</p> <p>-Stockpiles of construction material shall be kept covered at all times in order to reduce dust emissions.</p> <p>-Washing the vehicles (tires) when going out. Facilities should be provided for the washing of vehicles moving out.</p>	During the land preparation and construction phase including transportation	Levels of dust on surfaces	<p>When complaints are received by the relevant agencies / Daily by the Project Proponent and Contractor</p> <p>Sampling Points: SUSL On Site</p>	PP/ PIU / PMU / CON/ EO	Contractor

No	Anticipated Environmental Impact/s	Proposed Mitigation Measure/s	Phase of the subproject	Monitoring Parameter/s	Frequency of Monitoring	Institutional Responsibility	Facilities Available with the mentioned agencies
		<ul style="list-style-type: none"> -Traffic controls, traffic volume restrictions, the imposition of speed limits, and erosion reduction techniques. -Drivers transporting materials shall be informed to use speed controls within the town area. -Proper maintenance of machinery, equipment, and vehicles. -Surface treatment with penetration chemicals. -Soil from site clearance temporarily stored on site shall be covered by re-usable polythene sheets, thatched coconut leaves, or a similar alternative. -There shall be daily cleaning of streets and pathways in the vicinity of the construction site. -There shall be no burning of wastes on site. -Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01) and IFC General Environmental, Health and Safety Guidelines (Section No: 1.1 Air Emissions and Ambient Air Quality). 					
08	Vibration Effect during Construction	<ul style="list-style-type: none"> -Minimize unreasonable vibration impacts on sensitive receivers. -Avoid structural damage to the dam as a result of construction vibration. -Standard vibration mitigation measures are to be implemented throughout the construction and operational periods to reduce and control potential vibration impacts. 	Construction Phase	Overall level of noise that is transmitted in the immediate environment.	When complaints received / at the beginning and continuous monitoring during construction. Sampling Points:	PP/ PIU / PMU / CON/ EO	Contractor

No	Anticipated Environmental Impact/s	Proposed Mitigation Measure/s	Phase of the subproject	Monitoring Parameter/s	Frequency of Monitoring	Institutional Responsibility	Facilities Available with the mentioned agencies
		<p>-Minimize obstructions between the vibration source and the sensitive receiver. -Servicing of all construction vehicles and machinery shall be carried out regularly and during routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found defective shall be replaced.</p> <p>-Maintenance of vehicles, equipment, and machinery shall be regular and to the satisfaction of the engineer to keep noise levels to the minimum.</p> <p>-If having a vibration effect from the STP 1 during the operational phase, installation of vibrational cleaning of media is recommended to develop in the STP 1.</p> <p>-Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01).</p> <p>-Follow the CEA and NBRO standards.</p> <p>-In the event that construction vibration is found to be significantly below construction vibration criteria, no subsequent monitoring of that activity is required.</p> <p>-If monitored vibration levels are considered to be high-risk or close to the vibration criteria, vibration monitoring tests will be carried out on a continuous basis at the nearest vibration-sensitive receiver during the construction and operational stages.</p> <p>- If having a considerable effect on the dam or externals, it is often suggested that vibrations</p>	Operation Phase	Overall level of noise that is transmitted in the immediate environment.	<p>SUSL Premises Construction site</p> <p>When complaints received / at the beginning and continuous monitoring.</p> <p>Sampling Points: SUSL Premises STP 1</p>	PP/ PIU / PMU / EO	PP

No	Anticipated Environmental Impact/s	Proposed Mitigation Measure/s	Phase of the subproject	Monitoring Parameter/s	Frequency of Monitoring	Institutional Responsibility	Facilities Available with the mentioned agencies
		can be interrupted using the wave barriers concept.					
09	Impacts on Safety and Occupational Health	<p>-The contractor shall comply with requirements for the safety of the workmen as per the International Labor Organization (ILO) Convention No. 62 and the Safety and Health Regulations of the Factory Ordinance of Sri Lanka.</p> <p>- ICTAD guidelines for health and safety provided by the Construction Industry Development Authority (CIDA), guidelines of the Department of Labour, and IFC General Health and Safety Guidelines shall be followed.</p> <p>-High priority to prevent accidents at the site by giving high priority to health and safety measures.</p> <p>-Workmen should be provided with safety equipment such as dust masks, gloves etc. for use at required times.</p> <p>-Signage will be installed at the main road turn of the site and in front of the site during the construction.</p> <p>- All necessary safety precautions shall be taken by the contractor in order to prevent any risks to workers and the public due to accidents by providing adequate warning signs, barricades, flagman, and lighting as appropriate.</p>	Construction Phase	Number of accidents	Daily by the Project Proponent Sampling Points: On Site	PP/ PIU / PMU / CON	Contractor

No	Anticipated Environmental Impact/s	Proposed Mitigation Measure/s	Phase of the subproject	Monitoring Parameter/s	Frequency of Monitoring	Institutional Responsibility	Facilities Available with the mentioned agencies
		<p>-A safety inspection checklist shall be prepared to take into consideration what the workers are supposed to be wearing which shall be monitored during specific construction activities.</p> <p>-The contractor shall maintain two registers in order to keep records of complaints received with regard to environmental matters and for recording incidents/ accidents.</p> <p>-All drivers should have valid licenses for the category of vehicles they drive and follow the speed limits of roads.</p> <p>-Construction materials should not exceed the carrying capacity of trucks and the local road.</p>					
10	Construction waste generation	<p>-Excess excavated materials should be removed to dumping or disposal locations on a well-planned program approved by the Pradeshiya Sabha</p> <p>-Adhere to the ICTAD Guidelines (Ref. No. ICTAD/CM/01 and CIDA/STD/01) and IFC General Environmental, Health and Safety Guidelines (Section No: 1.6 Waste Management).</p> <p>-All discarded and used oil, grease, and empty paint buckets will be collected, stored, and disposed of in a sanitary way.</p> <p>-Any hazardous waste will be disposed of by two CEA licensed waste collectors.</p> <p>-Proper practices should be adopted.</p> <p>-Adhere to the ICTAD Guidelines.</p>		Facilities provided for waste separation, Disposal site, Storage facilities of oil	Daily by the Project Proponent and Disposing days by the relevant Agencies Sampling Points: Construction Huts	PP/ PIU / PMU / PS/ EO	Contractor

No	Anticipated Environmental Impact/s	Proposed Mitigation Measure/s	Phase of the subproject	Monitoring Parameter/s	Frequency of Monitoring	Institutional Responsibility	Facilities Available with the mentioned agencies
		<p>-Close supervision and use of an experienced contractor.</p> <p>-The construction site shall be cleaned of any solid wastes before the sites are handed over.</p>					
11	Noise due to the STP 1	<p>-The STP 1 should be operated at high noise free.</p> <p>-Noise levels at the boundary of the STP 1 land during the operational stage should be maintained at or below 55dB during the daytime from 6 am to 6 pm and 45dB during the nighttime from 6 pm to 6 am.</p>	Operation Phase	Overall level of noise that is transmitted in the immediate environment.	<p>When complaints received / at the beginning and continuous monitoring.</p> <p>Sampling Points: SUSL Premises STP 1</p>	PP/ PIU / PMU / EO	PP

X. CONCLUSION AND RECOMMENDATION

A. Conclusion

210. The proposed development is a Sewage Treatment Plant 1 (STP 1) subproject at Sabaragamuwa University, Pambahinna, within the Imbulpe Pradeshiya Sabha Area. The proposed STP 1 subproject includes an STP 1 tank and collecting tanks that link to the buildings within the university premises. This supplemental IEE report was prepared based on recommendations (Section X. B. 166 & 167) in the IEE report for proposed Faculty of Technology building complex to explain the findings of the STP 1 proposal for Sabaragamuwa University of Sri Lanka. With the new development of the Faculty of Technology, SUSL, a proper wastewater management system has become a mandatory construction. Accordingly, the major objective of this subproject is to manage the daily wastewater generation of the SUSL.

211. The STP 1 is planned and designed in accordance with the policies, plans, and standards of the relevant institutions such as CEA, ADB, World Bank and Local Authority. Thus, a clearance Environmental Recommendations from CEA was obtained for the proposed STP 1 tank (**See Annexure G - Environmental Recommendations Approval from CEA**). The Initial Environmental Examination Report (IEE) for the proposed STP 1 comprises baseline data on existing physical, ecological, socio-economic conditions of the subproject area. Details of subproject activities/components, possible significant social, economic, and environmental impacts due to subproject activities and mitigation measures for the proposed development have been particularly emphasized in the IEE report and should be adhere (See **Table 18**).

212. Noise generation during construction, community / stakeholder complaints on construction and operation of the development, soil erosion and surface drainage are the identified high implacable and probable anticipated environmental impacts in order of their significance. As per the RAM, disposal of wastewater and sewage, community / stakeholder complaints on construction and operation of the development, soil erosion and surface drainage have orderly high impacts for risks. Noise generation during construction has a high probability of risk. RAM shows that all environmental impacts are only at the risk of avoiding or control level as the mitigation method. 209. RAM shows that all environmental impacts can avoid or control as the mitigation method. All environmental impacts can avoid or control as the mitigation method.

213. Temporary changes may be occurred during the construction stage due to this proposed subproject. Most of the adverse impacts of STP 1 during construction period are short term and temporary in nature. The negative environmental impacts are mostly construction related and short term such as noise, vibration and dust. The anticipated adverse environmental impacts during operational phase are related to the disposal of wastewater and sewage. The IEE study did not find any adversely significant incompatibility with the surrounding physical, biological, socio-economic or cultural environment and does not pose any significant long-term environmental threat if managed properly during construction and during implementation.

B. Recommendation

214. The noise level at the boundary of land during the construction stage should be maintained at or below 75dB(A) during the day from 6.00 am to 9.00 pm. No noise generation activity should be carried out from 6.00 am to 9.00 pm. All the construction operation shall be carried out in such a way not to cause a nuisance to the neighbours. During the construction period, temporary covers should be erected to an adequate height to reduce the spread of dust and noise. Thus, noise level at the boundary of the STP 1 during the operation should be maintained at or below 55dB(A) during the day time from 6.00 am to 6.00 pm and at or below 45dB(A) during the night time from 6 pm to 6 am. Further, sludge handling operation shall be kept odor free.

215. A significant impact due to this subproject is happed mainly at stage of disposal of wastewater and sewage. Therefore, all wastewater generated from the subproject activities shall be **treated and the treated water should be complied the disposal standards for “Tolerance limits for the discharge of industrial wastewater into inland surface waters” as prescribed in Gazette Notification No. 1534/18 dated 01.02.2008 amended by Gazette Notification No. 2264/17 dated 27.01.2022 standard treated effluent parameters and SLSI standards for wastewater and sewage effluent to IFC-WB EHS guidelines.** Adhere to the proposed tolerance limits for the discharge of treated water as in table 19, frequently monitoring the quality of effluent discharged from the STP 1 during the operational phase is highly recommended under this subproject.

TABLE 19: DISCHARGE STANDARDS FOR EFFLUENT

<i>Parameter</i>	<i>Tolerance Limit Values</i>
<i>pH Value</i>	6.0 to 8.5
<i>Biochemical Oxygen Demand at 20°C (BOD₅)</i>	< 15 @ mg/l
<i>Chemical Oxygen Demand (COD)</i>	< 100 @ mg/l
<i>Total Suspended Solids (TSS)</i>	< 15 @ mg/l
<i>Oil & Grease</i>	< 1 @ mg/l
<i>Ammoniacal Nitrogen (as N)</i>	< 50 @ mg/l
<i>Dissolved phosphates (as P)</i>	< 5 @ mg/l
<i>Faecal Coliform</i>	< 40 @ MPN/100ml

216. The sludge tank is maintained under anaerobic conditions where the sludge is continuously reduced there by the holding tank has the capability to store sludge for 4-6 months. The digested sludge is inert and has next to no smell. The sludge will have to be removed and dried which could be used as fertilizer. As the contingency plan during any breakdown of the treatment plant, sludge will be sent out by gully bowser (Imbulpe PS or University as facility provider) for disposal at a suitable location. For STP 1 development subproject, the GRM and EMP provide appropriate guidance for suitable environmental and social safeguards. Accordingly, the proposed subproject can be recommended for implementation with strict adherence to EMP and GRM provided in this IEE ensuring that it does not contribute to the aggravation of any existing issues. Thus, such impacts can be mitigated by adopting the suggested mitigation measures. STP 1 breakdown during operation/maintenance and power failure

is the significant possible emergency situation that could be happened under this subproject. Therefore, adhering to the proposed contingency plan and taking steps is highly recommended (See **F.6 Contingency Management Plan**).

217. The EMP and associated LA, NBRO, CEA, UDA guidelines should be followed during construction activities and operational activities. As indicated by the MOH office, the proposed STP 1 is the best management option to resolve wastewater/sewerage leachate of polluting waterways due to the current SUSL operation. Thus, the developer should adhere to all the proposed mitigation measures during the pre-construction, construction, and operation phases and adhere to the conditions laid down by the relevant institutions when granting preliminary Planning approvals/clearances / no objection letters. Moreover, the developer requires confirming the proposed comprehensive monitoring plan and taking responsibility for the implementation in association with the institutions recommended. As finally, it is highly recommended the developer and the applicant to proceed with further works in accordance with the obtained environmental recommendations approval from CEA for the proposed STP 1. As per the CEA recommendation clearance, one month prior to commencement of the STP 1 operation, an EPL is required to obtain for this subproject (**See Annexure G - Environmental Recommendations Approval from CEA**).

ANNEXURES



CENTRAL ENVIRONMENTAL AUTHORITY
TERMS OF REFERENCE FOR THE
INITIAL ENVIRONMENTAL EXAMINATION (IEE)

Note: The developer should in consultation with technically qualified personnel, complete the following questionnaire. Separate sheet should be used where detailed information is required. It is in the developer interest to filling all information as completely and as accurately as possible. The duly completed questionnaire could be considered as an Initial Environmental Examination Report, if duly perfected by the developer. It is important note that this information is being used in decision making.

This Terms of Reference for the Environmental Impact Assessment (EIA)/ Initial Environmental Examination (IEE) has been issued by the CEA only as a means of providing guidance for preparation of the EIA/IEE for the proposed project. Issuance of the Terms of Reference does not in any way reflect an agreement on the part of the CEA regarding the granting of approval for the project.

It is the responsibility of the project proponent to resolve any issues regarding land ownership prior to embarking on the IEE/EIA in order to avoid undue delays. In case where the project is to be sited on state land we require "in principle" approval of the land owner prior to embarking on the EIA/IEE report preparation.

Project Proponent :

Project Approving Agency : **Central Environmental Authority**

Validity : This Terms of Reference is valid only for 18 months from the date of issue. The IEE report should be submitted within the validity period.

Date of issued :

Outline of the Report

Executive Summary :

PART	A	General Information
PART	B	Project Details
PART	C	Description of the Existing Environment
PART	D	Description of Environmental Impact & Proposed -Mitigatory measures
PART	E	Monitoring Program
PART	F	Conclusion and Recommendation.

Appendices:

- i. Terms of reference
- ii. Sources of data information
- iii. Reference
- iv. List of persons responsible for study including their work allocation
- v. Complete set of relevant maps, table chart, layout plane and other details

Study Area : The study should cover the project site and 500m from the boundary of the project site.

Executive Summary

The summary should be brief non the technical summery of the salient features of the proposed project, the exiting environment of the project site and its environs, key environmental impacts and proposed to mitigate the environmental impacts.



PART A: General Information.

- A.1 Name of the project:
- A.2 Name of the developer: (company/firm/individual)
 Postal address:
 Phone/ fax No:
 Contact person/name/designation/phone/fax:
- A.3 Nature of the project:
 Scale of the project:
 Main objective/s of the project:
 Justification:
- A.4 Investment and funding sources:
- A.5 Location of the project:
- i. Pradeshiya Sabha :
 - ii. a. Divisional Secretariat :
 b. GN Division
 - iii. District Secretariat :
 - iv. Provincial Council :
 - v. Provide a location map indicating the project site, access to the site, surrounding development and infrastructure within 500m of the project site. (at appropriate scale).
 - vi. Provide a copy of the survey plan of project site.
- A.6 Extent of the project area:
- A.7 Does the project wholly or partly or partly falls within the following areas:

Area	Yes	No	Unaware
100m from the boundaries of or within any area declared under the National Heritage Wilderness Act No 4 of 1988			
100m from the boundaries of or within any area declared under the Forest Ordinance (chapter 451)			
Coastal zone as defined in the Coast Conservation Act 57 of 1981			
Any erodible area declared under the Soil Conservation Act (chapter 450)			
Any flood areas declared under the Flood Protection Ordinance (chapter 449)			
Any flood protection area declared under the Sri Lanka Land Reclamation and Development Corporation Act 15 of 1968 as amended by Act No 52 of 1982			
60 meters from the bank of a public stream as defined in the Crown Lands Ordinance (Chapter 454) and having width of more than 25 meters at any point of its course			
Any reservation beyond the full supply level of a reservoir			
Any archaeological reserve, ancient or protected monument as defined or declared under the Antiquities Ordinance (chapter 188)			
Any area declared under the Botanic Gardens Ordinance (chapter 446)			
Within 100 meters from the boundaries of , or within , any area declared as a Sanctuary under the fauna and flora protection Ordinance (Chapter 469)			
100 m from the high flood level contour of within, a public lake as defined in the Crown Lands Ordinance (chapter 454) including those declared under section 71 of the said ordinance			
Within a distance of one mile of the boundary of a National Reserve declared under the Fauna and Flora protection Ordinance			



A.8 Present ownership of project site :

State	Private	Other- Specify

A.9 Present use of the land:

Land use Type		Land use Type	
Paddy		Marsh/Mangrove	
Tea		Scrub/ Forest	
Rubber		Grassland/ Chena	
Coconut		Built - up area	
Other Plantations/ Garden		Other (pl specify)	

A.10 Proposed timing and scheduled including phased development:

A.11 Applicable laws, regulations, standards and requirement covering the proposed project:

A.12 Clearance /permits obtained or should be obtained from relevant state agencies and /or local authorities. (*Attach required copies of same*)

PART B : PROJECT DETAILS

The Following Details should be provided

B.1 Brief description of the project including major components

B.2 Construction Stage

Identify all pre construction & construction activities which should include following.

- Clearing of land
- Removal of trees
- Cutting /filling of lands (including extents)
- Method of transportation of construction materials

B.3 Project layout plan (drawings to be provided)

(a) Contour map (1:1000) or higher

(b) I Necessary documents/survey plans information regarding on green belt along the main road

ii Tree species going to be used should be include

B.4 Infrastructure facilities and services required/ provided

- Energy (Source, Availability, Alternative sources)
- Water
 - a. Domestic
- Common Facilities
- Details of any access road to be built / improved (existing condition and anticipated improvement)



- Infrastructure facilities provided by the project to the surrounding community.
- Solid waste management facilities

B. 5 Other resources / facilities required/ provided

B. 6 Schedule of activities

B.7 Water requirement

- i Amount of water required for the project : (Processing activities)
- ii Source of water

PART C: DESCRIPTION OF THE EXISTING ENVIRONMENT.

Study area:

- a) Project site
- b) 500 m from the boundary of the site

The following details should be provided for the study area.

C.1 Physical Environment

- a) Give a topographic description of the site
(Flat, rolling, hilly, steep, slopes, mountainous etc.....)
- b) Hydrology
 - i Surface water bodies in the study area
 - ii Drainage pattern of the area
 - iii Presence of flood plains
 - iv Surface water quality and present uses of surface water
 - iv Ground water quality, availability and present uses of ground water
- c) Soil
 - Types of soil
 - Susceptibility to erosion
 - Soil stability/possibility of land slides or earth slips
(Detailed report from the NBRO should be submitted)

Land cover

- Present land use of the study area
 - Type of vegetation
 - Zoning if any
 -
- d) Does the project area prone/subject to natural disasters such as landslides, earth slips floods (give details)

C.2 Biological Environment

- a) Present status of Fauna and Flora in the study area
- b) List rare, threatened, and endemic flora and fauna within the study area
- c) Availability of any commercially important species
- d) Areas of major biological significance
- e) Existing natural habitats
- f) Does the site in the path of a migratory birds / animals



C.3 Historical & Archaeological Importance

- Describe any landmarks or evidence of historic, religious, archaeological, scientific or cultural importance known to be in the study area.
- Approval from the Archaeological Department should be submitted.

C.4 Socio-economic Environment

- Economic status of the study area
- Availability of infrastructure facilities
(eg: roads, power and water supply and other resources)
- Principal economic activities of the study area including details of planting, farming etc.

C.5 Human settlement

- i State The socio-economics status of the community/is in the:
- ii Number of households within the project area and 500m boundary from the project site

PART D : DESCRIPTION OF ENVIRONMENTAL IMPACT & PROPOSED MITIGATORY MEASURES

D.1 Constructional Impacts - State briefly the following

- i Impacts of land clearing, cutting, leveling and residual disposal
- ii Impacts due to removal of trees (Loss of Green cover)
- iii Noise, Vibration and dust due to construction activities
- iv Air quality impact from traffic during transportation of building material and equipment
- v Proposed mitigatory measures to reduce the above impacts

D.2 Soil erosion and surface drainage

- i Erosion prevention measures (approved by NRMC)
- ii proposed storm water drainage plan - (approved by NRMC)

D.3 Solid waste disposal

- i Excepted quantities of solid waste generated
- ii Proposed method of collection and disposal of solid waste including the Facilities to be provided
- iii Impact of the proposed Method on surface/ground water and/or air:

D.4 Impacts on ecological resources of the area

- a) Impacts of the project on ecological resources
- b) Will the project lead to encroachment of people into ecological sensitive areas
- c) Will the project result in impairment of valuable fisheries / aquatic ecology
- d) Does the project cause any destruction /alteration of habitats
- e) Impacts of project activities on fauna and flora in nearby reserves, parks and water bodies (direct impacts and indirect impacts)
- f) Mitigatory measures if any.

D.5 Access /Roads

- a) Impacts on access roads due to increased traffic



- b) Details of any access/ roads to be built / improved
- c) Details of Grid connection activities

D.6 Land use impacts

- a) Impacts on change of land use pattern
- b) Loss of agricultural lands

D.7 Social Impacts

- a) Visual Pollution
- b) Light reflecting impacts
- c) Lightening impacts

D.8 Any other impacts not listed here but may be significant in view of the project proponent and proposed mitigatory measures.

- a) Mitigation methods for visual pollution
- b) Precaution methods for reflection
- c) Methods for greenery buildup

PART E – MONITORING PROGRAMME

A Suitable monitoring program should be suggested to monitor changes and implementation of mitigatory measures proposed. This plan should include the following.

- Parameters to be monitored
- Proposed locations of sampling points
- Frequency of monitoring
- Responsible agency / agencies
- Facilities available with such agencies

PART F – CONCLUSION AND RECOMMENDATION

Summarize the key findings and recommendations of the assessment. The acceptability of the proposed project should be given.

The above information is accurate and true to the best of my knowledge. I am aware that this information will be utilized in decision making by the relevant state Authorities.

.....

.....

Date

Signature of Developer / Applicant

Annexes - IEE Study Team

No	Name	Designation	Educational and professional Qualification	Contact No & Email Address	Signature
1					
2					
3					
4					

18 වෙනි ආකෘති පත්‍රය
ආ. ඒ. ඇල් 46
G . A . L 46
(F* Sin.) 1/65



014370
31 JUL 2017

1964 අංක 28 දරණ ඉඩම් අත්කර ගැනීමේ (සංශෝධන) පනතින් සංශෝධිත පරිදි
ඉඩම් අත්කර ගැනීමේ පනතේ (460 වැනි පරිච්ඡේදය)

44 වැනි වගන්තිය යටතේ ඉඩමක් පැවරීමේ සහතික පත්‍රයයි

යොමු අංකය : IMDS/LND/05/ACO/SAB-02

මීට යා කර තිබෙන පළමුවෙනි උපලේඛණයෙහි විස්තර දක්වා ඇති ඉඩම ශ්‍රී ලංකා සබරගමුව
විශ්වවිද්‍යාලයේ (පළාත් පාලන මණ්ඩලයේ නම) කාර්යයන් සඳහා ඒ අධිකාරියට වුවමනා බැවින්, එම
ඉඩම 1964 අංක 28 දරණ (සංශෝධිත) පනතින් සංශෝධිත ඉඩම් අත්කර ගැනීමේ පනත යටතේ ඉහත
කාරණාවට අත්කර ගන්නා ලදී.

රත්නපුර දිස්ත්‍රික්කයේ/ ආණ්ඩුවේ උපදිසාපති ධුරය දරණ ඉඹුල්පේ ප්‍රාදේශීය ලේකම්...
ජයසිංහ ලේකම්ලායේ වත්දීම කීර්ති ජයසිංහ වන මම ශ්‍රී ලංකා ප්‍රජාතාන්ත්‍රික සමාජවාදී ජනරජයේ නාමයෙන්
එම ඉඩමේ භුක්තිය බාර ගෙන තිබෙන බැවින් ද,

මීට යා කර තිබෙන දෙවෙනි උපලේඛණයෙහි දක්වා ඇති කොන්දේසි සහ නියමයන්ට යටත් කොට
එකී පනතේ 44 වෙනි වගන්තියෙන් මා කෙරෙහි පැවරී ඇති බලතල පිට එකී ඉඩම ශ්‍රී ලංකා සබරගමුව
විශ්වවිද්‍යාලයට මේ සහතික පත්‍රයෙන් පවරා දෙමි.

ජේ.එල්.සී.කේ.ජයසිංහ,
ප්‍රාදේශීය ලේකම්,
ඉඹුල්පේ.

ශ්‍රී ජී. ඩී. කේ. ජයසිංහ
ප්‍රාදේශීය ලේකම්
ඉඹුල්පේ

2017 ජූලි මස දින දිස.

අදාළ තොරතුරු වර්තමාන කටුගා දමන්න.

D322/37-41
17.07.31

Handwritten signature

අධ්‍යක්ෂ ජනරාල්
ප්‍රාදේශීය ලේකම්
ඉඹුල්පේ

ස/ලේ/පාලන
සහ සහකාර
ලේකම්

පළමුවෙනි උප ලේඛණය

ඉඩම් පිළිබඳ විස්තරය

සබරගමුව පළාතේ රත්නපුර දිස්ත්‍රික්කයේ ඉඹුල්පේ ප්‍රාදේශීය ලේකම් කොට්ඨාශයේ කඩවත කෝරලේ තලාපිටගම්පත්තුවේ මුත්තෙටුවගම ගමේ පිහිටියාවූ, මිනින්දෝරු දෙපාර්තමේන්තුවේ මිනින්දෝරු ඩී.අයි.වී. සිල්වා මහතා විසින් පිළියෙල කරන ලද ර/අ/87/32 දරණ ප්‍රභමන අණුරේඛණය සර්වේයාර් ජනරාල් විසින් සහතික කරන ලද අ.ග.පි. 571අතිරේක 03 දරණ අවසාන ගම් පිඹුරෙහි ඇතුළත් පහත සඳහන් කැබලි අංක, නම, ප්‍රමාණය සහ හතර මායිම් දැක්වෙන ඉඩම්.

01) කැබලි අංකය : 338

ඉඩමේ නම : මහතැන්නේ මූකලාන

වර්ගඵලය හෙක්ටයාර් : 1.6997

▷ 322 / 37

මායිම් පිළිබඳ විස්තර :

උතුරට : කැබලි අංක 313

නැගෙනහිරට : කැබලි අංක 333

දකුණට : කැබලි අංක 339

බස්නාහිරට : කැබලි අංක 324

02) කැබලි අංකය : 339

ඉඩමේ නම : මහතැන්නේ මූකලාන

වර්ගඵලය හෙක්ටයාර් : 1.1306

▷ 322 / 38

මායිම් පිළිබඳ විස්තර :

උතුරට : කැබලි අංක 338

නැගෙනහිරට : කැබලි අංක 333

දකුණට : කැබලි අංක 341 හා 340

බස්නාහිරට : කැබලි අංක 340 හා 324

03) කැබලි අංකය : 340

ඉඩමේ නම : මහතැන්නේ මූකලාන

වර්ගඵලය හෙක්ටයාර් : 0.0202

▷ 322 / 39

මායිම් පිළිබඳ විස්තර :

උතුරට : කැබලි අංක 339

නැගෙනහිරට : කැබලි අංක 339 හා 341

දකුණට : කැබලි අංක 341 හා 324

බස්නාහිරට : කැබලි අංක 324 හා 339

04) කැබලි අංකය : 341

ඉඩමේ නම : මහතැන්නේ මූකලාන

වර්ගඵලය හෙක්ටයාර් : 1.2746

0322/40

මායිම් පිළිබඳ විස්තර :

උතුරට : කැබලි අංක 340,339 හා 333

නැගෙනහිරට : කැබලි අංක 333

දකුණට : කැබලි අංක 319

බස්නාහිරට : කැබලි අංක 324,340,339 හා 319

05) කැබලි අංකය : 342

ඉඩමේ නම : මහතැන්නේ මූකලාන

වර්ගඵලය හෙක්ටයාර් : 0.7817

මායිම් පිළිබඳ විස්තර :

උතුරට : කැබලි අංක 324 හා 319

නැගෙනහිරට : කැබලි අංක 319,333 හා 330

දකුණට : කැබලි අංක 330

බස්නාහිරට : කැබලි අංක 324

0322/41

රත්නපුර මිනින්දෝරු අධිකාරි විසින් පිලියෙල කරන ලද අ.ග.පි. 571 අතීරේක 03 මූලික පිඹුරේ සඳහන් ඉහත අංක දරණ ඉඩම් කැබලි 1964 අංක 28 දරණ ඉඩම් අත්පත් කර ගැනීමේ පනතේ 460 වැනි පරිච්ඡේද 38 වැනි වගන්තියේ (අ) අතූරු විධානය යටතේ ගරු ඉඩම් ඇමතිතුමා විසින් අංක 501/7 හා 1988.04.15 දින දරණ ගැසට් පත්‍රයේ පළ කරන ලද 1988 අංක 124 දරණ ආඥාව අනුව ඉහත ඉඩම් කැබලි වල භුක්තිය රජයට පැවරී ඇත. 1988 අංක 124 දරණ ආඥාව ඇතුලත් ගැසට් නිවේදනයේ සහ ඉඩම් අත්පත් පනතේ 7 වන වගන්තිය යටතේ පළ වූ අංක 652/7 හා 1991.03.05 දිනැති ගැසට් නිවේදනයේ සහතික පිටපත් මේ සමඟ ඉදිරිපත් කරමි.

දිනය:2017/07/23

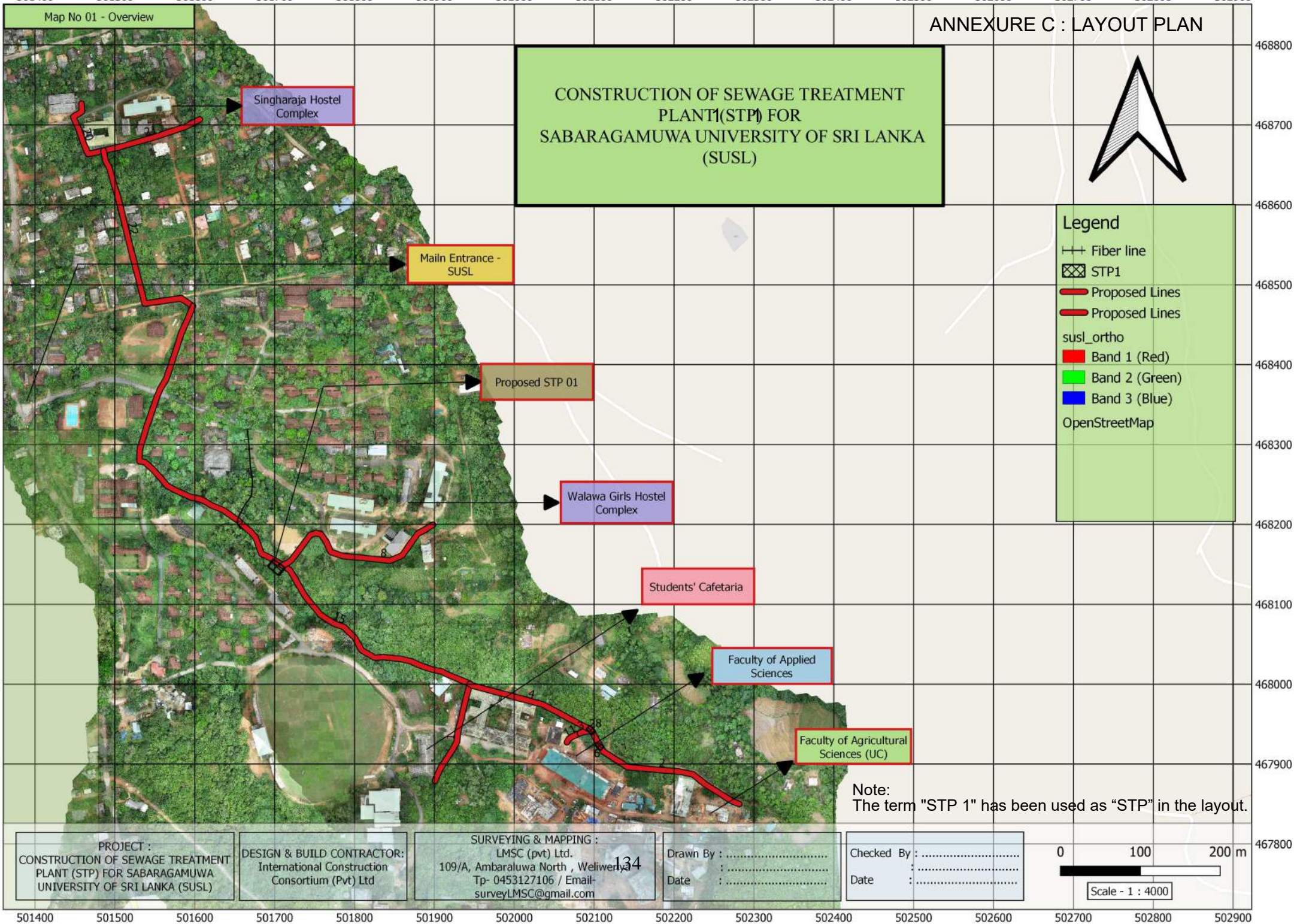
ජේ.එල්.සී.කේ.ජයසිංහ,
ප්‍රාදේශීය ලේකම්
ඉඩුල්ලේ

ජේ. එල්. සී. කේ. ජයසිංහ
ප්‍රාදේශීය ලේකම්
ඉඩුල්ලේ

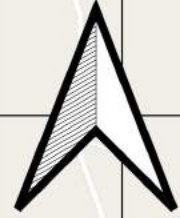
දෙවෙනි උපලේඛණය

කොන්දේසි හා සීමා

ශ්‍රී ලංකා සබරගමුව විශ්වවිද්‍යාලයේ සංවර්ධනය කිරීමේ කටයුතු හැර වෙනත් අවශ්‍යතාවයකට පාවිච්චි කිරීමට, විකිණීමට, බදු දීමට, උකස් තැබීමට හෝ වෙනයම් ආකාරයකින් ඉඩම සම්බන්ධව අයිතිවාසිකම් අත් අයකුට හෝ ආයතනයකට පැවරිය නොහැක.



**CONSTRUCTION OF SEWAGE TREATMENT
PLANT1(STP) FOR
SABARAGAMUWA UNIVERSITY OF SRI LANKA
(SUSL)**



Legend

- Fiber line
- ▣ STP1
- Proposed Lines
- Proposed Lines
- susl_ortho
- Band 1 (Red)
- Band 2 (Green)
- Band 3 (Blue)
- OpenStreetMap

Note:
The term "STP 1" has been used as "STP" in the layout.

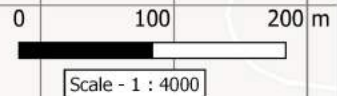
PROJECT :
CONSTRUCTION OF SEWAGE TREATMENT
PLANT (STP) FOR SABARAGAMUWA
UNIVERSITY OF SRI LANKA (SUSL)

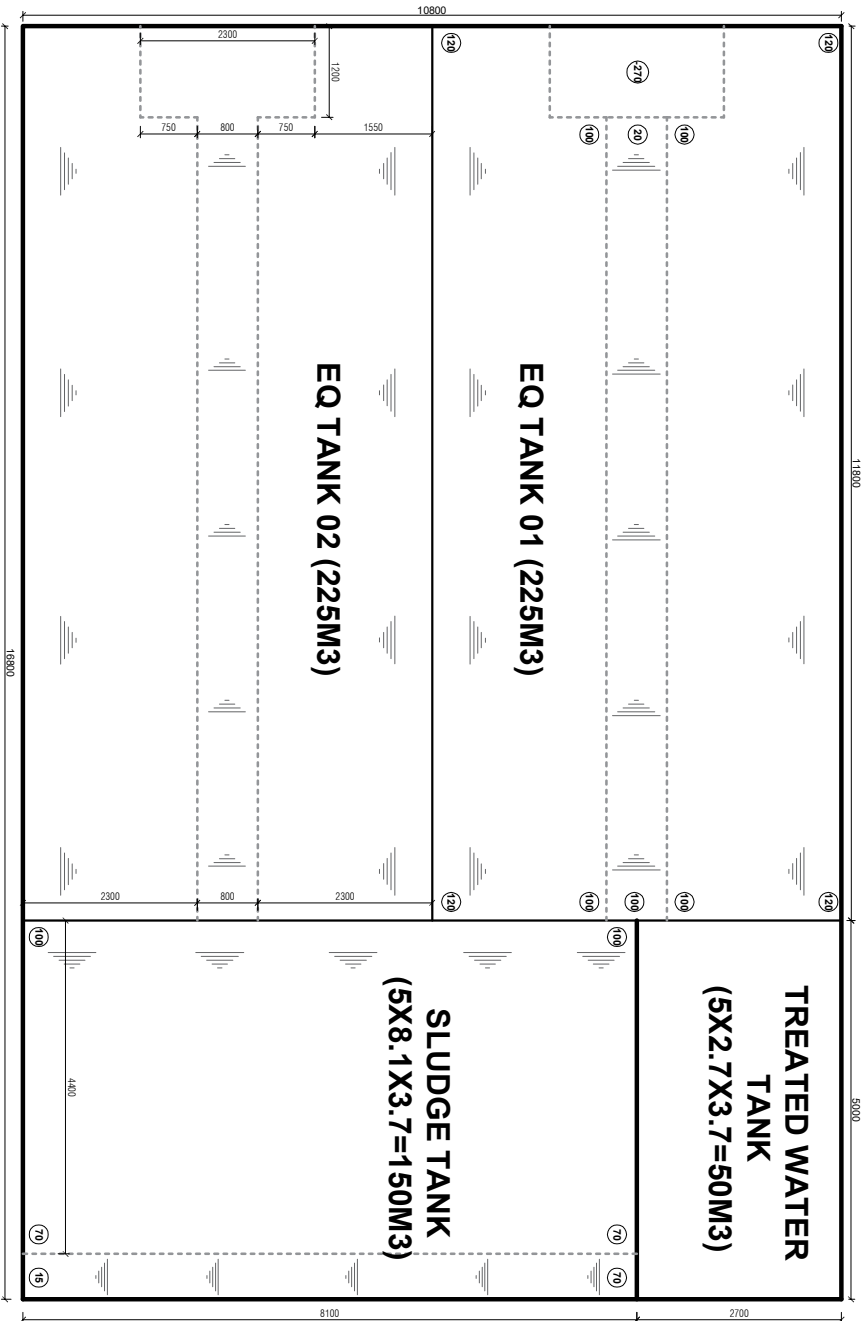
DESIGN & BUILD CONTRACTOR:
International Construction
Consortium (Pvt) Ltd

SURVEYING & MAPPING :
LMSC (pvt) Ltd.
109/A, Ambaraluwa North , Welisariya,
Tp- 0453127106 / Email-
surveyLMSC@gmail.com

Drawn By :
Date :

Checked By :
Date :





PLAN (EQ, SLUDGE AND TREATED WATER TANKS)

- NOTES:**
- INTERMEDIATE SUPPORTS FOR THE FBFR TANK SLAB ON TOP OF THE EQ TANK CAN BE DECIDED AS PER THE STRUCTURAL DESIGN REQUIREMENTS.

PROJECT

STP FOR SABARAGAMUWA UNIVERSITY
STP - 01
 24/1/2021/STP-1/SG/V/003

TITLE

PLAN VIEW OF EQ AND SLUDGE TANK (BASIC DIMENSION DRAWING)

NOTE

- ALL DIMENSIONS ARE IN MILLIMETERS
- ALL TANKS ARE R/C

DESIGNED ICC SMART ECO SOLUTIONS

DRAWN K.E

SCALE NYS

DWG NO SES/TP/SG/PV/003

DATE 24/1/2021

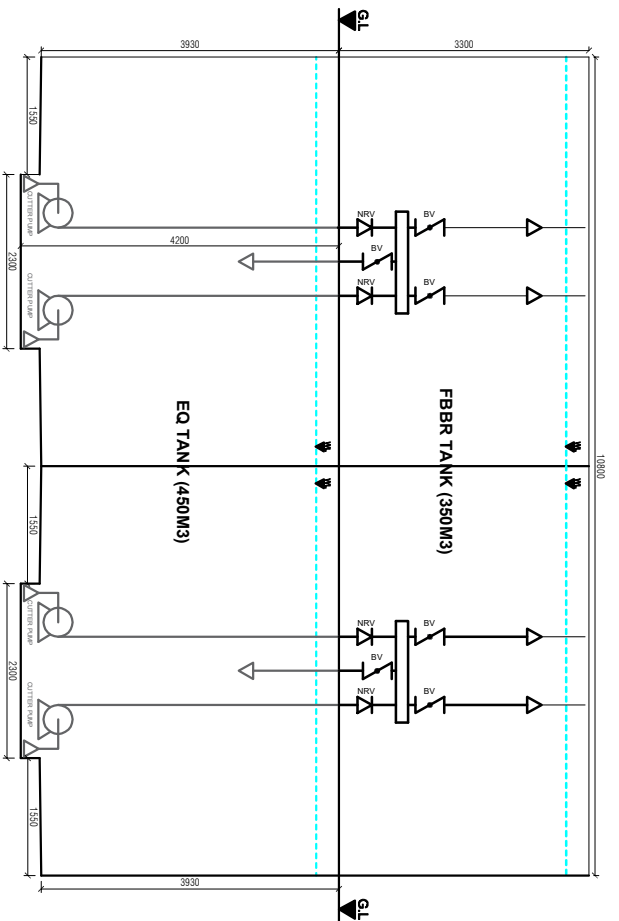
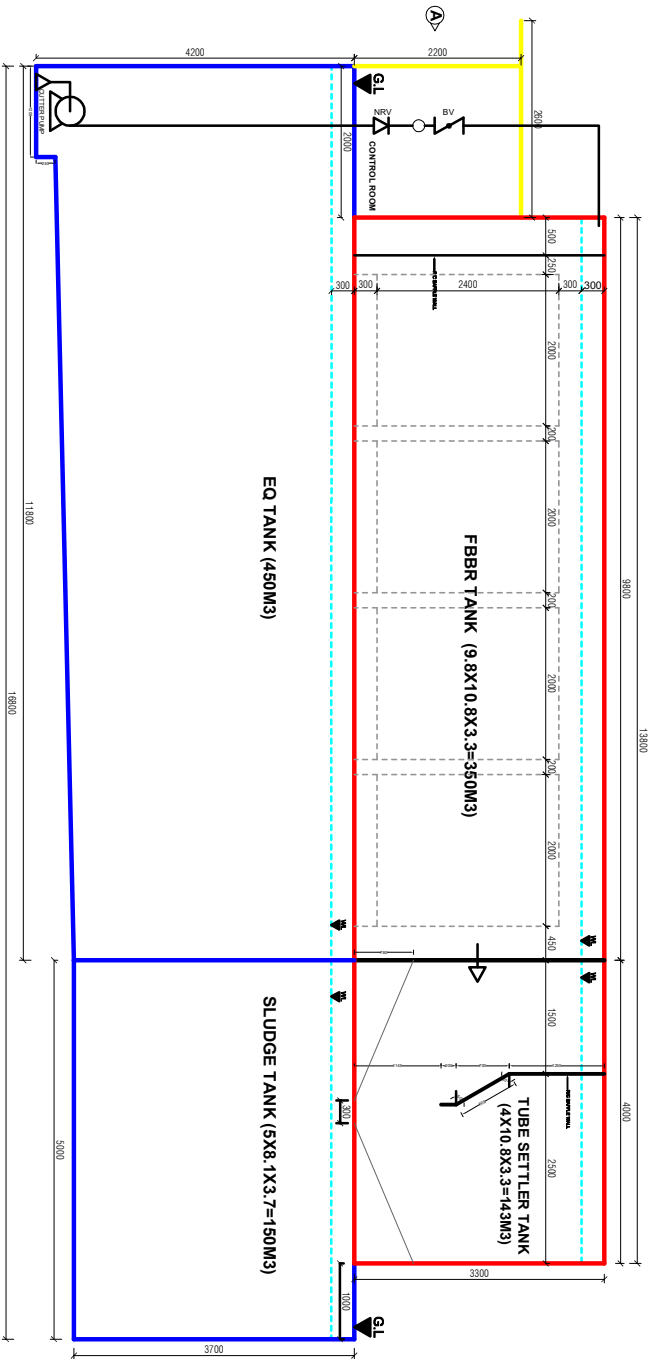
CAD FILE SES/TP/SG/PV/003

CHECKED C.B.S

SHEET NO 11 OF 06



ICC SMART ECO SOLUTIONS,
 No 57, Sabas Jayasinghe Mawatha,
 Kottimadu, Nugegoda, Sri Lanka.
 Tel : 011 2 814204,
 Email : smarteco@icc-construct.com
 Web : www.icc-construct.com



NOTE:

1. THE RED COLOUR LINES ARE SHOWN THE SUPER STRUCTURE.
2. THE BLUE COLOUR LINES ARE SHOWN THE SUBSTRUCTURE.

PROJECT

STP FOR SABARAGAMUWA UNIVERSITY
STP - 01
24/11/2021/STP-1/SG/V003

TITLE

SECTION OF STP
(BASIC DIMENSION DRAWING)

NOTE

1. ALL DIMENSIONS ARE IN MILLIMETERS
1. ALL TANKS ARE R/C

NO

REVISION

DATE

BY

CHKD

DATE

BY

CHKD

DATE

BY

CHKD

DATE

BY

CHKD

DATE

BY

CHKD

DATE

BY

CHKD

DATE

BY

CHKD

DATE

BY

CHKD

DATE

BY

CHKD

DATE

DESIGNED ICC SMART ECO SOLUTIONS

DRAWN K.E

SCALE NYS

DWG NO SES/PT/SG/SB/V03

DATE 24/11/2021

CAD FILE SES/PT/SG/SB

CHECKED C.B.S

SHEET NO 1 OF 06

DESIGNED ICC SMART ECO SOLUTIONS

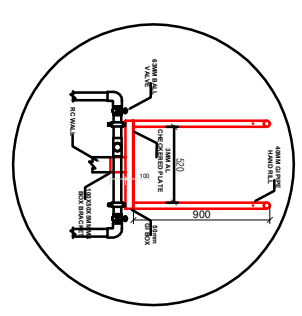
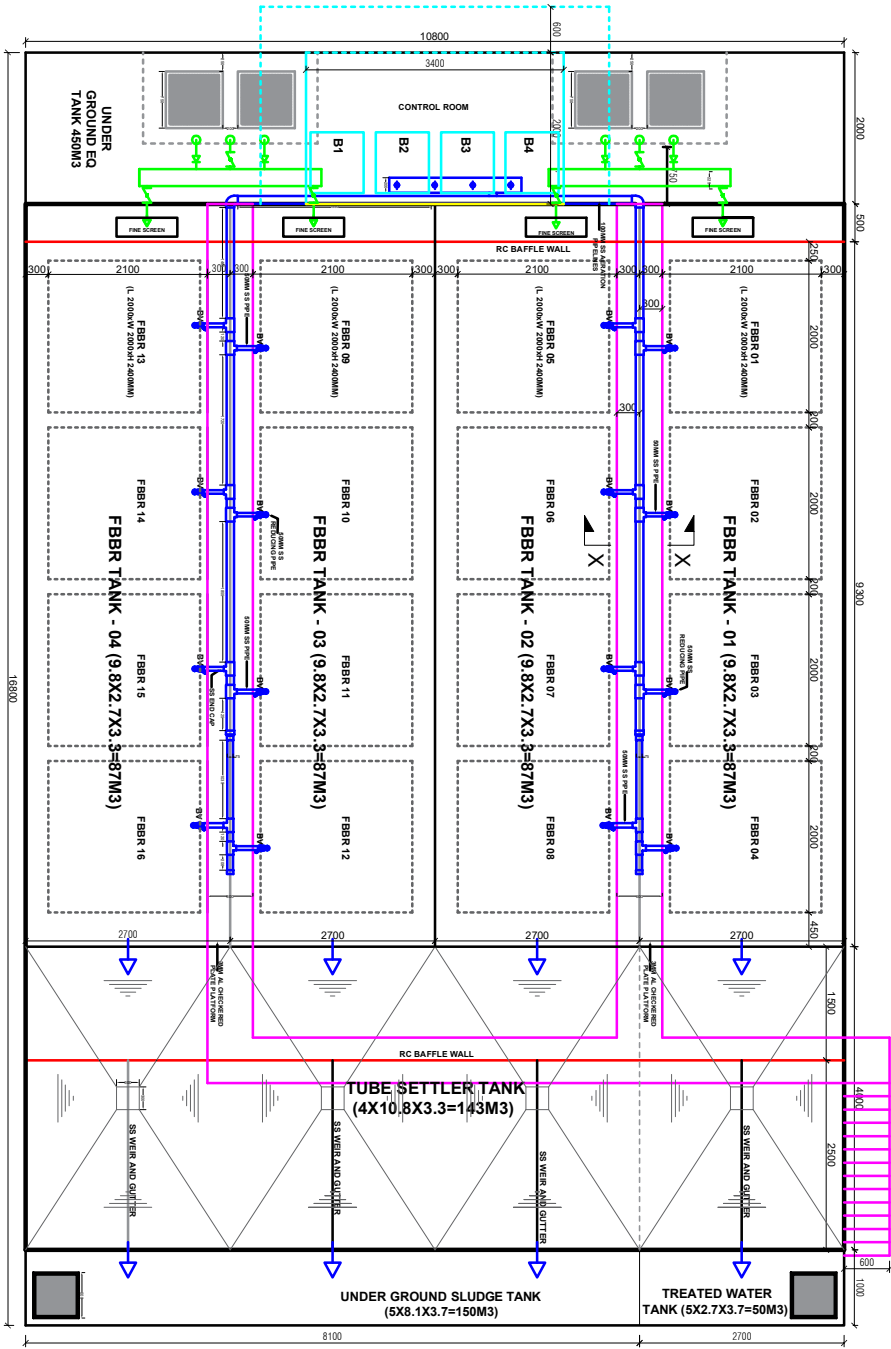
DRAWN K.E

SCALE NYS

DWG NO SES/PT/SG/SB/V03

DATE 24/11/2021

ICC SMART ECO SOLUTIONS,
No 57, Saba's Jayasinghe Mawatha,
Kottawadi, Nugegoda, Sri Lanka.
Tel : 0112814204,
Email : smarteco@icc-construct.com
Web : www.icc-construct.com



PLAN (PLATFORMS, AERATION SYSTEM AND CONTROL ROOM)

PROJECT

STP FOR SABARAGAMUWA UNIVERSITY
 STP - 01
 24/1/2021/STP1/SG/V003

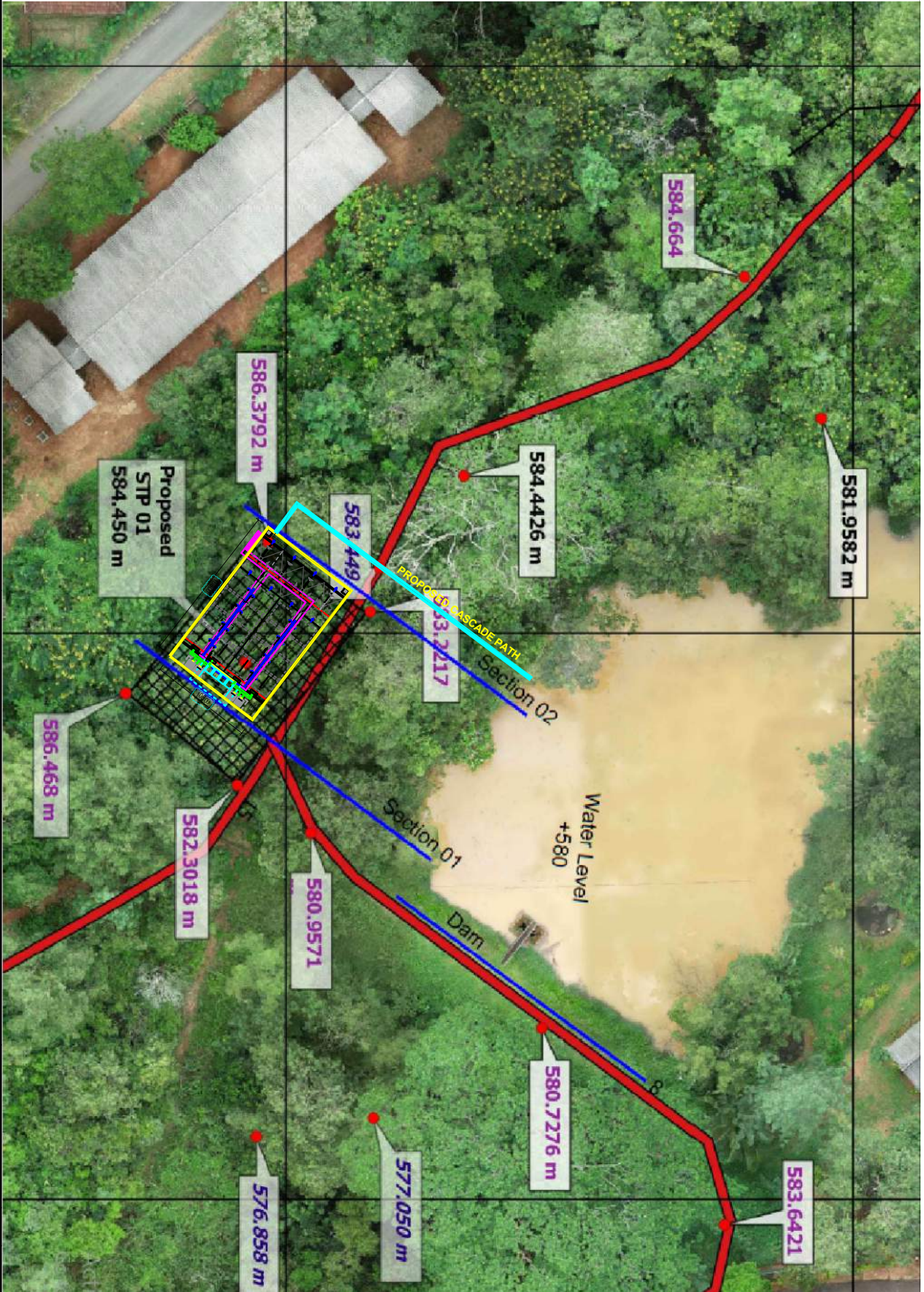
TITLE
 PLAN VIEW OF STP AERATION
 LINES & PLATFORMS
 (BASIC DIMENSION DRAWING)

NOTE
 1. ALL DIMENSIONS ARE IN
 MILLIMETERS
 1. ALL TANKS ARE R/C

NO.	REVISION	DATE
01	ISSUED FOR TENDER	24/1/2021
02	FOR CONSTRUCTION	24/1/2021

DESIGNED: ICC SMART ECO SOLUTIONS
 DRAWN: M.E.
 SCALE: NYS
 DWG NO: SES/TP/SG/PU/V03
 DATE: 24/1/2021
 CAD FILE: SES/TP/SG/V03
 CHECKED: C.B.S.
 SHEET NO: 11 OF 11
 Tel : 0112 814204
 Email : smarteco@icc-construct.com
 Web : www.icc-construct.com

DESIGNED	ICC SMART ECO SOLUTIONS
DRAWN	M.E.
SCALE	NYS
DWG NO	SES/TP/SG/PU/V03
DATE	24/1/2021
CAD FILE	SES/TP/SG/V03
CHECKED	C.B.S.
SHEET NO	11 OF 11



PROJECT

STP FOR SABARAGAMUWA UNIVERSITY
STP - 01
 31/03/2022/STP-1/SGM/003

TITLE

PLAN VIEW OF STP LAYOUT
 (BASIC DIMENSION DRAWING)

NOTE

- 1. ALL DIMENSIONS ARE IN MILLIMETERS
- 1. ALL TANKS ARE R/C

NO	REVISION	DATE

SMART ETECO
 ICC SMART ECO SOLUTIONS,
 No 57, Saba S Jayasinghe Mawatha,
 Kottawala, Nugegoda, Sri Lanka.
 Tel : 0112814204,
 Email : smarteco@icc-construct.com
 Web : www.icc-construct.com

DESIGNED	ICC SMART ECO SOLUTIONS
DRAWN	K.E
SCALE	NYS
DWG NO	SE/STP/05/PLA/003
DATE	31/03/2022
CAD FILE	SE/STP/05/ANS/SPC & LAYOUT
CHECKED	C.B.S
SHEET NO	1 OF 06

Note:
The term "STP 1" has been used as "STP" in the report.



**1.2 STP PRODUCT CATALOGUE AND
TECHNICAL DETAILS**



Product Introduction.

STP Proposal
Sabaragamuwa University
Sri Lanka



මධ්‍යම පරිසර අධිකාරිය
மத்திய சுற்றுமடல் அபிவிருத்தி
Central Environmental Authority



වරපර පිටිය, 104, වෙස්ට් කොස්ට්වෙලල මාවත, බත්තරමුල්ල, ශ්‍රී ලංකාව.

"புதிய பியார்", 104, வடக்கில் கොஸ்ட்வேலு மாவட்டம், பத்தரமுல்லை, இலங்கை.

"Parisara Piyaar", 104, Denzil Kobbekaduwa Mawatha, Battaramulla, Sri Lanka. Web: www.cca.lk

අපේ ලේඛණ
අංකය
Our Ref

071/M/Cons/164 2020

ඔබේ ලේඛණ
අංකය
Your Ref.

ලියවිල්ල
Date

01 of 2021

Mr. Prasanna Alahakoon,
 Head of the Department
 International Construction Consortium (Pvt.) Ltd,
 79, S. De. S. Jayasinghe Mawatha,
 Nugegoda.

Dear Sir/Madam,

Central Environmental Authority Recognized List of Consultant/Specialists for Environmental Pollution Control for the year 2021/2022

This is to inform you that your organization has been registered in the Central Environmental Authority as a consultant /specialist for technical guidance on pollution control for the year 2021/2022.

I appreciate your cooperation and willingness to work with the Central Environmental Authority in pollution control activities. In order to provide quality reasonable service to the industrial community, your work will be reviewed throughout the period.

Yours faithfully,

Dr. R.M.S.K. Rathnayake
 Actg. Deputy Director General
 Environment Protection Division
 Central Environmental Authority

Chairman	Tel: 2872361, 2872348 Fax: 2872347	Director General	Tel: 2872359 Fax: 2872608	General Office	Tel: 2872278, 2873447, 2872410, 2873448, 2872777-280	Comptroller	2888999
D. D. O.	HRD, Admin. & Finance Tel: 2965296, Fax: 2872337	Env. Pollution Control	Tel: 2872668, Fax: 2872668	Env. Mgt. & Assess.	Tel: 2872396, Fax: 2872396	Env. Edu. & Awareness	Tel: 2872297, Fax: 2872559
						Waste Mgt.	Tel: 2872409, Fax: 2882152
						Regional Oper.	Tel: 2872370

සරසර අවරණකාරය | சுற்றுமடல் அமைச்சு | Ministry of Environment

INTERNATIONAL CONSTRUCTION CONSORTIUM (PVT) LTD.



TECHNICAL PROPOSAL

Proposal to supply & Install Sewer Treatment System

at

Sabaragamuwa University, Sri Lanka

Our ref No -WWICC0048

Date: - 25.10.2021

Proposal

Institute: -	Faculty of Technology Sabaragamuwa University
Location: -	Sabaragamuwa
Influent: -	Black and Grey water
Design Volume: -	1000m ³ /day
Operation Time: -	24 h/d
Population: -	7,000 students made up of 7126-day students and 3200 hostelers

Purpose for installation of a wastewater treatment plant.

The generated Black and Grey wastewater to comply to CEA discharge standards as mentioned in Gazette Extraordinary of the Democratic Socialist Republic of Sri Lanka, Schedule 1534/18 dated 01.02.2008 page 7a, **Tolerance Limits for Discharge of Industrial Waste into Inland Surface Water.**

Introduction to System

In nature billions of liters of wastewater is cleaned per day using what is naturally available. Dirty water rich in organic matter flowing down a river is eaten up by hungry living organisms' such as bacteria, fish and in doing so multiply and thrive in their environment. They also consume oxygen in the water. If the water has excessive organic matter more and more oxygen will be consumed by the living organisms' depleting the oxygen in the water and eventually the living organisms will all die.

We could learn from this process and put to good use in a controlled environment the same mechanism nature uses to clean the waste (dirty) water to a level acceptable prior to release into our waterways.

Bacteria grow on anything they could cling to in waterways such as rocks, fallen branches etc. Wastewater treatment systems using biofilms that grow attached to a support media can either be an alternative or an improvement to the widely used suspended growth activated sludge process which occupy large areas and difficult to manage.

ICC Smart Eco Solutions, a division of ICC in Collaboration with Aqua Equipment Technologies LLC in USA design and build Fixed Bed Bio Reactor (FBBR) sewage treatment systems using the AET patented fixed film bio media and high efficiency tube settler units manufactured in Germany. FBBRs are a good and advantageous alternative to activated sludge processes.

PROCESS

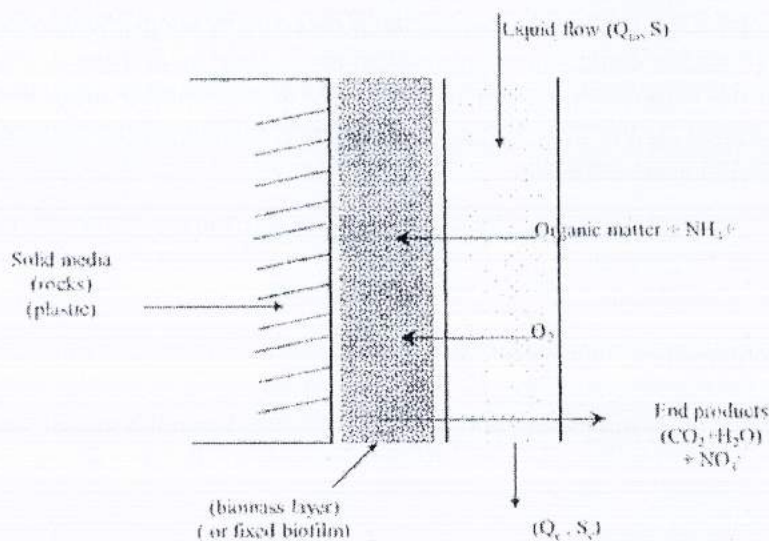
Attached Growth Biological Treatment System

Attached Growth is a biological treatment process in which microorganisms responsible for conversion of organic matter or other constituents in wastewater are attached to some inert material such as: rocks, sand, ceramic or plastic materials like in Nature.

Examples of Attached growth system:

- Trickling filters (biological tower).
- Rotating biological contactors (RBC).
- Packed bed reactors
- Fluidized bed biofilm reactors.

Theory of attached growth treatment:

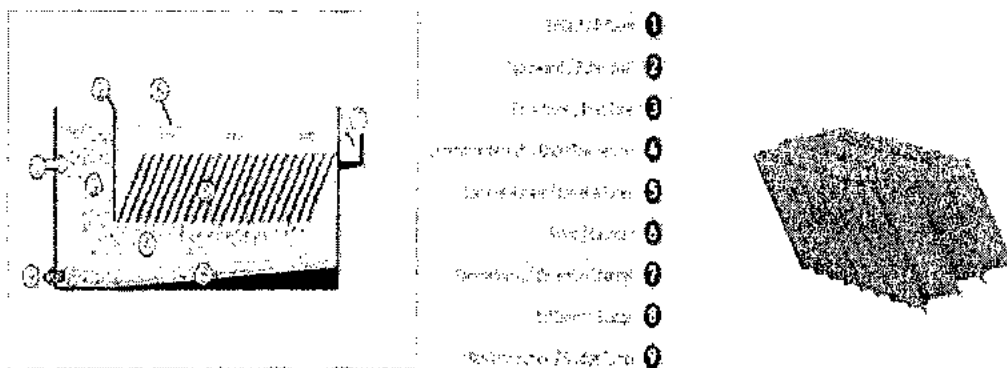


According to the figure shown, a biomass layer (bacteria) sticks to the solid media in water and grow. The liquid wastewater passes adjacent to the biomass layer forming a liquid layer, during the passage of the wastewater, the liquid layer in contact with the biofilm layer, organic matter, ammonia and dissolved oxygen in addition to other dissolved materials penetrate the biomass layer by diffusion.

The biochemical reactions such as organic matter oxidation, nitrification occur inside the biofilm layer. The end products such as CO₂, H₂O, and -- NO₃ Leave the biofilm layer back to the Liquid Layer and move out with the liquid flow to the effluent stream. Denitrification can be achieved in attached growth system in the lower parts of these systems where anoxic conditions exist. The bacteria in the biomass layer grow and some of it die. The dead bacteria lose its sticky characteristics and is removed from the biomass layer by the action of the moving liquid. The dead bacteria are then removed into the final sedimentation tank. The biochemical reaction for BOD₅ removal, nitrification and denitrification are the same as those in the suspended growth system.

Clarifier

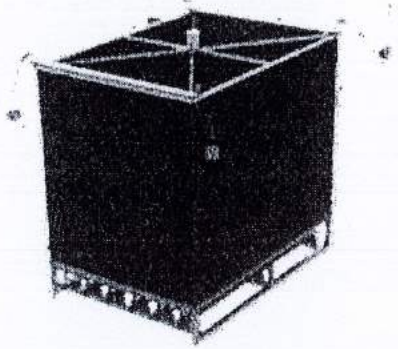
Solid liquid separation is made by use of Inclined tube settlers set at 60d angle to increase projected area. The Polypropylene tube settlers exhibit a life of over 50 years.



Advantages Of Tube Settler Systems

- Significant reduced tank size
- High mechanical strength
- Assembly process allows flexible tank geometries and shapes
- Complete package (support, anti-floating, sludge removal and water effluent) out of one hand
- Chevron shaped channel design offers most surface and best solid discharge

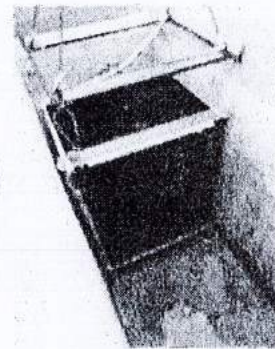
Items in use in a FBBR STP Plant.



Fill Media Tower



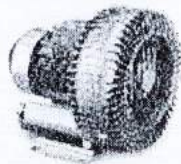
Aerator



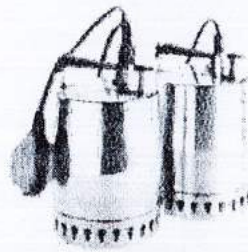
Media Block in Tank



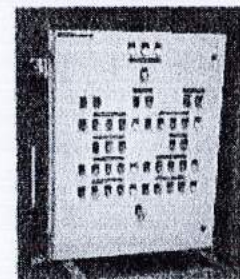
Cutter Pumps



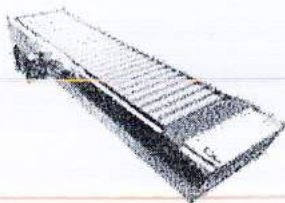
Blowers



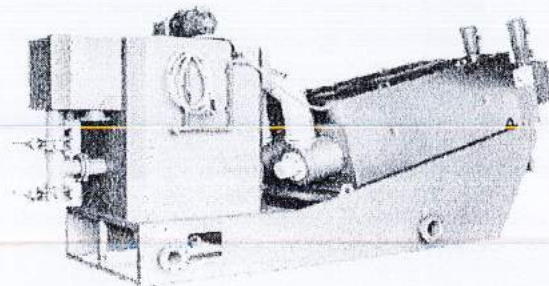
Decanter Pump



Control Panel



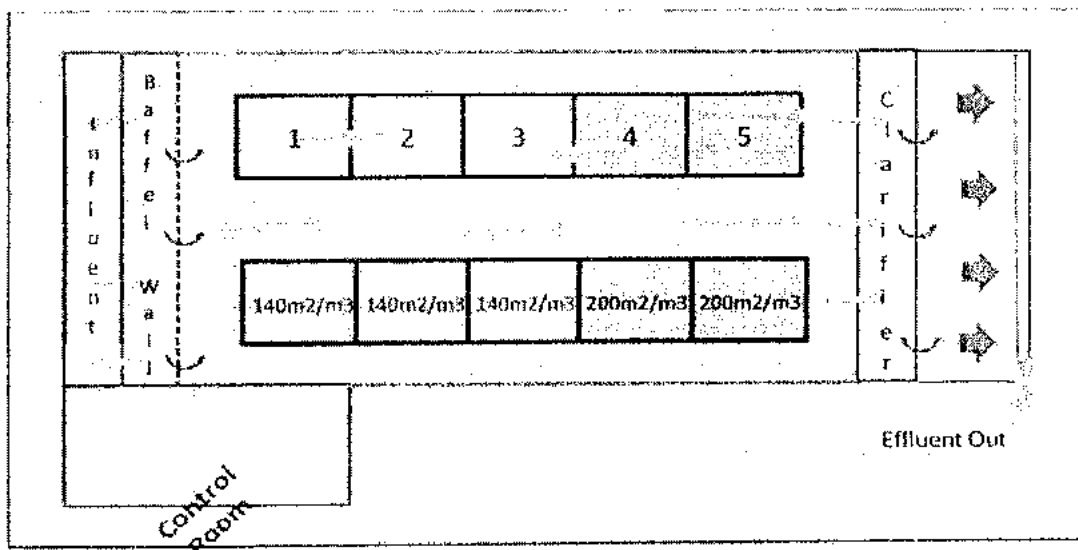
Auto bar Screen



Sludge Press

Operational Procedure

1. Influent (wastewater) from buildings will be first made to pass through a coarse screen to retrieve any unwanted large items that would interfere with downstream activities and collected in a "Balancing Tank". This will balance out variations of load throughout the day. From here influent will be pumped over 24 hours at a steady rate using stainless steel cutter pumps via a fine screen into the treatment tank (STP)
2. The first tank in the STP will consist of media towers where the bacteria grow. These towers will be well aerated to facilitate oxygen transfer to the water for bacteria growth. Here BOD, COD and Ammonia in wastewater will be reduced. After a short retention time of 5-8h the influent will flow into a quiescent section of the Clarifier.
3. The influent will then flow under and into the angled Tube settlers. The influent will flow out from the top of the tubes and solid matter will fall to the Clarifier bottom. This way liquid solid separation will take place
4. The effluent coming out of the Clarifier will be disinfected using chlorine. The effluent will meet the CEA standards for discharge to a waterway.
5. The sludge collected at the bottom of the Clarifier will be pumped out to a sludge holding tank at regular intervals. The sludge tank will be maintained under anaerobic conditions which will help the sludge to be further digested and reduced. The tank will have a holding capacity for about 30 days. Thereafter the sludge will have to be removed and dried which could be used as fertilizer or sent out by gully bowser for disposal at a suitable location. A screw press could also be provided to continuously dewater the sludge.



Process Description

The biological treatment process of the STP using the FBBR (Fixed Bed Biofilm Reactor) technology. The FBBR technology consists of FBBR media and aeration diffusers which are combined within individual stainless steel frame units. Compared to the conventional activated sludge process the FBBR technology is superior because the activated sludge for removal of BOD and ammonia in wastewater is attached as a biofilm to the surface of the FBBR media. The biofilm is self-regulating meaning it automatically generates the right amount and type of aerobic bacteria for effective removal of wastewater pollutants. Because of this the FBBR technology doesn't require large secondary clarifiers.

Usually in activated sludge treatment, sludge age in secondary and primary clarifiers for biological processes needs to be adjusted which require long retention times, so large primary and secondary clarifiers are needed. For FBBR technology, it does not require manual sludge age adjustment and can therefore be operated without primary clarifiers. The enhanced small-scale secondary clarifiers with tube settler modules are sufficient.

For the Sabaragamuwa University project the FBBR units will be split between 4 basin compartments. This gives the operator the opportunity to adjust the airflow to each tank depending on the incoming loading. This setup also provides 4 levels of redundancy meaning that one basin could be dewatered if ever required for maintenance while the other 3 basins are still in operation.

FBBRs can be operated as a single pass system, meaning wastewater does not have to be recycled, after biological treatment in the FBBR tank and settling in the lamella settler tank. On the other hand, recycling wastewater does not harm the process but will improve the treatment plant capacity additionally.

Overall, the FBBR technology has a larger number of active aerobic bacteria compared to activated sludge processes and does therefore result in a lower footprint, less power costs, easier maintenance, and operation.

For more information on the biological process of FBBR systems please click here:

<https://youtu.be/hoxvkiTfwA>

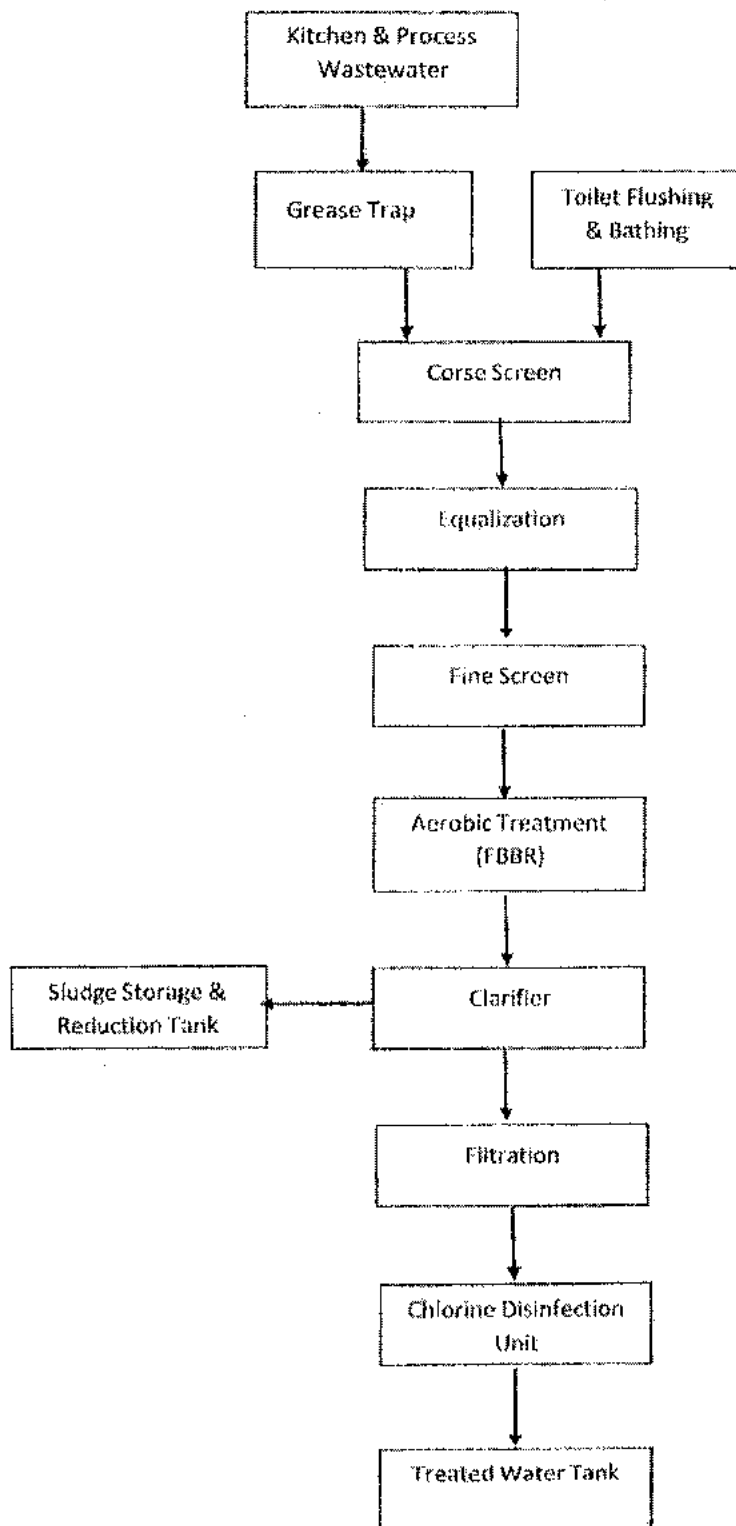
Summary comparison FBBR and ASP (Activated Sludge Process)

	FBBR	ASP (e.g. Anaerobic – Aerobic)
Space requirement	<p>Little</p> <ul style="list-style-type: none"> + no primary clarifier + small tube settler secondary clarifier + no separate anaerobic basin + Higher sludge amount per m³ tank volume 	<p>High</p> <ul style="list-style-type: none"> - primary and secondary clarifier required - anaerobic and aerobic basin - Lower sludge amount per m³ tank volume
Capital cost	<p>Lower (because doesn't require additional concrete basins)</p>	<p>Higher</p>
Operational cost	<p>Moderate</p> <ul style="list-style-type: none"> + Aeration required only for 20 hrs. per day and the Blower power cost will be lower. 	<p>High</p> <ul style="list-style-type: none"> - Same air volume requirement compared to FBBR but additional pumps for sludge recirculation required
Process	<p>The fixed biomass combines aerobic, anaerobic and anoxic zones and increases the Sludge Retention Time, promoting better nitrification compared to simple APS processes</p>	<p>Requires separate basins and a skilled operator for sludge age adjustment</p>
System stability	<p>High</p> <ul style="list-style-type: none"> + damaged biofilm will scuff off so that lower biofilm layers become active + Can sustain 4-5 days without aeration. 	<p>Low</p> <ul style="list-style-type: none"> - Interruption in oxygen supply can turn sludge quickly septic - Grease, fats and other substances can harm activated sludge already in small amounts
Sludge production	<p>Reduced</p> <ul style="list-style-type: none"> + heavier sludge = better settling and less volume 	<p>Moderate</p> <ul style="list-style-type: none"> - Lighter sludge = slower settling, more volume and in some cases scum
Ease of operation	<p>System is self-regulating</p> <ul style="list-style-type: none"> + If too much biofilm is noticed air volume can be increased to scour FBBR media 	<p>Requires skilled operators</p> <ul style="list-style-type: none"> - especially for manual regulation of sludge age
Contingency plan	<ul style="list-style-type: none"> + 4 basin solution meaning if one basin needs to be taken out of operation there is no significant loss of performance + Airflow can be adjusted depending on incoming load + FBBR system is modular meaning individual FBBR frames can be removed or added to the basin 	<ul style="list-style-type: none"> - No contingency unless there are at least 2 anaerobic and 2 aerobic basins - If activated sludge turns septic the whole system needs to be drained and cleaned before it can be restarted

Comparison of Activated Sludge & FBR WWTP Characteristics

Area	Activated Sludge	FBR
Area	High	Low
HRT	Low	High
Capital Cost	High	Low
Operator Requirement	High	Low
Power Requirement	High	Low
Stability absence of aeration	High	Low
Maintenance	High	Low
Performance	High	Low
Stability and reliability	High	Low
Upgradability	High	Low

Process Flow Chart



The total load of wastewater per day is distributed to 2 plants named STP1 and STP2, as shown in the map above.

The Chart below shows loading data.

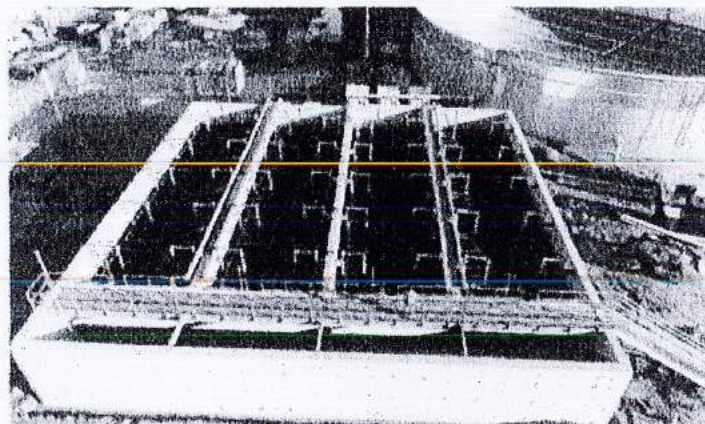
	Population	L/P/D	BOD/P/D	H Load	Org Load	mg/l
Total Required Population	7000	143	40	1,000,000	280,000	280
STP 2	1000	50	13	50,000	12,500	250
STP 1	6000	158	45	950,000	267,500	282

STP 1 – 950m³/day at an Organic load of 267.5 kgs/day

This STP will consist of eight (16) AET fixed film Bio Modules installed in specially fabricated RC tanks and a tube settler installed alongside with a control room consisting of blowers, and disinfection system. The daily load of wastewater will be first collected in an equalization tank and processed over a period of 24 hours to always give an even flow across the treatment plant. The sludge collected will need to be disposed periodically.

STP 1

1		2		3		1	Settler
4		5		6		2	
7		8		9		3	
10		11		12		4	



Process Calculation

STP 1- PE 6000 (RC Construction) – 4 tank units of 250m³/tank Bio Reactors

Max Hydraulic Load	- 3000 m ³ /day
Max Organic Load	- 267,500 g/d – 268 mg/l
Required Media at 11g/m ² BOD reduction/m ²	- 24,328 m ³ surface area

(Provided by 12 towers of 140 m² of volume 10 m³ and 4 towers of 200 m² of volume 10 m³)

Provided surface area - 24,800m²

Hydraulic Retention Time

Tank Volume	- 428 m ³ per tank
Flow/day	- 1000 m ³ /d
Flow/h	- 42m ³ /h
Hydraulic retention time	- 10h per tank

Clarifier – Tube settler

Flow calculated at 16h working per day	- 63 m ³ /h
Tube settler Hazen No	- 0.3
Required Surface area	- 208
Volume of tube settler at 11m ² /m ³	-19 m ³

Air required

Oxygen required to reduce 1 kg BOD taken at BOD for reduction	- 1.25 kg - 267 kg
Taking into consideration Oxygen transfer efficiency, Temperature, Alpha factor, depth of air discharged and percentage of O ₂ in air.	

Total air required - 1000 m³/h

This provided by 2 side channel blowers of 500m³/h and 1 blower on standby.

(Ref equipment catalogue for details of all equipment selected)

Sludge Disposal

Sludge separated from the tube settler will be transferred to the sludge storage and reduction reactor tank by solenoid valve which operates using pre-determined time intervals from control panel. Sludge storage, thickening and reduction will take place inside the sludge tank whereas the anaerobic conditions are maintained to achieve optimum sludge reduction.

- a. Estimated flow generated per day = 950.0 m³
- b. Estimated BOD per day = 267.5 kg
- c. Estimated TSS per day = 93.0 kg

Estimated sludge generated from FBBR system taken at 50% of BOD (Low for FBBR systems in comparison to Activated Sludge Systems)

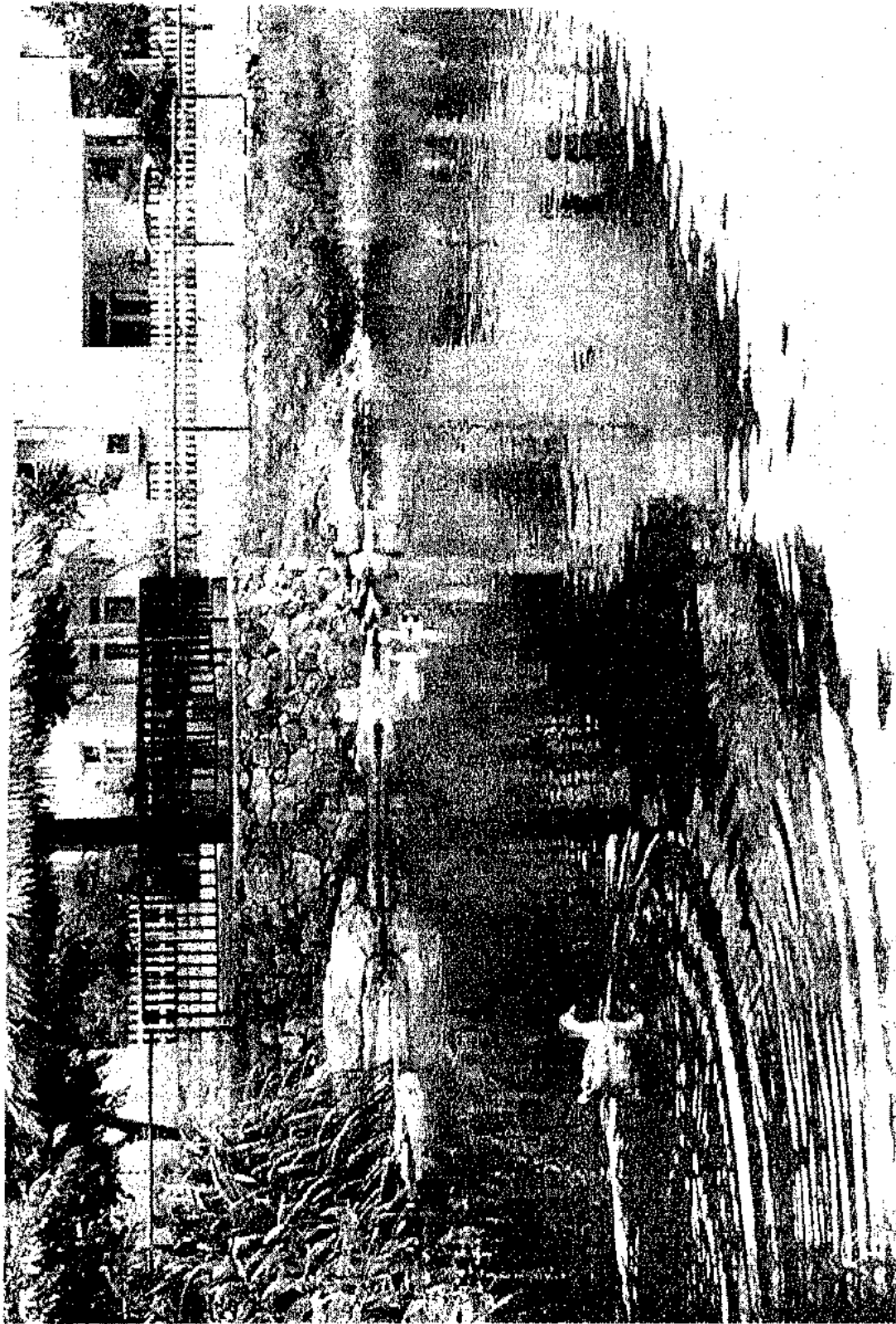
- 1. Estimated sludge generated from FBBR system = 133.75 kg per day
- 2. Total dry solids (133.75+93.0) = 226.75 kg per day
- 3. At 4% MLSS volume generated = 5668.75 L/d

This volume will be taken out from the Clarifier basins into a sludge holding tank. On retention of the slurry in the tank under anaerobic conditions it will thicken by 30% due to further digestion giving a

- Sludge volume of (226.75/0.3) = 755.83 L/d
- Sludge volume per month (755.83*30)/1000 = 22.68 m³/month
- Sludge volume per six months (22.68*6) = 136 m³/6 months

Our sludge tank size including free board is = 150 m³

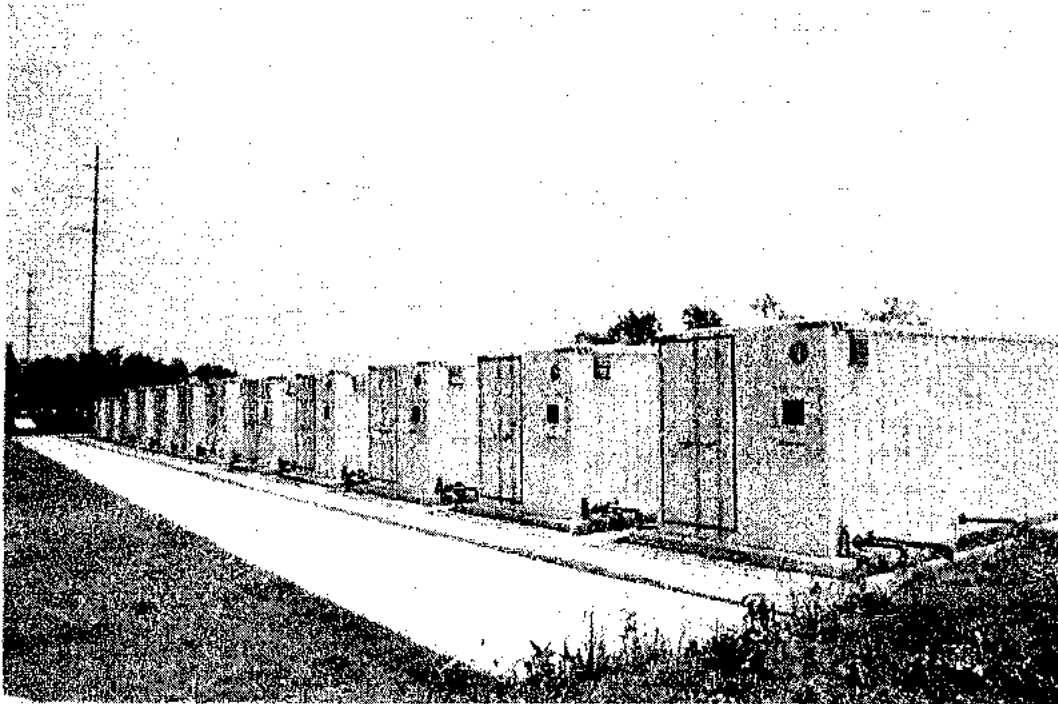
1. This sludge will be fully digested and free of pathogens etc. and could be used as fertilizer. The cheapest way to dry this would be to use simple drying beds. If presses are to be used the sludge will need to be further thickened by adding chemicals once dried will increase the sludge volume to the chemicals added. Further it will be unsuitable for use as fertilizer. The only way to dispose will be for incineration which would cause pollution.
2. The four biological treatment tanks could be used totally independently simply as four independent STP's giving the greatest flexibility for more if population drops out various times over the year due to holidays etc.
3. It is highly recommended to have collection ponds within the campus to collect the treated water for use within the campus for gardening etc. before it is released. See photo of a collection pond in a Malabe Orchid Housing project which has over 300 apartments and 200 houses.



Treated water Pond

STP 1 - List of Equipment

Item No	Description	Nos	Brand	Specifications
1.	Automatic Coarse Screen	1	Danmotec	SS304, 10 mm openings, 40 m ³ /hr 1-year Warranty
2.	Submersible Cutter pumps with guide rails	3	Tsurumi	Tsurumi, 80C 21.5, 1.5 kW,3-P,50 Hz1 year warranty
3.	Fine Screen	1	ICC Smart Eco	SS 304, 3 mm openings
4.	STP Tank	1	ICC SmartEco	Reinforced Concrete 25year warranty
5.	FBBR Media towers with aerators	16	ICC Smart Eco	Volume= 160 m ³ 25year warranty
6.	Tube Settler	1	ICC Smart Eco	Volume= 18 m ³ 25year warranty
7.	Sludge Transfer Pump	1	Evergush	1-P,50 Hz 1 year warranty
8.	Side Channel Blowers	3	Dereike	DHB 910C 16D5, 16.5 kW,3-P,50 Hz 1- Year Warranty
9.	Chlorine Disinfection Unit	1	FWT	5-7 lph,230 V,50 Hz Dosing Tank-PE,100 L 1- Year Warranty
10.	Control Panel	1	Orange	3 Phase,50Hz 1- Year Warranty
11.	Sludge Screw Press	1	Danmotec	1 m ³ /hr,2.07 Kw 1- Year Warranty
12.	Equalization Tank	1	ICC	RC -25years warranty
13.	Sludge Tank	1	ICC	RC-25years warranty
14.	Treated Water Tank	1	ICC	RC-25years warranty



Sewage Treatment Plant Bar Screen

Technical Commercial Offer

2021-10-14

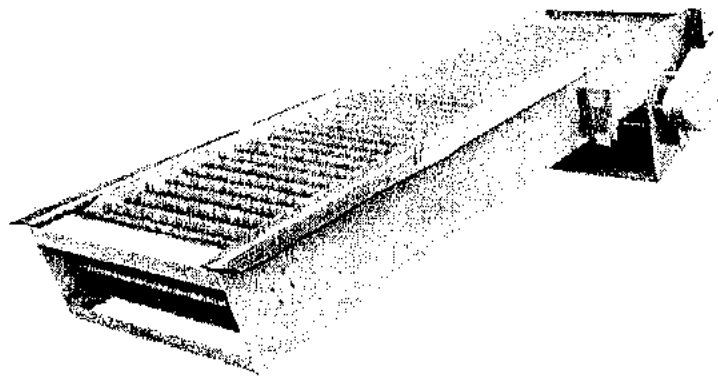
Shanghai Danmotech Environmental Technology Co., Ltd.

Add: Room 808, 3rd floor, No 175, East Yan'an Road, Huangpu District, Shanghai, China

www.danmotech.com Tel: 0086-18017588169

XQ0.6×2.5 Rotary Rake Bar Screen Machine

Technical Description



1. Technical parameter

quantity	1 Unit
Model	XQ0.6×2.5
Screen type	Coarse screen
Screen gap	B=10mm
Installation angle	$\alpha=75^\circ$
Outlet height	750mm
Motor Protect level	IP55
Motor insulation level	F level
Working time	24 hours/day continuous run or interval run

2. Main structures and Working principle

Rake Bar Screen is composed of transmission device, rake chain system, supporting frame and screenings removal mechanism.

1) Main structure

- a) Main machine frame is integrated type and the structure is secure and reasonable. It is welded to special assembly platform according to the JB/ZQ4000.3-86 General technical conditions for welding parts.
- b) Tooth is made of quality stainless steel and is formed through primary stamping by using mould and punching machine. Tooth surface shall have convex strips; ensure that deformation is not easy for the strength.
- c) tooth rake is a large rotational plane composed of many small tooth rakes. Nylon shall be used as isolation pad to ensure spacing between teeth. Dirt can be totally removed and the operation is flexible and reliable.
- d) Transmission device adopts horizontal cycloid pinwheel reduction box which is equipped with over-loading device (shear pin). This device can act accurately and it can effectively prevent damage caused by over-loading to motor reduction box.
- e) Chain is specially made wide chain plate stainless steel. Safety factor of chain is not less than 6 and there is no chain tension device. Chain and chain track form closed state, which can effectively prevent screenings falling into the track and to avoid jamming.
- f) Electrical overloading protection device adopts hot relay when faults occur on the machinery or over-loading is available, it will automatically stop and gives an alarm. Actions of this device are sensitive and reliable.
- g) This machine adopts fully automatic control. It can still work even if there is no one keeping it. In case of any jamming, it will give an alarm and automatically stop.

2) Working principle

This machine is an overall net composed of several small teeth. Under the driving by chain, it takes screenings from bottom to top. It discharges screening by means of self-weight of screenings and removal device.

3、 Assemble materials

·Tooth rake : SS304

·Pulling chain : SS304

·Holder : SS304

·Bolts and nuts : SS304

·Motor: SEW

4、 Electrical Control system

Screen is equipped with on-site control box with functions: running indicator lamp, start/stop control button, emergency stop button, socket for maintenance, local /remote switch. Protection level for shell of electrical control box is IP55.

Start and stop of screen can be automatically controlled by water level difference across the screen (self-prepared by users, liquid level difference controller interface shall be reserved in the electrical control box). Also, its start and stop can be controlled by time. on the site, manual switches are set to facilitate overhaul.

AWWA C504-74	Rubber Seated Butterfly Valves
ASTM B62	Composition Bronze or Ounce Metal Castings
ASTM B584-74	Copper-Alloy Sand Castings for General Applications
ASTM A307-74	Carbon Steel Externally/Internally Threaded Standard Fasteners
ASTM A153-73	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
DIN 2532	Cast-Iron Flanges, Nominal Pressure 10 ISO 2084-1974(e) Pipeline Flanges for General Use – Metric Series – Mating Dimensions
ISO R261-73 ISO	General purpose Metric Screw Threads – General Plan

ASTM A48/ASTM A126 Class B	Gray Iron Casting for valves, flanges, and fittings.
ASTM A167 - 74	Stainless and Heat Resisting Chromium - Nickel Steel Plate, Sheet and Strip.
ASTM B584/UNS C86700, C85800, C86200	Copper Alloy Sand Castings for General Application
CJ/T3048-1995	Plane bar screen waste remover
JB/T9046-1999	bar screen waste remover
JB2932-86	Water-treatment equipment manufacture specification
GB1220-84	Stainless steel chemical constitution and mechanical property
JB/ZQ4000.2-86	Cutting and machining common specification
JB/ZQ4000.3-86	Welding common specification
JB/ZQ4000.9-86	Assembly specification
GB1220	Stainless steel rod
GB8923-85	Surface rust-eaten level and rust cleaning level before painting
GB4879-99	Rust protection and packing
JB/ZQ4000.1-86	Product check common specification

6. Reliability and durability of the equipment

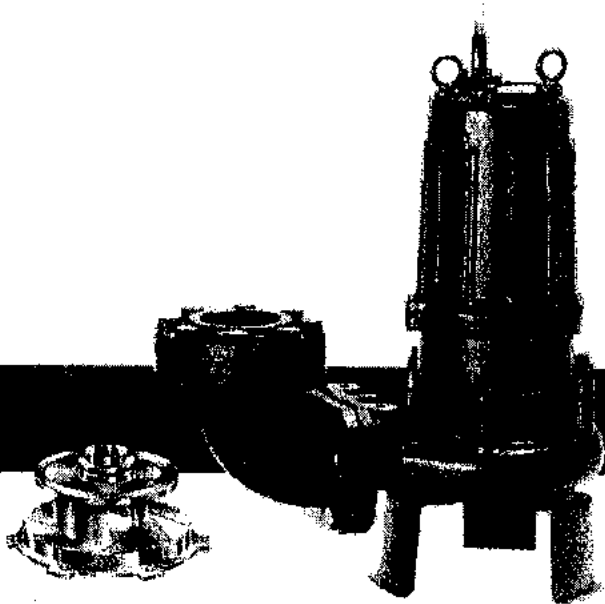
- a) Mean time between failures of the equipment is over 20000 hours.
- b) Service life of the overall machine is over 25 years.
- c) Maintenance for the equipment shall be made once per year; service life of reduction box and bearings must not be less than 15 years; service life of electrical devices is not less than 5 years.

7、 the prevention corrosion of the equipment

- a) After carbon steel pieces comply with the Sa2.5 level standard after de-rusting, apply primer, intermediate coat and top coat.
- b) After stainless steel parts are processed, their surface shall experience pickling treatment to increase surface degree of finish and to strengthen anti-oxidation ability.
- c) Prior to packaging, anti-corrosion treatment shall be made for mechanically processed surface according to requirements of GB4879.

C

**SEWAGE PUMPS
WITH CUTTER IMPELLER**



Submersible Sewage Pumps with Cutter Impeller

mi C-series pumps are heavy-duty, submersible cutter pumps for sewage and wastewater, which are made of castings and equipped with cutting mechanism. Featuring a combination of impeller vane razed sintered tungsten carbide alloy edge and a suction cover of serrated shape, the C-series pumps enable smooth pumping, while cutting fibrous foreign objects during suction. These pumps are used to drain sewage and wastewater from buildings and kitchens, and to transfer sewage and water in water treatment facilities of factories and commercial complexes.

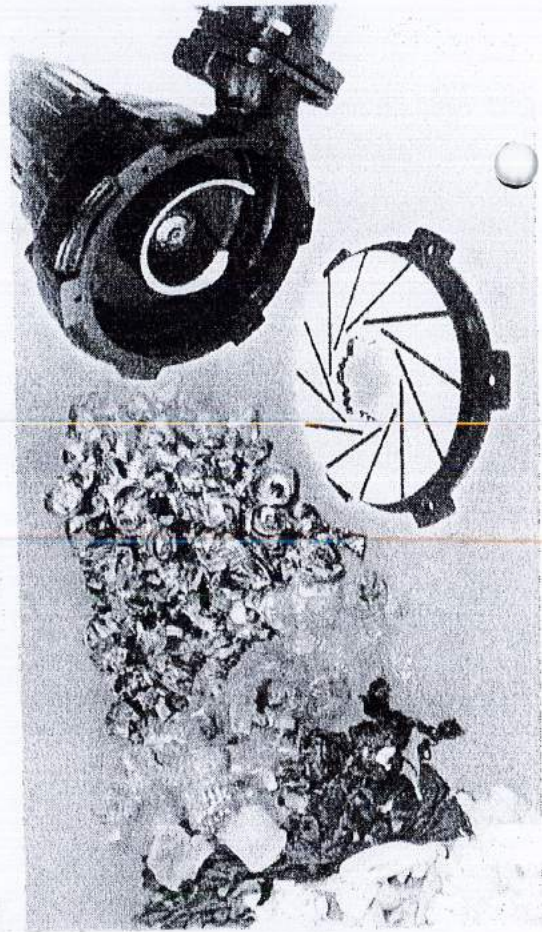
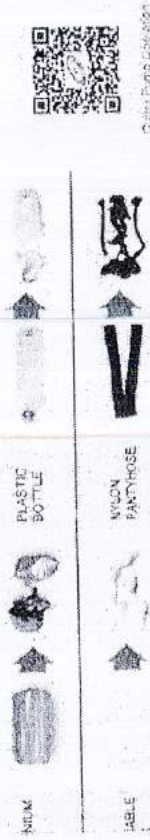
C-series comes in a wide product lineup, covering discharge bore diameters of 50 to 200 mm and outputs of 0.75 to 37 kW. Among the C-series pumps, "CR" models are available as highly-reliable cutter pumps, whose impeller and suction cover are made of high-chromium cast iron as a standard feature.

Models of the C-series can be used in combination with a guide rail fitting device that enables easy installation and maintenance. In addition, a new model of dry pit type is optionally available. The dry pit pump can be installed indoors, and outside a tank. With Tsurumi's original specifications for dry pit pump, it delivers the performance of conventional submersible pumps in a variety of sites.

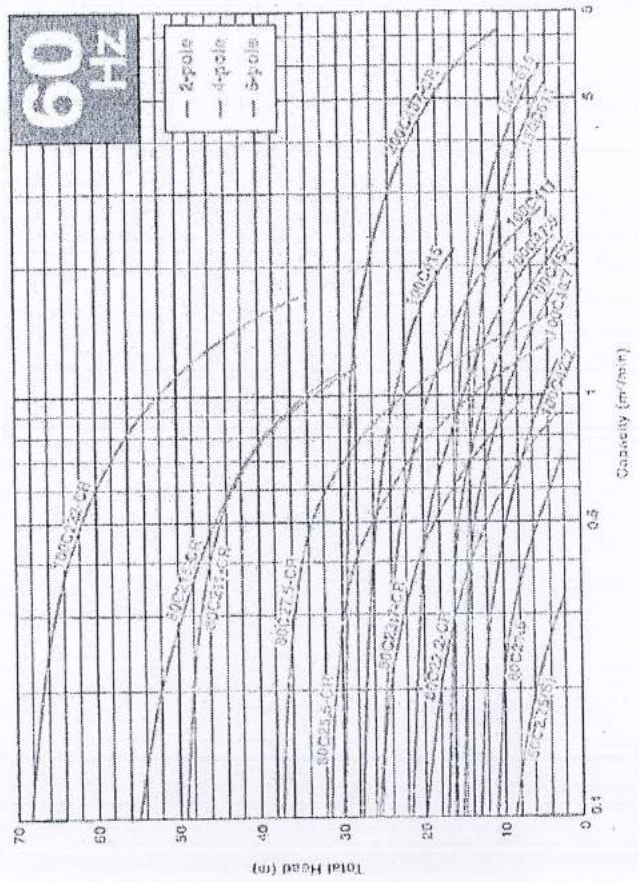
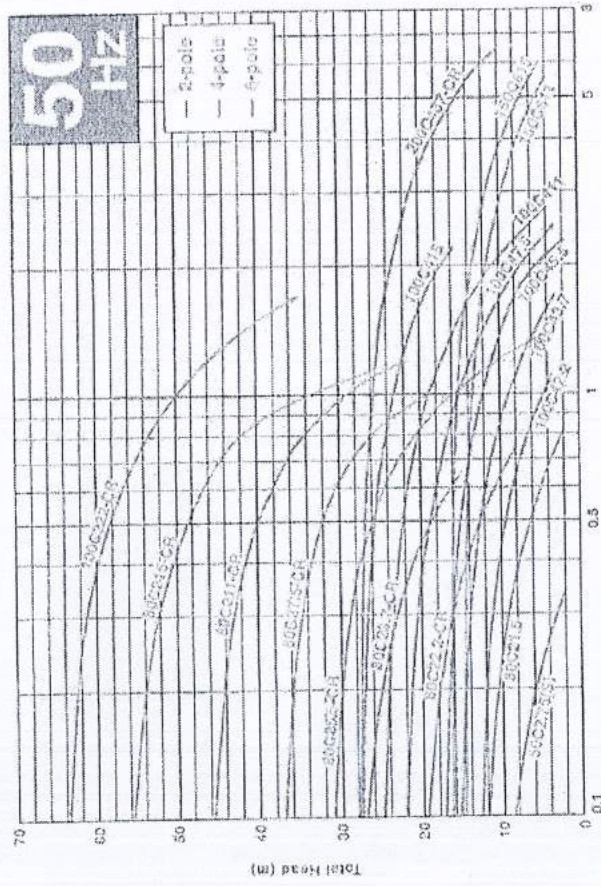
The pumps integrate original technologies that Tsurumi has researched and proven in the field over years, such as anti-wicking cable, dual inside mechanical seals with silicone carbide face and Oil etc.

Moreover, durability and wear resistance have been thoroughly considered in their design, so these pumps enable continuous duty over long periods of time. Our products are designed to provide excellent durability and sound quality, thus contributing to the smooth operation of facilities and enabling a considerable reduction in maintenance cost.

Handling various foreign objects with cutting mechanism



Performance Range



Selection Table

Discharge Pipe	50 - 150	100 - 200
Motor Output	0.75 - 22	0.2 - 97
Operation	[Checked Impeller with Cooling Engine]	
Coupling System	(Front) 10 - 2250 mm (Rear) 2250 - 5000 mm	18 meters pipe, 37.5m pipe (See note 1)
Automatic or Auto-Alternation Operation	W (Auto-Alternation) A (Automatic)	
Guide Rail System	B = 10	13 - 17
Feet Dia.		

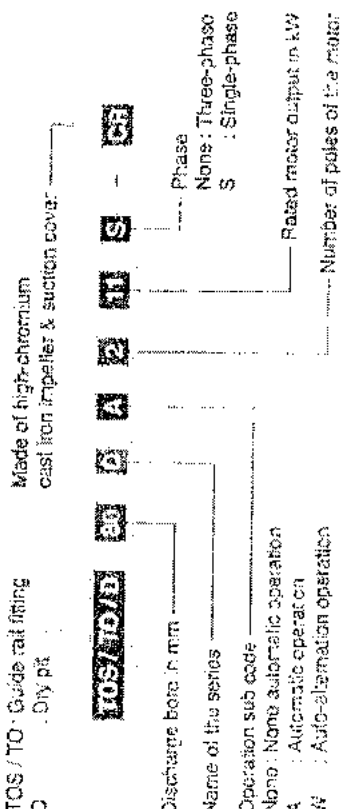
Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
CR	10	15	20	25	30	35	40	45	50	60	70	80	90	100	110	120	130	140
W	10	15	20	25	30	35	40	45	50	60	70	80	90	100	110	120	130	140
A	10	15	20	25	30	35	40	45	50	60	70	80	90	100	110	120	130	140
B	10	15	20	25	30	35	40	45	50	60	70	80	90	100	110	120	130	140
D	10	15	20	25	30	35	40	45	50	60	70	80	90	100	110	120	130	140
S	10	15	20	25	30	35	40	45	50	60	70	80	90	100	110	120	130	140
CR	10	15	20	25	30	35	40	45	50	60	70	80	90	100	110	120	130	140

* CR is high-chromium cast iron.
 * W is stainless steel with cooling engine.

Advanced Model "CR"

Among the C-Series pumps, the "CR" models have been developed to transfer wastewater containing foreign materials only and smoothly while maintaining high head and high volume. Since high-chromium cast iron is used for the impeller and the suction cover, the "CR" model pumps provide high durability and stable centrifugal duty over long periods of time. Also, with other models, the impeller and suction cover material can be upgraded to high-chromium cast iron as an option.

Model Number Designation

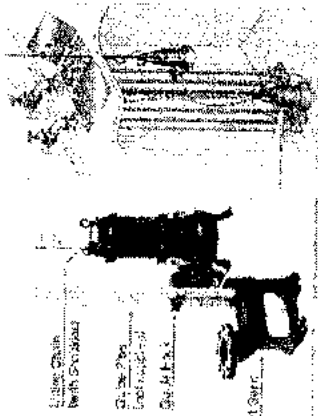


Guide Rail Fit System

The guide rail fitting system connects the pump to and from the piping easily just by lowering and raising the pump, allowing easy maintenance and inspection without the need to dismantle pumps. The TOS/TO is the guide rail fitting system made of cast iron and is compatible with cast iron pumps.

Accessories

- Duckfoot Bond
- Guide Support
- Guide Hook
- Lifting Chain Sm. (with Shankless)
- LSS (Lifting System) Pivoting



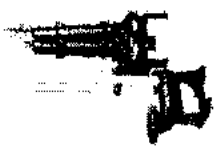
Search for details on

Automatic & Auto-Alternation Model

Tosumi offers an automatic alternation system by a duplex pump comprising an automatic model "A" unit and auto-alternation model "W" unit. The "A" unit is a submersible automatic pump and the "W" unit is a pump that has an alternating circuit. All without the need of extra wiring, level sensors, or control panels.

Automatic Model

The automatic model has an integral control circuit and a float switch that operates at low volume. It operates automatically in response to the change of water levels. This model can be identified by the suffix "A".



Search for details on

Auto-Alternation Model

The auto-alternation model is used along with an automatic model. The combination use of these two pumps enables each pump to operate alternately without control panels. This model can be identified by the suffix "W".

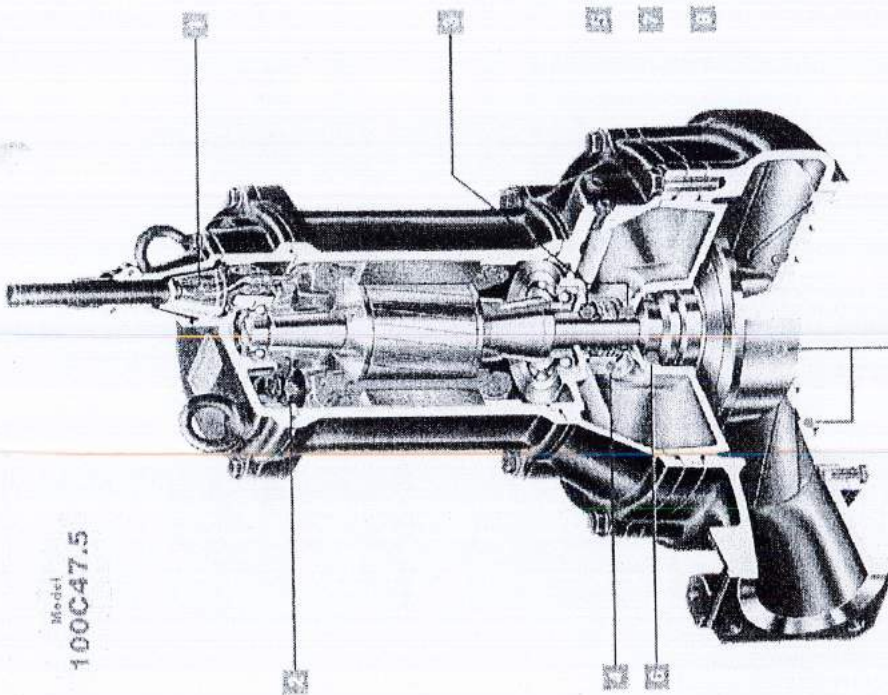


Search for details on

Options

- Seawater-resistant version; Galvanic anode & special impeller; 10 to 30°C
- High temperature liquids version; Made of high-chromium cast iron impeller & suction cover; Available upon request
- Special material version;
- Dry pit version;

Model
100C47.5



Impeller & Suction Cover

CUTTING MECHANISM

The cutter pump mechanism comprises a combination of impeller vanes with single or two brazed sintered tungsten carbide alloy edge and a suction cover of serrated shape. The front surface of the suction cover has numerous grooves that catch fibrous matter, which is then shredded by the tungsten carbide alloy edges of the impeller vanes and the saw teeth of the suction cover. This mechanism prevents the pump from being clogged with fibrous matter that can easily clog any pump.



Sintered Tungsten Carbide Alloy Edge

1 Anti-wicking Cable Entry

Prevents water intrusion due to capillary action should the cable sheath be damaged or the end of cable submerged. Also prevents moist air from infiltrating the motor housing and condensation from forming inside the housing due to temperature differences between the housing and outside air.

2 Motor Protector

Circle Thermal Protector (7.5kW and below)
Directly cuts the motor circuit if excessive heat builds up or occurrence occurs in the motor.
Miniature Thermal Protectors (1.1kW and above)
React to excessive heat caused by short-circuiting. The bimetal strip opens to cause the control panel to shut the power supply.

3 Dual Inside Mechanical Seals with Silicon Carbide Faces

Located in the oil chamber where a quiet, non-corrosive and abrasion-free lubricating environment is maintained. Combined with the water-cooled outside mechanical seal, it reduces the risk of failure caused by dry-heating and adhering matter. The silicon carbide provides 5 times higher corrosion, wear and heat resistance than the tungsten carbide. Rubber parts of the upper and lower fixing rings are made of NBR or FPM (FKM), which provides higher resistance to heat and chemicals.

4 Oil Lifter (Patented)

Provides lubrication and cooling of the seal faces down to 1/3 of normal oil level, thus maintaining a stable shaft sealing effect and prolonging seal life longer.

5 Leakage Sensor

Fleet Type (300C15-OR and 100C228-OR)
Electrode Type (200C437-OR)
Detects flooding into the incursion water storage chamber and oil chamber that may occur in a worst case scenario. When flooding is detected, signals are sent to operate the indicator lamps through the external control panel.

6 Oil Seal

Used as a "Dust Seal," it protects the mechanical seal from abrasive particles.

7 Seal Pressure Relief Port (5.5kW and above of 2-pole, 200C437-OR)

Protects the mechanical seal from pump pressure. It also protects the seal face by discharging wear particles.

8 Air Release Valve (Excluding some models)

Fitted on the pump casing to prevent the air lock. When air flows through the valve, the ball stays at the bottom, but when the pumped water starts to flow, the ball closes the outlet because of its buoyancy.

Options

✓ Seawater-Resistant Version

In seawater, a material's resistance to corrosion can be seen clearly. When metals with different potentials are brought into contact in seawater, only the metal of lower potential corrodes. As the difference in potential increases, the metal of lower potential corrodes faster. As an option, Tsurumi can supply pumps with parts made of higher electric potential metal as the sacrificial anode.

✓ High Temperature Liquids Version

Tsurumi's submersible pumps are applicable to high temperature liquids of up to 80°C. Pumps of the standard specification can discharge liquids of up to 40°C. However, there are many fields that need to discharge higher temperature liquids, e.g., discharging industrial water from a power plant or ironworks, or discharging hot spring water from a mine in a volcanic zone.

✓ Special Material Version

Tsurumi can also provide you with pumps with essential components such as the impeller, pump casing and the suction cover made of non-standard materials. Select from stainless steel, high-chromium cast iron and bronze to suit your specific requirements.

Special Option: Dry Pit Version

Developed with Tsurumi's original specifications, aiming for stable operation and reduction in maintenance labor.

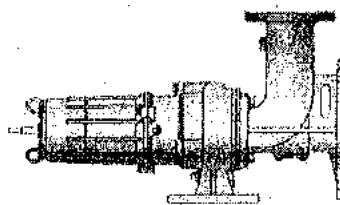
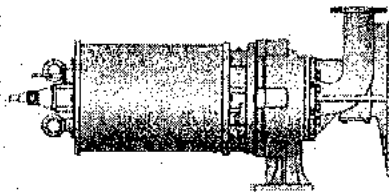
As a special option of the Tsurumi D-series cutter pumps, dry pit specifications are available. The dry pit pumps have been designed to drain wastewater from buildings, in which a mixture of all kinds of sewage and wastewater is expected.

The dry pit pumps can be installed indoors and outside of tanks, and still deliver the performance of conventional submersible pumps. Daily inspection and maintenance are easy, because the pump body is installed indoors.

These pumps have been developed with Tsurumi's original specifications, aiming for stable operation and reduction in maintenance labor. Of course, the dry pit pumps inherit the anti-wicking cable, dual inside mechanical seals with silicone carbide faces on the sides that are not in contact with wastewater, and Oil Lifter from Tsurumi's submersible pumps. In addition, they are designed with the maximum consideration for high-temperature resistance, with bearing grease for high temperature use, class H insulation, a leakage sensor, mechanical seals made of PPM (FKM), and high-grade lubricating oil as standard specifications. Pump models of 7.5 kW or lower motor output come without a water jacket, while the models of 11 kW or higher motor output are equipped with a water jacket as a standard feature.

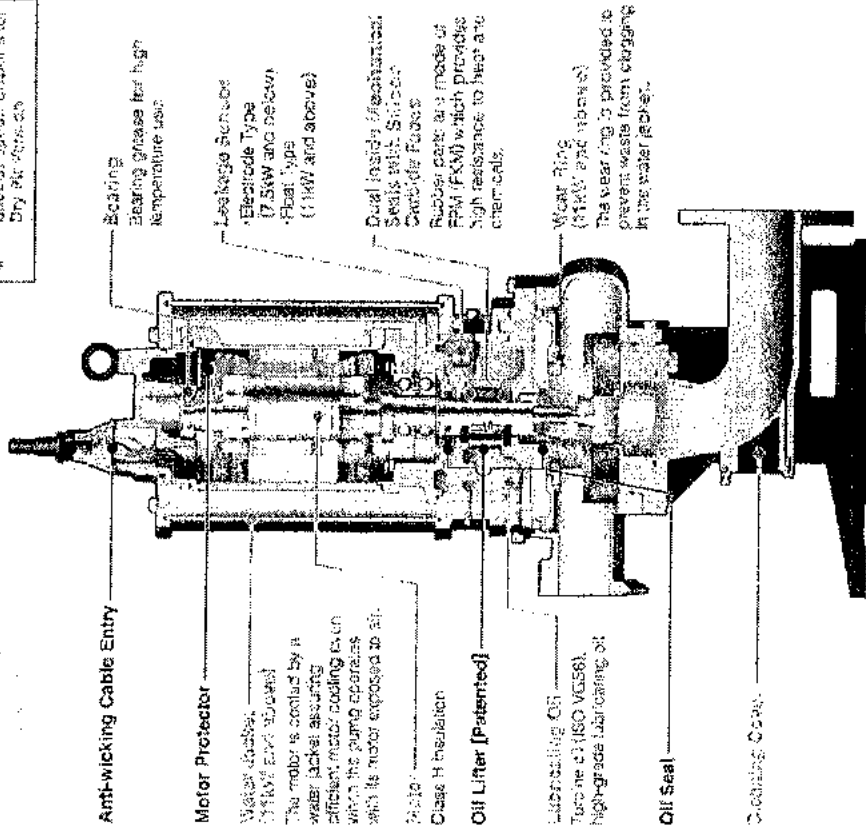
As the most advanced feature of the 11 kW or higher output models, a wear ring is provided to prevent waste from clogging in the water jacket. Thus, solids can enter too water jacket only through the minute clearance between the impeller and the wear ring. This structure is a Tsurumi-original design.

As described above, Tsurumi's dry pit pumps feature a high quality, highly-reliable design that ensures excellent durability and high wear resistance. They can be installed in a variety of sites and will help keep facilities operating steady and will necessarily reduce maintenance costs.

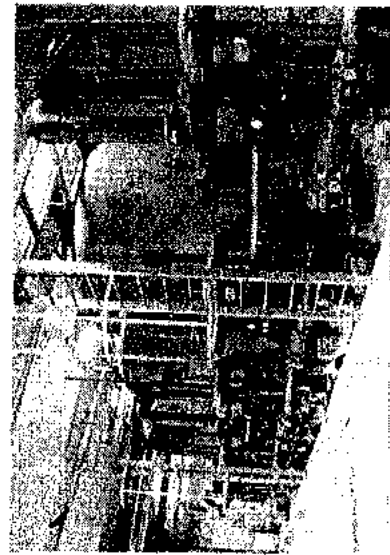
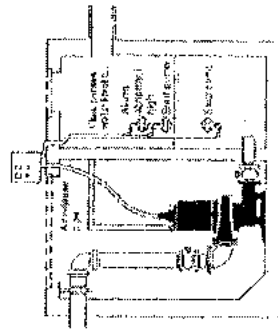


Model D100C415

Standard Specifications
 * - Sealed Special options for Dry Pit Version



Example of Installation

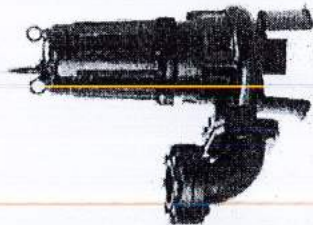


C (2-pole) -cutter Impeller

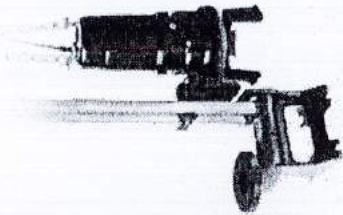
The C-series is a submersible cutter pump designed for handling raw sewage, wastewater, and heavy-duty industrial applications, where the pump is subject to clogging from excessive material. Single or two tungsten carbide alloy edge bladed on the impeller vane on the serrated suction cover. This mechanism cuts incoming fibrous material into pieces, permitting smooth passage of fibrous material. The impeller and suction cover of the "CR" type are made of high-chromium cast iron, ensuring excellent durability and enabling the pump to maintain high performance for an extended period.



50C2.75

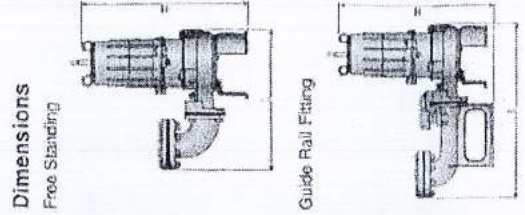
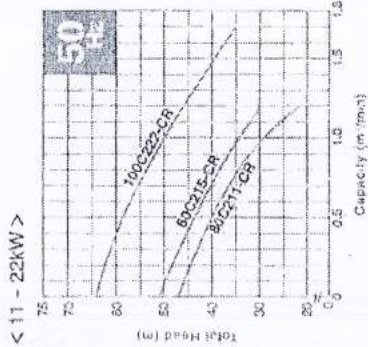
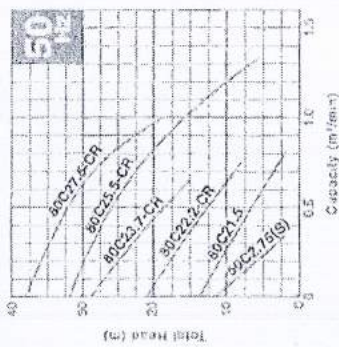
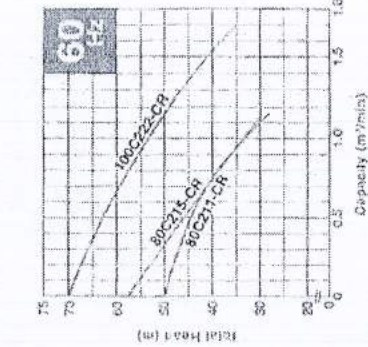
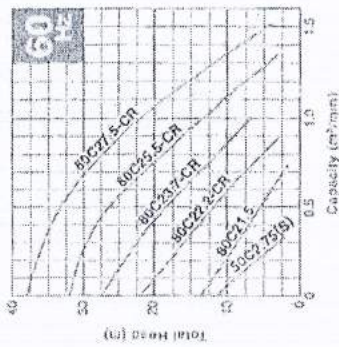


80C23.7-CR



TOS80C23.7-CR

Performance Curves



Dimensions
Free Standing

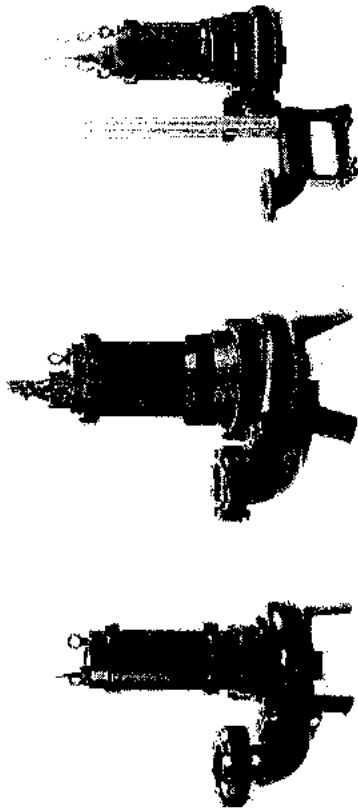
Guide Rail Fitting

Discharge Bore mm	Standard Model		Automatic Model		Auto-Alternation Model		Water Output kW	Starting Method	Phase	Dimensions L x H mm		Dry Weight kg		Cable Length m				
	Free Standing	Guide Rail Fitting	Free Standing	Guide Rail Fitting	Free Standing	Guide Rail Fitting				Free Standing	Guide Rail Fitting	Free Standing	Guide Rail Fitting		Free Standing	Guide Rail Fitting	Free Standing	Guide Rail Fitting
50	50C2.75	TOS80C2.75	50C2.75	TOS80C2.75	50C2.75	TOS80C2.75	0.75	Capacitor Start	Three	405 x 525	320 x 550	465 x 580	321 x 654	52	50	34	32	5
50	50C2.75	TOS80C2.75	50C2.75	TOS80C2.75	50C2.75	TOS80C2.75	0.75	D.O.L.	Three	405 x 525	320 x 550	465 x 580	321 x 654	52	50	34	32	5
50	80C21.5	TOS80C21.5	80C21.5	TOS80C21.5	80C21.5	TOS80C21.5	1.5	D.O.L.	Three	465 x 580	465 x 580	600 x 700	650	50	34	40	38	6
50	80C23.7-CR	TOS80C23.7-CR	-	-	-	-	2.2	D.O.L.	Three	465 x 580	465 x 580	-	-	70	54	-	-	10
50	80C25.5-CR	TOS80C25.5-CR	-	-	-	-	3.7	D.O.L.	Three	515 x 630	465 x 580	-	-	70	54	-	-	10
50	80C27.5-CR	TOS80C27.5-CR	-	-	-	-	5.5	D.O.L.*	Three	515 x 630	465 x 580	-	-	125	113	-	-	10
50	80C27.5-CR	TOS80C27.5-CR	-	-	-	-	7.5	D.O.L.**	Three	515 x 630	465 x 580	-	-	150	125	-	-	10
50	80C21.5-CR	TOS80C21.5-CR	-	-	-	-	11	Star-Delta	Three	515 x 630	465 x 580	-	-	150	125	-	-	10
50	80C21.5-CR	TOS80C21.5-CR	-	-	-	-	15	Star-Delta	Three	515 x 630	465 x 580	-	-	250	205	-	-	15
100	100C22-CR	TOS100C22-CR	-	-	-	-	22	Star-Delta	Three	807 x 1148	725 x 1148	-	-	400	340	-	-	10

* Star-Delta available upon request.
** All weights excluding cable.
Weights of guide rail fitting excluding installation.

C (4-6-pole) - Cutter Impeller -

The C-series is a submersible cutter pump designed for handling raw sewage, wastewater, and heavy-duty industrial applications, where the pump is subject to clogging from oversized material. Single or two tungsten carbide alloy edge blades on the impeller, sunk on the serrated suction cover. This mechanism cuts incoming fibrous material into pieces, permitting smooth passage of fibrous material. The impeller and suction cover of the "CR" types are made of high-strength cast iron, ensuring excellent durability and enabling the pumps to maintain high performance for an extended period.



100C43.7

100C45.5

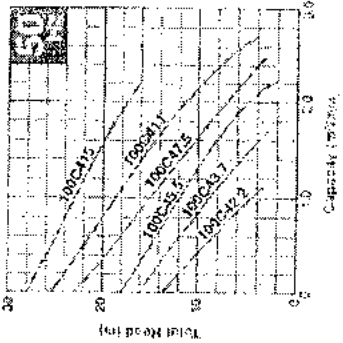
TOS100C411

Discharge Size mm	Model	Impeller Output (l/s)	Starting Method	Impeller L x H mm	Shaft Dia. mm	Impeller Dia. mm	Impeller Weight (kg)	Guide Rail Length (m)
120	100C43.2	10S100C411	D.O.L.	555 x 347	75.4 x 56	38	64	6
150	100C43.7	TOS100C411	D.O.L.	601 x 315	75.4 x 56	61	50	6
170	100C45.5	TOS100C411	D.O.L.	630 x 315	60.8 x 51.6	130	125	6
180	100C47.5	TOS100C411	D.O.L.	665 x 328	60.8 x 51.6	144	137	6
200	100C411	TOS100C411	Star-Point	700 x 360	50.8 x 51.6	175	172	2
240	100C415	TOS100C411	Star-Point	707 x 380	50.8 x 51.6	201	201	2
250	100C411 CR	TOS100C411-CR	Star-Point	707 x 380	50.8 x 51.6	201	201	2
250	100C415 CR	TOS100C415-CR	Star-Point	707 x 380	50.8 x 51.6	201	201	2
250	200C437-CR	TOS100C411-CR	Star-Point	707 x 380	50.8 x 51.6	201	201	2
250	200C457-CR	TOS100C411-CR	Star-Point	707 x 380	50.8 x 51.6	201	201	2

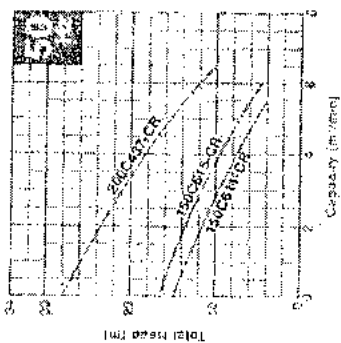
* Star-Point starting method is available only for CR type.
 * 200C437-CR and 200C457-CR are available only for CR type.

Performance Curves

< 4-pole 2.2 - 15kW >

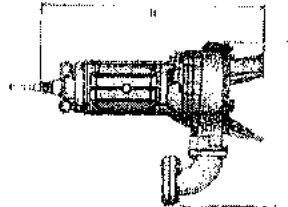


< 4-pole 37kW, 6-pole 11-15kW >

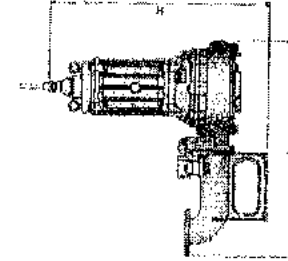


Dimensions

Prog Standing



Guide Rail Fishing





We reserve the right to change the specifications and designs for improvement without prior notice.

TSURUMI
MANUFACTURING CO., LTD.

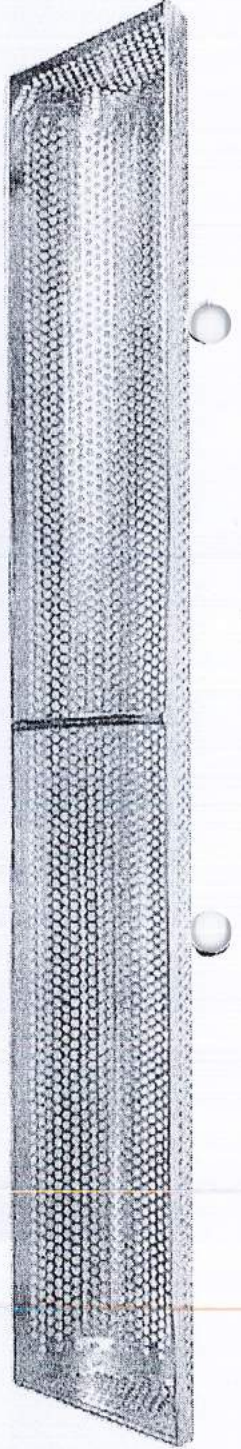
Your Dealer

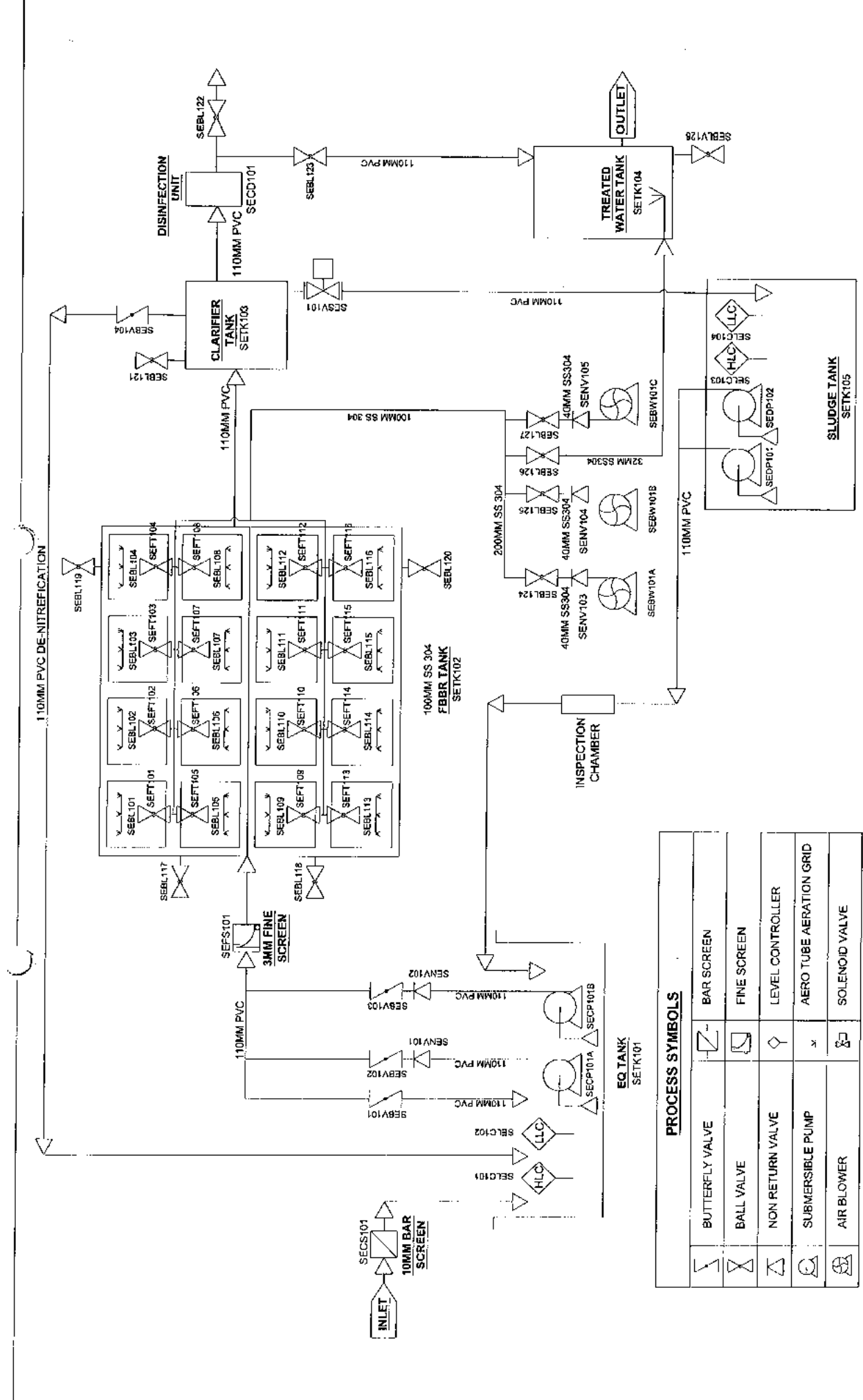
© 2018 TSURUMI MANUFACTURING CO., LTD.
Printed in Japan IA112-H-NPG-D-F-V

U-Shaped Trench Drain Scrap Basket



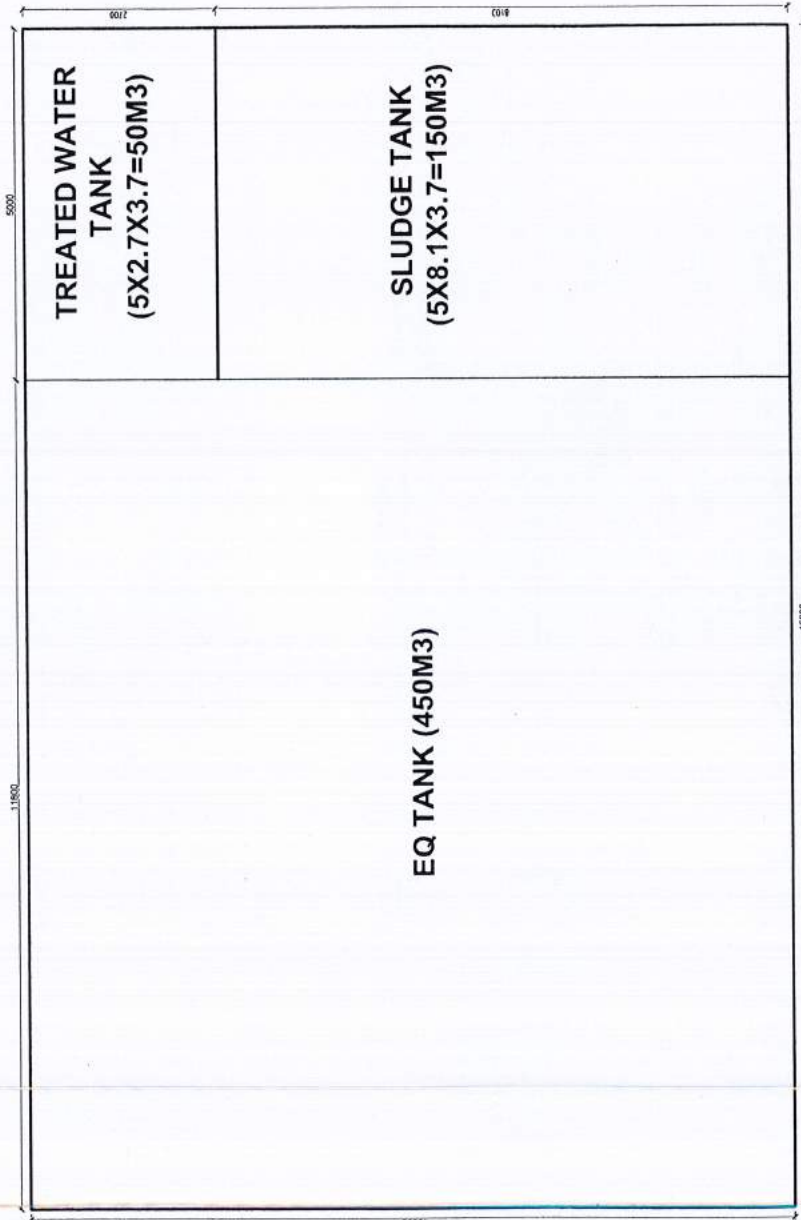
2 or 3 feet Long!





PROCESS SYMBOLS	
	BUTTERFLY VALVE
	BALL VALVE
	NON RETURN VALVE
	SUBMERSIBLE PUMP
	AIR BLOWER
	BAR SCREEN
	FINE SCREEN
	LEVEL CONTROLLER
	AERO TUBE AERATION GRID
	SOLENOID VALVE

<p>PROJECT</p> <p>STP FOR SABARAGAMUWA UNIVERSITY STP - 01 11/10/2021/SE/STP-01/SABARAGAMUWA/P&ID/ V001</p>	<p>TITLE</p> <p>PIPING AND INSTRUMENTATION DIAGRAM</p>
<p>NOTE</p>	
<p>NCC SMART ECD SOLUTIONS, No. 02, S. No. 5, Kohuwala, Nuwara-Eliya, Kohuwala, Nuwara-Eliya, Sri Lanka.</p> <p>Tel : 0112 814204, Email : smartecd@ncc-consult.com Web : www.ncc-consult.com</p>	
<p>DESIGNED: NCC SMART ECD SOLUTIONS</p> <p>DRAWN: N. B.</p> <p>SCALE: 1:1</p> <p>CAD NO: SEBTP/SABARAGAMUWA/P&ID/V001</p> <p>DATE: 11/10/2021</p> <p>CAD FILE: SEBTP/SABARAGAMUWA</p> <p>DRAWN BY: C.B.S</p> <p>SHEET NO: 01/01</p>	



PLAN

NOTES.
 1. INTERMEDIATE SUPPORTS FOR THE FBRR TANK SLAB ON TOP OF THE EQ TANK CAN BE DECIDED AS PER THE STRUCTURAL DESIGN REQUIREMENTS.

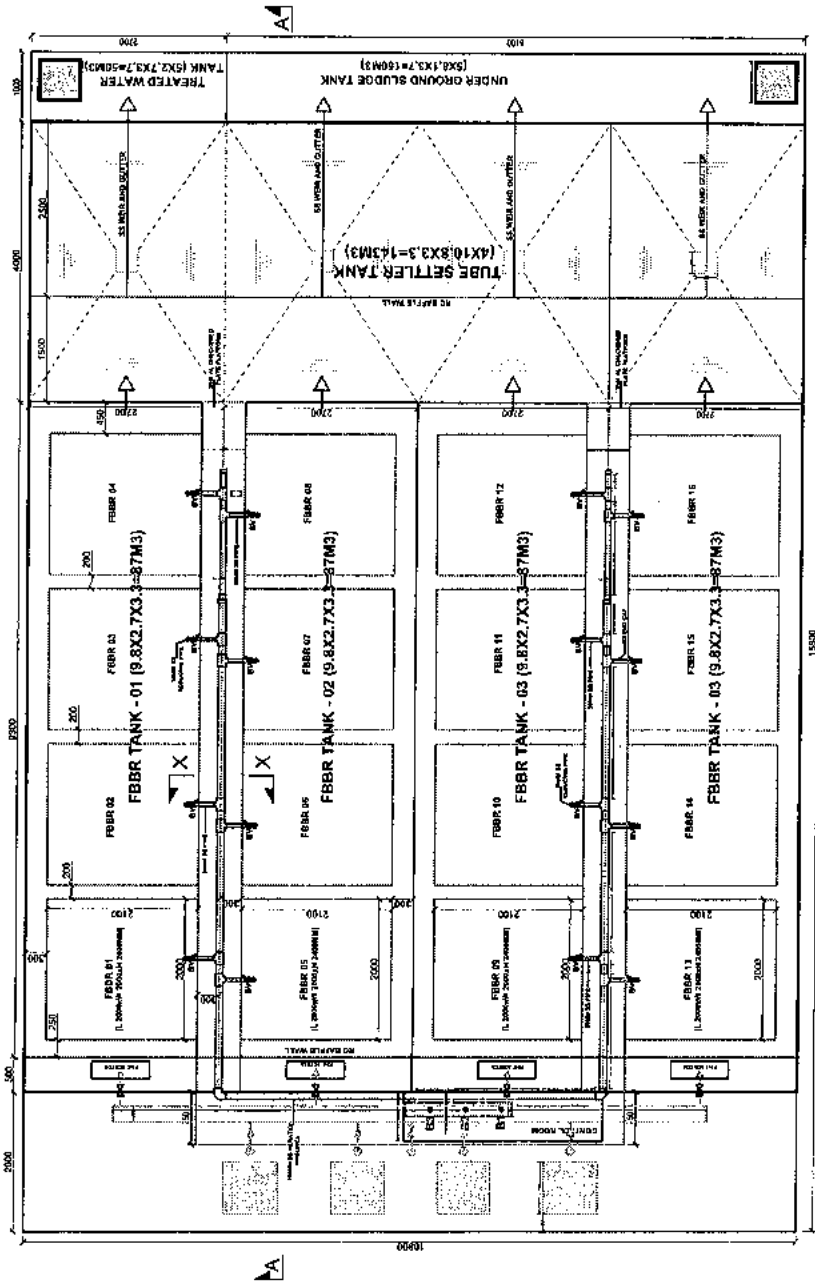
PROJECT
 STP FOR SABARAGAMUWA UNIVERSITY
 STP - 01
 18/10/2021/STP-1/SABARAGAMUWA/V003

TITLE
 PLAN VIEW OF EQ AND
 SLUDGE TANK
 (BASIC DIMENSION DRAWING)

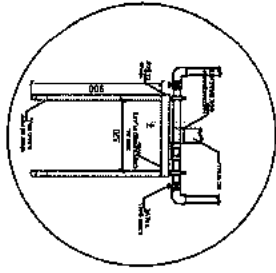
NOTE
 1. ALL DIMENSIONS ARE IN MILLIMETERS
 1. ALL TANKS ARE R/C

ICC SMART ECO SOLUTIONS
 ICC SMART ECO SOLUTIONS
 No 87, S ee S Jayasinghe Mawatha,
 Korumbala, Nugegoda, Sri Lanka.
 Tel : 0112 814204
 Email : smarsaco@icc-construct.com
 Web : www.icc-construct.com

DESIGNED	ICC SMART ECO SOLUTIONS
DRAWN	KE
SCALE	N/T
DWG NO	18/10/2021/STP-1/SABARAGAMUWA/V003
DATE	18/10/2021
CAD FILE	18/10/2021/STP-1/SABARAGAMUWA
CHECKED	KE
SHEET NO	14/14



PLAN



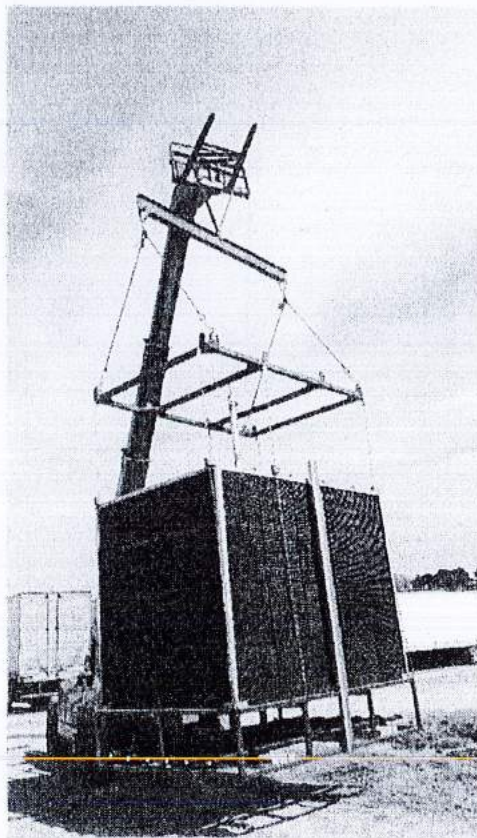
SECTION X-X

PROJECT STP FOR SABARAGAMUWA UNIVERSITY 18/10/2021/STP1/SABARAGAMUWA/V003	TITLE PLAN VIEW OF STP AERATION LINES & PLATFORMS (BASIC DIMENSION DRAWING)	NOTE 1. ALL DIMENSIONS ARE IN MILLIMETERS 1. ALL TANKS ARE R/C		DESIGNED: ICC SMART ECO SOLUTIONS
				DRAWN: A/E
				SCALE: 1/10
				DWG NO: 18/10/2021/STP1/SABARAGAMUWA/V003
				DATE: 18/10/2021
				CAD FILE: 18/10/2021/STP1/SABARAGAMUWA/V003
				CHECKED: C.B.S.
				SHEET NO: 01
				TALK : 0112814854 EMAIL : smartec@sabagmuwa.lk WEB : www.smartec.lk



Fixed bed biofilm reactor system (FBBR)

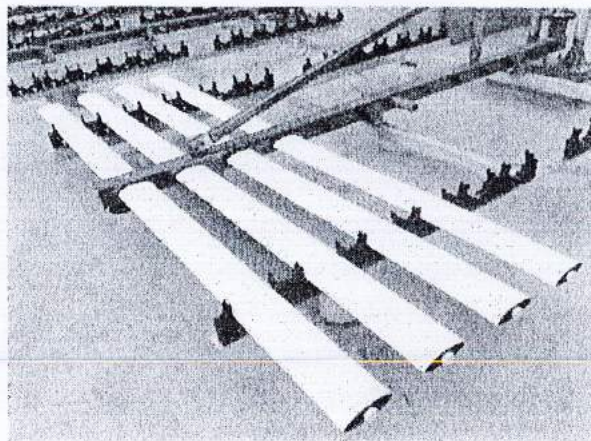
AET turnkey solutions for BOD and ammonia removal



Retrievable FBBR system unit



Component 1: Fill media



Component 2: Aeration diffusers



Aqua Equip Technologies LLC
PO Box 1790
Tarpon Springs, FL 34684

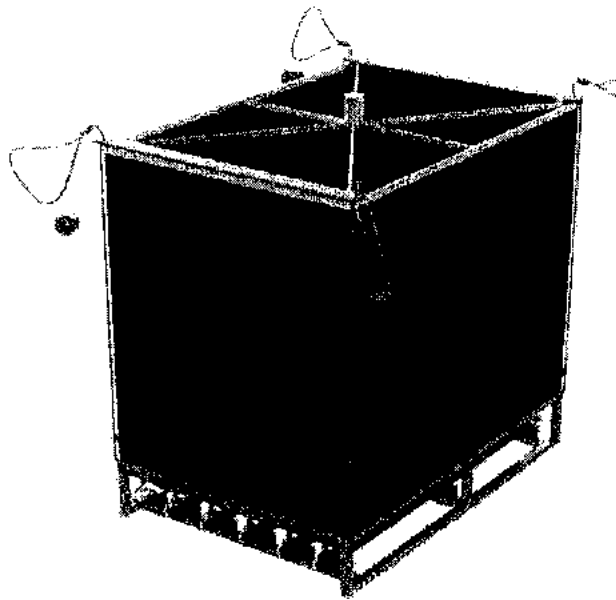
Phone: 727 238 2504
Email: info@aqua-equip.com

FBBRs (fixed bed biofilm reactors) are used in various wastewater treatment applications for BOD and ammonia removal. The product consists of two main components: Plastic fill media and aeration diffusers. Biofilm microorganisms settle down on the fill media surface and digest organic waste in water (BOD) under consumption of oxygen. After all BOD is removed the microorganisms facilitate the oxidization of ammonium NH_4^+ to NO_3^- (Nitrate).

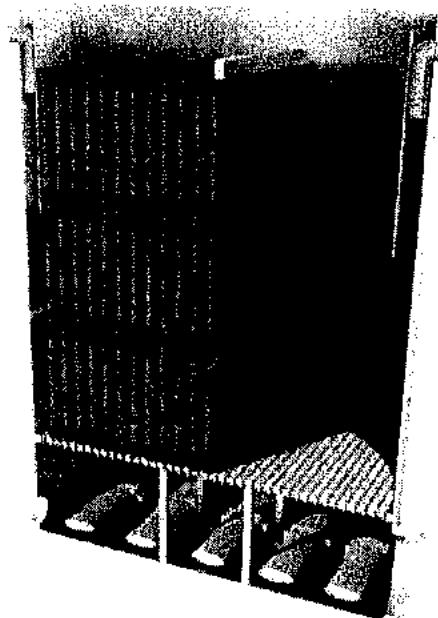
AET supplies various types of fill media and aeration diffusers differing in materials, surface area and dimensions to meet our customers individual demands.

The FBBR system consists of individual, retrievable cage units to allow easy installation, maintenance and upgrades. If needed, AET can also supply complementary air distribution piping, FRP tankage, blowers, monitoring equipment and more.

Design examples:



Single FBBR cage unit



FRP tankage incl. FBBR for smaller flows



Aqua Equip Technologies LLC
PO Box 1790
Tarpon Springs, FL 34684

Phone: 727 238 2504
Email: Info@aqua-equip.com

System advantages:

- Fine bubble strip diffusers for efficient oxygen supply of attached Biofilm growth
- Turndown rate of 16:1 and better SOTE% compared to disc or tube aeration reduces energy costs
- VFDs for automated blower operation and biofilm scouring possible
- Retrievable system and individual ball valves per FBBR unit ensure easy maintenance
- Modular cage construction allows easy FBBR expansion if needed
- Polypropylene fill media ensures long life span of media and reduces brittleness and chipping compared to PVC fill media
- Vertical flow design fill media provides maximum surface area of 38sft/cft but reduces risk of clogging

Applications:

In comparison to activated sludge, FBBRs are less sensitive for volatile flows, interrupted aeration or grease leaks which makes them a good fit for industrial applications such as:

- Food and beverages
- Meat processing
- Dairy
- Lagoon bypasses
- Chemicals
- Leachate
- Pharmaceuticals
- Energy
- Pulp and Paper

Furthermore, FBBRs are an easy and effective upgrade for existing activated sludge basins. By adding the FBBR units into an activated sludge basin additional biomass will grow on the media surface increasing the total sludge volume by up to 50%. The combination of activated sludge and FBBRs is also known as IFAS (integrated fixed film activated sludge).

Please contact us for more information and design support.

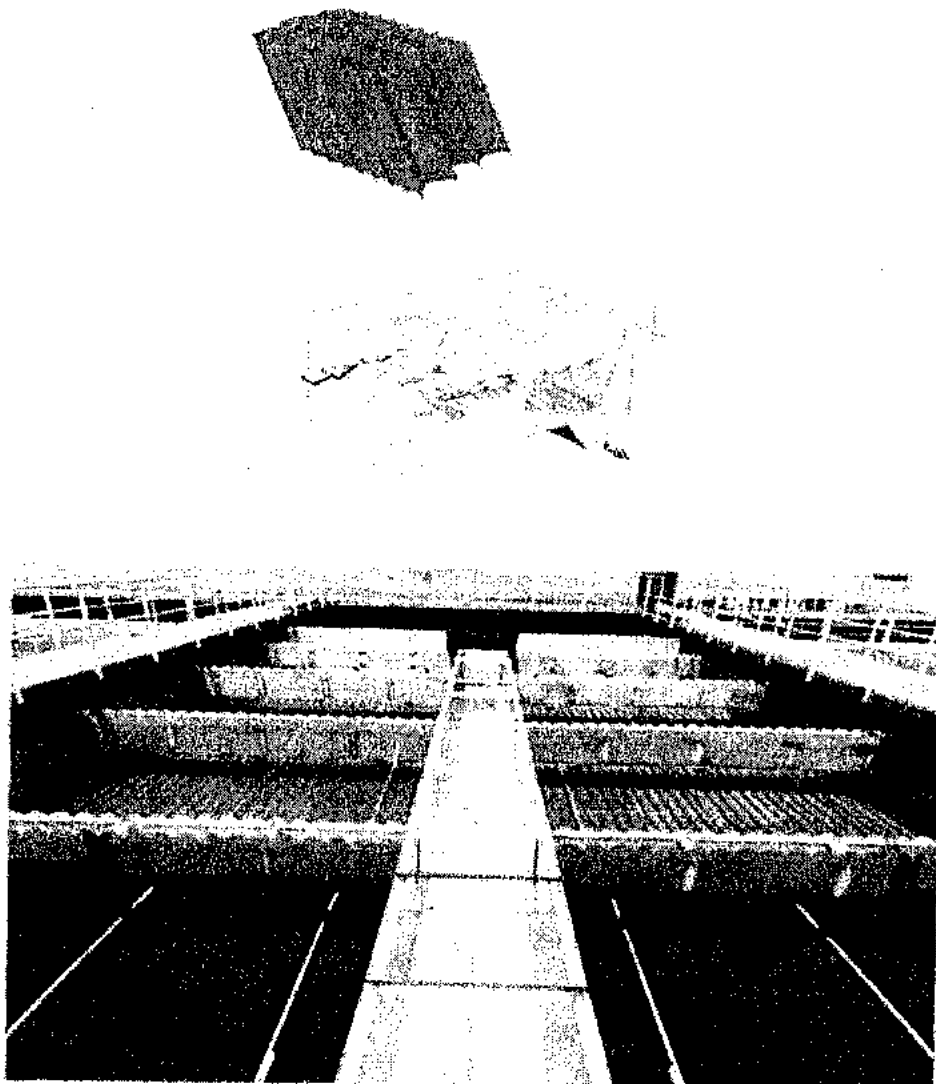
This information has been put together with greatest care. However, any performance data given in this leaflet is subject to compliance with certain surrounding conditions and hence may vary from case to case. Further, we reserve the right to make changes at any time and without notice. We strongly recommend reconfirm with us if this information is still valid.



Aqua Equip Technologies LLC
PO Box 1790
Tarpon Springs, FL 34684

Phone: 727 238 2504
Email: info@aqua-equip.com

The Clarifiers of all units will be similar with varying volumes of lamella tubes.

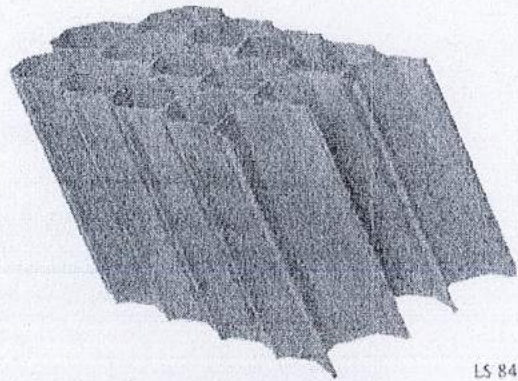
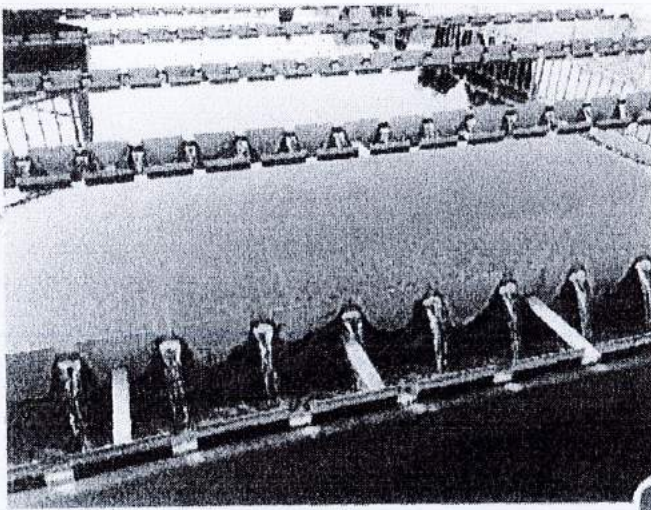


Solid liquid separation is made by use of inclined tube settlers set at 60d angle to increase projected area. The Polypropylene tube settlers exhibit a life of over 50 years.



HEWi^{Tube} Lamella Clarifier Series

Boosting the sedimentation efficiency



LS 84

The application of inclined settling planes to increase the sedimentation performance is an unchallenged technology; it's applied in numerous plants worldwide covering hundreds of applications.

HEWi^{Tube} modules equalize the flow and facilitates the phase separation of particles, flocs or sludge.

Depending on the task, we provide designs with different angles, lamella spacings and chevron types for a controlled pathway of down-sliding sludge.

HEWi^{Tube} modules are customized to fit into round or rectangular tanks. The modules are made of rigid Polypropylene and can be placed directly into the tank sitting on a supporting structure.

AET also provides additional customized package components such as support structure and HEWi^{Tube} effluent launders for the best benefit of our customers. For remote projects we offer a local self-assembly option in order to reduce logistics and labour cost.

Features:

- High settling efficiency
- Proven technology
- Made of rigid PP
- Up to 70°C temperature resistant
- Self-supporting structure
- Blue colour for potable water application
- High mechanical strength
- Easy installation of modules
- Circular or rectangular tanks
- Onsite Self-assembly option
- Optional components
- Proven technology





HEWI^{Tube} Lamella series

Water and waste water application



model	LS50	LS84	LS60	LS38
Typical Application	Potable water Rainwater treatment Process water Humus tanks	Primary sedimentation Activated sludge Combined sewer overflow	Effluent Polishing Potable water Humus tanks	Effluent Polishing Aquaculture Rainwater treatment
made	Polypropylene	Polypropylene	Polypropylene	Polypropylene/PVC
Angle	45°-90° STD 55°/60°	45°-90° STD 55°/60°	60°	60°
Channel	Equidistant chevron	Equidistant chevron	Trapezoidal flutes	Trapezoidal flutes
Specific surface*	~13 m ² /m ³ (55°) ~11 m ² /m ³ (60°)	~7 m ² /m ³ (55°) ~6.3 m ² /m ³ (60°)	11.5 m ² /m ³ (average)	15 m ² /m ³ (average)
Hydraulic radius	17mm	25mm	17mm	17mm
Certification	KTW / NSF	KTW / NSF		
Color(s)	Black Blue (KTW/NSF)	Black Blue (KTW/NSF)	Black	Black
Std dimension				
Length (mm)	300 - 1500	300 - 1500	800 - 2400	800 - 2400
Width (mm)	300 - 1500	300 - 1500	300 - 600	300 - 600
Height (mm)	500 - 2000	500 - 2000	300	600

* Vertical projected surface with 10% set back surface

Design Guideline for HEWI^{Tube} Lamella settlers

Most engineers are using Hazen's law as design approach for the settling efficiency.

Hazen's law links the settling velocity (Vs) of the target particle with the flow rate (Q) and the installed vertical projected surface (A_v).

The Hazen-velocity (V_H = Q/A_v) is the most important design parameter.

Particles with a settling velocity that is equal or faster than the Hazen-velocity will be removed.

Typical Design Hazen Velocity

Feed water	Hazen	Product HEWI ^{Tube}
Potable water	0,6 - 0,9 m/h	LS50 / LS60
Primary settling	0,9 - 1,2 m/h	LS85
MBBR effluent	0,4 - 0,5 m/h	LS50
Trickling filter effluent	0,5 - 0,8 m/h	LS50
Polishing	0,6 - 0,8 m/h	LS50 / LS60
Aqua culture	0,4 - 0,8 m/h	LS50 / LS38

This general information about technical data and descriptions of our products has been put together with greatest care. We reserve the rights of any changes without further notice. We recommend to check data before using in local project design. All data without obligations and consequences due to non-compliance.

Our partners



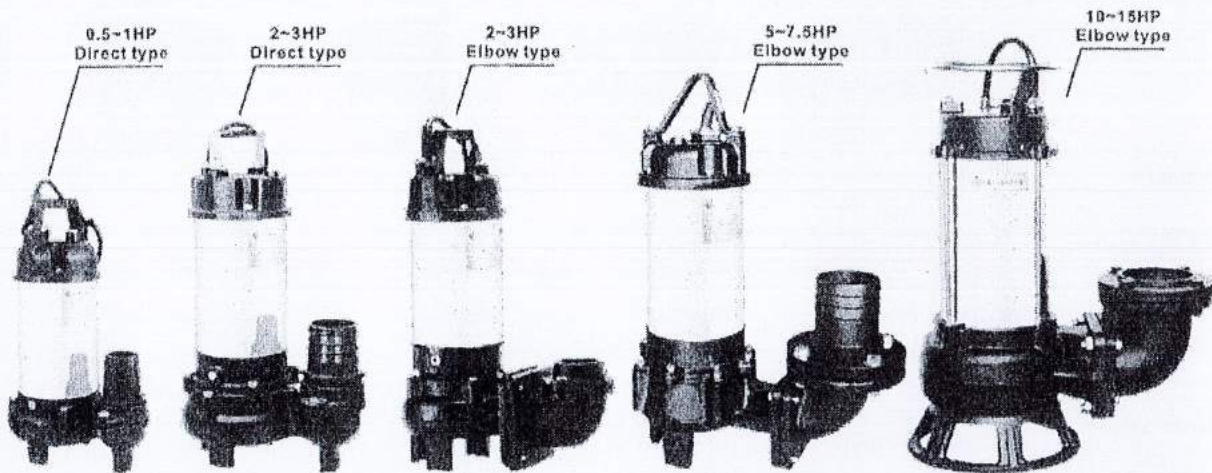
C. E. Shephard Company, L. P.



Aqua Equip Technologies LLC, PO Box 1790, Tarpon Springs, FL 34688

EF-series
50Hz

Submersible Sewage Pumps



Features

- Non-clogging impeller minimizes abrasives wear and allows large solid passage.
- Dry motor with overload protector; Cable with an epoxy resin sealed water-proof cable hood; Use deep groove C3 bearing to extend life time.
- Superior abrasion resistant double mechanical seal to ensure best seal effect.
- Oil seal mounted outside of seal chamber stops solids gathering around seal faces.

Motor Spec.

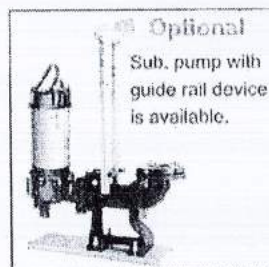
- 2P dry or oil type motor.
- Insulation: F class.
- Protection: IP68.
- Frequency: 50Hz
- Voltage: 1φ220~240V(0.5~2HP)
3φ220~660V(all models)



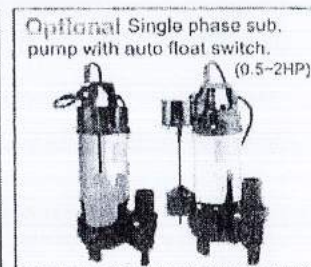
EF Non-clogging Vortex Impeller

Applications

- Waste water drainage from all industries.
- Sewage drainage from hotels, restaurants, schools, malls, and public facilities.
- Fishery, animal husbandry, stock farm, piggery, fecal sewage tank in waste water treatment plant.
- Drainage of waste water containing fibrous additives from leather factory, dyeing factory and food processing factory.



Optional Sub. pump with guide rail device is available.

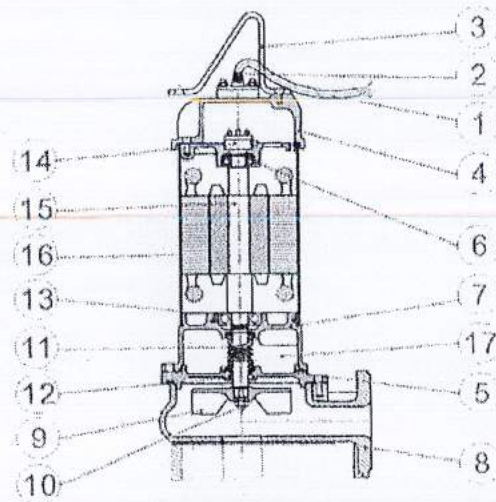


Optional Single phase sub. pump with auto float switch. (0.5~2HP)

Parts and Materials List

No.	Parts	Std. Material
		EF Model
1	Cable	UL-STOW or VCT
2	Cable hood	PVC
3	Handle	Nylon6 or SS400
4	Motor cover	Nylon66 or FC200
5	Seal housing	FC200
6	Bracket	FC200
7	Oil chamber	FC200
8	Pump casing	FC200
9	Impeller	FC200
10	Nut	SUS304
11	Mech. seal	CA/CE
12	Oil seal	NBR
13	Bearing	(NTN brand)
14	Overload protector	(J.I. brand)
15	Shaft	SUS410
16	Motor housing	SUS304
17	Lubricant oil	(Turbine Oil ISO VG46)

* Mech. seal (sic/sic) material is optional upon request.



EF-series 50Hz

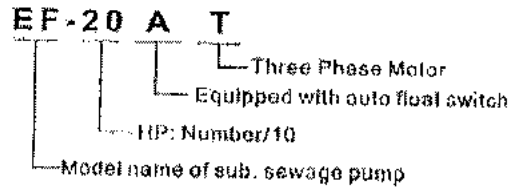
Submersible Sewage Pumps



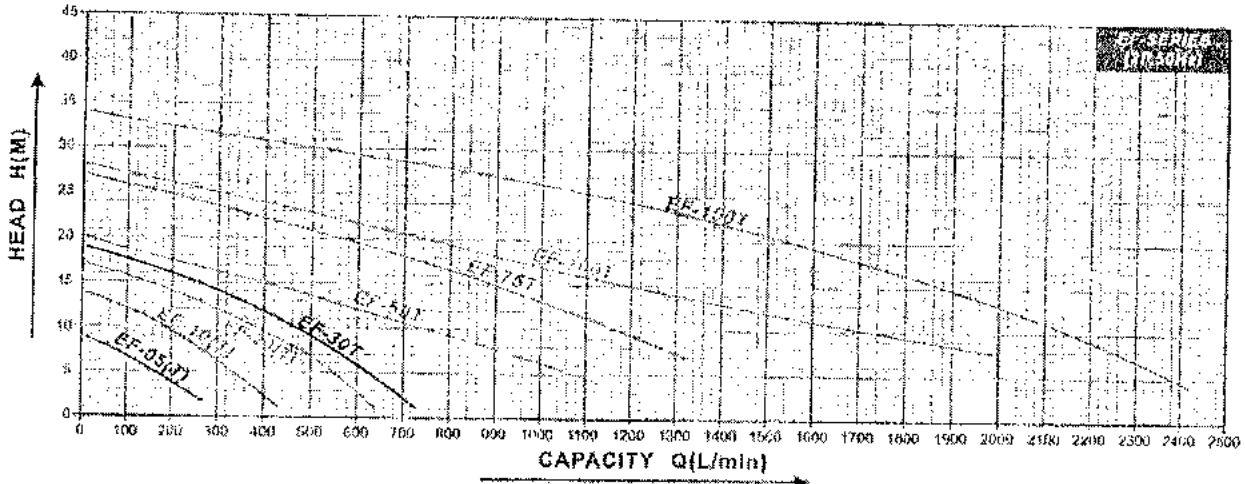
Operating Conditions

- * Water temperature: 0~40°C.
- * Ambient temperature: 0~40°C.
- * Solid passage: 35~50MM.
- * Operating water depth: Max. 10M.
- * No use in sea water.
- * No 24hrs continuously running.

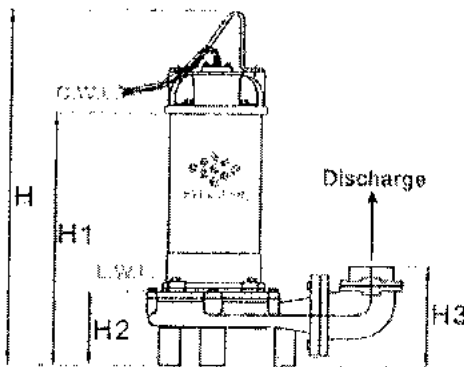
Model Code



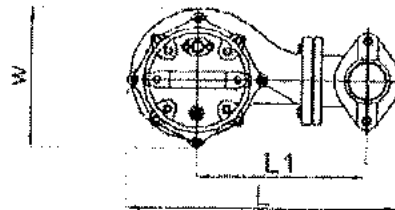
Performance Curves



Specification & Dimension



NOTE: Fabricating submersible pumps continuously under C.W.L.



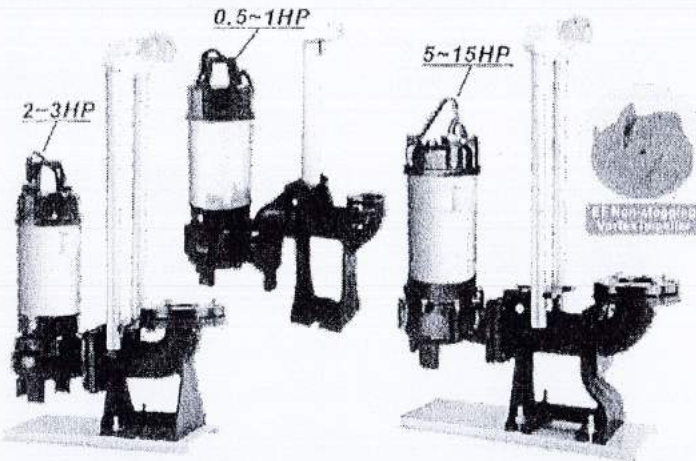
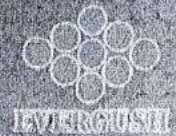
C.W.L.: Continuously Running Water Level.
L.W.L.: Local Running Water Level.

Model	Type	Power		Duct	Phase	Flow			Dimensions (mm)						Cable	Net Weight	Solid Passage		
		kw	HP			Head	Capacity	Head	Cap.	H1	H2	H3	H4	H5				L	
EF-05(A)(T)	Direct	0.37	0.5	2"	1.3	5~6	160~125	9.0	300	222	115	145	410	297	113	133	5	13	35
EF-10(A)(T)	Direct	0.75	1	2"	1.3	9~10	220~185	14	450	222	115	149	464	340	113	133	5	16	35
EF-20(A)(T)	Elbow	1.5	2	2"(3")	1.3	9~10	420~380	17	650	387	234	208	548	400	122	153	5	33	35
	Direct									316	163	208	548	400	122	153	5	30	35
EF-30T	Elbow	2.2	3	2"(3")	3	10~11	470~430	19	750	387	234	208	560	420	122	153	5	35	35
	Direct									316	163	208	560	420	122	153	5	32	35
EF-50T	Elbow	3.7	5	3"(4")	3	11~13	690~540	20	1200	459	256	227	630	471	160	220	5	55	50
EF-75T	Elbow	5.5	7.5	3"(4")	3	15~19	930~610	27	1450	458	256	227	678	511	160	220	5	61	50
EF-100T	Elbow	7.5	10	4"	3	17~18	1000~640	28	2100	550	280	310	680	511	210	250	5	87	50
EF-150T	Elbow	11	15	4"	3	18~22	1700~1400	34	2500	550	310	310	730	560	250	310	10	110	50

Remarks: *(A): Equipped with automatic float switch. *(T): Three phase motor. * 10M cable are available for 0.5~10HP models per special request.

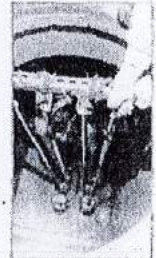
TOS-EF 50Hz

EF Submersible Sewage Pump with Guide Rail Device



Product Features

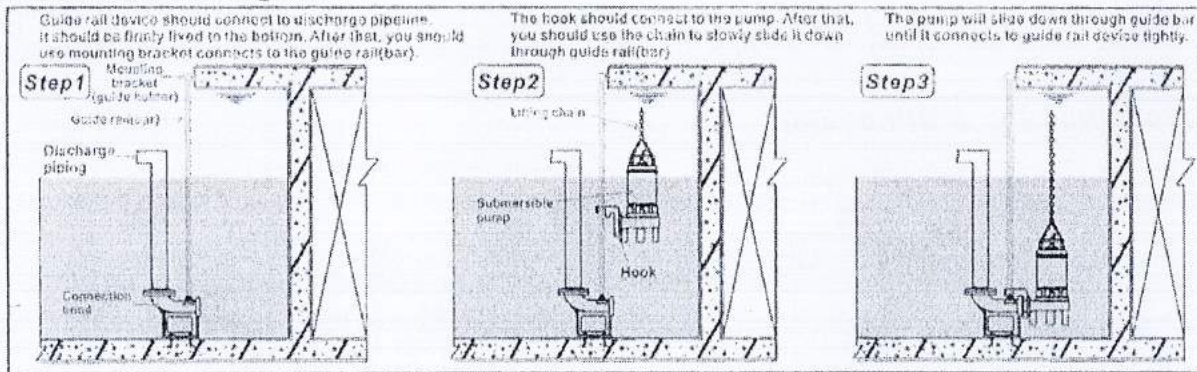
- Through simple and convenient install, we can connect the pump onto guide rail device. Whenever the pump needs maintenance, it can be easily pulled out through guide bar to dismantle, repair or examine the pump. For Safety purpose, the worker no longer needs to go down the septic tank for maintenance. It's greatly time-saving.



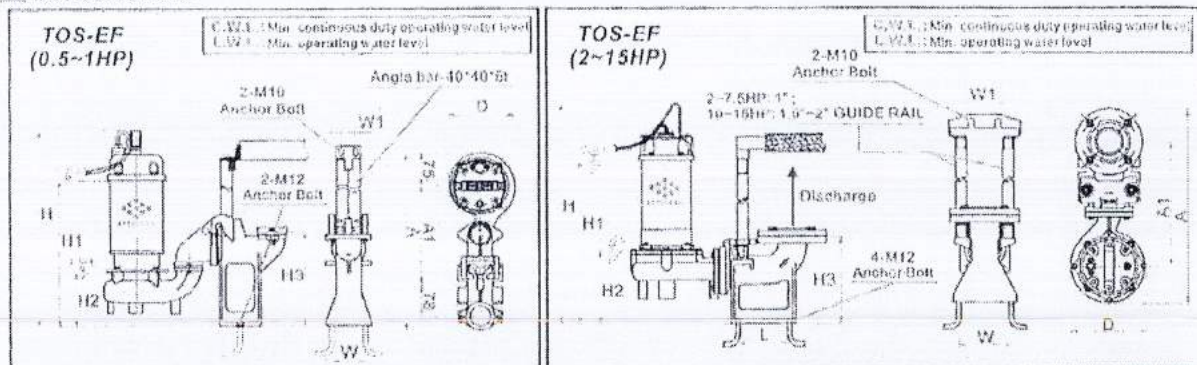
Applications

- Animal husbandry and dairying septic tank waste water drainage; sewers, apartments, buildings and basements sewage treatment equipment drainage; Dye house, fur and leather industry and steel industry waste water drainage; other waste water treatments drainage.

Installation Diagram:



Dimension:



Model	Power HP	Disch. Inch	Dimensions(mm)										Weight(KG)	
			A	A1	D	H	H1	H2	H3	L	W	W1	TOS Device	TOS & PUMP
TOS-EF-05(T)	0.5	2"	425	240	150	422	307	150	225	---	80	35	6	19
TOS-EF-10(T)	1	2"	425	240	150	502	377	150	225	---	80	35	6	24
TOS-EF-20(T)	2	3"	545	350	210	650	480	210	243	110	140	70	16	49
TOS-EF-30T	3	3"	545	350	210	670	500	210	243	110	140	70	16	51
TOS-EF-50T	5	4"	725	515	230	745	580	270	310	160	150	70	24	79
TOS-EF-75T	7.5	4"	725	515	230	785	620	270	310	160	150	70	24	85
TOS-EF-100T	10	4"	820	550	290	750	550	280	330	210	125	245	38	125
TOS-EF-150T	15	4"	770	510	310	785	635	305	360	180	125	245	40	150

Remarks: # TOS means cast iron guide rail device, (O.D.C:Quick Discharge Device) *T means 3 phase motor.

DHB Series

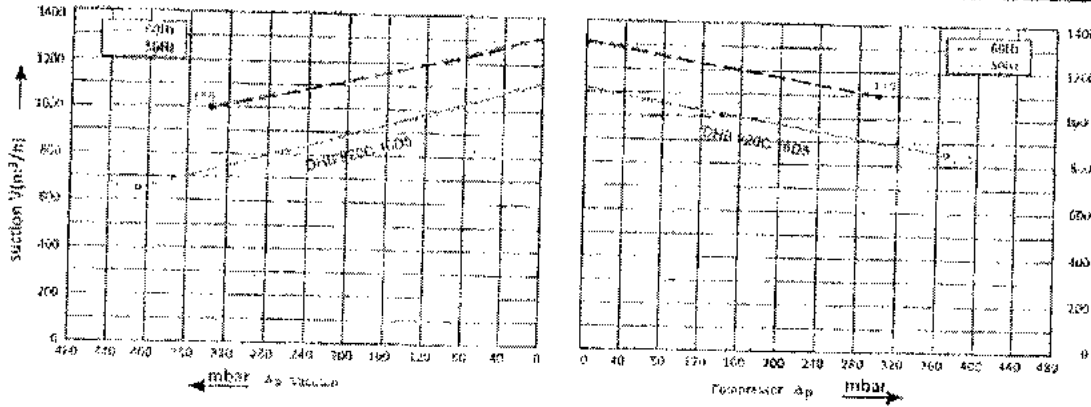
DHB 920C 16D5

Technical datasheet

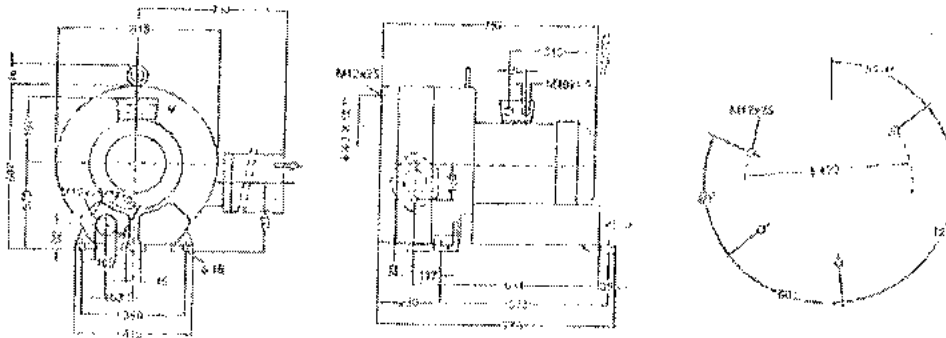


Dereike blower performance curves

Compressor selection diagram curve



Dereike blower installation drawing



Dereike blower installation parameter

Model	Frequency	Output	Voltage	Current	Airflow	Pressure		Noise	Weight
						vacuum mbar	compressor mbar		
DHB 920C 16D5	50	16.5	315-415Δ/300-800V	35.0Δ/20Y	1110	410	370	74	107
	60	19	380-480Δ/380-720V	38.5Δ/21.0Y	1310	~340	300	84	107

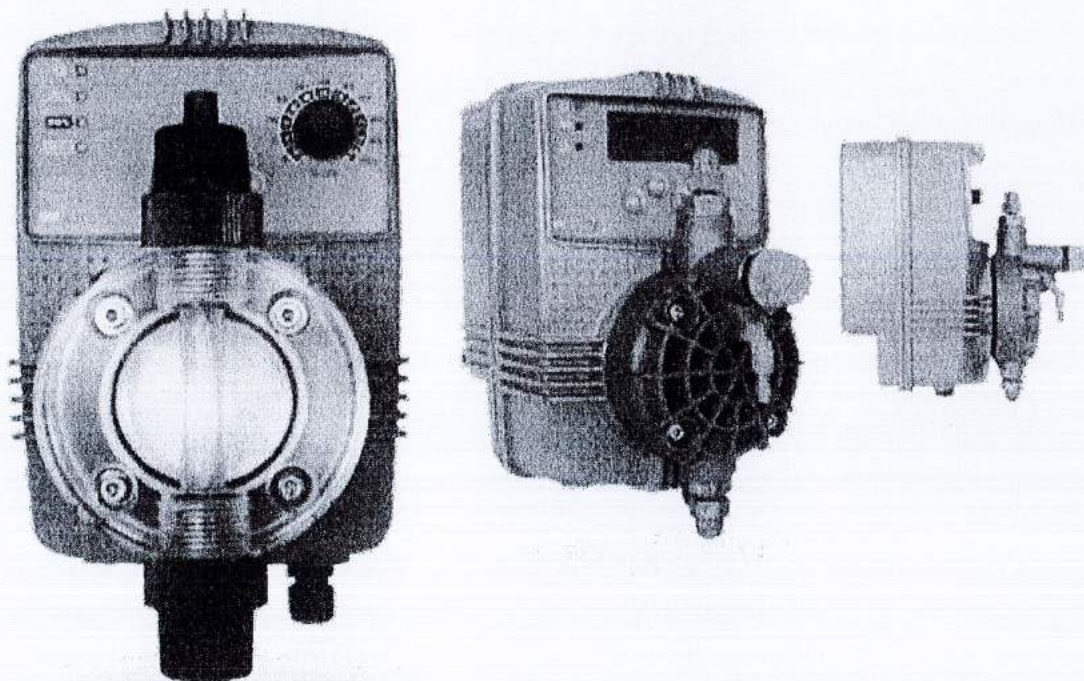
The performance curves of Dereike blower is tested through below ways:

Under one atmospheric pressure, suck 15°C air and then you can calculate the data, of course allow 10% difference, and when the sucked air and surroundings temperature are not higher than 25°C, you still can get total pressure difference as the curves shows.

Dongguan Dereike Intelligent M and E Equipment Co., Ltd
 Address: Building 2, CaiBai Street 3, CaiBai Village, Daopao Town, Dongguan City, 523170, China.
 Mobile/Whatsapp/Wechat: 0086 13826960346 Email: info@dereike.com Website: http://www.dereike.com

FWT[®]

fluid and water technology



SOLENOID DRIVEN DOSING PUMPS MX series

www.fwt-systems.it

INTRODUCING MX SERIES

FWT is pleased to introduce MX solenoid driven dosing pumps, a new series which will enable to widen the product range covering the market sectors where there is a request for wall mounting and competitive price.

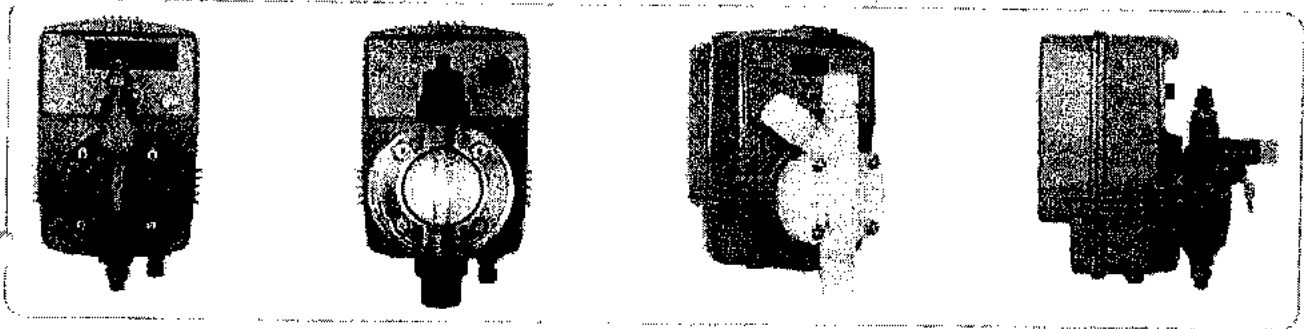
MX main characteristics are:

- **WALL MOUNTING HOUSING:** PP reinforced plastic housing, it includes a support bracket for easy quick mounting.
- **SMALL DIMENSIONS:** ready also for mounting into small cabinets and small environments.
- **PRICE AND QUALITY:** the new design allows a more competitive price but keeping the same quality of FX series.

Two versions are available:

MX series mounts a strong solenoid and CERAMIC ball check valves. Ceramic is widely known for its great chemical resistance to aggressive chemicals and excellent sealing performance

MXE series mounts a smaller type of solenoid with limited performances but good enough for applications such as cooling towers, small RO systems, swimming pools, small water treatment process. MXE series mounts LIP type valves in order to reduce price, however they are very efficient for the above mentioned applications.



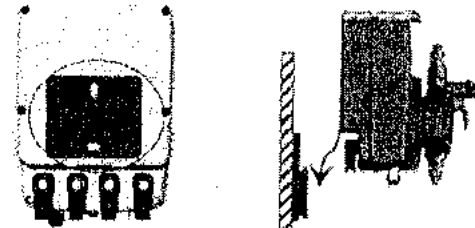
PUMPS MAIN FEATURES

- Power supply: 230 Vac ($\pm 10-15\%$) - 1 phase - 50/60 Hz
- Reproducibility under standard conditions: $\pm 5\%$
- Plastic housing and support: PP reinforced, IP65 (IP56)
- Connectors: 4 pole
- Upon request: 110 Vac/60 Hz; 12-24 Vdc (limited range)
- Ambient working temperature: 45°C
- Voltage working range: min. 207V - Max 253 V
- Voltage Peak: Max 270 V

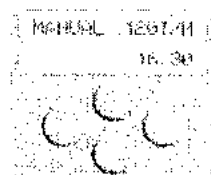
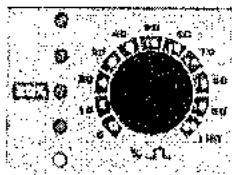
All products are provided with accessory kit, are individually tested and manufactured according CE regulations

MOUNTING MODE

MX and MXE series are wall mounting provided with a quick mounting bracket, easy to install and disassemble.



MX SERIES CONTROLS



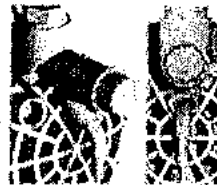
STROKE FREQUENCY ADJUSTMENT

MX series control operations feature two operating controls versions:

- Analog with L.E.D. indicators
- Digital with display and L.E.D.



Connectors: 4 pole IP65



Air bleed (manual) pump head
Available automatic air bleed pump head

LEVEL SWITCH WITH FIXING BRACKET



ACCESSORIES KIT

- => 1 - Injection valve;
- => 2 m - Discharge Hose PE semi-rigid;
- => 2 m - Suction Hose PVC flexible;
- => 1,5 m - Air Bleed Hose PVC flexible;
- => 1 - Foot Valve/Filter

TECHNICAL CHARACTERISTICS MX

Pump type range	Max Flow / Max Pressure		Start up* performance		Frequency imp/min	Stroke volume cc(ml) / stroke	Pump head type	Valves types
	l/h	bar	l/h	bar				
MX 1,5-10	1,5	10	1,5	10	120	0,21	PP 3/8"	Ball checks
MX 2,5-15	2,5	15	2,4	15	120	0,34	PP 3/8"	Ball checks
MX 5,5-07	5,5	7	6	7	120	0,77	PP 3/8"	Ball checks
MX 07-04	7	4	7	4	120	0,98	PP 3/8"	Ball checks

TECHNICAL CHARACTERISTICS MXE

Pump type range	Max Flow / Max Pressure		Start up* performance		Frequency imp/min	Stroke volume cc(ml) / stroke	Pump head type	Valves types
	l/h	bar	l/h	bar				
MXE 01-05	1	5	1,2	5	120	0,14	PP 3/8"	"Lip" types
MXE 2,5-06	2,5	6	3,2	6	120	0,34	PP 3/8"	"Lip" types
MXE 05-04	5	4	5	5	120	0,69	PP 3/8"	"Lip" types
MXE 07-02	7	2	7,4	2	120	0,98	PP 3/8"	"Lip" types

Hose size: 4 x 6 mm (available 6x8 fittings)

Max suction lift: 2 m

Power consumption: MX 37 watt - MXE 32 watt

Current consumption: MX 0,16 Amp - MXE 0,14 Amp

AVAILABLE: 12Vdc and 24Vdc are available only with following types: MX C/A, C/AL, MF - 1,5-10, 2,5-15, 5,5-07

***NOTE:** "Start up" refer to pump starting performances; such performances are constant only if duties are not for continuous working and/or for time periods not over than 30/40 min. continuously and with at least 15 minutes rest.

LIQUID ENDS

WETTED PARTS

Pump head
MX series Ball check valve
MXE series "Lip" type check valve
Diaphragm
Pump head Nipples / Hose-nut
Seals / O-rings
Injection Fitting
Injection No-Return Valve (sleeve)
Foot "Lip" type check valve
Filter body / Filtering media
Suction Hose/Air Bleed hose 4x6mm
Discharge Hose 4x6mm

STANDARD VERSION

PP
CERAMIC (MX series)
FPM (Viton ®) (MXE series)
PTFE
PP
FPM (Viton ®)
PP
FPM (Viton ®)
FPM (Viton ®)
PP / GLASSWOOL
PVC flexible
PE semi-flexible

UPON REQUEST

PVDF; PMMA ^{MEMO 1 / NOTE}; AISI 316
AISI 316
EPDM (Dutral®); NBR; SILICON

PVDF; AISI 316
EPDM (Dutral®); NBR; SILICON
PVDF; AISI 316; PTFE
EPDM (Dutral®); NBR; SILICON
EPDM (Dutral®); NBR; SILICON
PVDF; AISI 316
PTFE
PTFE

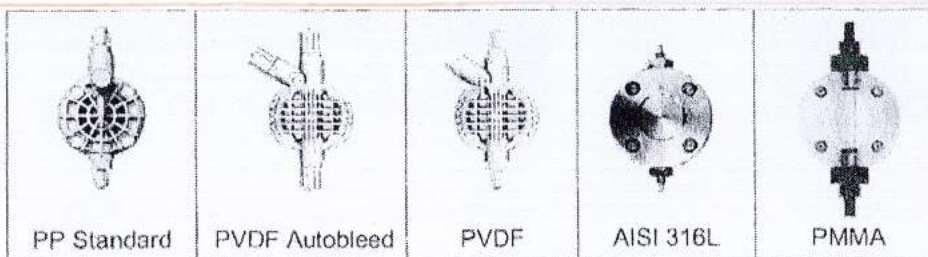
OTHER OPTIONS AND SPECIAL CONFIGURATIONS UPON REQUEST:

Hastelloy spring foot ball valve/Fitting	HASTELLOY/CERAMIC/PP-PVC	PVDF; AISI 316
Hastelloy spring injection valve/Fitting	HASTELLOY / PYREX / PP-PVC	PVDF; AISI 316
Automatic auto-bleed pump head	PVDF AUTO BLEED ^{NOTE}	-----
Aggressive chemicals configuration	PVDF acid configuration ^{MEMO2}	-----

MEMO 1: polymer viscous liquid configuration (only MX series)

MEMO 2: aggressive chemical configuration

NOTE Using AUTO-BLEED or Polymer PMMA configuration, pump pressure performance decreases of about 50%



COMMON CHARACTERISTICS TO ALL MX RANGE

- Ceramic ball checks MX series -"LIP" type valve MXE
 - "Sleeve" type no-return injection valve FPM (avail, EPDM)
 - Plastic housing PP reinforced
 - PTFE diaphragm
 - IP65 rating (when using connectors IP56)
 - Air Bleed valve for priming
 - Standard accessories
 - Quick mounting bracket
-
- Hastalloy Spring return Injection and Foot ball Valve: also available AISI 316 spring

CONSTANT-ON/OFF MODE - ANALOG CONTROLS

MX C/A • MXE C/A

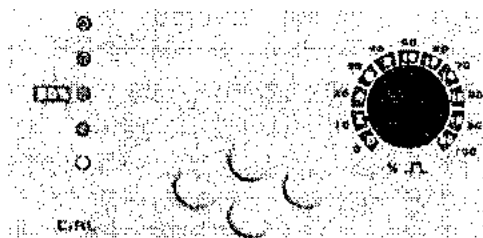
CONSTANT-ON/OFF pumps for those application where a simple pump at low cost is required but keeping maximum reliability. Pump flow rate is obtained by adjusting pulse frequency percentage (%). It also features reduction frequency scale range 1/5 reducing range from 100% to 20%.

- Constant flow rate / ON-OFF mode (also called Manual mode)
- Strokes frequency adjustment 0+100%
- Frequency reduction ratio 100%+20%
- Analog controls
- 2 LED display status: power and pulses



MX C/AL • MXE C/AL

- Constant flow rate – ON/OFF (Manual) with level control
- Provided with level control connector and floating level switch
- Other characteristics as above MX-MXE C/A.
- 3 LED display status: power, pulses and level alarm
- Available with double level control



CONSTANT MODE - DIGITAL CONTROLS - MICROPROCESSOR TECHNOLOGY

MX C/D • MXE C/D

Pump flow rate is obtained by adjusting pulse frequency percentage (%) by digital controls.

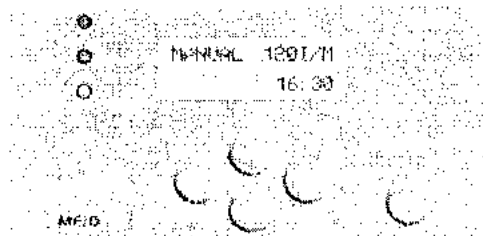
- Digital Constant flow rate / ON-OFF mode (Manual)
- Frequency adjustment 0+100%; imp/min; imp/hour; imp/day
- Microcontroller technology
- Digital controls and display
- Level control (Level switch upon request)
- Available with double level control



MULTIFUNCTIONS DOSING MODE PUMP

MX MF/D • MXE MF/D

- Multifunction dosing pumps including most dosing operations modes
- Microcontroller technology, display LCD and digital controls
- Proportional to external digital pulses: divider n : 1; multiplier 1xN
- Proportional to external analog signal 0...4 mA+20mA or reverse
- PPM dosing mode
- Constant mode with digital controls: imp/min; imp/hour; imp/day
- Digital timer, weekly and daily programming
- Sequence strokes/ injection with flow sensor (sensor on request)
- Level alarm output contact: NO/NC
- Level control (Level switch upon request)
- Available with double level control



PROPORTIONAL TO EXTERNAL DIGITAL CONTACT

MX P/D • MXE P/D

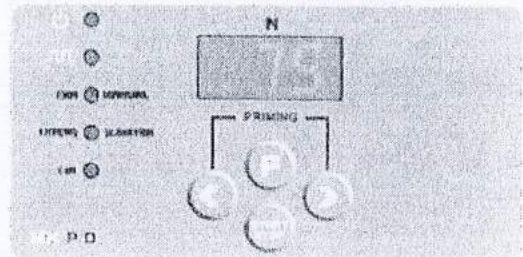
Proportional dosing pump to external digital pulses, (e.g. pulse water meters or equipment releasing voltage free pulse contacts).

- Proportional dosing pump to external digital pulses
- Constant modes operations
- Strokes frequency adjustment 0+100%
- Microcontroller technology, display and digital controls
- 3 LED display status: power, pulses and level
- Level control (Level switch upon request)
- Available upon request PPM dosing mode

For available **pulse water meters**, contact FWT sales office.

FX P/D+ • FXS P/D+

- Sequence strokes/ injection with flow sensor (latter on request)
- Other characteristics as above FX-FXS P/D



PROPORTIONAL MODES:

Divider n:1 (n= pulses received /1= injection)

Multiplier 1xN (1=pulse received *N= injections)

Multiplier 1xN M (1=pulse received with Memory)

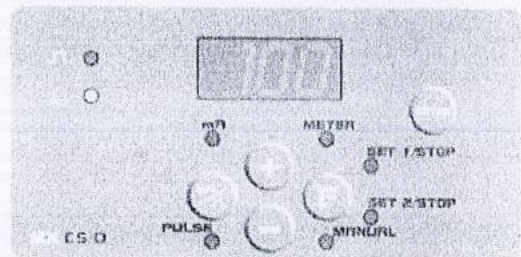
Pacing 1:1 (1 pulse received/1 injections)

PROPORTIONAL TO REMOTE CURRENT SIGNAL mA

MX CS/D • MXE CS/D

- Proportional dosing pump to remote mA signal
- Selection range 0/4...+20mA or reverse
- Constant modes operations
- Strokes frequency adjustment 0+100%
- Microcontroller technology, display and digital controls
- 2 LED display status: power, pulses and level
- Level control (Level switch upon request)

PROPORTIONAL MODES: Direct Or Reverse



DOSING PUMPS WITH BUILT-IN CONDUCTIVITY PROPORTIONAL CONTROLLER

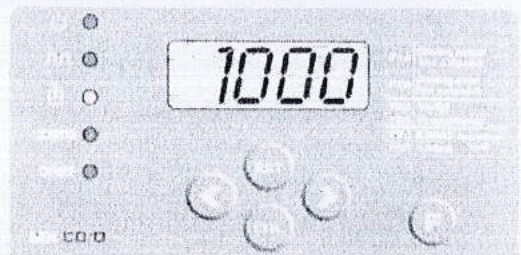
MX CD/D • MXE CD/D

Dosing pumps with built-in conductivity controller, all in one enclosure.

Conductivity range: 0+10mS = 10.000µS (resolution 0,1mS),

Available ranges: 0+1mS = 1000 µS • 0+100mS = 100.000 µS

- Proportional and ON/OFF control modes
- Microcontroller technology, display and digital controls
- Direct or Reverse mode
- Delay working time
- Hysteresis regulation
- Strokes frequency adjustment 0+100%
- Level control (Level switch upon request)



FWT dosing pumps with built-in CD controllers are provided with conductivity probe according to the controller measuring range. Please contact FWT sales office for conductivity probes characteristics.

DOSING PUMPS WITH BUILT-IN PH-RX PROPORTIONAL CONTROLLER

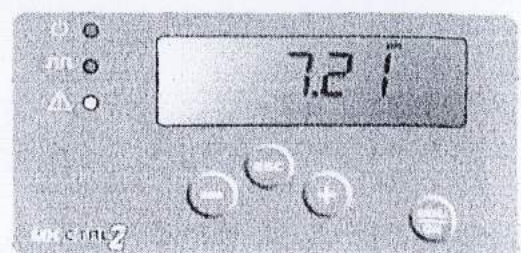
MX CTRL2 • MXE CTRL2

These series includes is a simple and economic version of above CTRL3 unit which features two parameters all in one enclosure: PH or RX (ORP). **BENEFITS:** reducing stock value against a versatile economic solution.

⇒ **pH:** measuring range 0+14,00 pH (resolution 0,01pH)

⇒ **RX:** measuring range: -1000+ +1400 mV (resolution 1mV)

- Microcontroller, back-lit LCD graphic display, digital controls
- ON-OFF and Proportional modes
- Level control (Level switch upon request)



CTRL2 is NOT provided with electrodes and sensors which are available upon request. Please contact FWT sales office for these characteristics.

DOSING PUMP WITH BUILD-IN PROPORTIONAL MULTIPARAMETER CONTROLLERS

MX CTRL3a • MXE CTRL3b

Three different controllers and a dosing pump into one enclosure with great advantage to stock only one model for 3 measuring parameters.

pH: measuring range 0+14,00 pH (resolution 0,01pH)

RX: measuring range -1000+ +1400 mV (resolution 1mV)

Free chlorine*: range 0+20,00 ppm (resolution 0,1ppm)

*CL controller is suitable either with amperometric-potentiostatic membrane Chlorine sensors or open Chlorine cells (later on request)

- Microcontroller technology, back-lit LCD display, digital controls
- Injection frequency adjustment
- Connectors: BNC for electrode and 4 pole IP65 for CL sensors
- 2 Reset modes: full reset - partial reset keeping calibration settings
- Level control (Level switch upon request).
- Proportional mode range value selection
- Delay adjustment - Delay at powering ON (electrodes polarization)
- Hysteresis regulation
- Password setting
- Calibration of mA output
- 4+20 mA output for chart recorder
- Alarm functions:
 - Over dosing alarm value to prevent excess of chemical injection
 - Alarm for minimum or Maximum time for reaching set point
- Direct or Reverse mode (Alkaline or Acid, Oxidant or Reducing RX)
- Stand-by mode for cleaning electrodes and sensors or re-calibration

MX CTRL3 dosing pump with integral controller is NOT provided with electrodes and sensors which are available upon request. Please contact FWT sales office for these items.

CTRL3 FEATURE TWO VERSIONS WITH TWO OPERATING MENUS:

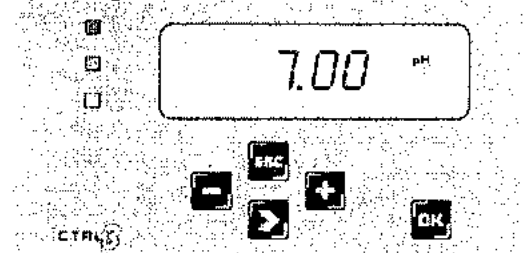
FX CTRL 3a (advanced)

ADVANCED MENU offers more measurements options and functions.

- Temperature measurement °C or °F
- Suitable for Temperature probe PT100
- Setting for proximity switch to stop operations in case of no water (in place of level control)
- Alarm functions and selling with relay output

FX CTRL 3b (basic)

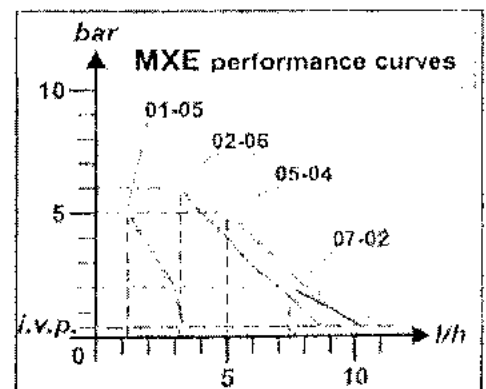
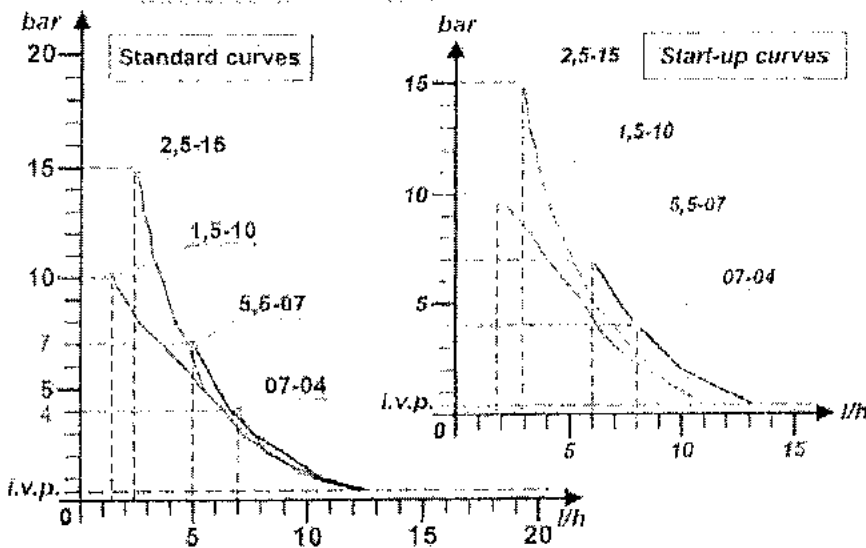
BASIC MENU for simple operations: without the functions listed in "advanced" operating menu.



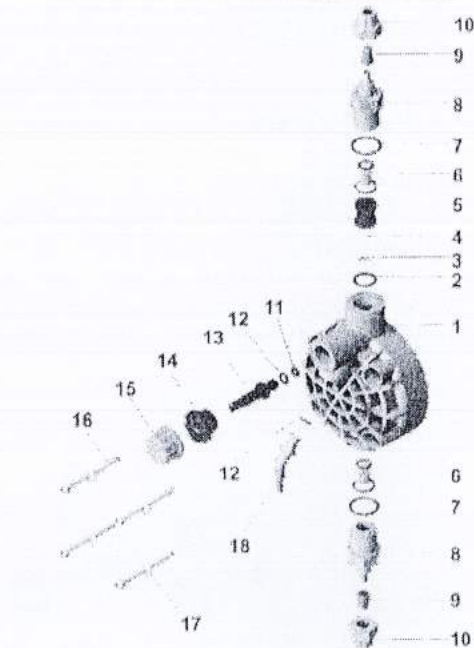
MX SERIES PERFORMANCE CURVES

Here in the following pages are shown mX series performance curves. Ratings can vary with a tolerance of 5+10 % which must be taken into account when choosing the type of pump. Also variations occur when using a self-bleed or PMMA pump head (polymer dosing), pressure performances decreases consequently of about 50/65%. All flow rates indicated in the following diagrams are obtained testing the pump with medium hardness water at rated pressure, 1,5 m suction lift, room temperature. Diagrams indicate max metering pump flow variation in relation to working pressure in the plant; diagrams also include Injection valve losses (I.V.P.).

MX performance curves

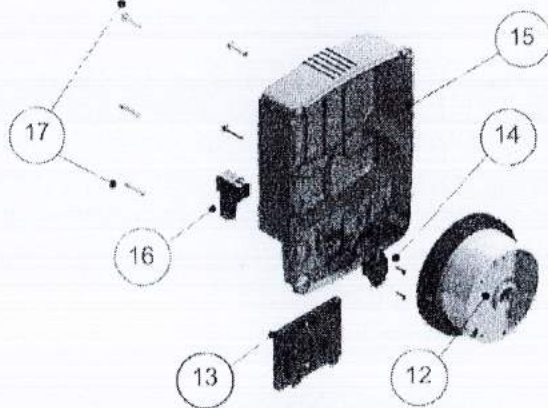


EXPLODED VIEWS



PUMP HEAD EXPLODED VIEW

1. PUMP HEAD (PP standard 1+15 l/h) *
2. AIR BLEED VALVE O-RING
3. BALL CHECK SEAT (air bleed)
4. BALL CHECK VALVE (air bleed)
5. VALVE SPACER (air bleed)
6. P.HEAD BALL CHECK VALVE ASSEMBLY
7. NIPPLE O-RING
8. NIPPLE
9. PROTECTION CAP
10. HOSE NUT
- 11 / 12 / 13 / 14 / 15. AIR BLEED KNOB ASSEMBLY
- 16 / 17. PUMP HEAD SCREWS
18. BLEED OUTLET

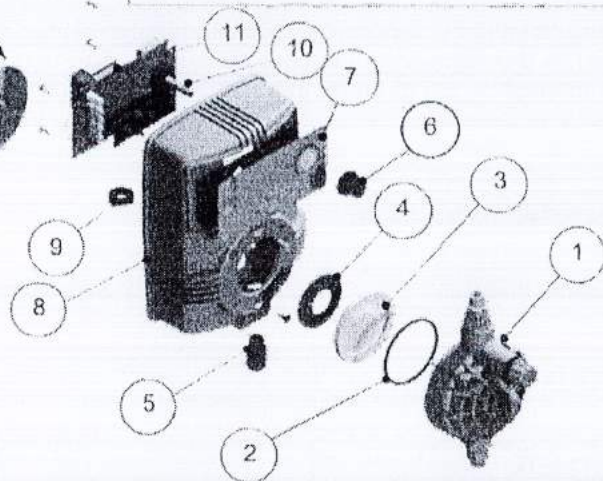


DOSING PUMP EXPLODED VIEW

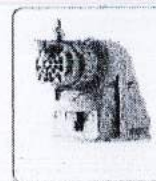
1. pump head (complete)
2. diaphragm / pump head o-ring
3. PTFE diaphragm
4. piston flange
- 5 / 9. power cable assembly
6. flow (pulse frequency) adjustment knob
7. front controls panel
8. housing

DOSING PUMP EXPLODED VIEW

10. controls PCB (printed circuit board)
11. pcb internal mounting screws
12. solenoid
13. wall quick mounting bracket
- 14 / 16. utility connector assembly
15. back housing
17. housing screws



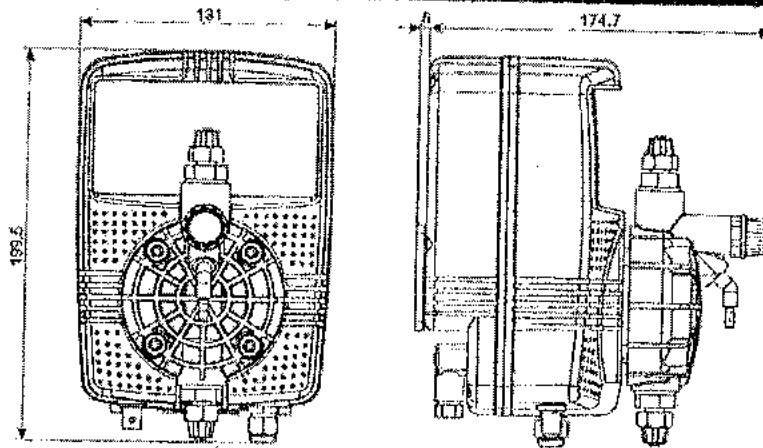
FWT OTHER SOLENOID DRIVEN PUMP FX SERIES



FX solenoid driven dosing pumps main characteristics are:

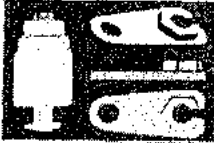
- **FOOT MOUNTING HOUSING:** PP reinforced plastic housing.
- **STROKE LENGTH ADJUSTMENT:** ready also for mounting into small cabinets and small environments.
- **PRICE AND QUALITY:** the new design allows a more competitive price but keeping high and durable quality.

MX SERIES OVERALL DIMENSIONS (mm)



Approximate net weight kg 1.9+2.7

LEVEL SWITCH WITH FIXING BRACKET



ACCESSORIES KIT

- ✓ 1 - Injection valve;
- ✓ 2 m - Discharge Hose PE semi-rigid;
- ✓ 2 m - Suction Hose PVC flexible;
- ✓ 1,5 m - Air Bleed Hose PVC flexible;
- ✓ 1 - Foot Valve/Filter

FWT PRODUCTS AND ACCESSORIES

FWT offers also a wide range of accessories and sensors to guarantee a complete service such as:

- Safety relief/Anti-siphon valves • Pulsation dampeners • Suction and injection lances • Over voltage protection

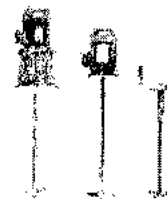
DOSING TANKS



PULSE WATER METER



MIXERS



CONTROLLERS



PROBES AND SENSORS



PERISTALTICS



MOTOR DRIVEN DOSING PUMPS



COMPLETE DOSING / CONTROL PANELS



FWT

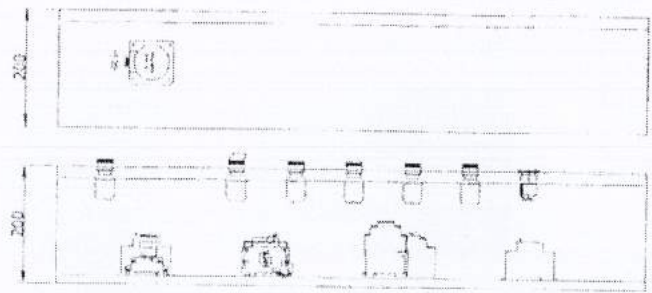
fluid and water technology

FWT di Tommaso Commonara
Via Ragusa, 13/a
00040, PAVONA di Albano Laziale (RM), ITALY
www.fwt-systems.it

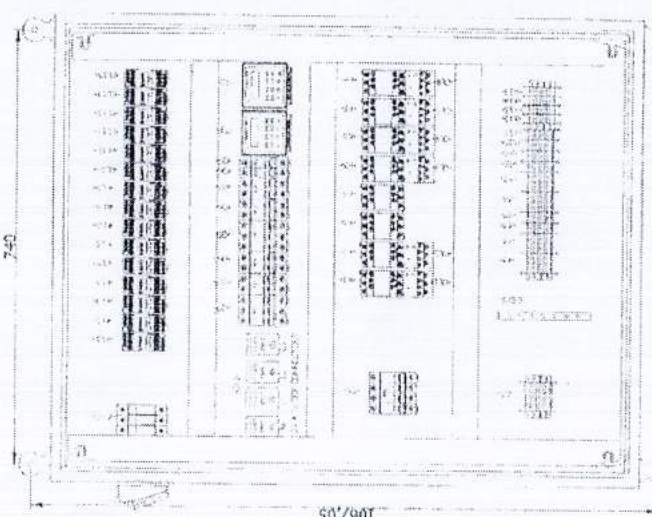
rev.01_0913

tel: +39 06 9311940
tel: +39 06 93895003
fax: +39 06 93160328
info@fwtfluidcontrol.it
sales@fwtfluidcontrol.it

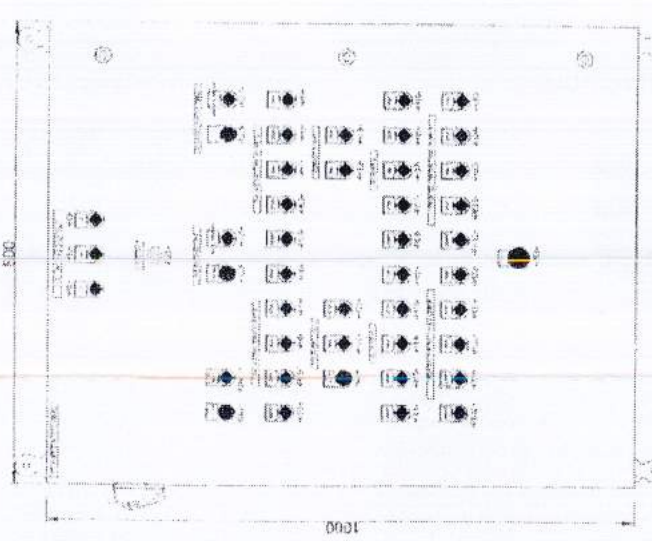
VERTICAL DISTANCE	400 (mm)
INSTALLATION	TEMA
VALVE TYPE / SYMBOL	[Symbol]
ISOTHERM SYSTEM	[Symbol]
TYPE OF MOUNTING	
WELL MOUNTING	
SIZES OF PORT SECTION	
DN 4	
CONNECTION	
FRANKS	
SHEET MATERIALS	
2mm Stainless	
COVER PLATE	
1.7mm	
ISOLATING MATERIAL	
1.5mm [Symbol]	
FLANGE MATERIAL	
1mm	
CLAMP PLATE	
1mm	
TYPE	
Borehole Plate	
MATERIAL	
S.S. 316	
LIFTING DIM	
S.S. 316	
MOUNTING POSITION	
SOLE	
NUT (mm)	
40mm	
HEIGHT (mm)	
100mm	
DEPTH (mm)	
250mm	
LENGTH (mm)	
-	
S1	
S2	
S3	
S4	
S5	
S6	
S7	
S8	
S9	
S10	
S11	
S12	
S13	
S14	
S15	
S16	
S17	
S18	
S19	
S20	
S21	
S22	
S23	
S24	
S25	
S26	
S27	
S28	
S29	
S30	
S31	
S32	
S33	
S34	
S35	
S36	
S37	
S38	
S39	
S40	
S41	
S42	
S43	
S44	
S45	
S46	
S47	
S48	
S49	
S50	
S51	
S52	
S53	
S54	
S55	
S56	
S57	
S58	
S59	
S60	



FRONT VIEW-DOOR CLOSED
FRONT VIEW-DOOR OPENED



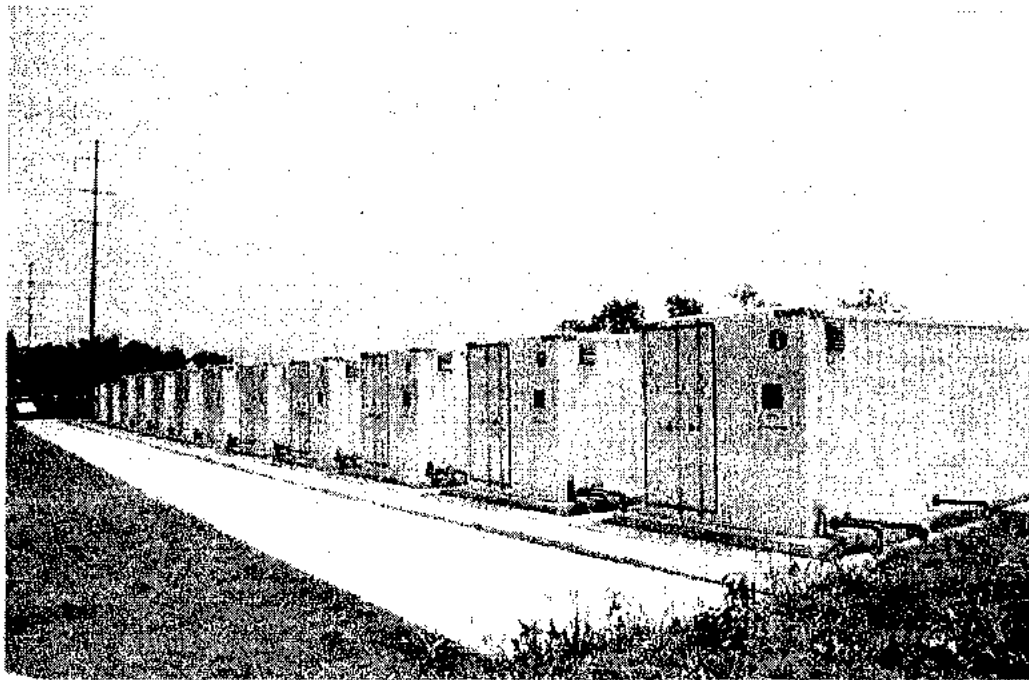
TOP VIEW



GLAND PLATE
BOTTOM VIEW

DESIGNER	[Name]
CHECKED BY	[Name]
DRAWN BY	[Name]
DATE	[Date]
PROJECT NO.	[Number]
CONTRACT NO.	[Number]
SCALE	[Scale]
PROJECT TITLE	PROJECT TITLE
STATION NO.	STATION NO.
DRAWING NO.	DRAWING NO.
SHEET NO.	SHEET NO.
TOTAL SHEETS	TOTAL SHEETS
PROJECT LOCATION	PROJECT LOCATION
CLIENT NAME	CLIENT NAME
CLIENT ADDRESS	CLIENT ADDRESS
CLIENT CONTACT	CLIENT CONTACT
CLIENT PHONE	CLIENT PHONE
CLIENT FAX	CLIENT FAX
CLIENT EMAIL	CLIENT EMAIL
CLIENT WEBSITE	CLIENT WEBSITE

DESIGNED, MANUFACTURED & SUPPLIED BY:
ORIEL CORPORATION (PVT) LTD.
INDUSTRIAL ZONE,
KORUMALLA,
MOHAKUDDA.
INTERNATIONAL CONSTRUCTION CORPORATION (PVT) LTD.
No. 78, S.E.C. SANYASIRERA MARGUATH,
KORUMALLA,
MOHAKUDDA.
100% LOCAL
CONSTRUCTION
CORPORATION
RANGE INDUSTRIES



Sewage Treatment Plant Sludge Treatment

Technical Commercial Offer

2021-08-18

Danmotech Environmental Technology Co., Ltd.

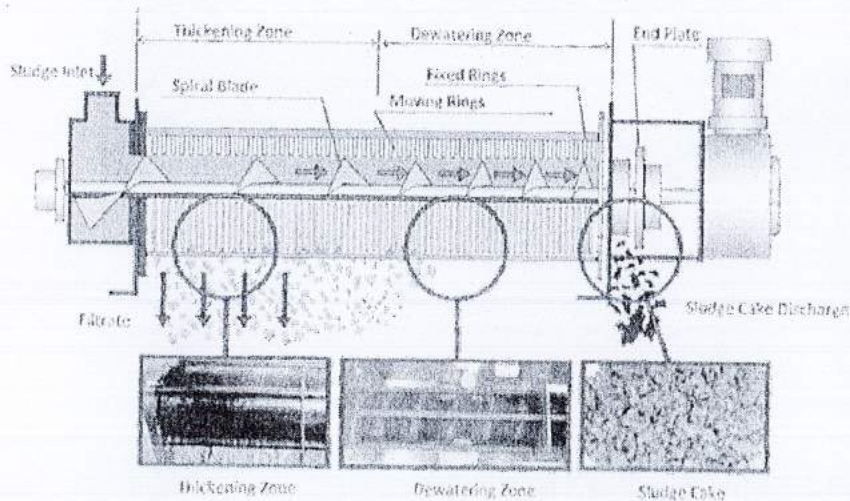
Add: Room 808, 3rd floor, No 175, East Yan'an Road, Huangpu District, Shanghai, China

www.danmotech.com Tel: 0086-18017588169

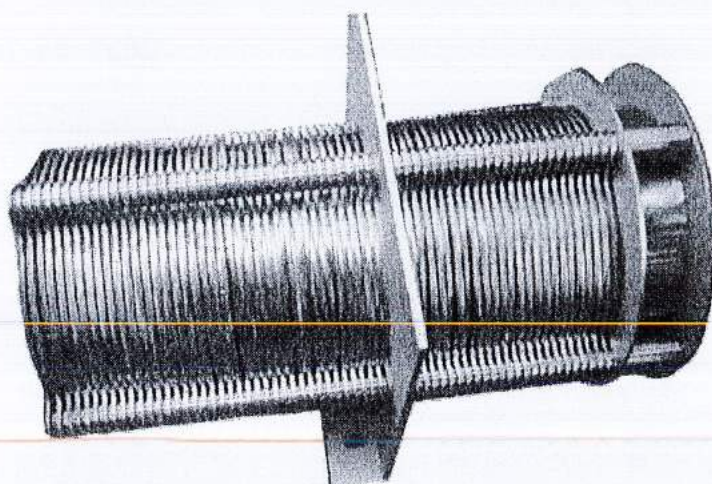
1. Process Design

(1) Working Principle

This Sludge Dewatering Machine features a slow-speed, low-wear screw within unique multi disc dewatering cylinder. The cylinder assembly is comprised of precision-made fixed, moving rings and screw shaft. When the washers (rings) are moved by the eccentric auger inside the tube a very narrow gap between the washers allows only the liquid excreted from the sludge to escape. The gap is too fine and does not allow the thickened sludge inside the cylinder to pass through.



Screw Body Details



(2) Main advantages

Features	Benefits
Skid mounted & prewired	Easy installation and setup
Minimal horsepower requirements	Low power consumption & energy costs
Integrated CIP spray bars	Non-clogging operation
Low speed operation	Low noise output, low maintenance input
In-place shielding & guarding	Reduced odor levels & positive containment
Simplistic function and mechanical operation	Uncomplicated maintenance procedures
Small footprint	Reduced space constraints & deployment
Efficient slip disc operation	Excellent dewatering & capacity outcomes
Multi directional compression auger	Produces dry high solids cake
Fine slip disc gap interface	Reduces solid excrement and escape, creates a clean, high-quality filtrate
Optional PLC controlled & HMI touch screen	Automated for total system integration for continuous and unattended operation

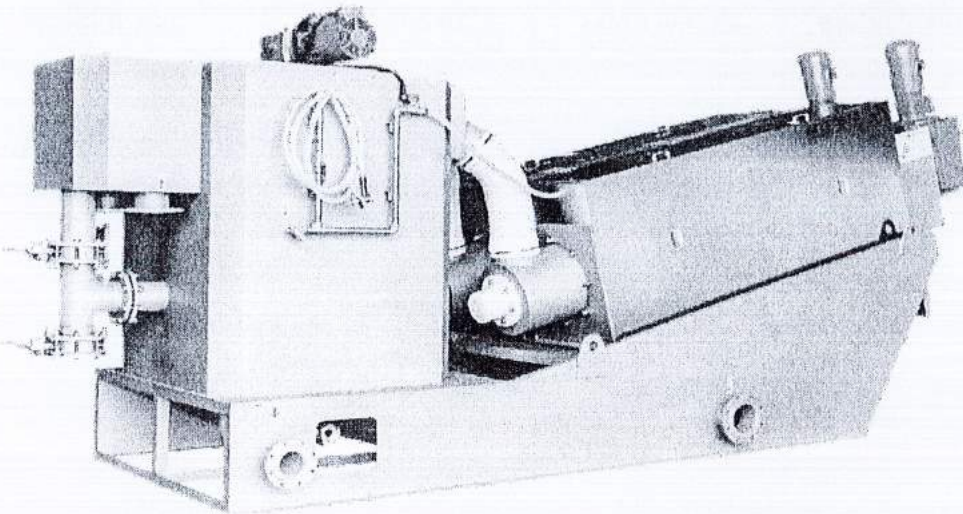
(3) Comparison With other Types

Capability/Feature	Screw Press	Belt Press	Centrifuge
Highly dilute sludge	Yes	No	No
Pre-thickening	Not required	Required	Required
Storage tank	Not required	Required	Required
Footprint	Small	Large	Small
Power requirements	Low	Medium	High
Wash water consumption	Extremely low	Extremely high	Low
Noise generation	Low	High	High
Vibration	Extremely low	High	High
Maintenance requirements	Extremely Low	High	High

(4) Main Design Parameter

Design Parameter	1m ³ /hr			
	Machine	Model/Brand	Capacity	Exit water content
Sludge Dewatering	DMEP131	1m ³ /hr	75%~85%	1
Polymer dosing Machine	MDJY2000	2000L/hr	NA	1
Sludge feed pump	Xinglong	1.9m ³ /hr	NA	1
Polymer dosing pump	CNP	170L/hr	NA	1

(5) Multi-disc Screw Press Picture (for reference)



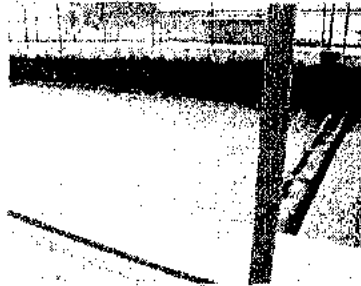
(6) Data Sheet for DMEP131

Design Parameter	Model	DMEP131
	Dimension	L1940×W730×H1040(mm)
	Power	0.36kw
	Protection	IP55 F
	Power Supply	As need
	Polymer Feeding Rate	DS 0.2~0.6%
	Flush Water	48L/h

	Water Supply Pressure	≥0.2MPa
Screw Body	Specification × Length	Φ130×1190(mm)
	Quantity	1
	Material	SS304
	Motor Power	0.18kW
Flocculation Mixing tank	Dimension	L330×W330×H550(mm)
	Volume	About 60L
	Material	SS304
	Motor Power	0.18kw
Electric control panel	Function	1. Controls polymer mixing device; 2. Realize the switch of automatic operation and manual operation.
Equipment Net Weight		250kg

(7) Table2: Material and Model of Main Parts

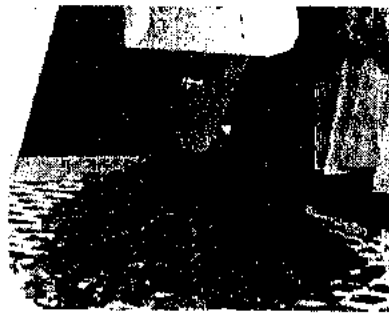
No.	Name	Material	Brand or Manufacturer
1	Fixed rings	SS304	Maoyuan
2	Moving rings	SS304	Maoyuan
3	Screw shaft	SS304	Maoyuan
4	Filtrate receiver	SS304	Maoyuan
5	Mixing tank	SS304	Maoyuan
6	Mixing shaft and blades	SS304	Maoyuan
7	Motor brackets	SS304	Maoyuan
8	Sludge inlet pipe	SS304	Maoyuan
9	Flushing system	SS304	Maoyuan
10	Reducer for screw body	Finished product	NORD
11	Reducer for mixing shaft	Finished product	NORD
12	Liquid level switch	Finished product	OMRON
13	Solenoid valve	Finished product	ASCO
14	Frequency converter for screw body motor	Finished product	Schneider



Before



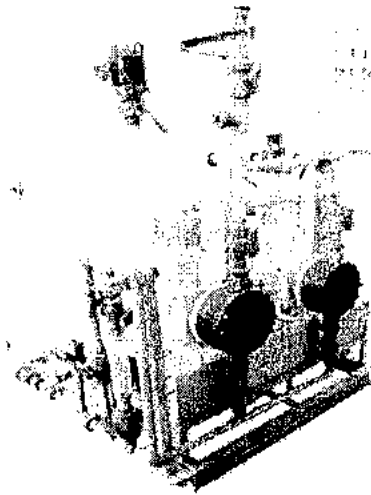
MDS-Screw Press



After

(8) Description of MDJY 2000 dosing Machine (for reference)

A) MAIN TECHNICAL PARAMETER



- Tank volume: 2m³
- Mixer power: N=1.5kw
- Motor protection level: IP55
- Insulation grade: F
- Working: 24-hour/continuous or intermittent operation

B) MAIN STRUCTURE AND WORKING PRINCIPLE

➤ Main structure

The mixing tank is mainly composed of tank, machine base, mixer, level gauge, pipe and valve fittings and other components.

The mixing tank is made of PE, which is solidified at room temperature. The bottom of the tank is equipped with vent pipe, also a polymer discharge pipe at bottom side face.

➤ Working principle

The polymer and water go into the tank, under the function of the mixer, the polymer dissolves sufficiently, and the soup enters the metering pump for dosing.

C) MATERIAL OF MAJOR PARTS AND COMPONENTS

- Tank: PE
- Mixing shaft: SS304
- Impeller: SS304
- Power Supply: As need

D) STANDARD CATALOGUE FOR EQUIPMENT DESIGN, MANUFACTURE, AND INSPECTION

- JB2932-86 Conditions for Manufacturing Water Treatment Equipment
- JB/ZQ4000.2-86 General Technical Conditions for Cutting Parts
- JB/ZQ4000.3-86 General Technical Specifications for Welding Parts

- JB/ZQ4000.10-86 General Technical Conditions for Painting
- JB/ZQ4286-86 General Technical Conditions for Packaging
- GB3797-89 Technical requirements for electronic control boxes with electronic devices
- GB4720-84 Low Voltage Electrical Control Box
- GB/T4942.2-93 Protection Grade of Low Voltage Electrical Apparatus Shell
- GB8923-85 Surface Corrosion and De-rusting Grade of Steel before coating
- GB4879-99 Rustproof packaging
- YJ010 Technical Conditions and Inspection Method of Shot Blasting and Sandblasting
- JB/ZQ4000 1-86 General Technical Requirements for Product Inspection

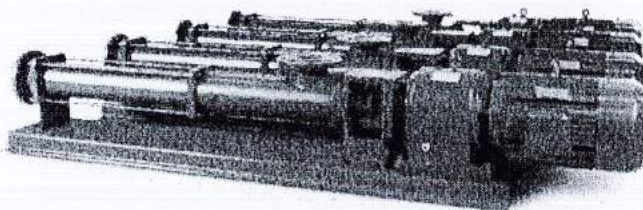
E) RELIABILITY AND DURABILITY OF EQUIPMENT

- Fault-free running time of equipment shall be no less than 20000 hours.
- The service life of motor reducer and bearing is more than 10 years, and the electrical components are no less than 3 years.

F) ANTICORROSION OF EQUIPMENT

- Rust removal of carbon steel castings and castings up to Sa2.5 standard.
- Primer, intermediate and alkyd topcoat. The total film thickness no less than 200 um.
- Anti-rust treatment is given to the machined surface according to GB4879 standard before packaging.

G) SLUDGE FEED PUMP



Brand	Xinglong
Type	Screw
Model	XG030B01ZQ
Flow rate	1.9m ³ /hr
Head	30m
Power	1.1kw

H) POLYMER DOSING PUMP



Brand	CNP
Type	Diaphragm
Model	GM0170PQ3MNN
Flow rate	170L/hr
Power	0.25kw

Operating Cost

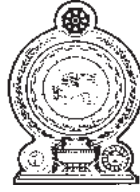
Item No	Equipment	Rated Power kW	Operational time per day/hr	No of units	Total Units per day / kWh
1	Tsurumi 80C21.5 1.5 kW Submersible sewer Cutter pump (2 Duty/ 1 Standby)	1.5	18	2	54
2	Dereike DHB 920C 16D5 16.5 kW Side Channel Blower (2 Duty/1 Standby)-65% Capacity	16.5	18	2	386.1
3	FWT Chlorine Dosing Pump	0.3	18	1	5.4
4	Evergush Sludge Transfer pump	1.5	0.5	1	0.75
Total Power consumption per day/ kWh					446.25

Unit cost for industrial category /LKR = 14.00
 Electricity cost per day /LKR = 6247.50
 Monthly electricity cost /LKR = 187,425.00

Chemical Cost

Sodium Hypochlorite dosing mg/l = 5.00
 Sodium Hypochlorite concentration = 70%
 Active chlorine for given flow / kg/m³ = 4.75
 Required Sodium Hypochlorite mass/ kg = 6.79
 Cost for Chlorine per day/LKR = 3,392.86
 Cost for Chlorine per month/LKR = 101,785.71

Total Plant operational cost per Month/LKR = 289,210.71



ශ්‍රී ලංකා ප්‍රජාතාන්ත්‍රික සමාජවාදී ජනරජයේ ගැසට් පත්‍රය
අති විශේෂ

The Gazette of the Democratic Socialist Republic of Sri Lanka

EXTRAORDINARY

අංක 2264/17 – 2022 ජනවාරි මස 27 වැනි බ්‍රහස්පතින්දා – 2022.01.27

No. 2264/17 – THURSDAY, JANUARY 27, 2022

(Published by Authority)

PART I: SECTION (I) – GENERAL

Government Notifications

L.D. B. 4/81(X)

THE NATIONAL ENVIRONMENTAL ACT, No. 47 of 1980

REGULATIONS made by the Minister of Environment under Section 32 of the National Environmental Act, No. 47 of 1980 read with Sections 23A and 23B of that Act.

MAHINDA AMARAWEEERA,
Minister of Environment.

Colombo,
18th January, 2022.

Regulations

1. The National Environmental (Protection and Quality) Regulations, No. 1 of 2008 published in the *Gazette Extraordinary* No. 1534/18 of February 1, 2008 is hereby amended as follows:-

(1) by the substitution for Regulation 2 thereof, of the following regulation: -

“2(1) A person who carries on a prescribed activity in terms of Section 23A of the National Environmental Act, No.47 of 1980 shall,



2A

I කොටස: (I) ඡේදය – ශ්‍රී ලංකා ප්‍රජාතාන්ත්‍රික සමාජවාදී ජනරජයේ අති විශේෂ ගැසට් පත්‍රය – 2022.01.27

PART I: SEC. (I) – GAZETTE EXTRAORDINARY OF THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA – 27.01.2022

- (a) only discharge, deposit or emit waste into the environment in such a manner that it shall not cause or likely to cause pollution; and
- (b) carry on such activity-
 - (i) under the authority of a licence issued by the Central Environmental Authority (hereinafter referred to as “the Authority”) and subject to specified terms and conditions set out therein; and
 - (ii) in accordance with such standards and criteria specified in the Schedule 1 hereto, in respect of specified industries.

(2) No person shall emit, discharge or deposit any waste into the pollution prevention zone declared in Proclamation made by the President under section 7 of the Maritime Zones Law, No. 22 of 1976 and published in the *Gazette Extraordinary* No. 248/I of January 15, 1977:

Provided however, a person, for the purpose of carrying out any prescribed activity under the authority of a licence issued under regulation 7, may emit, discharge or deposit waste into such zone in accordance with the tolerance limits specified in Lists IA, IB, IIA, IIB, V, VIA and VIB of the Schedule I hereto and as provided in any regulation hereunder.”;

(2) by the substitution for regulation 3 thereof, of the following regulation: -

“3. Notwithstanding anything contained in regulation 2, the Authority-

- (a) may, in respect of any prescribed activity, impose more stringent standards and criteria, than those specified under the Act, by a direction issued under regulation 12, having regard to the need to protect the receiving environment; or
- (b) shall, on a case by case basis, decide the parameters that are representative of the contaminants, pollutants or any other material causing emission or disposal of waste, in accordance with such standards and criteria specified for any prescribed activity.”;

(3) in Regulation 4 thereof by the substitution for the words “in Schedule I hereto”, of the words, “for any prescribed activity”;

(4) by the insertion, immediately after regulation 7 thereof, of the following new regulations which shall have effect as regulation 7A and 7B:-

“7A. (1) The Authority shall be responsible for periodic monitoring of any prescribed activity by-

- (a) reviewing the periodic reports submitted to it by the licence holder;
- (b) requiring the licence holder to conduct a further study or submit additional information relating to such prescribed activity;
- (c) visiting or inspecting the site or sites where such prescribed activity is carried on and record observations in respect of the manner in which the activity is carried out;
- (d) obtaining assistance of any other authority to carry out any inspection relating to such prescribed activity.

(2) Every licence holder, prior to the commencement of any prescribed activity, shall submit a detailed- initial report on-

- (a) the existing state of the site or sites, used for the prescribed activity;
- (b) risk analysis of prescribed activity, environment risk management plans, tools, assessment standards, methods and manner of record-keeping;
- (c) available insurance coverage and minimum limits of indemnity in such policies.

(3) The Authority shall, after considering the degree of intensity of the environmental risk involved in carrying out the prescribed activity, on case by case basis, instruct the licence holder to take necessary mitigatory measures.

(4) Every licence holder shall, as specified in the terms and conditions of the licence shall submit periodic reports quarterly, bi annually or annually, containing-

- (a) an analysis of the condition of the site or sites and the standards and methods used to assess such condition;
- (b) risk analysis of the industry.

(5) The Authority shall require the licence holder to submit an audit report on any of the periodic reports submitted by the licence holder.

7B. (1) The Authority, for the purpose of prevention of pollution of marine environment shall-

- (a) be responsible in the prompt implementation of the provisions of these regulations with the cooperation of the Marine Environment Protection Authority (MEPA), the Department of Coast Conservation and Coastal Resources Management (CC&CRM) and any other relevant authority;
- (b) in consultation with the Marine Environment Protection Authority and the Department of Coast Conservation and Coastal Resources Management determine the maximum daily load of pollutants to be discharged into marine waters;
- (c) register, rank and maintain an inventory of the treatment plants;
- (d) in coordination with the Marine Environment Protection Authority and the Department of Coast Conservation and Coastal Resources Management, install monitoring stations to carry out monitoring of any emission, discharge or deposit into the marine environment;
- (e) publish monitoring results periodically; and
- (f) take such other measures to control and prevent any emission, discharge or deposit into the marine environment other than the permitted loads.”;

(5) by the substitution for the Schedule I thereof, of the following:-

"SCHEDULE I

LIST IA

Tolerance limits for the discharge of wastewater or effluent into Marine Waters

No.	Parameter	Unit, type of limit	Tolerance limit values for an outfall leading up to near-shore water	Tolerance limit values for a short sea outfall	Tolerance limit values for a long sea outfall
1.	Total suspended solids	mg/l, max.	30	50	250
2.	Total dissolved solids	mg/l, max.	2100	-	-
3.	pH value at ambient temperature	-	6.0 – 8.5	5.5 – 9.0	5.5 – 9.0
4.	Biochemical Oxygen demand (BOD ₅ in 5 days at 20°C)	mg/l,max.	15	75	400
5.	Temperature at the point of discharge	°C, max	Ambient water temperature +/- 5 or 35 whichever is lesser	Ambient water temperature +/- 5 or 35 whichever is lesser	Ambient water temperature +/- 5 or 35 whichever is lesser

No.	Parameter	Unit, type of limit	Tolerance limit values for an outfall leading up to near-shore water	Tolerance limit values for a short sea outfall	Tolerance limit values for a long sea outfall
6.	Oils and greases	mg/l,max.	5	12	15
7.	Phenols (as C ₆ H ₅ OH)	mg/l,max.	1	1	5
8.	Chemical oxygen demand (COD)	mg/l,max.	50	400	800
9.	Dissolved phosphates (as P)	mg/l,max.	1	5	10
10.	Ammoniacal nitrogen (as N)	mg/l,max.	15	50	150
11.	Cyanides (as CN)	mg/l,max.	0.1	0.2	0.4
12.	Total residual chlorine (as Cl ₂)	mg/l,max.	0.5	0.5	1.0
13.	Fluorides (as F)	mg/l,max.	2	2	5
14.	Sulphides (as S)	mg/l,max.	2	2	5
15.	Arsenic, total (as As)	mg/l,max.	0.08	0.1	0.2
16.	Cadmium, total (as Cd)	mg/l,max.	0.02	0.05	0.10
17.	Chromium, total (as Cr)	mg/l,max.	0.05	0.05	0.10
18.	Chromium, hexavalent (as Cr ⁶⁺)	mg/l,max.	0.01	0.01	0.05
19.	Copper, total (as Cu)	mg/l,max.	1.0	1.0	1.0
20.	Lead, total (as Pb)	mg/l,max.	0.05	0.10	0.10
21.	Mercury, total (as Hg)	mg/l,max.	0.001	0.002	0.01
22.	Nickel, total (as Ni)	mg/l,max.	0.1	0.2	1.0
23.	Selenium, total (as Se)	mg/l,max.	0.01	0.05	0.10
24.	Zinc, total (as Zn)	mg/l,max.	3	3	5
25.	Silver, total (as Ag)	mg/l,max.	0.005	0.035	0.35
26.	Pesticides (Total)	mg/l,max.	0.005	0.005	0.05
27.	Surfactants (Total)	mg/l, max.	1	5	10
28.	Faecal Coliform	MPN/100ml,max	150	1500	10 ⁷
29.	Radioactivity Gross alpha activity +	Bq/l maximum	0.5	0.5	0.5
30.	Radioactivity Gross beta activity +	Bq/l maximum	1.0	1.0	1.0

LIST IB

Colour Parameters

No.	Parameter	Unit, type of limit	Tolerance limit values for an outfall leading up to near shore water
	Colour		Maximum spectral absorption coefficient
1.	400-499 nm- (Yellow range)	m ⁻¹	7 max
2.	500-599 nm- (Red range)	m ⁻¹	5 max
3.	600-750 nm- (Blue range)	m ⁻¹	3 max

Note 1: All efforts shall be made to remove unpleasant odour as practicable as possible.

Note 2: These limit values are based on the premise that for an outfall leading up to near-shore water with no dilution, for short sea outfalls 1:10 and for long sea outfalls 1: 100 respectively. In an event where the dilution factor for a respective category mentioned above is found to be less, the limit values given in the Lists shall be adjusted on a proportional basis so as to give rise to more stringent values.

Note 3: The limit values given in the List shall be measured at the entrance of the outfall preferably at the pumping station or a manhole.

Note 4: In the case of application of this List, the design incorporating bathymetry, dilution based on actual meteorological and current data at the place of construction, construction details such as pipe details (length of the pipe), anchoring details and diffuser descriptions etc. shall be approved by the Coast Conservation and Coastal Resource Management Department, the Marine Environment Protection Authority, and any other relevant authorities as the case may be, and the letter/s of approval shall be submitted to the Authority along with the application for Environmental Protection Licence.

Note 5: The Authority may decide the final discharge point for either near shore water, short sea out fall or long sea out fall as the case may be, on the basis of an environmental screening of the likely impacts.

Note 6: In case of the tolerance limits of radioactive materials exceeds, the standards stipulated by the Sri Lanka Atomic Energy Regulatory Council shall apply.

LIST IIA

Tolerance limits for the discharge of wastewater or effluents into Coastal Waters

No.	<i>Parameter</i>	<i>Unit, type of limit</i>	<i>Tolerance limit values for coastal waters</i>
1.	Total suspended solids	mg/l, max.	50
2.	Total dissolved solids	mg/l, max.	1000
3.	pH at ambient temperature	-	6.0 – 8.5
4.	Biochemical oxygen demand (BOD ₅ in 5 days at 20°C)	mg/l,max.	30
5.	Temperature at the point of discharge	°C, max	Ambient water temperature ± 5 or 40 whichever is lesser
6.	Oils and greases	mg/l,max.	10
7.	Phenols (as C ₆ H ₅ OH)	mg/l,max.	1
8.	Chemical oxygen demand (COD)	mg/l,max.	250
9.	Dissolved phosphates (as P)	mg/l,max.	5
10.	Total Kjeldhal nitrogen (as N)	mg/l,max.	150
11.	Ammoniacal nitrogen (as N)	mg/l,max.	50
12.	Cyanide (as CN)	mg/l,max.	0.05
13.	Total residual chlorine (as Cl ₂)	mg/l,max.	0.5
14.	Chlorides (as Cl)	mg/l, max.	Shall not change 20% from the ambient level at any point of the tidal cycle.
15.	Fluorides (as F)	mg/l,max.	2.0
16.	Sulphides (as S)	mg/l,max.	2.0
17.	Arsenic, total (as As)	mg/l,max.	0.05

6A

I කොටස: (I) ඡේදය - ශ්‍රී ලංකා ප්‍රජාතාන්ත්‍රික සමාජවාදී ජනරජයේ අති විශේෂ ගැසට් පත්‍රය - 2022.01.27

PART I: SEC. (I) - GAZETTE EXTRAORDINARY OF THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA - 27.01.2022

No.	Parameter	Unit, type of limit	Tolerance limit values for coastal waters
18.	Cadmium, total (as Cd)	mg/l,max.	0.05
19.	Chromium, total (as Cr)	mg/l,max.	0.05
20.	Chromium, hexavalent (as Cr ⁶⁺)	mg/l,max.	0.01
21.	Copper, total (as Cu)	mg/l,max.	0.05
22.	Lead, total (as Pb)	mg/l,max.	0.05
23.	Mercury, total (as Hg)	mg/l,max.	0.001
24.	Nickel, total (as Ni)	mg/l,max.	0.2
25.	Selenium, total (as Se)	mg/l,max.	0.05
26.	Zinc, total (as Zn)	mg/l,max.	1.0
27.	Silver, total (as Ag)	mg/l,max.	0.035
28.	Pesticides (Total)	mg/l,max.	0.005
29.	Surfactants (Total)	mg/l, max.	5.0
30.	Sulphates (as S)	mg/l, max.	250
31.	Faecal coliform	MPN/100ml, max.	150
32.	Radioactivity Gross alpha activity +	Bq/l maximum	0.5
33.	Radioactivity Gross beta activity +	Bq/l maximum	1.0

LIST IIB
Colour Parameters

No.	Parameter	Unit, type of limit	Tolerance limit values for coastal waters
	Colour		Maximum spectral absorption coefficient
1.	400-499 nm- (Yellow range)	m ⁻¹	7 max
2.	500-599 nm- (Red range)	m ⁻¹	5 max
3.	600-750 nm- (Blue range)	m ⁻¹	3 max

Note 1: All efforts shall be made to remove unpleasant odour as practicable as possible.

Note 2: These limit values are based on the premise that for coastal water the dilution factor may be at least 1:8. In an event where the dilution factor is found to be less, the limit values given in the Lists shall be adjusted on a proportional basis so as to give rise to more stringent limit values.

Note 3: In case of the tolerance limits of radioactive materials exceeds, the standards stipulated by the Sri Lanka Atomic Energy Regulatory Council shall apply.

LIST IIIA

Tolerance limits for the discharge of wastewater or effluent into Inland Surface Waters

No.	Parameter	Unit, type of limit	Tolerance limit values for Inland surface waters
1.	Total suspended solids	mg/l, max.	50
2.	Total dissolved solids	mg/l, max.	1000
3.	pH at ambient temperature	-	6.0 – 8.5
4.	Biochemical oxygen demand (BOD ₅ in 5 days at 20 ⁰ C)	mg/l,max.	30
5.	Temperature at the point of discharge	⁰ C, max.	Ambient water temperature ± 5 or 40 whichever is lesser
6.	Oils and greases	mg/l,max.	10
7.	Phenols (as C ₆ H ₅ OH)	mg/l,max.	1.0
8.	Chemical oxygen demand (COD)	mg/l,max.	250
9.	Dissolved phosphates (as P)	mg/l,max.	5
10.	Total Kjeldhal nitrogen (as N)	mg/l,max.	150
11.	Ammoniacal nitrogen (as N)	mg/l,max.	50
12.	Nitrate (as N)	mg/l,max.	10
13.	Cyanide (as CN)	mg/l,max.	0.05
14.	Total residual chlorine (as Cl ₂)	mg/l,max.	0.5
15.	Chlorides (as Cl)	mg/l,max.	400
16.	Fluorides (as F)	mg/l,max.	2.0
17.	Sulphides (as S)	mg/l,max.	0.5
18.	Arsenic, total (as As)	mg/l,max.	0.05
19.	Cadmium, total (as Cd)	mg/l,max.	0.03
20.	Chromium, total (as Cr)	mg/l,max.	0.05
21.	Chromium, hexavalent (as Cr ⁶⁺)	mg/l,max.	0.01
22.	Copper, total (as Cu)	mg/l,max.	0.05
23.	Iron, total (as Fe)	mg/l,max.	3.0
24.	Lead, total (as Pb)	mg/l,max.	0.05
25.	Mercury, total (as Hg)	mg/l,max.	0.001
26.	Nickel, total (as Ni)	mg/l,max.	0.2
27.	Selenium, total(as Se)	mg/l,max.	0.05
28.	Zinc, total (as Zn)	mg/l,max.	2.0
29.	Silver, total (as Ag)	mg/l,max.	0.035
30.	Pesticides (Total)	mg/l,max.	0.005
31.	Surfactants (Total)	mg/l, max.	5.0
32.	Faecal coliform	MPN/100ml, max.	150
33.	Sulphates (as S)	mg/l, max.	250
34.	Radioactivity Gross alpha activity +	Bq/l maximum	0.5
35.	Radioactivity Gross beta activity +	Bq/l maximum	1.0

LIST III B

Colour Parameters

No.	Parameter	Unit, type of limit	Tolerance limit values for inland surface waters
	Colour		Maximum spectral absorption coefficient
1.	400-499 nm- (Yellow range)	m ⁻¹	7 max
2.	500-599 nm- (Red range)	m ⁻¹	5 max
3.	600-750 nm- (Blue range)	m ⁻¹	3 max

Note 1: All efforts shall be made to remove unpleasant odour as practicable as possible.

Note 2: These limit values are based on the premise that for inland surface waters the dilution factor may be at least 1:8. In an event where the dilution factor is found to be less, the limit values given in the Lists shall be adjusted on a proportional basis so as to give rise to more stringent limit values.

Note 3: In case of the tolerance limits of radioactive materials exceeds, the standards stipulated by the Sri Lanka Atomic Energy Regulatory Council shall apply.

LIST IV

Tolerance limits for the discharge of wastewater or effluent on land for agriculture purposes

No.	Parameter	Unit, type of limit	Tolerance limit values for on land disposal
1.	Total dissolved solids	mg/l, max.	2000
2.	pH at ambient temperature	-	6.5 – 8.5
3.	Biochemical oxygen demand (BOD ₅ in 5 days at 20°C)	mg/l,max.	250
4.	Oils and greases	mg/l,max.	10
5.	Chemical oxygen demand (COD)	mg/l,max.	400
6.	Chlorides (as Cl)	mg/l,max.	300
7.	Sulphates (as S)	mg/l,max.	350
8.	Boron (as B)	mg/l,max.	2.0
9.	Arsenic, total (as As)	mg/l,max.	0.01
10.	Cadmium, total (as Cd)	mg/l,max.	0.003
11.	Chromium, total (as Cr)	mg/l,max.	0.05
12.	Lead, total (as Pb)	mg/l,max.	0.01
13.	Mercury, total (as Hg)	mg/l,max.	0.001
14.	Sodium adsorption ratio (SAR)	max	10
15.	Residual Sodium carbonate (RSC)	miliequivalent / l, max.	1.25
16.	Nitrate (as N)	mg/l,max.	10
17.	Electrical conductivity	μS/cm, max	2500

No.	Parameter	Unit, type of limit	Tolerance limit values for on land disposal
18.	Faecal coliform	MPN/100ml, max.	1000
19.	Copper total (as Cu)	mg/l,max.	0.2
20.	Cyanide (as CN)	mg/l,max.	0.05
21.	Nickel total (as Ni)	mg/l,max.	0.02
22.	Selenium total (as Se)	mg/l,max.	0.01
23.	Zinc total (as Zn)	mg/l,max.	1.0
24.	Discharge rate Hydrolic loading rate	m ³ /hectare/day	as decided in accordance with the notes given herein below
25.	Radioactivity Gross alpha activity +	Bq/l maximum	0.5
26.	Radioactivity Gross beta activity +	Bq/l maximum	1.0

Note 1: The effluent discharge on land shall only be allowed under the following conditions;

- (a) The highest seasonal groundwater table usually envisaged during rainy season Shall be at least 0.5 meters below the existing ground surface.
- (b) The natural slope of the existing ground surface shall not be steeper than 30 Percent (or 16.7 degrees).

Provided however, the discharge on ground, steeper than 30% could be allowed under the circumstances where measures are taken in order to curtail the run off arising due to the said discharge.

In this context a report showing the methods by which the runoff be curtailed shall be submitted to the Authority and the approval for the proposed method shall be obtained.

A test report indicating the design infiltration rate done by a competent authority for the soil investigations shall be submitted to the Authority.

Note 2: The in-situ infiltration rate of the land to which the effluents be discharged shall be measured in accordance with the standard test method for infiltration rate of soils in the field using double- ring infiltrometers stipulated in ASTM D3385-09 or by a standard test method followed at present.

Note 3: In case if the soil layers are different, the number of in-situ tests to be carried out for the land to which the effluents discharge is planned shall be decided as follows:-

- (i) For a land having an extent up to 0.1 hectare (1000 m²) - 1 test
- (ii) For a land having an extent greater than 0.1 hectare (1000 m²) and up to 1.0 hectare (10,000m²) - 2 tests
- (iii) For a land having an extent greater than 1.0 hectare (10,000 m²) and up to 5.0 hectare (50,000m²) - 3 tests
- (iv) For a land having an extent greater than 5.0 hectare (50,000 m²) - 5 tests

Note 4: Design infiltration rate will be obtained by getting the average infiltration rate from clause (3) and it will be multiplied by the factor of safety 1/3. This method of estimation of infiltration rate will be recommended merely to account for the variation of soil strata in the land to which the effluent be discharged.

Note 5: A report encompassing method of delivery of effluents to the land, method of irrigation over the land, number of hours of application, effluent storage facilities, types of crops and any other details envisaged shall be forwarded to the Authority.

Note 6: The Authority has the sole discretion to decide based on the reports submitted the applicable infiltration rate so that the project developer could adhere to the given infiltration rate in deciding the land requirement for disposal of effluent for the purpose of agriculture.

Note 7: In case of the tolerance limits of radioactive materials exceeds, the standards stipulated by the Sri Lanka Atomic Energy Regulatory Council shall apply.

LIST V

Tolerance limits for the discharge of leachates in respect of either solid waste or hazardous waste landfill into either Inland Surface Waters, Coastal Water or both

No.	Parameter	Unit, type of limit	Tolerance limit values
1.	pH at the ambient temperature	-	6.0 – 8.5
2.	Total suspended solids	mg/l,max.	100
3.	Biochemical oxygen demand (BOD ₅ in 5 days at 20 ⁰ C)	mg/l,max.	80
4.	Chemical oxygen demand (COD)	mg/l,max.	1000
5.	Total nitrogen (as N)	mg/l,max.	100
6.	Ammoniacal nitrogen (as N)	mg/l,max.	50
7.	Total phosphorus (as P)	mg/l,max.	8.0
8.	Arsenic, total (as As)	mg/l,max.	0.1
9.	Cadmium, total (as Cd)	mg/l,max.	0.05
10.	Chromium, total (as Cr)	mg/l,max.	0.5
11.	Chromium, hexavalent (as Cr ⁶⁺)	mg/l,max.	0.05
12.	Copper, total (as Cu)	mg/l,max.	0.05
13.	Iron, total (as Fe)	mg/l,max.	3.0
14.	Lead, total (as Pb)	mg/l,max.	0.1
15.	Mercury, total (as Hg)	mg/l,max.	0.002
16.	Nickel, total (as Ni)	mg/l,max.	0.2
17.	Selenium, total (as Se)	mg/l,max.	0.05
18.	Zinc, total (as Zn)	mg/l,max.	1.0
19.	Silver, total (as Ag)	mg/l,max.	0.035

Note 1: All efforts shall be made to remove unpleasant odour and colour as practicable as possible.

Note 2: These limit values are based on the premise that for either inland surface water or coastal water, as the case may be, the dilution factor may be at least 1:8. In an event where the dilution factor is found to be less, the limit values in the List shall be adjusted on a proportional basis so as to give rise to more stringent limit values.

Note 3: The List V is a set of interim criteria applicable for a specific period of 3 years from the date of enactment of these regulations and thereafter the general standards given in either List IIA, List IIB, List IIIA or List IIIB, as the case may be, shall be applicable.

Note 4: The Authority may decide the final discharge point for either inland surface water or coastal water, as the case may be, on the basis of an environmental screening of the likely impacts.

LIST VIA

Tolerance limits for the discharge of wastewater or effluent into public sewer network, connected either to a common treatment plant or a sea outfall or a combination of both

No.	Parameter	Unit, type of limit	Tolerance limit values
1.	Total suspended solids	mg/l, max.	500
2.	Total dissolved solids	mg/l, max.	3000
3.	pH at the ambient temperature	-	5.5 - 9.0
4.	Biochemical oxygen demand (BOD ₅ in 5 days at 20 ⁰ C)	mg/l,max.	400
5.	Temperature at the discharge point	⁰ C, max	45
6.	Oils and greases	mg/l, max.	20
7.	Phenols (as C ₆ H ₅ OH)	mg/l, max.	5.0
8.	Chemical oxygen demand (COD)	mg/l, max.	800
9.	Total Phosphorous (as P)	mg/l, max.	3.5
10.	Total Kjeldhal nitrogen (as N)	mg/l, max.	350
11.	Free ammonia (as N)	mg/l, max.	50
12.	Ammoniacal nitrogen (as N)	mg/l, max.	50
13.	Cyanide (as CN)	mg/l, max.	2.0
14.	Total residual chlorine (as Cl ₂)	mg/l, max.	2.0
15.	Chlorides (as Cl)	mg/l, max.	1200
16.	Fluorides (as F)	mg/l, max.	10
17.	Sulphides (as S)	mg/l, max.	2.0
18.	Arsenic, total (as As)	mg/l, max.	0.1
19.	Cadmium, total (as Cd)	mg/l, max.	0.1
20.	Chromium, total (as Cr)	mg/l, max.	2.0
21.	Chromium, hexavalent (as Cr ⁶⁺)	mg/l, max.	0.5
22.	Copper, total (as Cu)	mg/l, max.	3.0
23.	Lead, total (as Pb)	mg/l, max.	0.1
24.	Mercury, total (as Hg)	mg/l, max.	0.005
25.	Nickel, total (as Ni)	mg/l,max.	3.0
26.	Selenium, total (as Se)	mg/l,max.	0.1
27.	Zinc, total (as Zn)	mg/l,max.	5.0
28.	Pesticides (Total)	mg/l,max.	0.005
29.	Surfactants (Total)	mg/l, max.	50
30.	Sulphates (as S)	mg/l, max.	350
31.	Radioactivity Gross alpha activity +	Bq/l maximum	0.5
32.	Radioactivity Gross beta activity +	Bq/l maximum	1.0

LIST VIB

Colour Parameters

<i>No.</i>	<i>Parameter</i>	<i>Unit, type of limit</i>	<i>Tolerance limit values</i>
	Colour		Maximum spectral absorption coefficient
1.	400-499 nm- (Yellow range)	m^{-1}	7 max
2.	500-599 nm- (Red range)	m^{-1}	5 max
3.	600-750 nm- (Blue range)	m^{-1}	3 max

Note 1: Following conditions shall be met:

- Discharge of highly viscous material shall be prohibited.
- Sludge including Calcium Carbide shall not be discharged.
- Substances producing inflammable vapours shall be absent
- Oil based substances shall not be discharged.

Note 2: In case of the tolerance limits of radioactive materials exceeds, the standards stipulated by the Sri Lanka Atomic Energy Regulatory Council shall apply.

For the purposes of this Schedule-

“Coastal water” means a body of surface water confined in an area lying within a limit of 300 meters landwards of the mean high water line or surface water in a river, stream, lagoon or any other body of water connected to the sea either permanently or periodically, within to a limit of 2 km landwards measured perpendicular from the mean high water line;

“Coastal Zone” means that the area referred to in the Coast Conservation Act, No.57 of 1981;

“Dilution factor” means the ratio of the quantity of wastewater or effluent that is discharged to the average quantity of diluting water available which accounts for both the effluent discharged and the receiving water at the point of disposal;

“Ground water” means water that collects or flows beneath the Earth's surface, filling the porous spaces in soil, sediment, and rocks, which originates from rain and is the source of water for aquifers, springs, and wells; the upper surface of groundwater is reckoned to be the water table;

“Inland surface water” means any standing or flowing water on the surface of the land extending up to the boundary of the coastal water;

“Leachate” means liquid that seeps through solid waste or other medium and has extracts of dissolved or suspended material from it.

“Long sea outfall” means a pipeline or a tunnel that discharges wastewater or effluent from a prescribed activity and is laid underneath the marine water with a mechanism to achieve intended dilution in such a manner that there shall be a minimum dilution factor of 1:100 at a distance of 500 metres from the point of exit of the pipeline or tunnel;

“Marine water” means the water in the area bounded by the mean low water line and the outer limit of the territorial sea;

“Near-Shore water” means the water in the area bounded by the mean low water line and a line drawn parallel to wave breaking with a depth of 2.0 metres from the mean sea level;

“Outfall leading up to the near-shore” means a pipeline or a tunnel that discharges wastewater or effluent from a prescribed activity and is laid underneath the marine water with no dilution expected at a distance of 1.0 metre from the point of exit of the pipeline or tunnel;

“Short sea outfall” means a pipeline or a tunnel that discharges wastewater or effluent from a prescribed activity and is laid underneath the marine water with a mechanism to achieve intended dilution in such a manner that there shall be a minimum dilution factor of 1:10 at a distance of 10 metres from the point of exit of the pipeline or tunnel; and

“Surface Water” means any standing or flowing water on the surface of the land which includes inland surface water, coastal water and marine water excluding ground water.”.

(6) by the substitution for the Schedule III thereof, of the following:-

“SCHEDULE III
LICENCE FEE

The Licence Fee and the Renewal Fee for the activities, except the mining activities, specified in Parts A, B and C of the Order made under section 23A of the National Environmental Act, No.47 of 1980, shall be as follows: -

<i>Part</i>	<i>Duration</i>	<i>Fee Rs</i>
A	One year or less	15,000/=
B	One year or less	10,000/=
C	Two years or less	4,000/=
		(payable in two equal installments)
D	Three years or less	4,500/=
		(payable in three equal installments)

The Licence Fee and the Renewal Fee for the mining activities, specified in Parts A, B and C of the Order made under Section 23A of the National Environmental Act, No.47 of 1980, shall be as follows:-

<i>Part</i>	<i>Duration</i>	<i>Fee Rs</i>
A	Three years or less	45,000/=
B	Three years or less	30,000/=
C	Three years or less	6,000/=

Note: Half of the actual Licence Fee and the Renewal Fee shall be levied from hospitals and waste management facilities operated by government and government institutions.”.

2. Any person, who, on the date of coming into operation of these regulations, is carrying out a prescribed activity with specific tolerance limits shall, within a period of twelve (12) months or within a period specified by the Authority, make an application to the Authority in the form set out in the Schedule II and obtain an Environmental Protection License in respect of such activity.

EOG 01 - 0261/1



1.3 Wastewater and Ambient Water Quality

Applicability and Approach.....	25
General Liquid Effluent Quality.....	26
Discharge to Surface Water.....	26
Discharge to Sanitary Sewer Systems.....	26
Land Application of Treated Effluent.....	27
Septic Systems.....	27
Wastewater Management.....	27
Industrial Wastewater.....	27
Sanitary Wastewater.....	29
Emissions from Wastewater Treatment Operations.....	30
Residuals from Wastewater Treatment Operations.....	30
Occupational Health and Safety Issues in Wastewater Treatment Operations.....	30
Monitoring.....	30

Applicability and Approach

This guideline applies to projects that have either direct or indirect discharge of process wastewater, wastewater from utility operations or stormwater to the environment. These guidelines are also applicable to industrial discharges to sanitary sewers that discharge to the environment without any treatment. Process wastewater may include contaminated wastewater from utility operations, stormwater, and sanitary sewage. It provides information on common techniques for wastewater management, water conservation, and reuse that can be applied to a wide range of industry sectors. This guideline is meant to be complemented by the industry-specific effluent guidelines presented in the Industry Sector Environmental, Health, and Safety (EHS) Guidelines. Projects with the potential to generate process wastewater, sanitary (domestic) sewage, or stormwater should incorporate the necessary precautions to avoid, minimize, and control adverse impacts to human health, safety, or the environment.

In the context of their overall ESHS management system, facilities should:

- Understand the quality, quantity, frequency and sources of liquid effluents in its installations. This includes knowledge about the locations, routes and integrity of internal drainage systems and discharge points
- Plan and implement the segregation of liquid effluents principally along industrial, utility, sanitary, and stormwater categories, in order to limit the volume of water requiring specialized treatment. Characteristics of individual streams may also be used for source segregation.
- Identify opportunities to prevent or reduce wastewater pollution through such measures as recycle/reuse within their facility, input substitution, or process modification (e.g. change of technology or operating conditions/modes).
- Assess compliance of their wastewater discharges with the applicable: (i) discharge standard (if the wastewater is discharged to a surface water or sewer), and (ii) water quality standard for a specific reuse (e.g. if the wastewater is reused for irrigation).

Additionally, the generation and discharge of wastewater of any type should be managed through a combination of:

- Water use efficiency to reduce the amount of wastewater generation
- Process modification, including waste minimization, and reducing the use of hazardous materials to reduce the load of pollutants requiring treatment
- If needed, application of wastewater treatment techniques to further reduce the load of contaminants prior to discharge, taking into consideration potential impacts of cross-media transfer of contaminants during treatment (e.g., from water to air or land)

When wastewater treatment is required prior to discharge, the level of treatment should be based on:

- Whether wastewater is being discharged to a sanitary sewer system, or to surface waters
- National and local standards as reflected in permit requirements and sewer system capacity to convey and treat wastewater if discharge is to sanitary sewer
- Assimilative capacity of the receiving water for the load of contaminant being discharged wastewater if discharge is to surface water
- Intended use of the receiving water body (e.g. as a source of drinking water, recreation, irrigation, navigation, or other)
- Presence of sensitive receptors (e.g., endangered species) or habitats
- Good International Industry Practice (GIIP) for the relevant industry sector

General Liquid Effluent Quality

Discharge to Surface Water

Discharges of process wastewater, sanitary wastewater, wastewater from utility operations or stormwater to surface water should not result in contaminant concentrations in excess of local ambient water quality criteria or, in the absence of local criteria, other sources of ambient water quality.³⁵ Receiving water use³⁶ and assimilative capacity³⁷, taking other sources of discharges to

³⁵ An example is the US EPA National Recommended Water Quality Criteria <http://www.epa.gov/waterscience/criteria/wqcriteria.html>

³⁶ Examples of receiving water uses as may be designated by local authorities include: drinking water (with some level of treatment), recreation, aquaculture, irrigation, general aquatic life, ornamental, and navigation. Examples of health-based guideline values for receiving waters include World Health Organization (WHO) guidelines for recreational use (http://www.who.int/water_sanitation_health/dwq/guidelines/en/index.html)

³⁷ The assimilative capacity of the receiving water body depends on numerous factors including, but not limited to, the total volume of water, flow rate, flushing rate of the water body and the loading of pollutants from other effluent sources in

the receiving water into consideration, should also influence the acceptable pollution loadings and effluent discharge quality. Additional considerations that should be included in the setting of project-specific performance levels for wastewater effluents include:

- Process wastewater treatment standards consistent with applicable Industry Sector EHS Guidelines. Projects for which there are no industry-specific guidelines should reference the effluent quality guidelines of an industry sector with suitably analogous processes and effluents;
- Compliance with national or local standards for sanitary wastewater discharges or, in their absence, the indicative guideline values applicable to sanitary wastewater discharges shown in Table 1.3.1 below;
- Temperature of wastewater prior to discharge does not result in an increase greater than 3°C of ambient temperature at the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use and assimilative capacity among other considerations.

Discharge to Sanitary Sewer Systems

Discharges of industrial wastewater, sanitary wastewater, wastewater from utility operations or stormwater into public or private wastewater treatment systems should:

- Meet the pretreatment and monitoring requirements of the sewer treatment system into which it discharges.
- Not interfere, directly or indirectly, with the operation and maintenance of the collection and treatment systems, or pose a risk to worker health and safety, or adversely impact

the area or region. A seasonally representative baseline assessment of ambient water quality may be required for use with established scientific methods and mathematical models to estimate potential impact to the receiving water from an effluent source.

characteristics of residuals from wastewater treatment operations.

- Be discharged into municipal or centralized wastewater treatment systems that have adequate capacity to meet local regulatory requirements for treatment of wastewater generated from the project. Pretreatment of wastewater to meet regulatory requirements before discharge from the project site is required if the municipal or centralized wastewater treatment system receiving wastewater from the project does not have adequate capacity to maintain regulatory compliance.

Land Application of Treated Effluent

The quality of treated process wastewater, wastewater from utility operations or stormwater discharged on land, including wetlands, should be established based on local regulatory requirements.

Where land is used as part of the treatment system and the ultimate receptor is surface water, water quality guidelines for surface water discharges specific to the industry sector process should apply.³⁸ Potential impact on soil, groundwater, and surface water, in the context of protection, conservation and long term sustainability of water and land resources should be assessed when land is used as part of any wastewater treatment system.

Septic Systems

Septic systems are commonly used for treatment and disposal of domestic sanitary sewage in areas with no sewerage collection networks, Septic systems should only be used for treatment of sanitary sewage, and unsuitable for industrial wastewater treatment. When septic systems are the selected form of wastewater disposal and treatment, they should be:

- Properly designed and installed in accordance with local regulations and guidance to prevent any hazard to public health or contamination of land, surface or groundwater.
- Well maintained to allow effective operation.
- Installed in areas with sufficient soil percolation for the design wastewater loading rate.
- Installed in areas of stable soils that are nearly level, well drained, and permeable, with enough separation between the drain field and the groundwater table or other receiving waters.

Wastewater Management

Wastewater management includes water conservation, wastewater treatment, stormwater management, and wastewater and water quality monitoring.

Industrial Wastewater

Industrial wastewater generated from industrial operations includes process wastewater, wastewater from utility operations,, runoff from process and materials staging areas, and miscellaneous activities including wastewater from laboratories, equipment maintenance shops, etc.. The pollutants in an industrial wastewater may include acids or bases (exhibited as low or high pH), soluble organic chemicals causing depletion of dissolved oxygen, suspended solids, nutrients (phosphorus, nitrogen), heavy metals (e.g. cadmium, chromium, copper, lead, mercury, nickel, zinc), cyanide, toxic organic chemicals, oily materials, and volatile materials. , as well as from thermal characteristics of the discharge (e.g., elevated temperature). Transfer of pollutants to another phase, such as air, soil, or the sub-surface, should be minimized through process and engineering controls.

Process Wastewater – – Examples of treatment approaches typically used in the treatment of industrial wastewater are summarized in Annex 1.3.1. While the choice of treatment

³⁸ Additional guidance on water quality considerations for land application is available in the WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater. Volume 2: Wastewater Use in Agriculture http://www.who.int/water_sanitation_health/wastewater/gsuweg2/en/index.html

technology is driven by wastewater characteristics, the actual performance of this technology depends largely on the adequacy of its design, equipment selection, as well as operation and maintenance of its installed facilities. Adequate resources are required for proper operation and maintenance of a treatment facility, and performance is strongly dependent on the technical ability and training of its operational staff. One or more treatment technologies may be used to achieve the desired discharge quality and to maintain consistent compliance with regulatory requirements. The design and operation of the selected wastewater treatment technologies should avoid uncontrolled air emissions of volatile chemicals from wastewaters. Residuals from industrial wastewater treatment operations should be disposed in compliance with local regulatory requirements, in the absence of which disposal has to be consistent with protection of public health and safety, and conservation and long term sustainability of water and land resources.

Wastewater from Utilities Operations - Utility operations such as cooling towers and demineralization systems may result in high rates of water consumption, as well as the potential release of high temperature water containing high dissolved solids, residues of biocides, residues of other cooling system anti-fouling agents, etc. Recommended water management strategies for utility operations include:

- Adoption of water conservation opportunities for facility cooling systems as provided in the Water Conservation section below;
- Use of heat recovery methods (also energy efficiency improvements) or other cooling methods to reduce the temperature of heated water prior to discharge to ensure the discharge water temperature does not result in an increase greater than 3°C of ambient temperature at the edge of a scientifically established mixing zone which takes into

account ambient water quality, receiving water use, potential receptors and assimilative capacity among other considerations;

- Minimizing use of antifouling and corrosion inhibiting chemicals by ensuring appropriate depth of water intake and use of screens. Least hazardous alternatives should be used with regards to toxicity, biodegradability, bioavailability, and bioaccumulation potential. Dose applied should accord with local regulatory requirements and manufacturer recommendations;
- Testing for residual biocides and other pollutants of concern should be conducted to determine the need for dose adjustments or treatment of cooling water prior to discharge.

Stormwater Management - Stormwater includes any surface runoff and flows resulting from precipitation, drainage or other sources. Typically stormwater runoff contains suspended sediments, metals, petroleum hydrocarbons, Polycyclic Aromatic Hydrocarbons (PAHs), coliform, etc. Rapid runoff, even of uncontaminated stormwater, also degrades the quality of the receiving water by eroding stream beds and banks. In order to reduce the need for stormwater treatment, the following principles should be applied:

- Stormwater should be separated from process and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge
- Surface runoff from process areas or potential sources of contamination should be prevented
- Where this approach is not practical, runoff from process and storage areas should be segregated from potentially less contaminated runoff
- Runoff from areas without potential sources of contamination should be minimized (e.g. by minimizing the area of impermeable surfaces) and the peak discharge rate should

be reduced (e.g. by using vegetated swales and retention ponds);

- Where stormwater treatment is deemed necessary to protect the quality of receiving water bodies, priority should be given to managing and treating the first flush of stormwater runoff where the majority of potential contaminants tend to be present;
- When water quality criteria allow, stormwater should be managed as a resource, either for groundwater recharge or for meeting water needs at the facility;
- Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage and containment areas.
- Sludge from stormwater catchments or collection and treatment systems may contain elevated levels of pollutants and should be disposed in compliance with local regulatory requirements, in the absence of which disposal has to be consistent with protection of public health and safety, and conservation and long term sustainability of water and land resources.

Sanitary Wastewater

Sanitary wastewater from industrial facilities may include effluents from domestic sewage, food service, and laundry facilities serving site employees. Miscellaneous wastewater from laboratories,

medical infirmaries, water softening etc. may also be discharged to the sanitary wastewater treatment system. Recommended sanitary wastewater management strategies include:

- Segregation of wastewater streams to ensure compatibility with selected treatment option (e.g. septic system which can only accept domestic sewage);
- Segregation and pretreatment of oil and grease containing effluents (e.g. use of a grease trap) prior to discharge into sewer systems;
- If sewage from the industrial facility is to be discharged to surface water, treatment to meet national or local standards for sanitary wastewater discharges or, in their absence, the indicative guideline values applicable to sanitary wastewater discharges shown in Table 1.3.1;
- If sewage from the industrial facility is to be discharged to either a septic system, or where land is used as part of the treatment system, treatment to meet applicable national or local standards for sanitary wastewater discharges is required.
- Sludge from sanitary wastewater treatment systems should be disposed in compliance with local regulatory requirements, in the absence of which disposal has to be consistent with protection of public health and safety, and conservation and long term sustainability of water and land resources.

Table 1.3.1 Indicative Values for Treated Sanitary Sewage Discharges^a

Pollutants	Units	Guideline Value
pH	pH	6 – 9
BOD	mg/l	30
COD	mg/l	125
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Oil and grease	mg/l	10
Total suspended solids	mg/l	50
Total coliform bacteria	MPN ^b / 100 ml	400 ^a
Notes: ^a Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation. ^b MPN = Most Probable Number		

Emissions from Wastewater Treatment Operations

Air emissions from wastewater treatment operations may include hydrogen sulfide, methane, ozone (in the case of ozone disinfection), volatile organic compounds (e.g., chloroform generated from chlorination activities and other volatile organic compounds (VOCs) from industrial wastewater), gaseous or volatile chemicals used for disinfection processes (e.g., chlorine and ammonia), and bioaerosols. Odors from treatment facilities can also be a nuisance to workers and the surrounding community. Recommendations for the management of emissions are presented in the Air Emissions and Ambient Air Quality section of this document and in the EHS Guidelines for Water and Sanitation.

Residuals from Wastewater Treatment Operations

Sludge from a waste treatment plant needs to be evaluated on a case-by-case basis to establish whether it constitutes a hazardous

or a non-hazardous waste and managed accordingly as described in the Waste Management section of this document.

Occupational Health and Safety Issues in Wastewater Treatment Operations

Wastewater treatment facility operators may be exposed to physical, chemical, and biological hazards depending on the design of the facilities and the types of wastewater effluents managed. Examples of these hazards include the potential for trips and falls into tanks, confined space entries for maintenance operations, and inhalation of VOCs, bioaerosols, and methane, contact with pathogens and vectors, and use of potentially hazardous chemicals, including chlorine, sodium and calcium hypochlorite, and ammonia. Detailed recommendations for the management of occupational health and safety issues are presented in the relevant section of this document. Additional guidance specifically applicable to wastewater treatment systems is provided in the EHS Guidelines for Water and Sanitation.

Monitoring

A wastewater and water quality monitoring program with adequate resources and management oversight should be developed and implemented to meet the objective(s) of the monitoring program. The wastewater and water quality monitoring program should consider the following elements:

- *Monitoring parameters:* The parameters selected for monitoring should be indicative of the pollutants of concern from the process, and should include parameters that are regulated under compliance requirements;
- *Monitoring type and frequency:* Wastewater monitoring should take into consideration the discharge characteristics from the process over time. Monitoring of discharges from processes with batch manufacturing or seasonal process variations should take into consideration of time-dependent

variations in discharges and, therefore, is more complex than monitoring of continuous discharges. Effluents from highly variable processes may need to be sampled more frequently or through composite methods. Grab samples or, if automated equipment permits, composite samples may offer more insight on average concentrations of pollutants over a 24-hour period. Composite samplers may not be appropriate where analytes of concern are short-lived (e.g., quickly degraded or volatile).

- *Monitoring locations:* The monitoring location should be selected with the objective of providing representative monitoring data. Effluent sampling stations may be located at the final discharge, as well as at strategic upstream points prior to merging of different discharges. Process discharges should not be diluted prior or after treatment with the objective of meeting the discharge or ambient water quality standards.
- *Data quality:* Monitoring programs should apply internationally approved methods for sample collection, preservation and analysis. Sampling should be conducted by or under the supervision of trained individuals. Analysis should be conducted by entities permitted or certified for this purpose. Sampling and Analysis Quality Assurance/Quality Control (QA/QC) plans should be prepared and implemented. QA/QC documentation should be included in monitoring reports.

Annex 1.3.1 - Examples of Industrial Wastewater Treatment Approaches

Pollutant/Parameter	Control Options / Principle	Common End of Pipe Control Technology
pH	Chemical, Equalization	Acid/Base addition, Flow equalization
Oil and Grease / TPH	Phase separation	Dissolved Air Floatation, oil water separator, grease trap
TSS - Settleable	Settling, Size Exclusion	Sedimentation basin, clarifier, centrifuge, screens
TSS - Non-Settleable	Floatation, Filtration - traditional and tangential	Dissolved air floatation, Multimedia filter, sand filter, fabric filter, ultrafiltration, microfiltration
Hi - BOD (> 2 Kg/m ³)	Biological - Anaerobic	Suspended growth, attached growth, hybrid
Lo - BOD (< 2 Kg/m ³)	Biological - Aerobic, Facultative	Suspended growth, attached growth, hybrid
COD - Non-Biodegradable	Oxidation, Adsorption, Size Exclusion	Chemical oxidation, Thermal oxidation, Activated Carbon, Membranes
Metals - Particulate and Soluble	Coagulation, flocculation, precipitation, size exclusion	Flash mix with settling, filtration - traditional and tangential
Inorganics / Non-metals	Coagulation, flocculation, precipitation, size exclusion, Oxidation, Adsorption	Flash mix with settling, filtration - traditional and tangential, Chemical oxidation, Thermal oxidation, Activated Carbon, Reverse Osmosis, Evaporation
Organics - VOCs and SVOCs	Biological - Aerobic, Anaerobic, Facultative; Adsorption, Oxidation	Biological : Suspended growth, attached growth, hybrid; Chemical oxidation, Thermal oxidation, Activated Carbon
Emissions – Odors and VOCs	Capture – Active or Passive; Biological; Adsorption, Oxidation	Biological : Attached growth; Chemical oxidation, Thermal oxidation, Activated Carbon
Nutrients	Biological Nutrient Removal, Chemical, Physical, Adsorption	Aerobic/Anoxic biological treatment, chemical hydrolysis and air stripping, chlorination, ion exchange
Color	Biological - Aerobic, Anaerobic, Facultative; Adsorption, Oxidation	Biological Aerobic, Chemical oxidation, Activated Carbon
Temperature	Evaporative Cooling	Surface Aerators, Flow Equalization
TDS	Concentration, Size Exclusion	Evaporation, crystallization, Reverse Osmosis
Active Ingredients/Emerging Contaminants	Adsorption, Oxidation, Size Exclusion, Concentration	Chemical oxidation, Thermal oxidation, Activated Carbon, Ion Exchange, Reverse Osmosis, Evaporation, Crystallization
Radionuclides	Adsorption, Size Exclusion, Concentration	Ion Exchange, Reverse Osmosis, Evaporation, Crystallization
Pathogens	Disinfection, Sterilization	Chlorine, Ozone, Peroxide, UV, Thermal
Toxicity	Adsorption, Oxidation, Size Exclusion, Concentration	Chemical oxidation, Thermal oxidation, Activated Carbon, Evaporation, crystallization, Reverse Osmosis

SA/RN/PIM/07/34/2022

2022.05.17

Sabaragamuwa Provincial Office, 582/2, Court Junction,
New Town,Ratnapura. Tel:- 0452226984/ Fax: - 0452233984

Chairman,
Pradhesiya Sabha,
Imbulpe.

Environmental Recommendations from Central Environmental Authority for the proposed Septage Treatment Plant at Sabaragamuwa University of Sri Lanka , Belihuloya as land marked called Mahathenna Mukalana, Lot No 354 of sheet no 06 in F.V.P 571.

Vice chancellor, University of Sabaragmuwa ,Belihuloya has submitted an application dated 07.04.2022 to this authority regarding the above matter.

This is to inform you that this Authority has recommended your approval for the proposed Sewerage treatment plant at the above location subject to following conditions, which should be strictly adhered by the developer to abate environmental pollution likely to arise from the operations of this apartment.

1. The Preliminary Planning Clearance for the proposed Sewerage treatment plant should be obtained from Urban Development Authority.

Control Noise, Dust and Vibration Construction Stage:

2. 2.1 Noise level at the boundary of land during the construction stage should be maintained at or below 75 dB (A) during day. (from 0600 hrs to 2100 hrs)
- 2.2 No noise generation activities shall be carried out from 6.00 a.m. to 9.00 p.m.
3. All the construction operations shall be carried out in such a way not to cause a nuisance to the neighbors. During the construction period temporary covers shall be constructed to an adequate height to reduce the spread of dust and noise.

Operation Stage :

4. Noise levels at the boundary of the Sewerage treatment plant during the operation should be maintained at or below 55 dB (A) during day time (between 0600 hrs and 1800 hrs) and at or below 45 dB (A) during night time (between 1800 hrs and 0600 hrs).

Air Pollution Control :

5. Sludge handling operation shall be kept odor free.

Water Pollution Control:

6. 6.1 Sewerage treatment plant should be constructed to treat domestic waste water and sewerage arising from building complexes of University premises (hostels, administrative buildings, canteens, quarters...etc), according to the project proposal dated April 2022.

- 6.2 Treated waste water should be conformed to tolerance limits for the discharge of wastewater or effluent into inland surface waters, in accordance with the standards and criteria prescribed by the National Environmental (Protection and Quality) Regulations No. 1 of 2008, published in the gazette No. 1534/18 dated 01.02.2008 amended by gazette No. 2264/17 dated 27.01.2022 (Annexure I).
- 6.3 Treated wastewater should be discharged disinfected through a natural pond as proposed.
- 6.4 If there will be excess quantity of treated waste water will be stored in tanks for recycling or gardening purposes.
- 6.5 Except storm waters any other waste water generated from the building complex of University premises should not be discharged into road side drain or outside the premises.

Solid Waste Management :

- 7. 7.1 Solid waste including sludge of the Sewerage treatment plant should not be burnt in an open area.
- 7.2 Waste disposal methods should be implemented with the assistance and approval of the Imbulpe Pradhisiya Sabha.
- 7.3 The bio-degradable waste may be disposed through Imbulpe Pradhisiya Sabha.
- 7.4 Adequate precautions shall be adopted to ensure that the transportation of garbage would not cause any nuisance or damage to any person.
- 7.5 No solid waste shall be disposed of into water way or at a site where it is likely to enter a water body.
- 7.6 Litter, insects, odor and vectors shall be controlled to prevent sanitary nuisance and unsightly appearance.

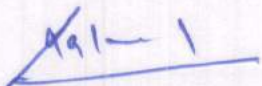
General Conditions :

- 8. Any technological guidance on Environmental Pollution Control could be obtained from any one of the consultant/specialists listed in the annexed document (Annexure II).
- 9. **According to gazette extraordinary no.1466/5 dated 10/10/2006 polythene or polythene products which are 20 microns (20µm) or below in thickness shall not be used for the industrial/ domestic activities.**
- 10. If an electricity generator is envisaged to be used, it should be located in a sound proof chamber and exhaust line of the generator should be directed upwards from the top of the sound proof chamber where the generator to be installed. Stack emission from the standby generator should be complied with the following interim source emission standards of CEA.

Type of pollutant	Emission Limit
Particulate Matter (PM) Sulfur Dioxide (SO ₂) Nitrogen Oxides (NO _x)	Shall be controlled by fuel quality and stack height as defined in Regulation 11 and 12 (Annexure II)
Smoke /Opacity	10% Opacity

- 11. Fire protection equipments and facilities shall be made available at strategic locations within the Treatment Plant premises in consultation with fire service Department.

12. Fire protection certificate should be obtained in consultation with Chief Officer of Fire Brigade of the Ratnapura Municipal Council.
13. Good housekeeping practices shall be adopted at every time.
14. Any expansion to the sewerage treatment plant other than those stated in the application dated 07.04.2022 shall be affected with the prior approval of Central Environmental Authority.
15. Any additional conditions stipulated by the Central Environmental Authority as and when required for controlling any kind of pollution arising from the operation of this facility shall be strictly adhered to.
16. This Environmental recommendation letter is issued in relation to this proposed sewerage treatment plant should no way be considered as a final approval granted for the sitting of this proposed treatment plant at this location. The written approval of the relevant Local Authority (Pradhesiya Sabha - Imbulpe) should be obtained in order to establish this sewerage treatment plant at this location.
17. This letter of Environmental Recommendations is valid only for establishment of this proposed Sewerage treatment plant within one year from the date of issue.
18. This Environmental Recommendation Letter is issued only with respect to proposed Sewerage treatment plant **at Sabaragamuwa University of Sri Lanka, Belihuloya as land marked called Mahathenna Mukalana, Lot No 354 of sheet no 06 in F.V.P 571. Certified by superintendent of Survey, Survey Department, Ratnapura.**
19. 20.1 In accordance with section 23 (A) of the National Environmental Act No. 53 of 2000 an Environmental Protection License shall be obtained from the Central Environmental Authority by the developer to carry out operations of the industry.
20.2 One month prior to commencement of operation of the industry the developer shall submit an Environmental Protection License application to the Authority with the building approval letter or certificate of conformity from Local Authority. An application for license could be obtained from the Central Environmental Authority or from the relevant Local Authority of the area.
20. This Environmental Recommendation is issued to carry on only the permitted activities state therein; It shall not and is not intended to confer the recipient there of any right to assert ownership to the land where the permitted activities are carried on.

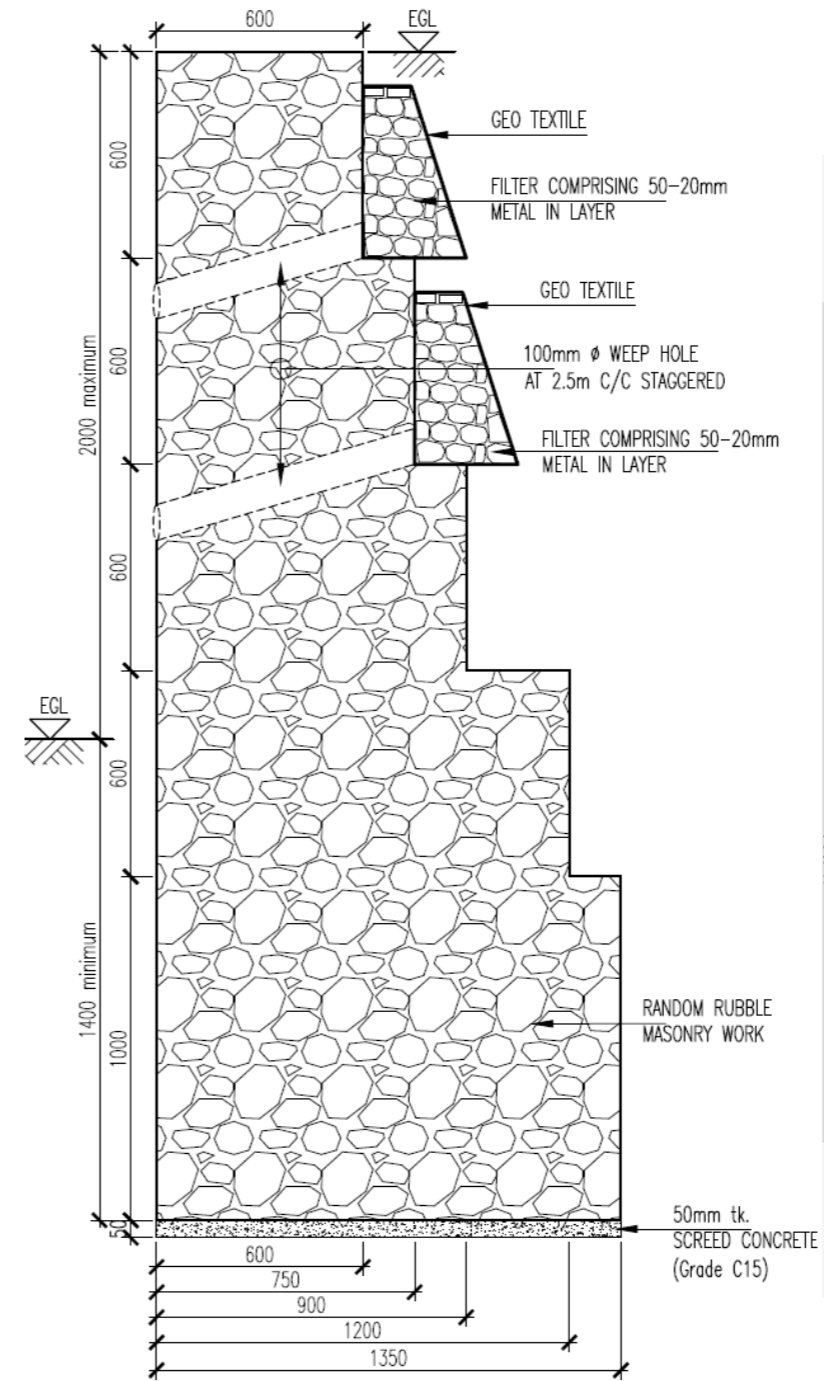
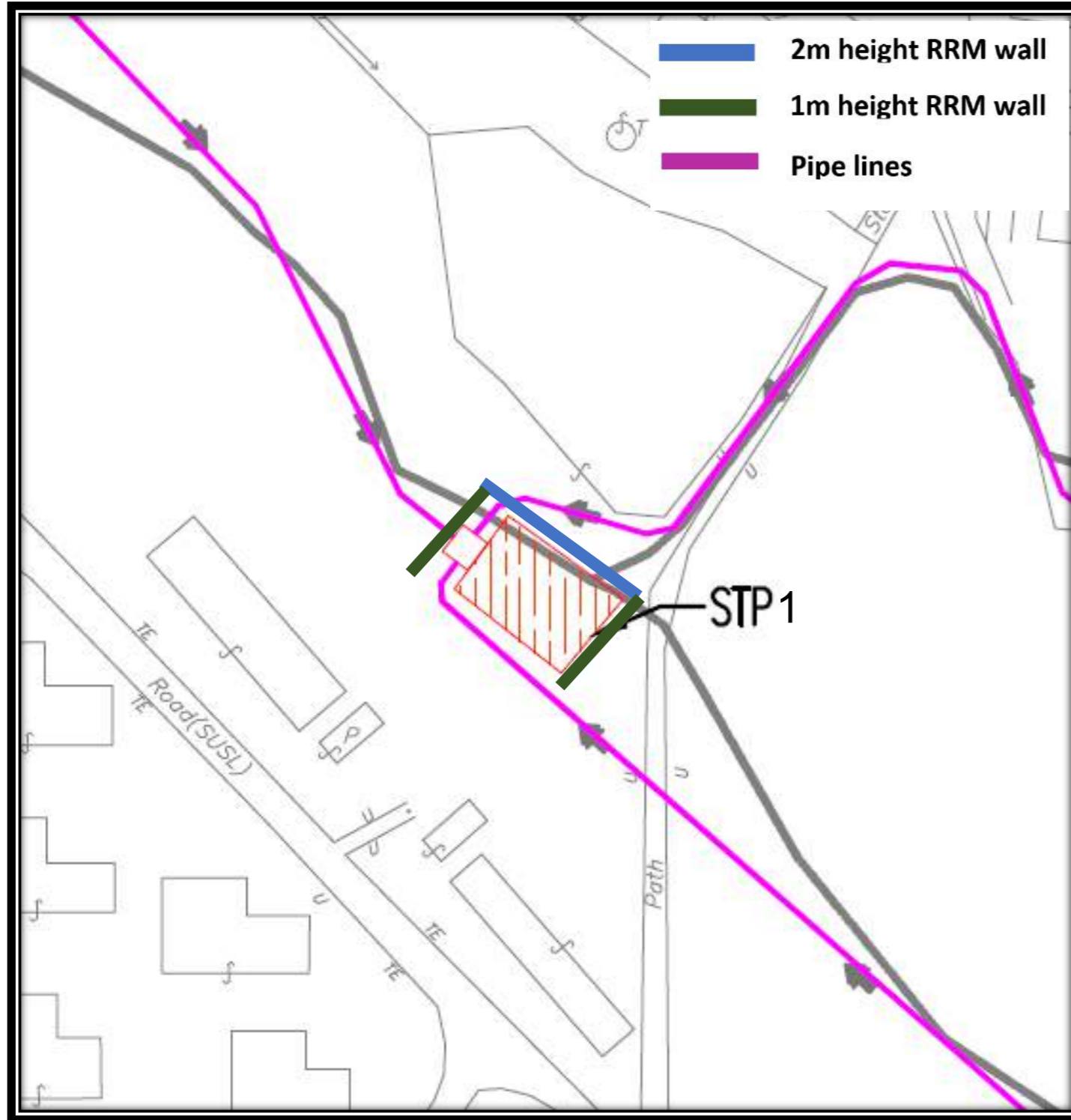

S.M.A.Senanayaka,
Director (Sabaragamuwa),
Central Environmental Authority,
Sabaragamuwa Province Office,
Ratnapura.

CC:

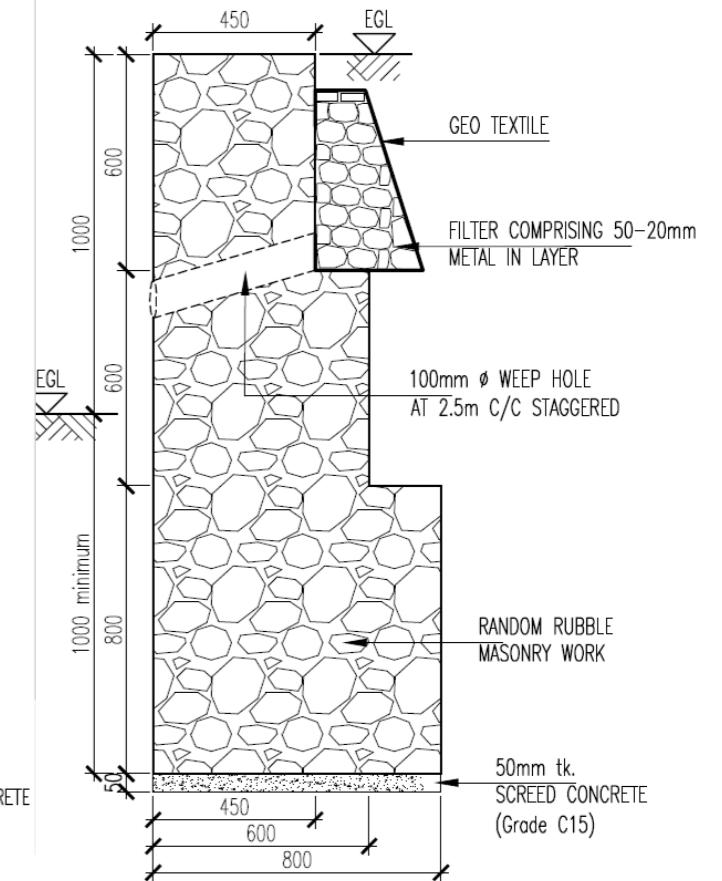
1. Director, Urban Development Authority Sabaragamuwa Provincial Office, Newtown, Ratnapura.- F.Y.I.plf
2. Prof. R.M.U.S.K.Ratnayaka, Vice chancellor, University of sabaragmuwa, Belihuloya . -F.Y.I.plf

PROPOSED RETAINING WALL DETAILS FOR SEWER TREATMENT PLANT 1 – FOT SABARAGAMUWA

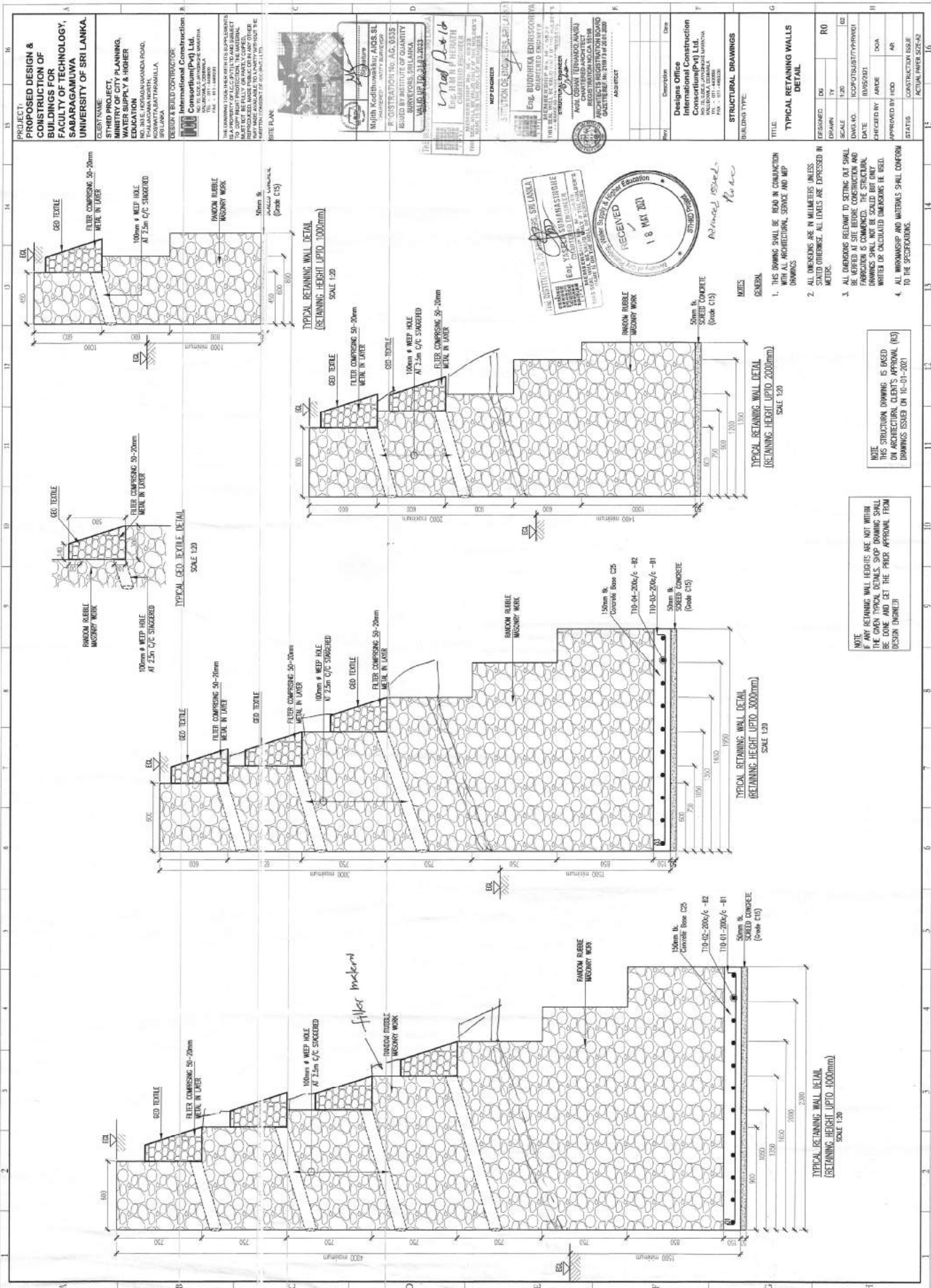
Note:
The term "STP 1" has been used as "STP" in this report.



TYPICAL RETAINING WALL DETAIL
(RETAINING HEIGHT UPTO 2000mm)



TYPICAL RETAINING WALL DETAIL
(RETAINING HEIGHT UPTO 1000mm)



NOTE: IF ANY RETAINING WALL HEIGHTS ARE NOT WITHIN THE GIVEN TYPICAL DETAILS, SHOP DRAWING SHALL BE DONE AND GET THE PRIOR APPROVAL FROM DESIGN ENGINEER

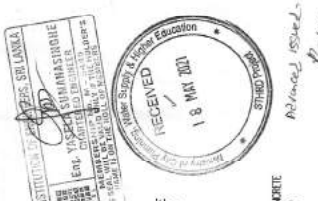
NOTE: THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL, SERVICE AND MEP DRAWINGS

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS STATED OTHERWISE. ALL LEVELS ARE EXPRESSED IN METERS.

2. ALL DIMENSIONS RELEVANT TO SETTING OUT SHALL BE KEPT AT SITE BEFORE CONSTRUCTION AND FABRICATION IS COMPLETED. THE STRUCTURAL DRAWINGS SHALL NOT BE COULD BY ONLY WRITER OR CALCULATED DIMENSIONS BE USED.

3. ALL WORKMANSHIP AND MATERIALS SHALL CONFORM TO THE SPECIFICATIONS.

- GENERAL**
1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL, SERVICE AND MEP DRAWINGS.
 2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS STATED OTHERWISE. ALL LEVELS ARE EXPRESSED IN METERS.
 3. ALL DIMENSIONS RELEVANT TO SETTING OUT SHALL BE KEPT AT SITE BEFORE CONSTRUCTION AND FABRICATION IS COMPLETED. THE STRUCTURAL DRAWINGS SHALL NOT BE COULD BY ONLY WRITER OR CALCULATED DIMENSIONS BE USED.
 4. ALL WORKMANSHIP AND MATERIALS SHALL CONFORM TO THE SPECIFICATIONS.



PROJECT
PROPOSED DESIGN & CONSTRUCTION OF BUILDINGS FOR FACULTY OF TECHNOLOGY, SABARAGAMUWA UNIVERSITY OF SRI LANKA.

CLIENT NAME: STRIPD PROJECT, MINISTRY OF CITY PLANNING, EDUCATION & HOUSING, NO. 38 E, NEGAMBODI MAHAPALA ROAD, SRI LANKA.

DESIGNER'S BUILDING CONTRACTOR: International Construction Consortium(Pvt) Ltd.

REGISTERED PROFESSIONAL ENGINEER'S NAME: Mr. Ajantha Jayasinghe

REGISTERED PROFESSIONAL ENGINEER'S NO.: 011-149520

REGISTERED PROFESSIONAL ENGINEER'S SIGNATURE: [Signature]

REGISTERED PROFESSIONAL ENGINEER'S ADDRESS: No. 14, 'SARASWATI', 12th Street, Colombo 11, Sri Lanka.

REGISTERED PROFESSIONAL ENGINEER'S CONTACT NO.: 011-26132323

REGISTERED PROFESSIONAL ENGINEER'S VALID UP TO: 12-12-2023

REGISTERED PROFESSIONAL ENGINEER'S PHOTO: [Photo]

REGISTERED PROFESSIONAL ENGINEER'S PROFESSIONAL ADDRESS: No. 14, 'SARASWATI', 12th Street, Colombo 11, Sri Lanka.

REGISTERED PROFESSIONAL ENGINEER'S REGISTERED ADDRESS: No. 14, 'SARASWATI', 12th Street, Colombo 11, Sri Lanka.

REGISTERED PROFESSIONAL ENGINEER'S REGISTERED ADDRESS: No. 14, 'SARASWATI', 12th Street, Colombo 11, Sri Lanka.

REGISTERED PROFESSIONAL ENGINEER'S REGISTERED ADDRESS: No. 14, 'SARASWATI', 12th Street, Colombo 11, Sri Lanka.

REGISTERED PROFESSIONAL ENGINEER'S REGISTERED ADDRESS: No. 14, 'SARASWATI', 12th Street, Colombo 11, Sri Lanka.

SUMMARY OF STAKEHOLDER CONSULTATION MEETING

SEWAGE TREATMENT PLANT 1 (STP 1) PROJECT IN SABARAGAMUWA UNIVERSITY OF SRI LANKA

HELD IN SABARAGAMUWA UNIVERSITY OF SRI LANKA **Date:** 3rd June 2022 **Time:** 9.00 am - 11.00 am **Location:** Board Room of the Vice Chancellor's Office, University of Sabaragamuwa University of Sri Lanka.

Invitees:

Government Officer Representatives

- School Teacher - Mr. K.K. Sameera Madushantha
- School Teacher - Mr. K. Sisira Kumara
- Head Monk - Dhammada Thero
- PHI, MOH - Mr. B.L.K.L. Kumarasinghe

Sabaragamuwa University of Sri Lanka Representatives

- Dean of the Faculty of Technology & Science – Prof. K.R. Koswattage
- Senior Lecturer - Dr. Naleen Liyanawaduge
- Senior Lecturer - Dr. Sandun Perera
- Coordinator - Dr. Asanga Ampitiyawatta
- PHI in university of Sabaragamuwa - Mr. H.A. Nimal Wijesiri

Student Representatives

- Mr. Thanuj Madushan
- Mr. Sabanda Athanda

Representation from the community

- Carpenter – Mr. R.M.S. Ruwantha
- Farmer – Mr. W.M. Jayantha
- Farmer – Mr. A. Senadeera
- Farmer – Mr. R. Amarakon
- Driver – Mr. E.A. Chaminda Kumara
- Businessman – H.M. Wasantha

Consultant firm representatives

- Environmental Specialist, PMU – Mr. Buddhika Silva
- Team Leader, RDC – Mr. Ravi Nishantha
- MEP Consultant, RDC – Mr. Bandula Karunaratne
- Director, Circle Consultancy (Pvt) Ltd. – Dr. Chameera De Sliva
- Head Projects, Circle Consultancy (Pvt) Ltd. – Ms. Amali Pathiraja
- Project Assistant, Circle Consultancy (Pvt) Ltd. – Mr. Pasindu Madusanka

ICC Representatives

- Team Leader – Mr. Nishantha Ratnayake
- Project Manager – Mr. H.P. Gayal Pinnapola

- MEP Engineer – Mr. W.M. Baratha Wijesundara
- Site Manager – Mr. Sampath Narasinghe
- Planning Engineer– Mr. Kawinga Dissanayake

The meeting was attended by 28 stakeholders listed above. We were informed that no invitation letters were sent out to convene the meeting but they were invited through personnel contact. No representation was made from the DS Office, GN Office, UDA, NBRO, CEA etc. Three representatives have not been signed in the participant form. Mr. Buddhika Silva was joined through the online zoom platform. There was less female representation at this meeting.

Matters Presented at the Meeting:

- a) Good introduction about the University of Sabaragamuwa with historical context. Purpose of subproject and the benefits to the community were explained.
- b) Brief introduction and present status of the project were provided.
- c) A detail presentation was conducted on location, STP1 project details, identified significant environmental impact and mitigation measures.
- d) Description of importance of the meeting and its scope was addressed.
- e) Discussion with the Stakeholders.

Section (a) was presented by Professor K.R. Koswattage, Dean of the Faculty of Technology & Science, University of Sabaragamuwa. Mr. Nishantha Ratnayake, ICC and Dr. Chameera De Silva, Circle Consultancy (Pvt) Ltd. (IEE Consultant) provided (b) a brief introduction and present status of the project. Section (c) was presented by Ms. Amali Pathiraja, Circle Consultancy (Pvt) Ltd. (IEE Consultant Team). Section (d) was done by Mr. Buddhika Silva, Environmental Specialist, PMU. Presentations were made in Sinhala.

Method of information dissemination and collection:

- Notes were taken on the discussion
- Discussion took the form of round table discussion
- Discussion was based on adoption of possible migratory measures for environmental issues that were encountered as result of project activities
- Record of the Meeting: General information of the participants such as name, name of the organization along with their signature was recorded during the public consultation meetings and is attached in the report.

The issues that were broadly covered at the meeting include:

- How the proposed STP 1 will benefit the surrounding community?
- Perception on wastewater and sludge generation and its sources
- Perception on design and treatment process of the STP 1
- Perception on STP 1 operational procedure and maintenance
- Perception on treated water quality
- Perception on treated water and sludge disposal and how it will impact on surrounding area
- Perception on the water drainage and soil erosion
- Perception on ecology and biodiversity issue
- Perception on noise, vibration and dust

Common issues and concerns raised at public consultation meetings

1. Professor K.R. Koswattage, Dean of the Faculty of Technology & Science gave an introduction to the proposed project purpose and explained the benefits to the community. After that, Mr. Nishantha Ratnayake, ICC and Dr. Chameera De Silva, Circle Consultancy (Pvt) Ltd. (IEE Consultant) provided a brief introduction and present status of the project. Then after, Ms. Amali Pathiraja, Circle Consultancy (Pvt) Ltd. (IEE Consultant Team) conducted a detail presentation about project location, STP 1 project details, identified significant environmental impact and mitigation measures. After, Mr. Buddhika Silva, Environmental Specialist, PMU explained the importance of the meeting and its scope was addressed. After that, the discussion was started with the stakeholders.
2. Head Monk, Karagasthalawa Sri Shaila Gangarama Rajamaha Viharaya, Dhammada Thero mentioned that this is a good project to the university and also the villagers, as this is a temporal and long-term requirement to protect the environment. Further, Thero raised a question on how wastewater is being managed at the university premises and what are the impacts on the communities. Ms. Amali Pathiraja responded that STP 1 installation is proposed within the University as a solution to manage the daily wastewater generation within the university and to provide a proper method to dispose the current sewage and wastewater. Accordingly, all wastewater generated from the university activities shall be treated and the treated wastewater dispose to the nearby pond as per the local and international disposal water quality standards and guidelines. She explained that proposed subproject will temporary changes that may occur during the construction stage. Most of the adverse impacts of STP 1 during construction period are short term and temporary in nature. The negative environmental impacts are mostly construction related and short term such as noise, vibration and dust. The anticipated adverse environmental impacts during operational phase are related to the disposal of wastewater and sewage.
3. Ms. Amali Pathiraja further explained about the main concerns of project which are impacts on surface / ground water due to wastewater discharge and surface runoff. The treated water will be discharge to a nearby water pond. Rainwater harvesting is the main use of this pond. Therefore, during the dry season, if there will be access quantity of treated wastewater will be stored in tanks for recycling or gardening purposes. Further, she explained that existing water pond is located within nearly 12m from the proposed STP 1 site. The overflow of the pond discharges as a stream to the below lands during rainy season. Currently the stream water during the rainy season is used by the nearby settlements for paddy and other crop cultivations. Therefore, disposal of treated wastewater at proposed tolerance limits will be highly considered here. Furthermore, placing crushed stone and planting vegetation covers around the bank of the tank is proposed to mitigate the anticipated soil erosion. 1.0m and 2.0m height retaining walls have been proposed at the STP 1 to reduce the impact to the dam and pond.
4. Mr. B.L.K.L. Kumarasinghe, PHI, MOH raised a question on what is the current method of wastewater management and why this is proposed. Professor K.R. Koswattage responded that the generated wastewater was discharged into septic tanks, but with the increasing number of student population with the new faculty developments and the future expansion plans of the university, the need of a proper wastewater

management system rather than relying on the fixed capacities of the current septic tanks is necessary. Currently, disposal of sewerage and wastewater is a huge issue for university and also villagers. At the current state, the SUSL provides accommodation for all of its students, which are around 44 hostels owned by the University or rented private houses. With the new development of the Faculty of Technology, SUSL, a proper wastewater management system has become a mandatory construction. He explained that the major objective of this project is to manage the daily wastewater generation of the SUSL and provide a proper method to dispose the sewage and wastewater of the increasing student and staff population within the university.

5. Head Monk Thero and few villagers mentioned that there are many cultivation areas in the low land areas, as they cultivated lands from natural water flow and Thero asked on whether any effects to them. Dr. Chameera De Silva and Ms. Amali Pathiraja responded that wastewater and sewage will not be disposed without a treatment. Thus, all wastewater generated from the project activities shall be treated and the treated water quality shall be complied the local and international disposal standards and guidelines. Mitigation measures specially against sewer and wastewater generation and management which are the main concerns associated with the subproject. The IEE study did not find any adversely significant incompatibility with the surrounding physical, biological, socio-economic or cultural environment and does not pose any significant long-term environmental threat if managed properly during construction and during implementation. Therefore, such impact would not happen for the communities due to this project. Finally, Dr. Chameera De Silva recommended that water quality of the disposed treated water should be regular checked and need to correct actions during the operational phase.
6. Mr. K. Sisira Kumara pointed out that the university was one of the major resources that bring economic benefits to the community. he mentioned that we are so happy about this project and If this proposed project is implemented without any harm to the villagers, we have no objections to this project.
7. Mr. B.L.K.L. Kumarasinghe, PHI, MOH asked about the site extent and present use of the land. Mr. Nishantha Ratnayake, ICC explained the land extend for the proposed STP 1 is 250m². He explained that it was an abandoned land with a shrub forest and a water pond. This site is vacant land at present status. The clearance of scrubs and leveling the land have been undertaken at this phase. The site area was previously a slopy terrain with some scrubs on the land.
8. Mr. B.L.K.L. Kumarasinghe, PHI, MOH questioned on what are the main wastewater generation sources to the proposed STP 1. Mr. H.P. Gayal Pinnapola, ICC replied that proposed Sewage Treatment Plant facilitates 6000 student and staff population. The STP 1 tank treats wastewater collected from the university's Student Cafeteria premises, Faculty of Agriculture, Faculty of Applied Science, Walawa Hostel Complex and Sinharaja Hostel Complex. They are the main input sources for the STP 1.

9. Mr. B.L.K.L. Kumarasinghe, PHI, MOH further questioned on is this STP 1 for new developments or current usage. Professor K.R. Koswattage responded that this proposed STP 1 is only for the current wastewater demand.
10. H.M. Wasantha as a villager pointed out that bad smell from gully browsers and overflow of sewerage is a huge issue for villagers also. Therefore, this type of sewerage management method is an advantage for the villagers also.
11. Mr. Thanuj Madushan (Student), Mr. B.L.K.L. Kumarasinghe (PHI) and Head Monk Thero jointly raised questions on amount of wastewater generation, STP 1 design capacity, final discharge of point the wastewater and STP 1 type whether is it a manual or automatic. Ms. Amali Pathiraja answered that daily wastewater generation is 950 m³ and design volume of the proposed STP 1 is 950 m³/day. the proposed STP 1 is an automatic system. She explained that after the wastewater treatment, treated water was released to the nearby water tank with 1:8 dilutions as per the water quality standards.
12. Mr. Thanuj Madushan further questioned about odor, noise, dust, and vibration at the site during the operational stage. Mr. H.P. Gayal Pinnapola, ICC replied such an impact would not happen with this proposed STP 1 technology.
13. Dr. Chameera De Silva, Circle Consultancy (Pvt) Ltd. (IEE Consultant) provided a brief introduction of the project and presented status of the approval of the CEA. He clearly explained as the project IEE Environmental Consultant that there are a summary of the potential environmental impacts during the construction and operation phases along with recommended mitigation measures are provided in the IEE report in the form of an EMP. The STP 1 project may cause significant adverse impacts associated with the construction process with is temporary. Also, the subproject will adopt mitigation measures specially against sewer and wastewater generation and management which are the main concerns associated with the subproject. He pointed out that a report was submitted to the CEA and the environmental clearance was obtained at this moment. Therefore, PP and Contractor should adhere to the recommendations given by the CEA.
14. Mr. B.L.K.L. Kumarasinghe, PHI, MOH raised a question about the STP 1 maintenance. Mr. H.P. Gayal Pinnapola, ICC replied Operational and maintenance Procedure of this project. He answered that 1-year period will be maintained by the ICC as the developer and after 1-year agreement period, the maintenance will hand over to the university. However, the maintenance will be done by the trained officers and they are trained by the ICC maintenance team. As per his experiences, Mr. B.L.K.L. Kumarasinghe explained the importance of STP 1 maintenance. And, he asked to ensure the proper importance during the operational phase, otherwise it may create worse environmental issues.

15. Mr. Ravi Nishantha and Mr. B.L.K.L. Kumarasinghe raised a question about the amount of sludge generation of this project and the storage capacity. Ms. Amali Pathiraja replied that total sludge volume is 755.83 L/day and, STP 1 have a 6 months' storage capacity.

16. Mr. B.L.K.L. Kumarasinghe, PHI, MOH raised a question about the disposal method of the sludge. Ms. Amali Pathiraja responded that as the disposal method of the sludge, fully digested and pathogens free sludge will be used as a fertilizer in the university premises or else as huge garden area is in the university premises, or sludge could be sent out by gully bowsers for disposal at a suitable location. Mr. B.L.K.L. Kumarasinghe recommended to reuse the sludge as a byproduct (fertilizer). Further he advised (if possible) to locate a dry pit near the STP 1 to use sludge as the fertilizer.

17. Mr. B.L.K.L. Kumarasinghe finally recommended to ensure the disposal of treated water quality, reuse the sludge as a byproduct (fertilizer) and importance of STP 1 maintenance.

18. Meeting was ended with no further matters.



At Public Perception Survey:



Sign Sheets of Stakeholder meeting:

DESIGN & CONSTRUCTION OF BUILDINGS AND INFRASTRUCTURE FACILITIES FOR FACULTY OF TECHNOLOGY - SABARAGAMUWA UNIVERSITY OF SRI LANKA

Sewer treatment plant construction works progress review meeting at site

On - 03/06/2022 - 09.00 HRS

S:N අනු:	Name නම	Company / Representation ආයතනය / නියෝජනය	Designation තනතුර	Address / Contact Number ලිපිනය / දු.න අංකය	Signature අත්සන
01	K.R. Koswattage	SUSL	Dean and DPD/STHO	0714565006	
02	Ravi Arisaratna	RDC	Team Leader	OMC site office 031785536	
03	Bandula Kamunaratne	RDC	MEP Consultant	0773034651	
04	Chameera De Silva	Circle consultancy Pvt Ltd	Director	27/16, 1st Lane, Bandaranayake Mw, Katubedda	
05	Aruni Pathiraja	Circle consultancy Pvt Ltd	Project Head	No.396/1/1, Onlle Rd, Katubedda	
06	Pasindu Madusumeka	Circle consultancy Pvt Ltd	Assistant	No. 396/1/1, Galle Rd, katubedda	
07	Nishantha Rathnayake	ICC	Team Leader	8B, newala Horana	
08	H.P.Gajil Pinnapela	ICC	Project Manager	05th mile PUSK, Kuda Oya, Britthalu	
09	W.M.Baratha Wijesundara	ICC	MEP Engineer	No 238 Reservoir Road, Bandaranayake	
10	N. Sampath Sandaruwa	ICC	site manager	215A/ Dr. Demota De Silva road, colony 9	
11	Ravanga Dissanayake	ICC	Planning Engineer	Madethayagalla, Pansyagama	
12	Thanuj Madushan	University	Student	11315 Bethmale Pathalagala Ambelussa	
13	Sabanda Athanda	University	student	675, Hapuganagedara, Alawwa	
14	K.K. Sameera Madushantha	Villageer	Teacher.	92. marangodu Cealagama Belilulla	
15	RM ඩබ්ලිව් ඩබ්ලිව් විජේසේන.	ජනපති	විද්වතු	විජේසේන. විජේසේන	
16	N.M. Shanthi	ජනපති	විද්වතු.	විජේසේන විජේසේන	

17	ක සිසිල සුනිල්	ප්‍රවේශකය	ප්‍රවේශකය	6m.14016 වසරේ මුද්‍රාපිටිකරුවා	S.Simma
18	EA සේන 2010	ප්‍රවේශකය	පොදු	විද්‍යාල විද්‍යාල විද්‍යාල	SR
19	H.M. Wasantha	Village	Businessman	Baddegangama, Udugoda	SR
20	A. වර්මා	ප්‍රවේශකය	වෙළෙඳ	වෙළෙඳ වෙළෙඳ	වෙළෙඳ
21	A. අමරසේන	ප්‍රවේශකය	වෙළෙඳ	වෙළෙඳ	SR
22	ම. සේන		වෙළෙඳ	වෙළෙඳ	SR
23	H.A. Alimath Wijesiri	SLSU	P.H.I	071 3763941	SR
24	B.L.K.L Kumarasinghe	MOH / Kumbura	PH / Kumbura	057739609	SR
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					

STAKEHOLDER MEETING

for

PROPOSED SEWAGE TREATMENT PLANT 1 (STP 1)

@ Sabaragamuwa University of Sri Lanka, Pambahinna

BY : CIRCLE CONSULTANCY (PVT) LTD.

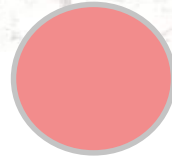


Note: The term "STP 1" has been used as "STP" in the Slides.

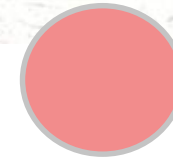
I N T R O D U C T I O N



General Information



Location



Project Details

Name of the Project : Proposed **Sewage Treatment Plant** at Sabaragamuwa University of Sri Lanka, Pambahinna

Asian Development Bank (ADB) Funded Project

Present Ownership of the Project Site : **State Owned** - Sabaragamuwa University of Sri Lanka

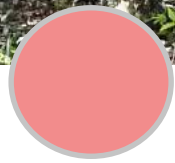
Main objectives of the project : To **manage the daily wastewater generation** within the university; to provide a proper method to dispose sewage and wastewater.



Current Method :  Generated wastewater was discharged into septic tanks

 244

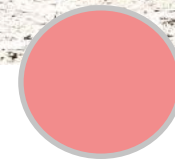
The future expansion plans of the university.....



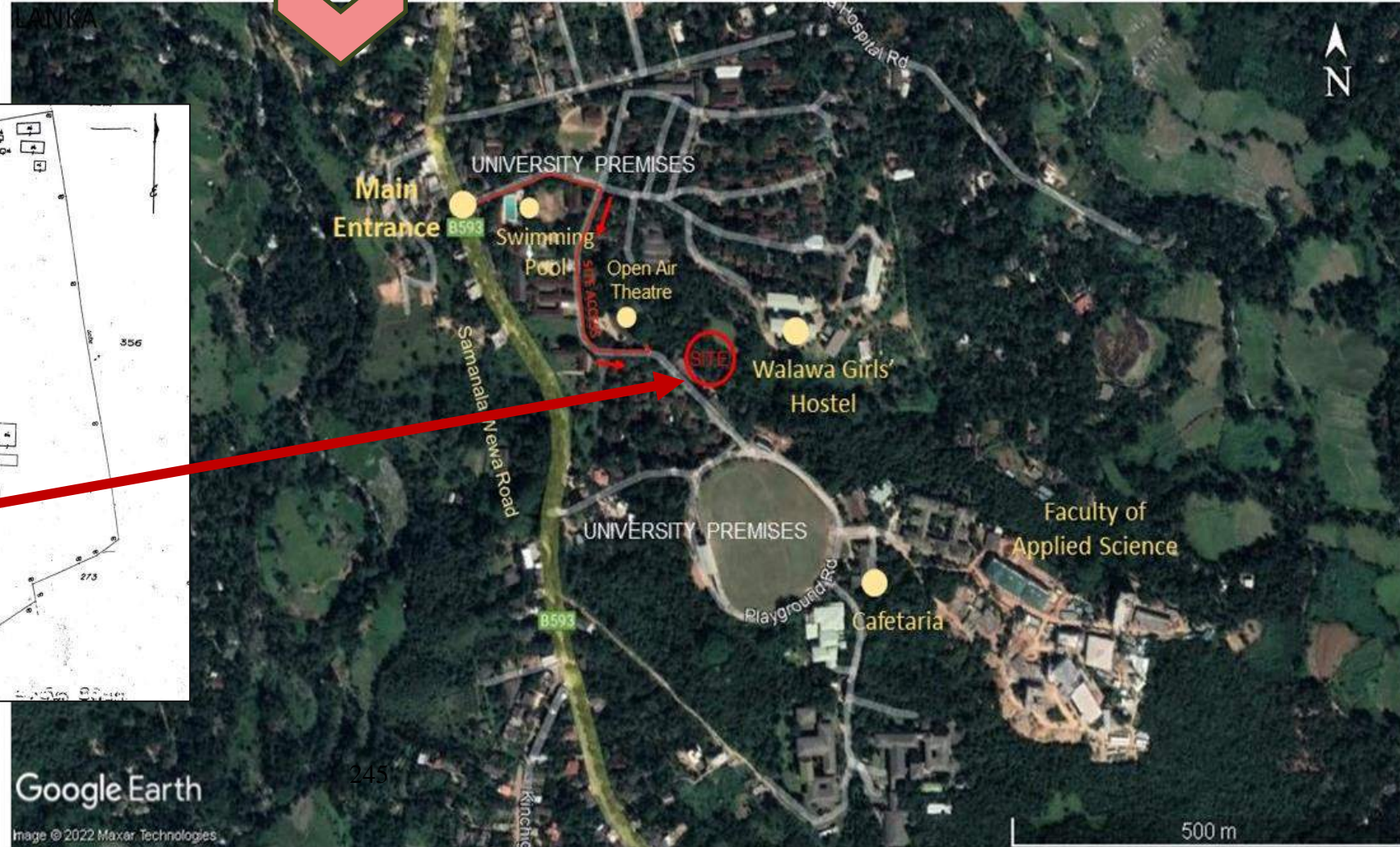
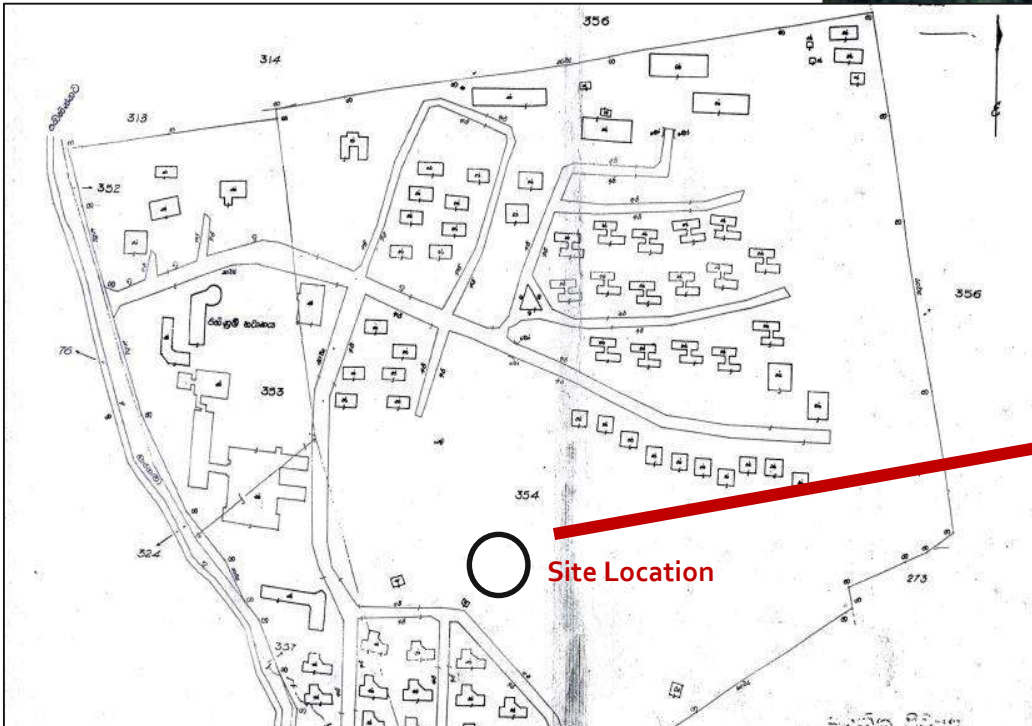
General Information



Location



Project Details



Google Earth

245

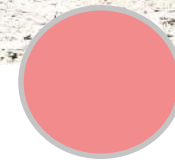
500 m



General Information



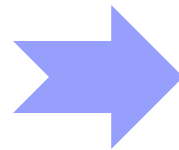
Location



Project Details

Land Extent : 250 m²

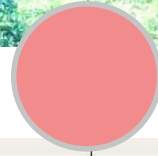
Present use of the Land : A cleared **vacant land** at the current status (Previous – A Scrub Land)



I N T R O D U C T I O N



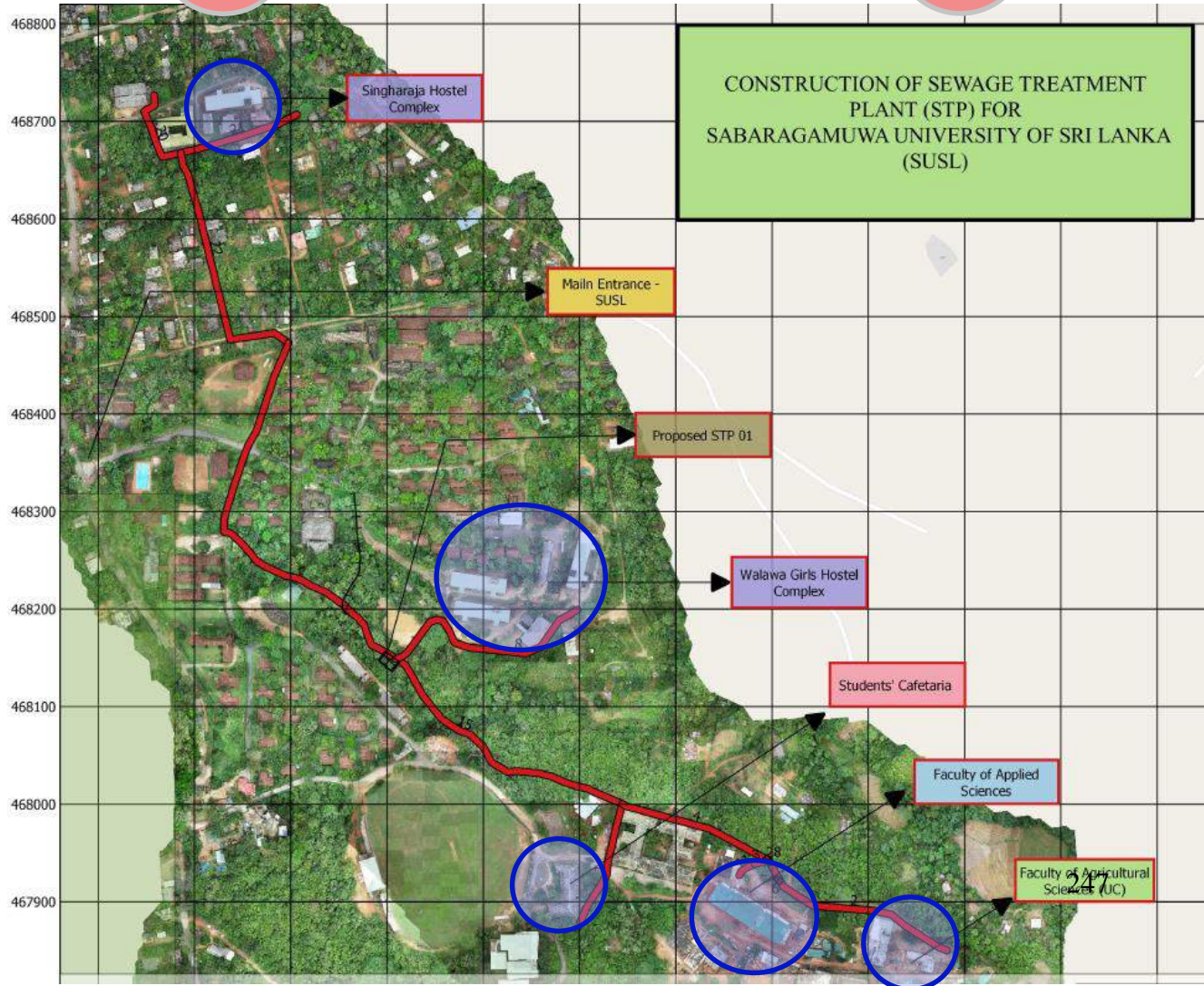
General Information



Location



Project Details



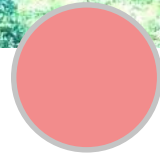
The STP tank treats **wastewater collected from,**

1. University's Student Cafeteria Premises
2. Faculty of Agriculture Science
3. Faculty of Applied Science
4. Walawa Hostel Complex
5. Sinharaja Hostel Complex

I N T R O D U C T I O N



General Information



Location



Project Details

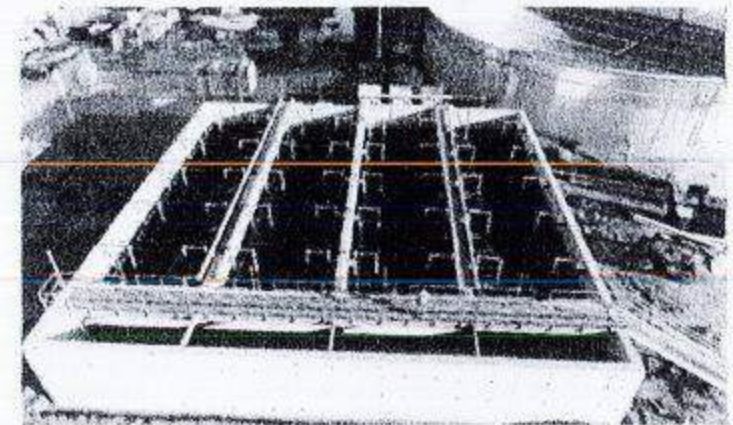
The proposed Sewage Treatment Plant facilitates 6000 student and staff population.

Quantity of wastewater to be generated ?

	Population	L/P/D	BOD/P/D	H Load	Org Load	mg/l
STP 1	6000	158	45	950000	2675000	282

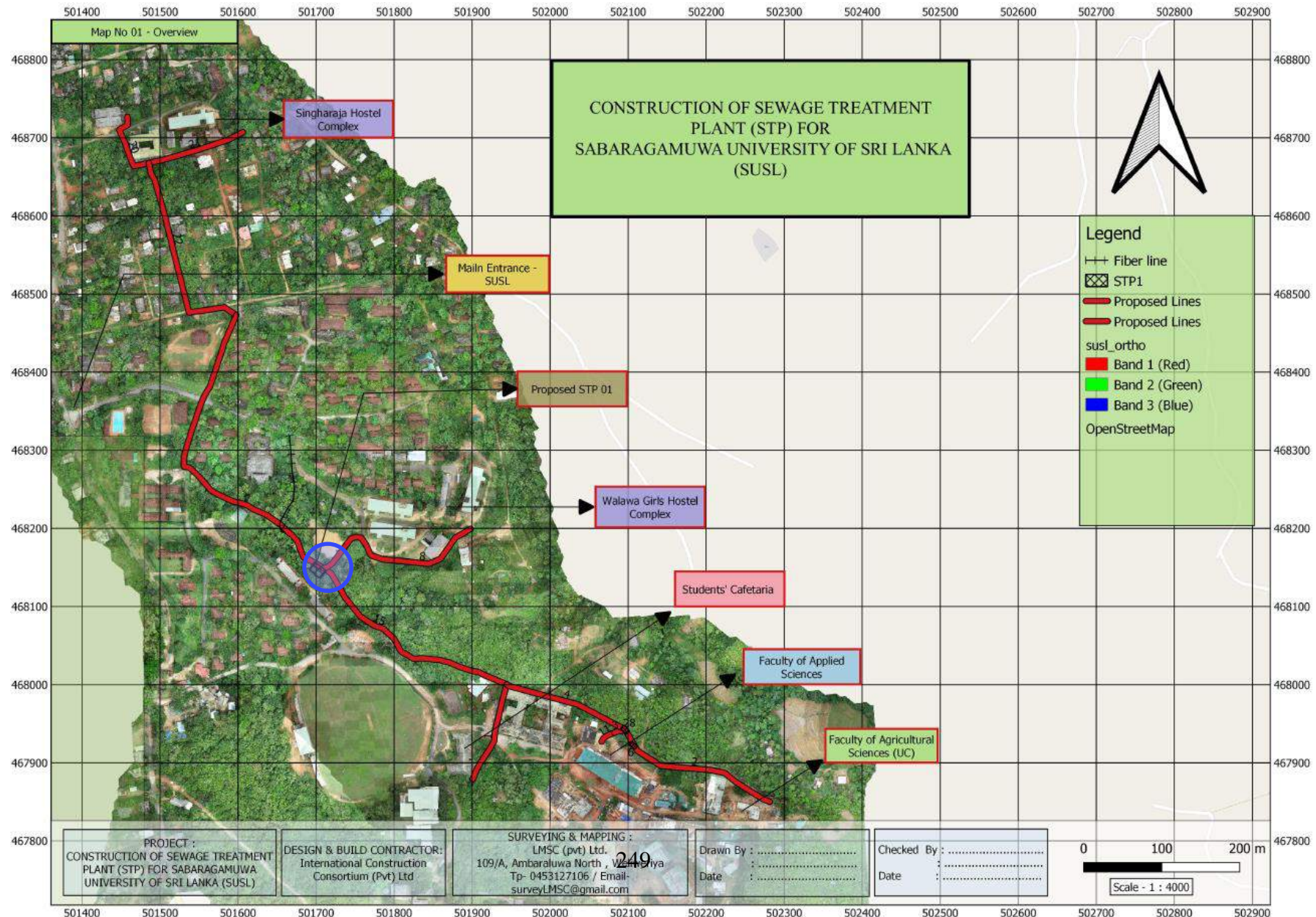
- Influent: Black and Grey water
- Design Volume: 1000m³/day
- Operation Time:24 h/day
- Wastewater Generation: 950m³/day at an Organic load of 267.5 kgs/day

1	2	3	1	Settles
4	5	6	2	
7	8	9	3	
10	11	12	4	

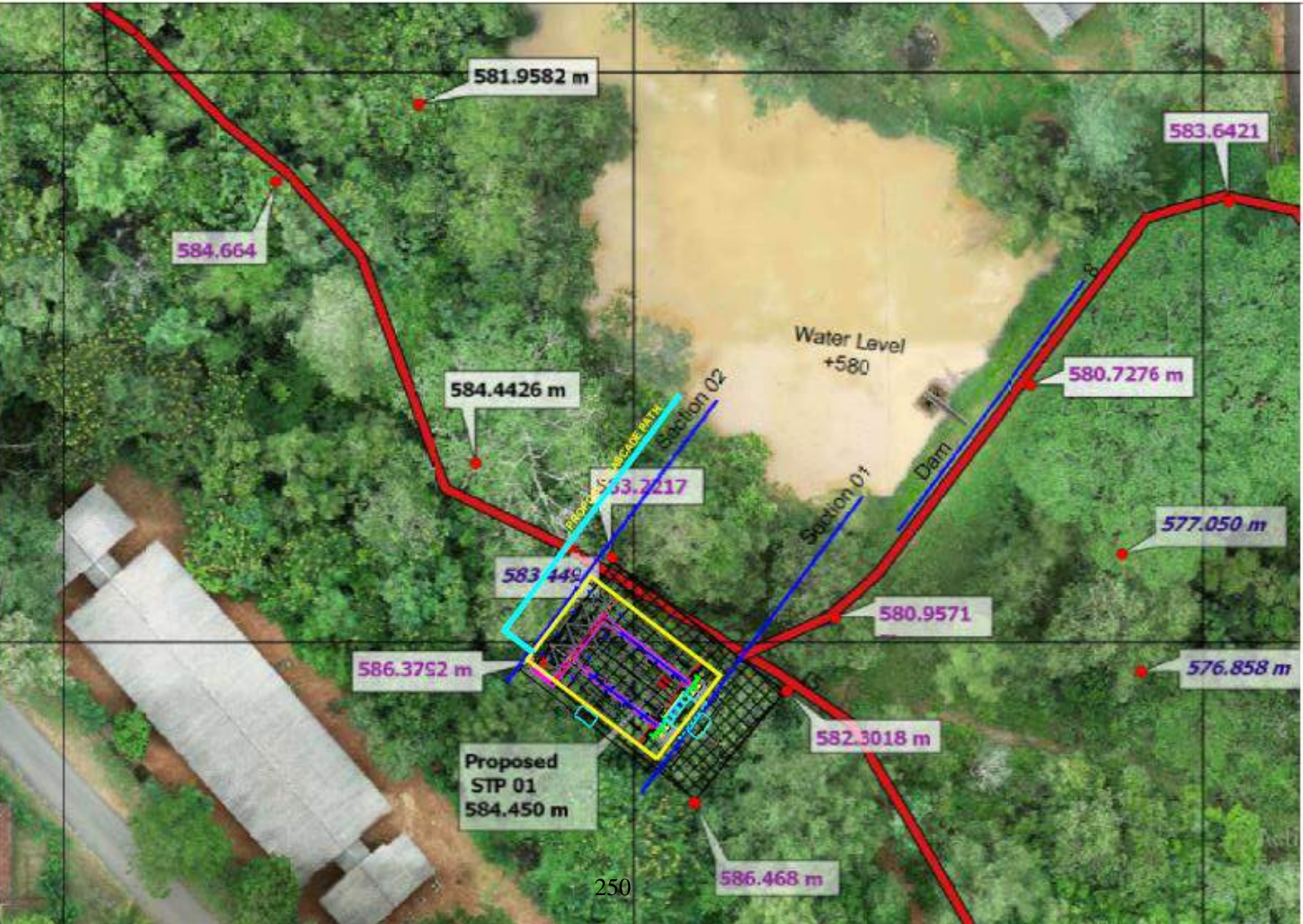


STP Tank Model

Arrangements for treatment and disposal of Sewage:



Conceptual plans of waste water treatment plant:



WHAT WORRIES ABOUT THIS PROJECT?

STP ?????



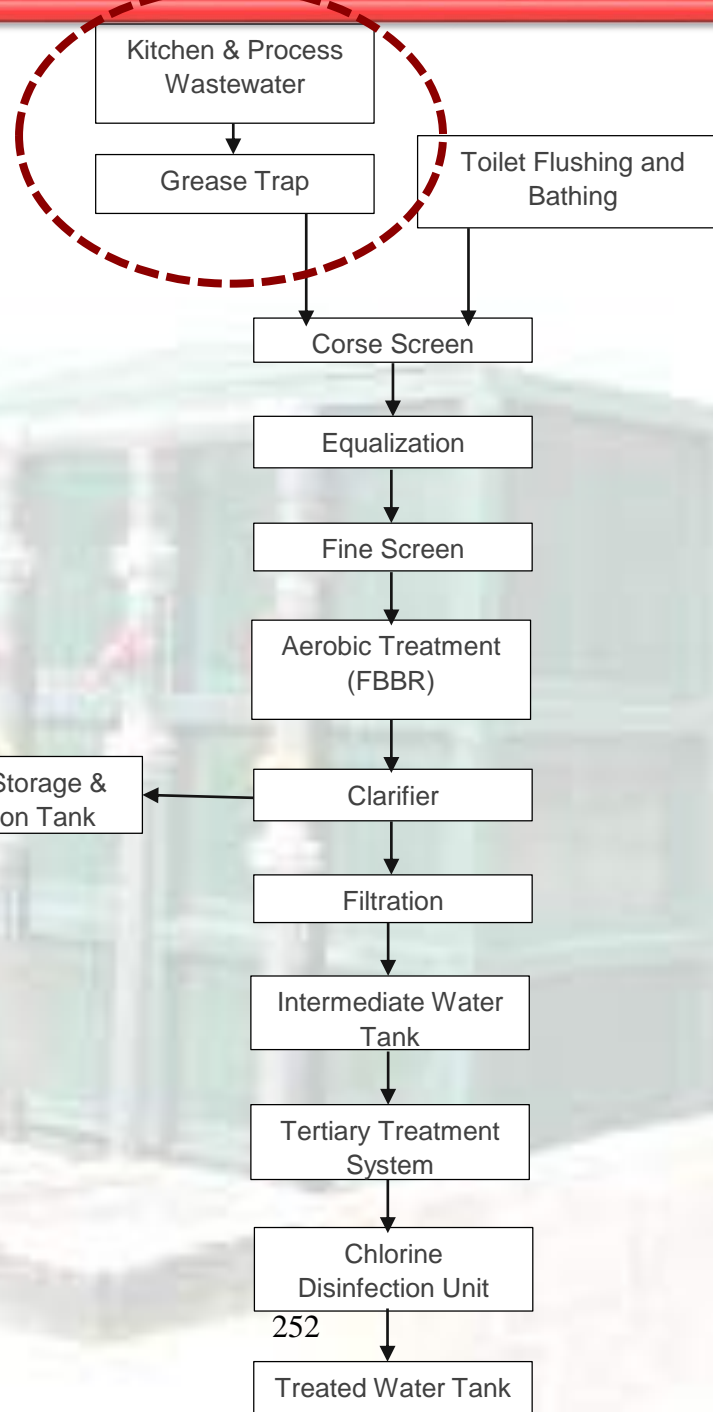
Anticipated problems ?

Wastewater Disposal...

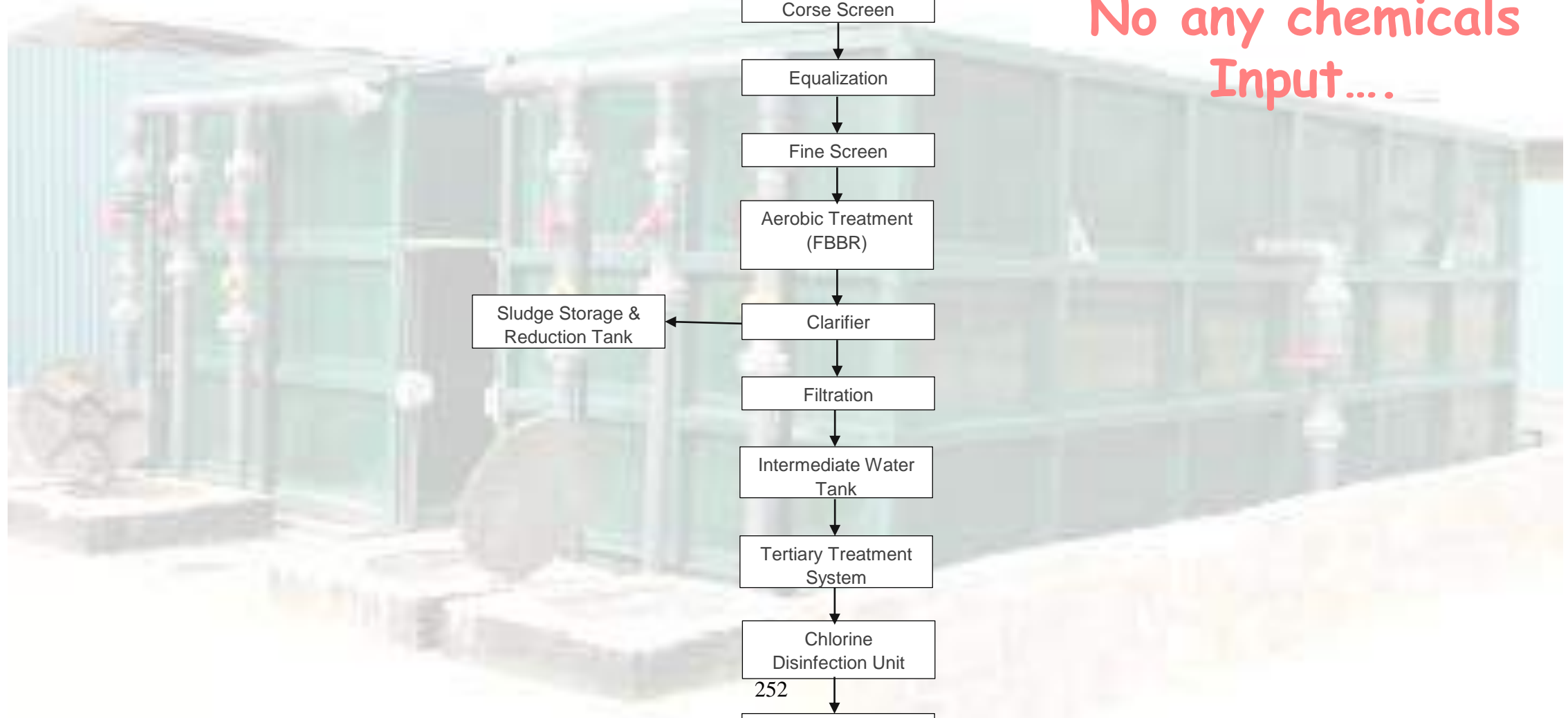
- *Impacts on surface / ground water due to wastewater discharge*
- *Surface runoff*



STP Process Flowchart



No any chemicals
Input....



Quality of wastewater to be generated ?

Parameter	Proposed Tolerance Limit Values
pH Value	6.0 to 8.5
Biochemical Oxygen Demand at 20°C (BOD ₅)	< 15 @ mg/l
Chemical Oxygen Demand (COD)	< 100 @ mg/l
Total Suspended Solids (TSS)	< 15 @ mg/l
Oil & Grease	< 1 @ mg/l
Ammoniacal Nitrogen (as N)	< 50 @ mg/l
Dissolved phosphates (as P)	< 5 @ mg/l
Faecal Coliform	< 40 @ MPN/100ml

No Impacts on surface / ground water due to wastewater discharge...

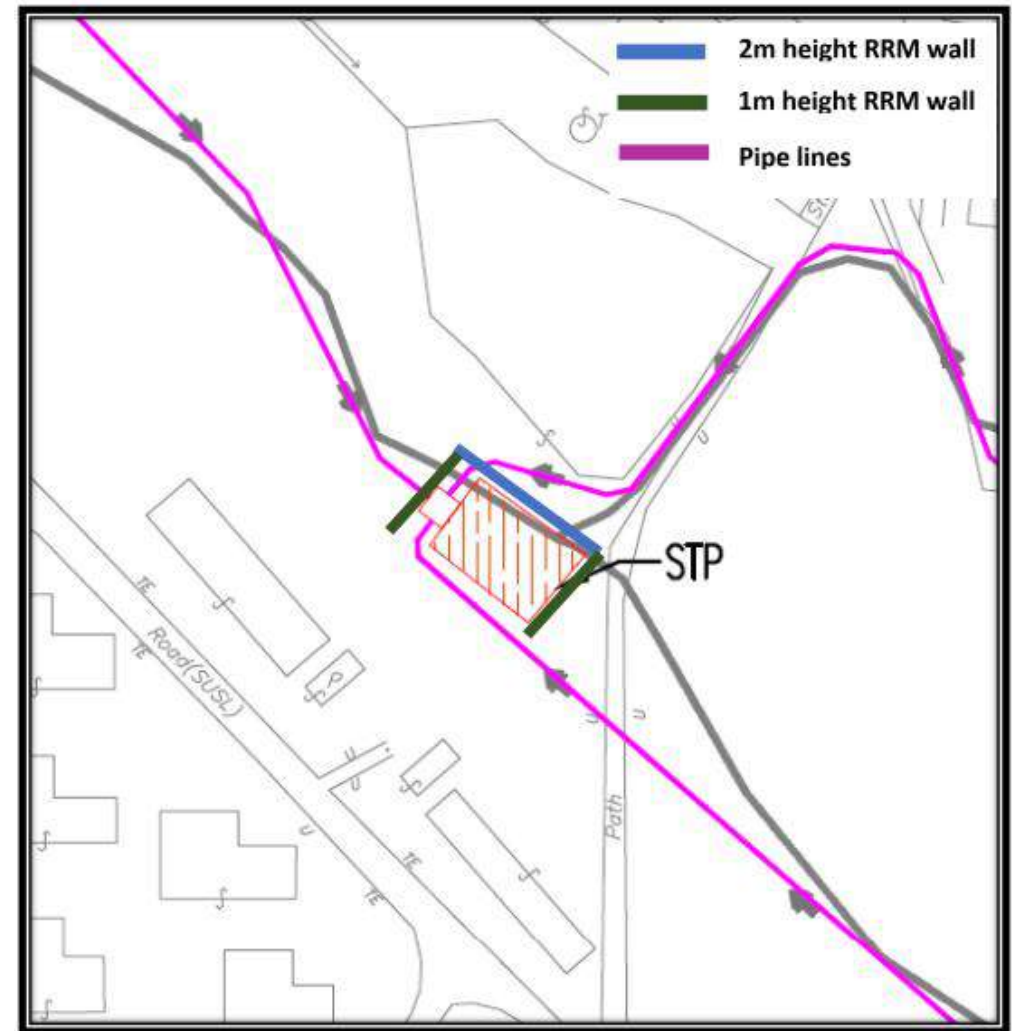


Final discharge point of the sludge

- + The fully digested and pathogens free sludge will be used as a fertilizer in the university premises; Or else, sludge could be sent out by gully bowzers for disposal at a suitable location.

Final discharge point of the treated wastewater

- + Treated water will be discharge to a nearby water pond.
- + Existing water pond is located within nearly 12m from the proposed STP site.
- + The treated waste water will be discharged under the 1:8 dilutions.
- + Retaining wall will be developed to minimize the impact to the pond and dam.



No Impacts on Surface runoff...

Final discharge point of the treated wastewater

Existing water quality:

Test Parameter	Test Method	Test Result
pH at 25 ^o C ± 2 ^o C	APHA 23 rd edition) 4500-H Electrometric method	7.2
Total Suspended Solids (TSS) mg/l,max	APHA (23 rd edition) 2540 D. Total suspended solids at 103-105 ^o C , MDL-01	14
Biochemical Oxygen Demand (BOD)5, mg/l, max	APHA (23 rd Edition) 5210 B, 5 day BOD test, MDL 05	15
Chemical Oxygen Demand (COD), mg/l, max	APHA (23 rd edition) 5220 D, Closed refluxed colorimetric, MDL 05	40
Oil and grease, mg/l, max	APHA (23 rd edition) 5520 B, Liquid-liquid partition gravimetric, MDL-01	Less than 01

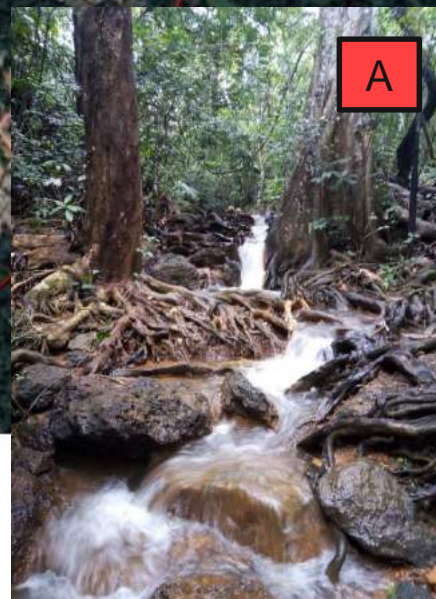
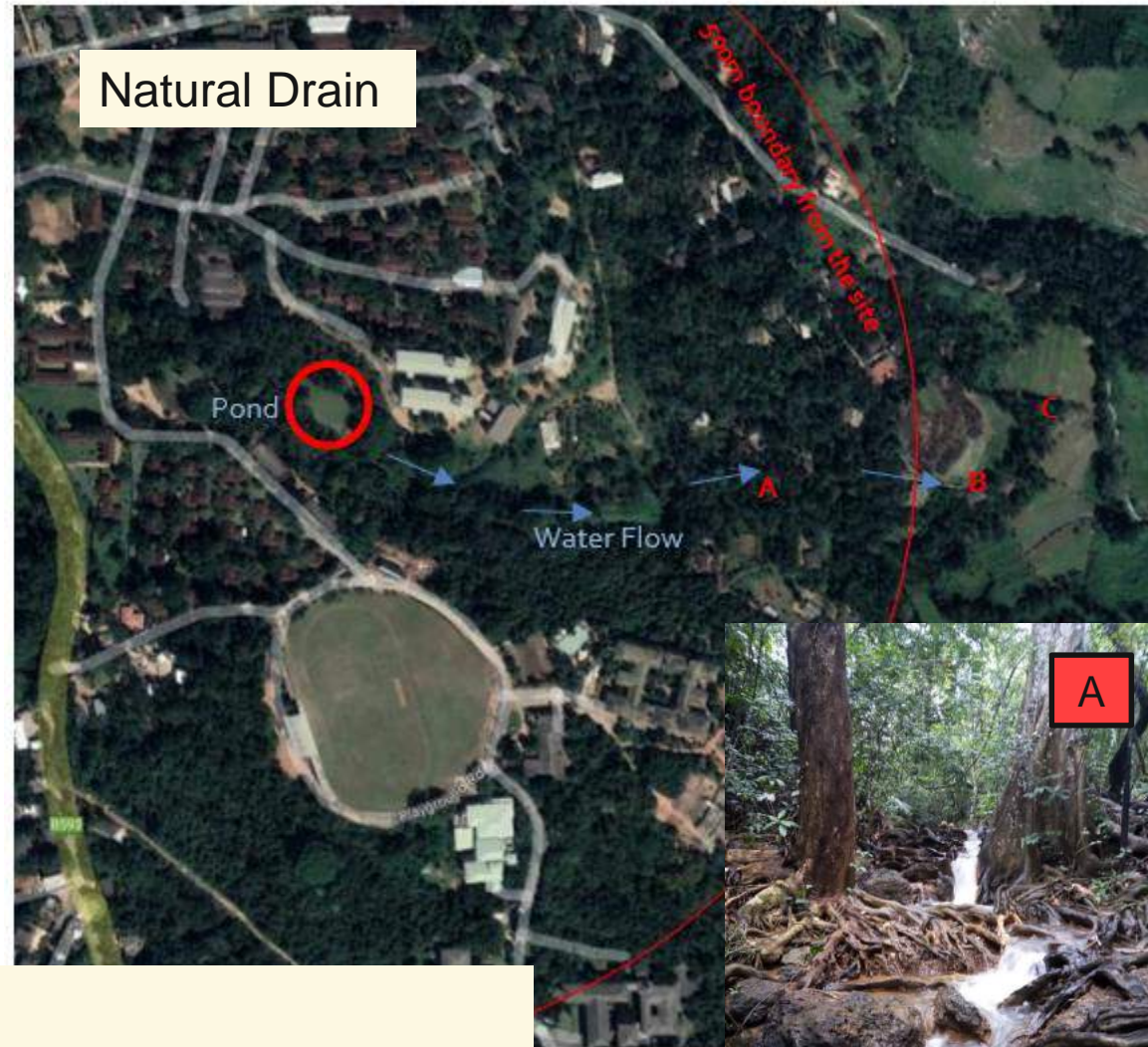
During the dry season, **if there will be access quantity of treated wastewater will be used gardening / irrigation purposes.**



Existing water pond capacity: 2,370.0 m³

No Impacts on Low Level Activities ...

No obstructions to Natural Drain ...



Low Level :
Currently the stream water during the rainy season is used by the nearby settlements for paddy and other crop cultivations.

Thank You!



WELCOME!!!!

- ▶ Questions!
- ▶ Comments!
- ▶ Concerns!



International Construction Consortium (Pvt) Ltd.

No.70, S De S Jayasinghe Mawatha,

Kohuwala, Nugegoda, Sri Lanka.

Tel : 0094 11 4 400600 Fax : 0094 11 4 400230 / 4 400241

E-mail: icc@icc-construct.com

Web : www.icc-construct.com Company Reg. No. PV 3013

WATER REQUIREMENT: CONSTRUCTION OF SEWAGE TREATMENT PLANT (STP) FOR THE SABARAGAMUWA UNIVERSITY OF SRI LANKA

AMOUNT OF WATER REQUIRED FOR THE PROJECT

Daily water demand of the project is 2800 l per day during the construction stage

CONSTRUCTION STAGE

Number of Employees	=	20	
Domestic Usage	=	135	l/person/per day
Total Domestic Usage	=	2700	l/per day
Construction Usage	=	100	l/per day
Total Water Requirement	=	2800	l/per day

SOURCE OF WATER: University Premises


H.P. Gayal Pinnapola
Senior Project Manager
Faculty of Technology - Sabaragamuwa
International Construction Consortium (Pvt) Ltd

Note:

The term "STP 1" has been used as "STP" in this report.

*Winner of IFAWPCA Gold Medal For Civil Engineering
Winner of ICTAD Awards for Construction Excellence*



REPORT ON

THE MEASURING OF NOISE LEVELS FOR THE EXPANSION OF THE PROJECT OF
FACULTY BUILDING AT FACULTY OF TECHNOLOGY, UNIVERSITY OF SABARAGAMUWA,
PABAHINNA, BELIHULOYA

(FOR INTERNATIONAL CONSTRUCTION CONSORTIUM (PVT) LTD)

(BASELINE STAGE – MAY 2022)



ENVIRONMENTAL STUDIES & SERVICES DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1, JAWATTA ROAD
COLOMBO - 05
SRI LANKA

Tel: 0112-588946, 0112-501834, 0112-503826. Fax: 0112-502611, e-mail: nbro.essd@gmail.com

REPORT ON THE MEASURING OF NOISE LEVELS FOR THE EXPANSION OF THE PROJECT OF
FACULTY BUILDING AT FACULTY OF TECHNOLOGY, UNIVERSITY OF SABARAGAMUWA,
PABAHINNA, BELIHULOYA

DATE OF ISSUE : 24th May 2022
JOB NO : NBRO/AQ/22/107d

Report to:

International Construction Consortium (Pvt) Ltd.
No. 70, S. De. S. Jayasignhe Mawatha,
Kohuwala, Nugegoda

Issued by:

Environmental Studies and Services Division
National Building Research Organisation
99/1, Jawatta Road
Colombo - 05
Sri Lanka

This report contains four pages



ජාතික ගොඩනැගිලි පර්යේෂණ සංවිධානය
தேசிய கட்டிட ஆராய்ச்சி நிறுவனம்
NATIONAL BUILDING RESEARCH ORGANISATION



99/1, ජාවත්ත පාර, කොළඹ 5. 99/1, ஜாவத்தள வீதி, கொழும்பு 5. 99/1, Jawatta Road, Colombo 5.

දුරකථන } 011-2588946
தொலைபேசி } 011-2503431
Telephone } 011-2500354
අධ්‍යක්ෂ ජනරාල් }
பணிப்பாளர் தாயகம் } 011-2505149
Director General }
ෆැක්ස් }
தொலைநகல் } 011-2502811
Fax }
වෙබ් අඩවිය }
இணையத்தளம் } www.nbro.gov.lk
Website }
විද්‍යුත් තැපෑල }
மின்னஞ்சல் } info@nbro.gov.lk
E-mail }

මගේ අංකය }
எனது இல. } NBRO/AQ/22/107d
Our Ref. }

ඔබේ අංකය }
உமது இல. }
Your Ref. }

දිනය }
திகதி }
Date }

24th May 2022

Client: International Construction Consortium (Pvt) Ltd.
No. 70, S. De. S. Jayasignhe Mawatha,
Kohuwala, Nugegoda

REPORT ON

THE MEASURING OF NOISE LEVELS FOR THE EXPANSION OF THE PROJECT OF FACULTY BUILDING AT
FACULTY OF TECHNOLOGY, UNIVERSITY OF SABARAGAMUWA, PABAHINNA, BELIHULOYA

(FOR INTERNATIONAL CONSTRUCTION CONSORTIUM (PVT) LTD)

(BASELINE STAGE – MAY 2022)

1.0 SCOPE

As per the letter dated 05th April 2022 the client, Mr. Chamiindu Jayathilake, Quality Assurance Engineer, International Construction Consortium (pvt) Ltd. requested the Environmental Studies and Services Division (ESSD) of National Building Research Organisation (NBRO) to measure noise levels at the expansion of the project of Faculty of Technology, University of Sabaragamuwa, Pabahinna, Belihuloya to assess the environmental condition due to the before start the construction activities.

In this regard, following officers of the Environmental Studies and Services Division of NBRO carried out noise measuring programme on 03rd May 2022.

Staff Involved:

Mr. Vimukthi Sumanasekara - Scientist - ESSD, NBRO
Mr. W A Weerasinghe - Field Assistant - ESSD, NBRO
Mr. A S Premarathne - Field Assistant - ESSD, NBRO

Witness: Mr. Chamindu Jayathilake – Quality Assurance Engineer, International Construction Consortium (pvt) Ltd

2.0 DESCRIPTION OF THE MONITORING AREA

The expansion of the project of the faculty building at the Faculty of Technology, University of Sabaragamuwa, Pabahinna, Belihuloya within the Imbulpe Pradeshiya Sabaha area. The project activities will involve such as drilling, excavating, hammering and heavy vehicle movements etc. The site operates from 7.30 am to 18.30 pm with about 200 working staff.

Cont.....2

3.0 WEATHER CONDITION

Table 01: Meteorological data

Temperature	26 °C	Wind Speed	2.5 ms ⁻¹
Humidity	72 %	Wind Direction	Western

4.0 NOISE LEVEL MEASUREMENTS

4.1 NOISE LEVEL MEASURING LOCATIONS:

In this regard, one (01) location at the boundary of the premises was selected for the measurement of noise levels. Location description is given in Table 02.

Table 02: Description of noise measuring location

Location	GPS Coordinates	Location Description
N1	06.712459° N 80.789025° E	At a location, close to the sewage treatment Plant.

- Refer attached map for further details

4.2 MEASURING INSTRUMENTS:

Sound Level meter : RION NL 52
 Calibrator : RION NC 74 – IEC 60942 (JIS C 1515), Class 1
 Calibration due : December 2022

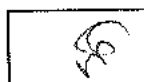
The sound level meter conforms to the requirements of both IEC 61672-12002 class 1 and JIS C 1509-1:2005 class 1.

4.3 METHOD OF MEASUREMENTS:

The sound level measurements were carried out in accordance with the methods laid down in National Environmental Noise Control Regulations stipulated under the Extraordinary Gazette No. 924/12- Thursday, May 23, 1996 of Sri Lanka. The equivalent continuous (A) weighted sound pressure level (Leq,T) was measured for a periods of T with the integrated time of one (1.0) second in the fast selection mode of the meter.

4.4 MEASURING CONDITIONS:

A set of one hour continuous time integrated noise levels were taken at one (01) selected location during day time. Height of the noise level meter receiver was about 1.5 m from the ground level for each measurement. Wind speed is 2.5 ms⁻¹ during the measuring period.



4.5 NOISE MEASURING RESULTS:

Table 03: Noise Levels at each measuring location

Location	Time	Run time	Measured Residual Noise Level Leq (dB)	Background Noise level L ₉₀ dB(A)
N1	Day	1 hour	48	44

Where;


- Measured Noise Level (Leq):- The equivalent continuous baseline noise level over the measuring period.
- Background Noise Level (L₉₀):- A weighted sound pressure level of baseline noise level that is exceeded 90% of a measuring period.

5.0 CONCLUSION

During the measuring period, noise generated by noise of vehicle movements is the main contribution source to the measured day time noise levels for the location. Accordingly, the existing day time residual noise levels at the location was 48 dB.

The maximum permissible noise levels should be maintained within 75 dB during Day time and 50 dB night time at the construction stage.

The location was located within the Pradeshiya Sabha area which considered as a low noise area. During operation period noise levels should be maintained at the noise levels of 55 dB and 45 dB during Day time and night time respectively at the location.

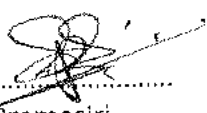
Prepared by: 

Scientist
Air Noise & Vibration Studies Unit
Environmental Studies & Services Division
National Building Research Organisation.

Checked by: 

Scientist
Air Noise & Vibration Studies Unit
Environmental Studies & Services Divi:
National Building Research Organisation.

Authorized by:


.....
H.D.S. Premasiri
Director
Environmental Studies & Services Division
National Building Research Organisation

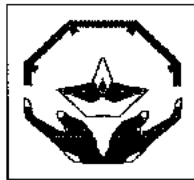


REPORT ON

THE MONITORING OF AMBIENT AIR QUALITY FOR THE EXPANSION OF THE PROJECT OF
FACULTY BUILDING AT FACULTY OF TECHNOLOGY, UNIVERSITY OF SABARAGAMUWA,
PABAHINNA, BELIHULOYA

(FOR INTERNATIONAL CONSTRUCTION CONSORTIUM (PVT) LTD)

(BASELINE STAGE – MAY 2022)



ENVIRONMENTAL STUDIES & SERVICES DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1, JAWATTA ROAD
COLOMBO - 05
SRI LANKA

Tel: 0112-588946, 0112-501834, 0112-503826. Fax: 0112-502611, e-mail: nbro.essd@gmail.com

REPORT ON THE MONITORING OF AMBIENT AIR QUALITY FOR THE EXPANSION
OF THE PROJECT OF FACULTY BUILDING AT FACULTY OF TECHNOLOGY,
UNIVERSITY OF SABARAGAMUWA, PABAHINNA, BELIHULOYA

DATE OF ISSUE : 24th May 2022
JOB NO : NBRO/AQ/22/107c

Report to:

International Construction Consortium (Pvt) Ltd.
No. 70, S. De. S. Jayasignhe Mawatha,
Kohuwala, Nugegoda

Issued by:

Environmental Studies and Services Division
National Building Research Organisation
99/1, Jawatta Road
Colombo - 05
Sri Lanka

This report contains five pages



ජාතික ගොඩනැගිලි පර්යේෂණ සංවිධානය
தேசிய கட்டிட ஆராய்ச்சி நிறுவனம்
NATIONAL BUILDING RESEARCH ORGANISATION



99/1, ජාවත්ත පාර, කොළඹ 5. 99/1, ஜாவத்தள வீதி, கொழும்பு 5. 99/1, Jawatta Road, Colombo 5.

දුරකථන } 011-2588946 අධ්‍යක්ෂ ජනරාල් } දුරකථන } වෙබ් අඩවිය } විද්‍යුත් }
தொலைபேசி } 011-2503431 பணிப்பாளர் தயாகம் } 011-2505149 தொலைநகல் } 011-2502611 இணையத்தளம் } www.nbro.gov.lk மின்னஞ்சல் } info@nbro.gov.lk
Telephone } 011-2500354 Director General } Fax } Website } E-mail }

මගේ අංකය } NBRO/AQ/22/107c මගේ අංකය } දිනය } 24th May 2022
எனது இல. } Your Ref. } Date }

Client: International Construction Consortium (Pvt) Ltd.
No. 70, S. De. S. Jayasignhe Mawatha,
Kohuwala, Nugègoda

REPORT ON
THE MONITORING OF AMBIENT AIR QUALITY FOR THE EXPANSION OF THE PROJECT OF FACULTY BUILDING AT FACULTY OF TECHNOLOGY, UNIVERSITY OF SABARAGAMUWA, PABAHINNA, BELIHULOYA

(FOR INTERNATIONAL CONSTRUCTION CONSORTIUM (PVT) LTD)

(BASELINE STAGE – MAY 2022)

1.0 SCOPE

As per the letter dated 05th April 2022 the client, Mr. Charniindu Jayathilake, Quality Assurance Engineer, International Construction Consortium (pvt) Ltd. requested the Environmental Studies and Services Division (ESSD) of National Building Research Organisation (NBRO) to monitor ambient air quality levels at the expansion of the project of Faculty of Technology, University of Sabaragamuwa, Pabahinna, Belihuloya to assess the environmental condition area before start the construction activities.

In this regard, following officers of the Environmental Studies and Services Division of NBRO carried out air sampling programme on 04th & 05th May 2022.

Staff Involved:

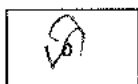
Mr. Vimukthi Sumanasekara - Scientist - ESSD, NBRO
Mr. W A Weerasinghe - Field Assistant - ESSD, NBRO
Mr. A S Premarathne - Field Assistant - ESSD, NBRO

Witness: Mr. Chamindu Jayathilake – Quality Assurance Engineer, International Construction Consortium (pvt) Ltd

2.0 DESCRIPTION OF THE MONITORING AREA

The expansion project of the faculty building at the Faculty of Technology, University of Sabaragamuwa, located at Pabahinna, Belihuloya within the Imbulpe Pradeshiya Sabaha area. The project activities will involve such as drilling, excavating, hammering and heavy vehicle movements etc. The site operates from 7.30 am to 18.30 pm with about 200 working staff.

Cont.....2



3.0 WEATHER CONDITION

Cloudy weather condition with fair westerly wind prevailed during the monitoring period.

4.0 MONITORING OF AMBIENT AIR QUALITY

4.1 SELECTION OF MONITORING LOCATIONS:

Air samples were collected from the selected location at the faculty premises as per the client's requirement. Location description is given in Table 01.

Table 01: Air quality monitoring Location Description

Location	GPS Coordinates	Description
L1	06.712459° N 80.789025° E	At a location, close to the sewage treatment Plant.

- Refer attached layout map for further details.

4.2 SAMPLING AND ANALYTICAL CONDITIONS:

Air samples were collected from locations on 3-hour basis for the analysis of Total Suspended Particulate Matter (TSPM) and 08-hour basis for the analysis of SO₂, NO₂, CO Sampling duration for and Particulate Matter (PM₁₀ & PM_{2.5}) analysis were 24 hours. The sampling height was about 1.5 m from the ground level and the sampling rates were 0.5 L/min for SO₂ and NO₂, 16 L/min for PM_{2.5} and 1.0 m³/min for TSPM, PM₁₀ analysis. CO levels were measured at the site. Samples collected for the analysis of SO₂ and NO₂ were stored in a cooling box and TSPM, PM₁₀ & PM_{2.5} samples were stored in filter cassettes. Then they were sent to the NBRO laboratory for the analysis. During the sampling period, the site was functioning at its normal working conditions.

The laboratory received samples on 05th May 2022 in satisfactory condition and they were analyzed on the same day for SO₂ and NO₂. TSPM, PM₁₀ & PM_{2.5} samples were analyzed on 09th May 2022 after drying to a constant weight in a desiccator.

4.3 SAMPLING AND ANALYTICAL METHODOLOGY:

Table 02: Description of the Sampling & Analytical methods used for each parameter.

Parameter	Testing Method	Minimum Detection Limits	CEA Recommended method	Instrumentation
SO ₂	ASTM D 2914 – 95, 2015 West-Geake & Pararosaniline Spectrometric method	4 µg/m ³	Pararosaniline method or equivalent (pulsed fluorescent method)	*Standard Personal Air Samplers * UV-Visible Spectrophotometer

Cont.....3

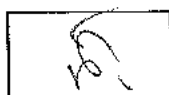


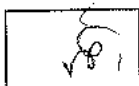
Table 02: Cont.....

Parameter	Testing Method	Minimum Detection Limits	CEA Recommended method	Instrumentation
NO ₂	ASTM D 1607 - 91, 2011, Griess – Saltzman Reaction Method	4 µg/m ³	Colorimetric using Saltzman method or equivalent (gas phase Chemiluminescence)	*Standard Personal Air Samplers * UV – Visible Spectrophotometer
CO	Non-Dispersive Infra-Red Sensor (NDIR)	1000 µg/m ³	Non - dispersive infrared(IR) spectroscopy	* Portable Gas Analyzer (SKY2000-M5)
PM ₁₀ & PM _{2.5}	High - Volume Sampling and Gravimetric Analysis	2 µg/m ³	Hi - volume sampling, and Gravimetric	* High Volume Sampler with size selective sample inlet * SHIMADZU AUW120D Analytical balance
TSPM	ASTM D 4096-17, 2017 High-Volume Sampler method and Gravimetric Analysis	2 µg/m ³	Hi-volume sampling and gravimetric	High Volume Sampler with size selective sample inlet * SHIMADZU AUW120D Analytical balance

4.4 AMBIENT AIR QUALITY MONITORING RESULTS:

Table 03: Concentration of each parameter for ambient air quality

Parameter	Date of Sampling	Date of Analysis	Time Average	Units	Concentrations at L1
TSPM	05/05/2022	09/05/2022	3 hrs	µg/m ³	35
SO ₂	05/05/2022	05/05/2022	8 hrs	µg/m ³	15
NO ₂	05/05/2022	05/05/2022	8 hrs	µg/m ³	19
CO	05/05/2022	05/05/2022	8 hrs	µg/m ³	<1000
PM ₁₀	04-05/05/2022	09/05/2022	24 hrs	µg/m ³	21
PM _{2.5}	04-05/05/2022	09/05/2022	24 hrs	µg/m ³	11



Cont.....4

4.5 AMBIENT AIR QUALITY STANDARDS:

Table 04a: Ambient Air Quality Standards stipulated under the Extraordinary Gazette, No. 1562/22 – August 15, 2008, by the Ministry of Environment and Natural Resources of Sri Lanka.

Pollutant	Time Average	Concentration ($\mu\text{g}/\text{m}^3$)
SO ₂	8 hrs	120
NO ₂	8 hrs	150
CO	8 hrs	10,000
PM ₁₀	24 hrs	100
PM _{2.5}	24 hrs	50

Table 04b: Stationary source emission control regulations for fugitive dust emission standards levels for TSPM between two simultaneous 3 hours measurement at upwind and downwind stipulated under the Extraordinary Gazette, No. 2126/36 – June 05, 2019, by the Democratic Socialist Republic of Sri Lanka.

Pollutant	Time Average	Concentration ($\mu\text{g}/\text{m}^3$)
TSPM	3-hour	450

5.0 CONCLUSION

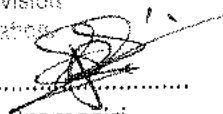
Under the measuring condition, measured ambient air quality levels with respect to SO₂, NO₂, CO, PM_{2.5} and PM₁₀ at the location during the measuring period were lower than the Ambient Air Quality Standards stipulated under the Extraordinary Gazette, No. 1562/22 – August 15, 2008, by the Ministry of Environment and Natural Resources of Sri Lanka.

The Total Suspended Particulate Matter levels at the location itself was lower than the Stationary source emission control regulations for fugitive dust emission standards levels for TSPM (450 $\mu\text{g}/\text{m}^3$) stipulated under the Extraordinary Gazette, No. 2126/36 – June 05, 2019, by the Democratic Socialist Republic of Sri Lanka.

Prepared by: 

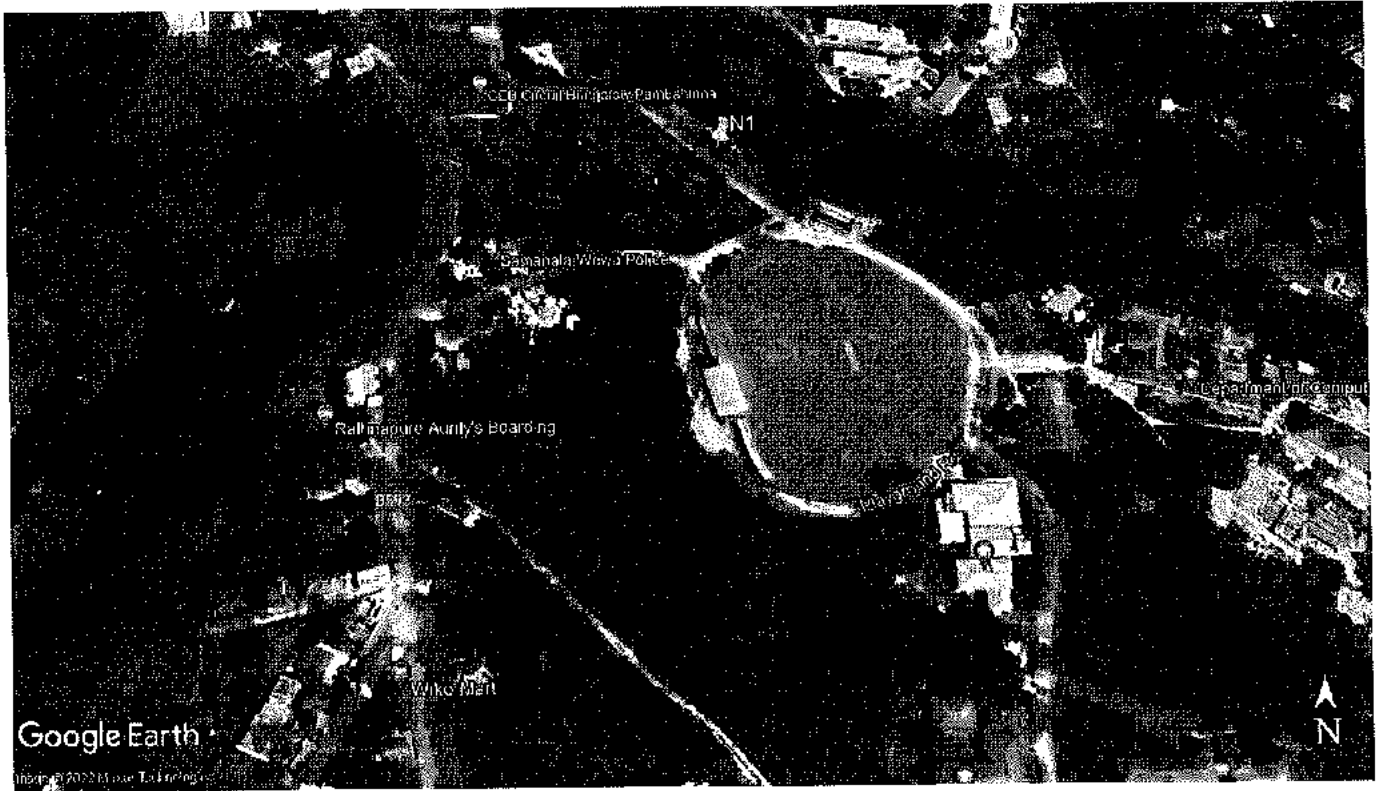
Scientist
Air Noise & Vibration Studies Unit
Environmental Studies & Services Division
National Building Research Organisation

Authorized by:


H.D.S. Premasiri
Director
Environmental Studies & Services Division
National Building Research Organisation

Checked by: 

Scientist
Air Noise & Vibration Studies Unit
Environmental Studies & Services Division
National Building Research Organisation



BRIEF SITE INSPECTION REPORT

SEWAGE TREATMENT PLANT 1 (STP 1) PROJECT IN SABARAGAMUWA UNIVERSITY OF SRI LANKA

23rd March 2022 and 26th April 2022

INTRODUCTION

The proposed subproject is a Sewage Treatment Plant 1 (STP 1), located in Sabaragamuwa University of Sri Lanka. The location coordinates are 6°42'46.3"N 80°47'20.6"E. The university is located alongside Pambahinna-Kumbalgama-Rajawaka-Kapugala Road (B 593) which connects to the main Colombo – Batticaloa Highway (A4). Site inspection of proposed subproject was carried out on 23rd March 2022 and 26th April 2022.

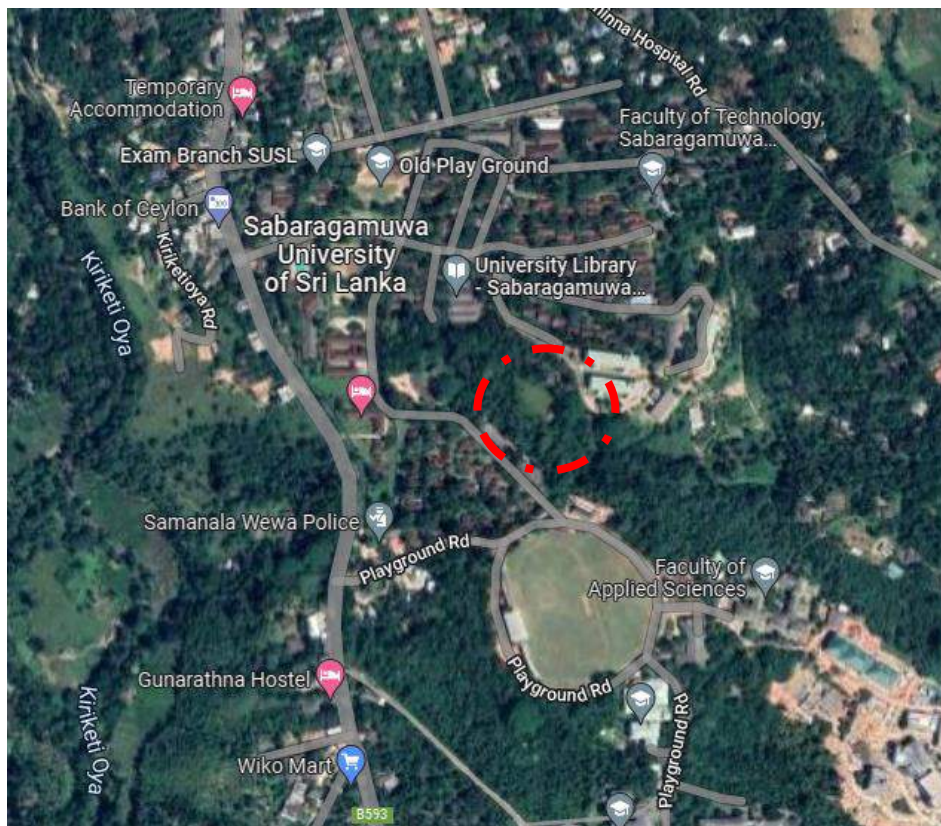


Figure 1: SITE LOCATION

HISTORY OF THE UNIVERSITY

Sabaragamuwa University of Sri Lanka commenced in 1991 as an affiliated collage to the University of Sri Jayawarhanapura. In 1995 Sabaragamuwa Affiliated University Collage was converted in to National University as the twelfth national university of the country under the Act No.16 of 1978. At present there are six faculties and the total land area of the university is 56 acres.

The University was given the former Japanese Expatriate Village of Samanalawewa Project in Belihuloya. Academic programs were started form 1992, with three study areas namely; Travel and Tourism Management, Accounting & Finance, and English. In 1995, when the Sabaragamuwa

University became a National University, it already had the following facilities: Lecture Halls, an Auditorium, Computer and Language Laboratories and Reading Rooms, Welfare and Medical Centers, an Open-Air Theatre and an Herbarium. The facilities that existed at the premises when taking over from CEB viz, the housing complex, the residences, offices, Gymnasium, Swimming Pool, Tennis Courts and a pipe borne water supply scheme, have made it possible to fulfill as many of the requisites and basic needs of a University".

The Sabaragamuwa University of Sri Lanka is located about 162 km away from Colombo along the Colombo - Badulla main road. The main campus of Sabaragamuwa University in Belihuloya possesses sufficient land for future development. It consists of approximately 232 acres as detailed below:

- Main university premises transferred by the Ceylon Electricity Board - 66 acres
- Main playground and building complex (proposed) premises – 56 acres
- University Farm premises – 31 acres
- Non Pareil land – 50 acres
- Other lands – 29 acres (water pumping and purification unit, hostels, nature park and reserve)

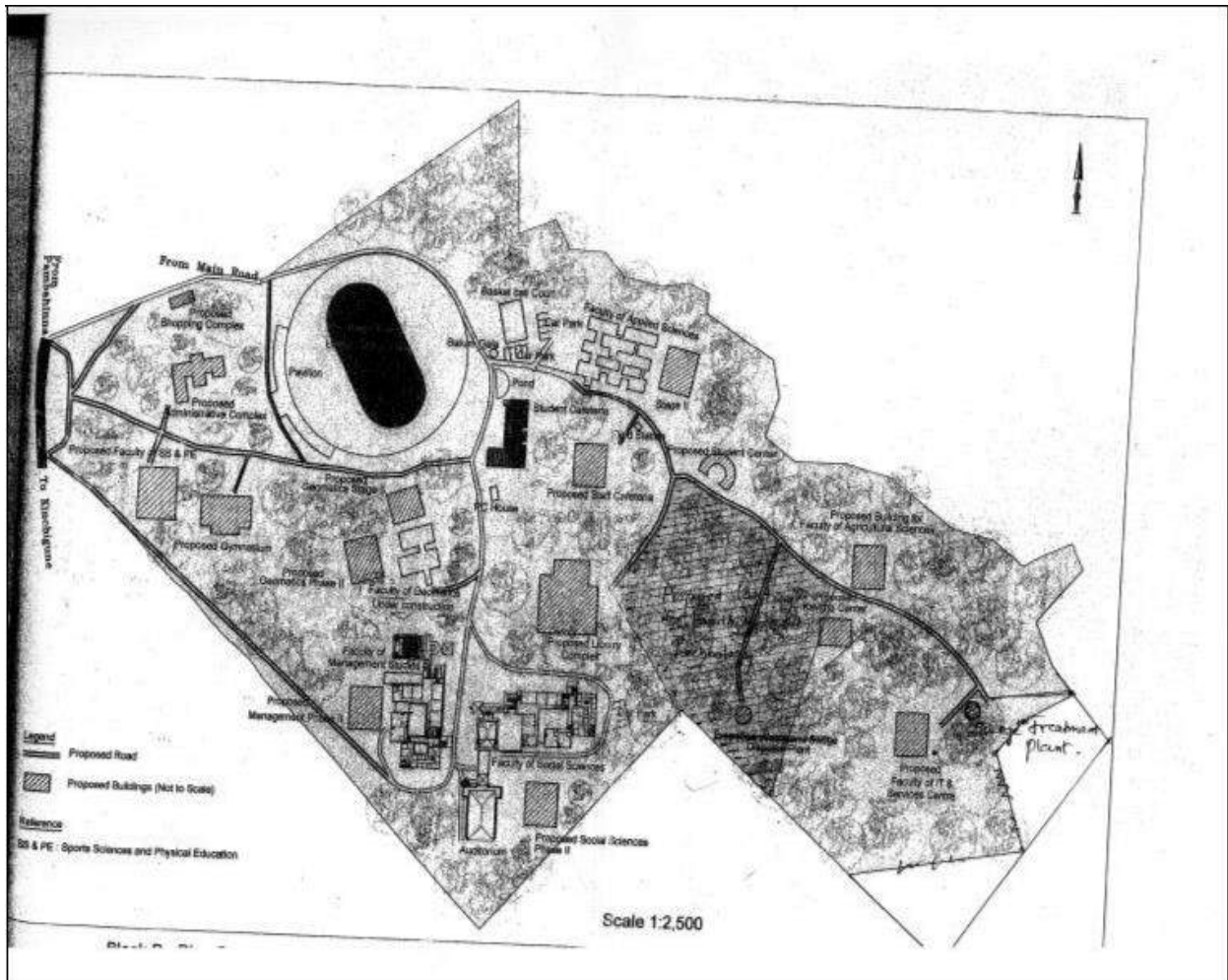


Figure 2: MASTER PLAN OF THE UNIVERSITY

SITE DESCRIPTION

The proposed site is located in Imbulpe in Rathnapura District within the current SUSL premises.

- A. Pradeshiya Saba : Imbulpe Pradeshiya Saba
- B. Divisional Secretariat : Imbulpe Divisional Secretariat
- C. G. N. Division : Muttettuwegama GN Division
- D. District Secretariat: : Rathnapura District Secretariat
- E. Provincial Council : Sabaragamuwa Provincial Council
- F. GPS Point : 6°42'46.3"N 80°47'20.6"E

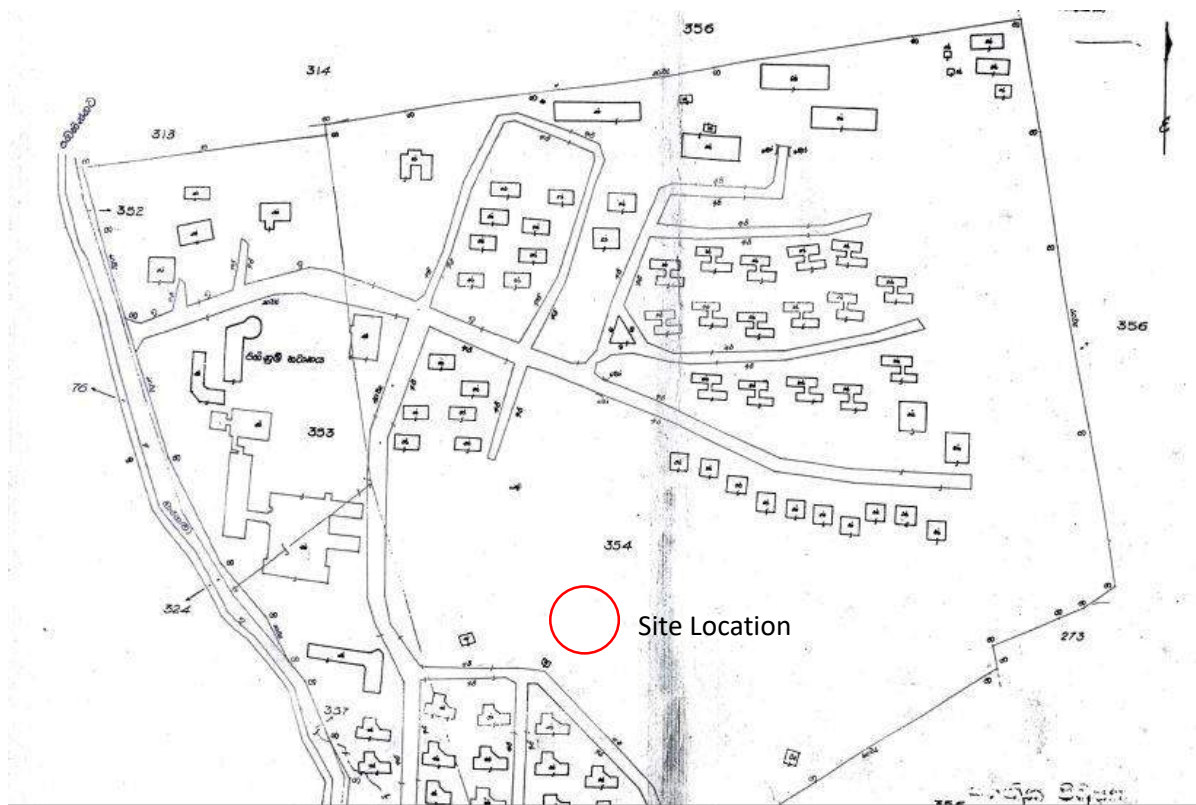


Figure 3: SURVEY PLAN

DESCRIPTION OF THE SUBPROJECT

The proposed subproject is Sewage Treatment Plant 1 (STP 1), located at Sabaragamuwa University of Sri Lanka. The subproject aims to provide a proper method to dispose of sewage and wastewater of the increasing student and staff population within the university. The proposed Sewage Treatment Plant facilitates 6000 students and staff population. The STP tank 1 treats wastewater collected from the university's Student Cafeteria premises, Faculty of Agriculture, Faculty of Applied Science, Walawa Hostel Complex and Sinharaja Hostel Complex. The Estimated cost of the subproject is approx. 109,605,118.98 LKR and 183,735.00 USD.

With the new development of the Faculty of Technology, SUSL, a proper wastewater management system has become a mandatory construction. At the current state, the SUSL provides

accommodation for all of its students, which are around 44 hostels owned by the University or rented private houses. The generated wastewater was discharged into septic tanks, but with the increasing number of student population with the new faculty developments and the future expansion plans of the university, the need of a proper wastewater management system rather than relying on the fixed capacities of the current septic tanks is necessary. Accordingly, the major objective of this subproject is to manage the daily wastewater generation of the SUSL.

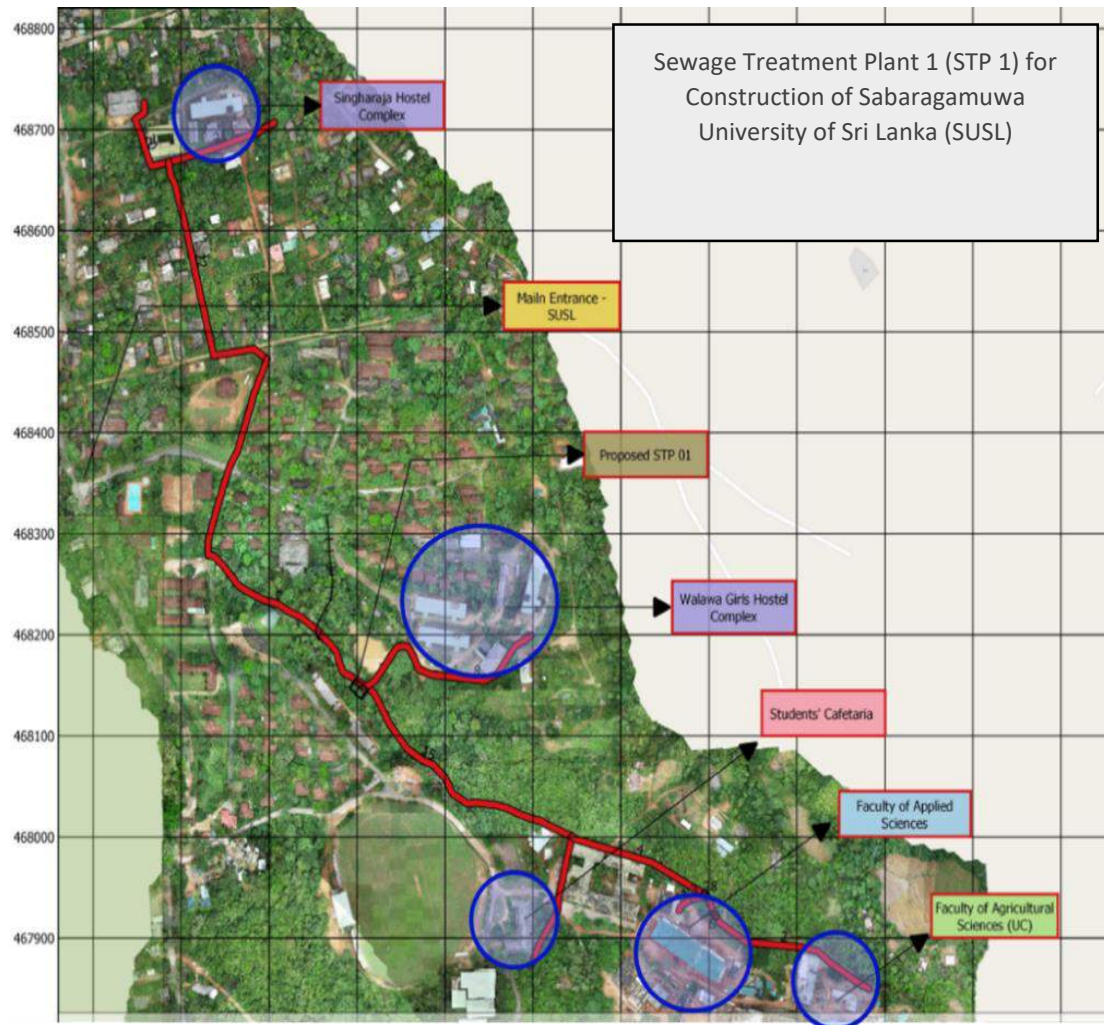


Figure 4: SUBPROJECT PLAN

DESCRIPTION OF THE EXISTING ENVIRONMENT

The proposed subproject site is situated within the existing SUSL complex. The project land is a state owned land, owned by the Sabaragamuwa University of Sri Lanka. This site is a vacant land at present status. Proposed land is fully occupied with the natural vegetation with a slopy terrain. No significant environmentally sensitive receptors exist in the subproject site's immediate surroundings. The only possible such receptors will be the SUSL community, the closest functional building 500 m from the site. The area acquired by the project is 250m².



Figure 5: PROPOSED DEVELOPMENT LAND



Figure 6: FEW FOOTAGES OF THE PROJECT AREA

PROPOSED PLAN

The time duration of the proposed project is 16 months and it planned to commence on February 2023.

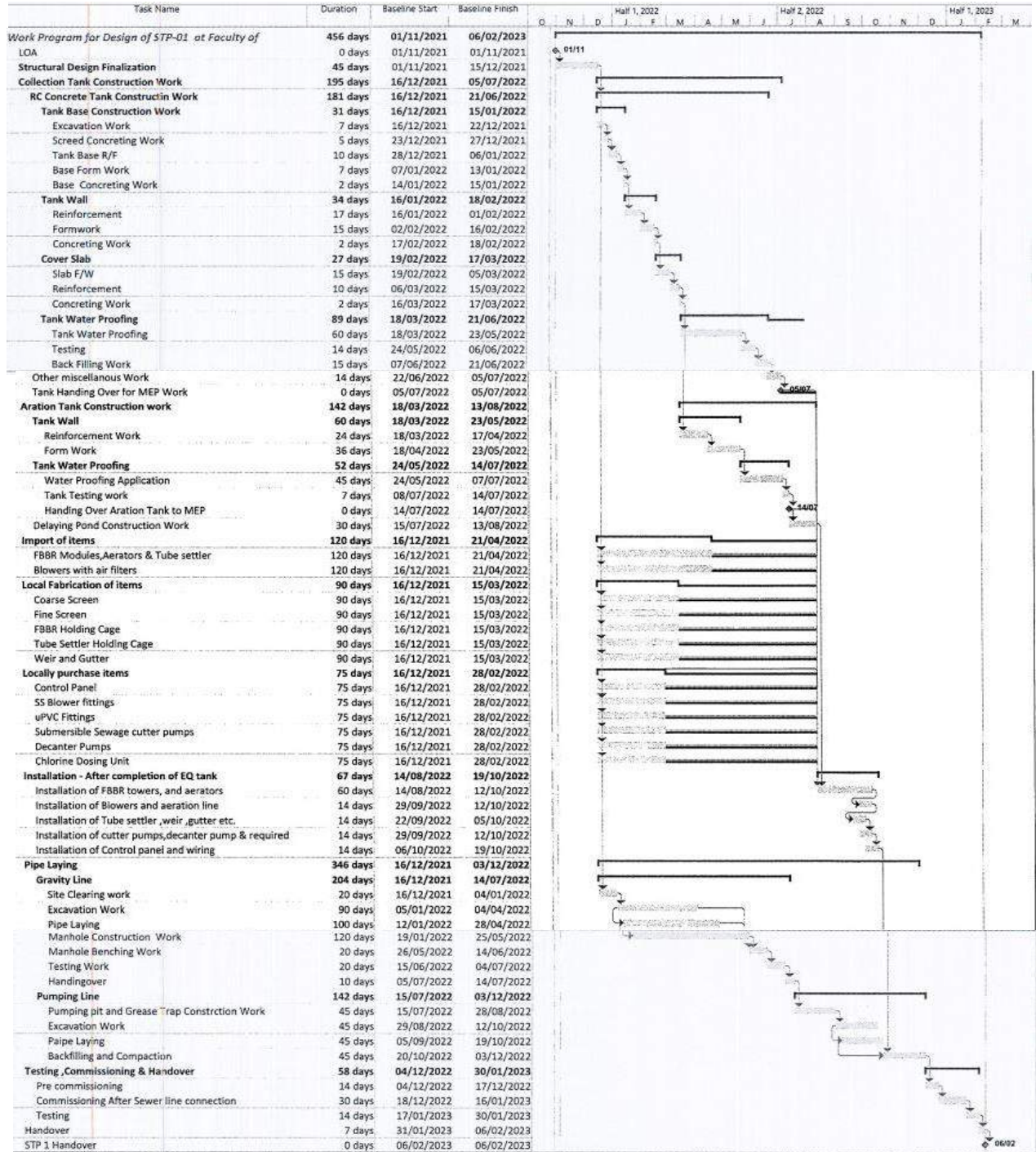


Figure 7: PROJECT SCHEDULE

RECOMMENDATIONS

Sewage disposal is currently a problem in the University. As a residential university, the whole student population of SUSL is provided with hostel facilities in university hostels or rented houses. Wastewater

accumulated in these hostels is frequently emptied from the septic tank systems. A proper sewage disposal system is a high priority requirement for SUSL. Further, maintaining cleanliness at the university premises appears to be rather neglected at the moment. Further, it is a harm to the communities surrounding the University also. The developmental activities that are planned, parallel expansion of these facilities should be considered and proposed.

It is recommended that the IEE give special attention to the following:

- A. It was an initial requirement to clear definition as to what type of EA (IEE or EIA) will be required under the national legislation. Therefore, we recommend to the Sabaragamuwa University of Sri Lanka and the developer (ICC) to obtain government approval as an immediate action. This includes obtaining approval from the CEA, LA and the UDA, etc. Considering the magnitude of the project this will be called for an IEE under the national regulations as well at a minimum.
- B. Review ADB guidelines and previous environmental recommendations provided by IEE Report of proposed Faculty of Technology, Sabaragamuwa University of Sri Lanka.
- C. We feel that the first stage of development should focus more on the best locations for installing the STP 1 & pits and laying the plumbs.
- D. The proposed development plan should be done with better consultation and all the relevant local authority's approval should also be obtained.
- E. A proper soil investigation, water quality test, air quality test and noise quality test needs to be carried out prior to any site clearance.
- F. Assess the economic viability of the selected site for the purpose with respect to the other available option.
- G. Submit an initial screening form to CEA providing particulars of the project (fill out a BIQ for the project) prior to any site clearance or project commencement. As per the environmental recommendations provided by the CEA, take the necessary actions.
- H. Propose a better stormwater management plan and drain plan to mitigate the soil erosions.
- I. Manage odor, noise, dust, and vibration at the site.
- J. Ensure the disposal of treated water quality and disposal of sludge.
- K. Ensure the STP 1 maintenance.
- L. Conduct an awareness programme for villagers, government officers and other stakeholders about this project and collect comments from them.
- M. Assessment of uninterrupted power supply: The Ceylon Electricity Board (CEB) has provided a separate power exchange for the University. However, the University experiences frequent power failures, and therefore alternative sources of power supply should be thought of in view of this automatic STP 1.

ANNEXURE N : COMPLAINS FORM **COMPLAINS FORM**

Sample Grievance Registration Form (To be available in Sinhala and English)

The _____ Project welcomes complaints, suggestions, queries, and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing ***(CONFIDENTIAL)*** above your name. Thank you.





Date	Place of registration	Project Town Project		
Contact information/personal details				
Name	Gender	* Male *Female	Age	
Home address				
Place				
Phone no.				
E-mail				
Complaint/suggestion/comment/question Please provide the details (who, what, where, and how) of your grievance below: If included as attachment/note/letter, please tick here:				
How do you want us to reach you for feedback or update on your comment/grievance?				

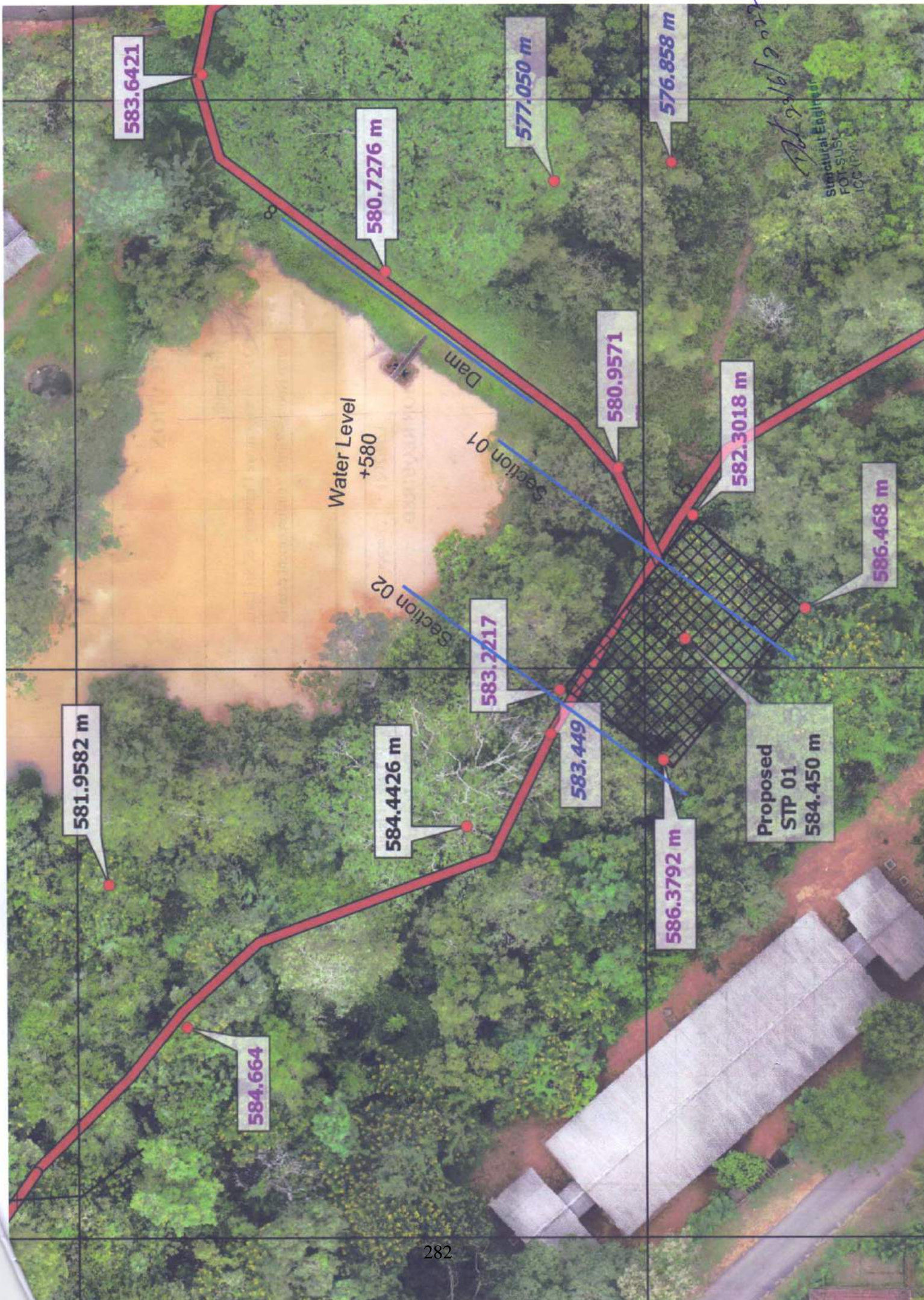
FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)		
Mode of communication: Note/letter E-mail Verbal/telephonic		
Reviewed by: (Names/positions of officials reviewing grievance)		
Action taken:		
Whether action taken disclosed:	Yes No	
Means of disclosure:		

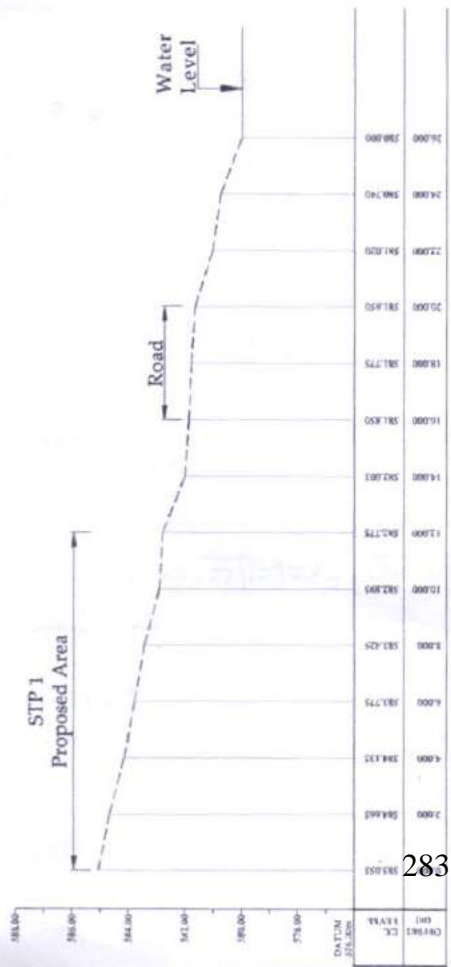
ANNEXURE O : DAM DETAILS

Note: The term "STP 1" has been used as STP in the report.

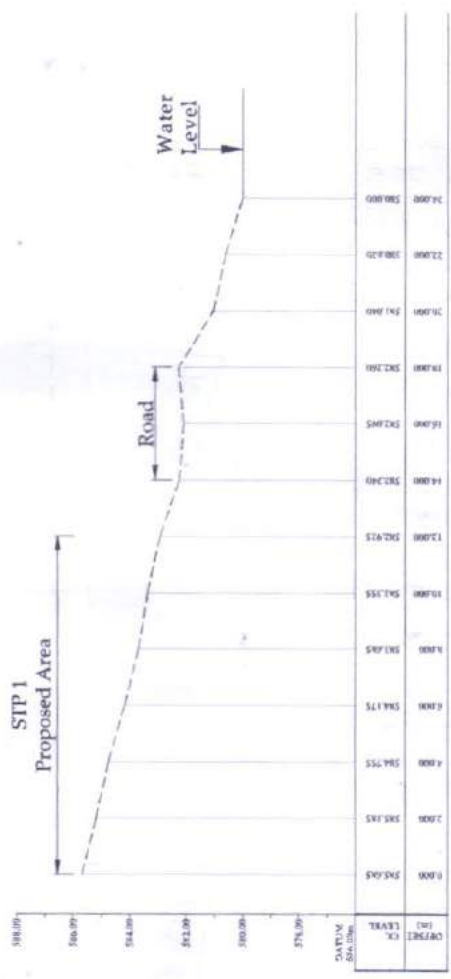
REQUEST FOR CLARIFICATION		 Sabaragamuwa University of Sri Lanka			
ATTENTION	Mr. Damith	Division	DO	Clarification No	RFC/FOT/CIVIL/158
PROJECT	FOT Sabaragamuwa University of Sri Lanka	Drawing No		Revisions	
SUBJECT	Impact for the existing dam of the tank due to STP 01 construction	Date of Issue (Response)	22.06.2022	Eng./Arch./TO/Client's RESPONSE	
ATTACHMENT		Response Expected date:	22.06.2022	Eng./Arch./TO/Client's RESPONSE	
<p>CLARIFICATION REQUIRED</p> <p>Mr Damith, As per the request of the Environmental Consultant, It should be clarified whether the construction work of STP 01 can affect the existing dam in the tank. - The dam is located 12 m from the STP. Explain the possibility of impact due to vibration or any other ways.</p>		<p>The dam is located 12.0 m away from the outer wall of STP. According to the operation of dam and STP and distance to the dam from STP, there is no any pressure distribution or vibration towards the Dam due to STP.</p>			
Kawinga Dissanayake Planning Engineer Applicant's Name	 Planning Engineer FOT-SUSL ICC (Pvt) Ltd. 22.06.2022 Applicant's Signature/Date	Eng./Arch./TO/Client's Signature	 Eng. M. D. DAMITH GAMAGE CHARTERED ENGINEER		
		QS Dept. Signature	MEMBERSHIP NO. M - 7616 THIS SEAL WILL BE VALID ONLY IF THE HOLDER'S NAME IS ON THE ROLL OF MEMBERS		
		Manager's Signature	THE INSTITUTION OF ENGINEERS, SRI LANKA 24/6/2022		
Director's Signature					



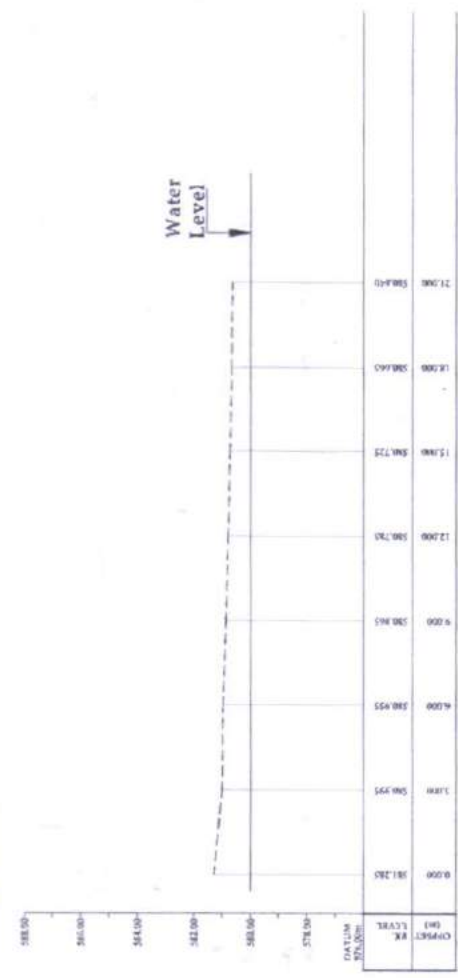
1



2

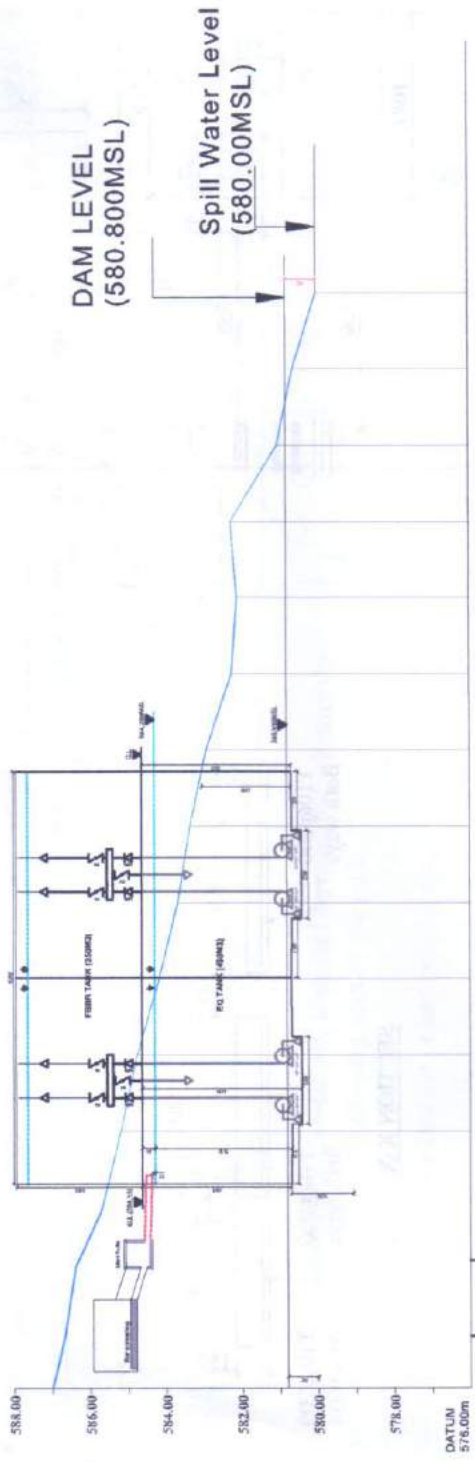


Dam



Handwritten signature
 Structural Engineer
 FOT-SUSL
 ICC (Pvt) Ltd.

2



Offset Ex. Level (m)	Level (m)
587.685	0.000
585.185	2.000
584.755	4.000
584.175	6.000
583.685	8.000
583.355	10.000
582.925	12.000
582.240	14.000
582.095	16.000
582.260	18.000
581.040	20.000
580.620	22.000
580.000	24.000

29/6/2022
 Structural Engineer
 FOT-SUSL
 ICC (Pvt) Ltd.

Village Muttettuwagama
 Minor Division Kadawata Korale
 DS Division Imbulpe
 District Ratnapura
 Province Sabaragamuwa

REFERENCES

B	Bore
C	Canal
CU	Culvert
EA	Earth bank
ED	Earth drain
EL	Earth levee
F	Flow line
GR	Gravel
M	Main road
MP	Minor road
N	Natural drainage
P	Proposed building
R	Road
R(S)	Road (State)
R(U)	Road (University)
R(SUSL)	Road (Sabaragamuwa University of Sri Lanka)
S	Settlement
T	Telephone
U	Underpass
WF	Wire fence





ISO/IEC: 17025
TL 020-02



MicroChem Laboratories (Pvt) Ltd
No 134, Dehiwala Road, Bellanwila, Boralesgamuwa Sri Lanka.
Telephone : 0112 710637/639, +94 773152797
E-mail : microchem@sltnet.lk, Web : www.microchem.lk

ANALYSIS REPORT

TRF NO. TRF/MCL/0103
REF NO. 22/03/C/MCL/0146

REPORT ISSUE DATE 10.03.2022

CLIENT : ICC (Pvt) Ltd, No. 70, S.D.S. Jayasingha Mawatha, Kohuwala, Sri Lanka

SPECIMEN : Pond Water

PLACE OF COLLECTION : Directly from the Pond – University of Sabaragamuwa

SAMPLE DESCRIPTION : Clear transparent liquid with suspended particles

SAMPLE SUBMITTED BY : Mr. Dhanjana Demel - ICC (Pvt) Ltd
Sample Submitted in a 5L can

DATE OF SAMPLE COLLECTION : 02.03.2022 around 7.00 a.m.

DATE OF SAMPLE RECEIPT : 02.03.2022 around 4.15 p.m.

DATES OF PERFORMANCE : 03.03.2022 - 08.03.2022

PHYSICAL AND CHEMICAL CHARACTERISTICS

NO	TEST PARAMETER	TEST METHOD	TEST RESULT
1	pH at 25°C ± 2°C *	APHA (23 rd edition) 4500- H ⁺ Electrometric method	7.2
2	Total Suspended Solids (TSS), mg/l, max	APHA (23 rd edition) 2540 D. Total suspended solids at 103-105 °C, MDL-01	14
3	Biochemical Oxygen Demand (BOD) ₅ , mg/l, max	APHA (23 rd edition) 5210 B. 5-day BOD test, MDL-05	15
4	Chemical Oxygen Demand (COD), mg/l, max	APHA (23 rd edition) 5220 D, Closed refluxed, colorimetric, MDL-05	40
5	Oil and grease, mg/l, max	APHA (23 rd edition) 5520 B, Liquid - liquid partition gravimetric, MDL-01	Less than 01

Abbreviations & remarks : MDL - Minimum Detection Limit, *Accredited Parameters, ** Measured at the site

.....
Authorized Signatory

Manel Perera
B.Sc. (Hons), M.Phil.(Chemistry)
M.Sc. (Microbiology)
Managing Director

This report refers specially to the sample analyzed and findings recorded herein relate to the sample provided by customer or third party acting at the customer direction. Warranty shall not be claimed for representativeness of entire population/lot of the analyte.

Under no circumstances does MicroChem Laboratories (Pvt) Ltd, accept any liability or loss or damage caused by use or misuse of the report. Perishable specimens will be destroyed immediately after testing, and other specimens are kept for one month from the date of issue of the report and it depends on availability of the specimen.

ANNEXURE R : BOQ OF THE STP 1

**CONSTRUCTION OF SEWAGE TREATMENT PLANT (STP) AS A VARIATION OF DESIGN AND CONSTRUCTION OF
BUILDINGS AND INFRASTRUCTURE FACILITIES FOR FACULTY OF TECHNOLOGY, SABARAGAMUWA UNIVERSITY
OF SRI LANKA - STHRDP/PMU/SB-CW**

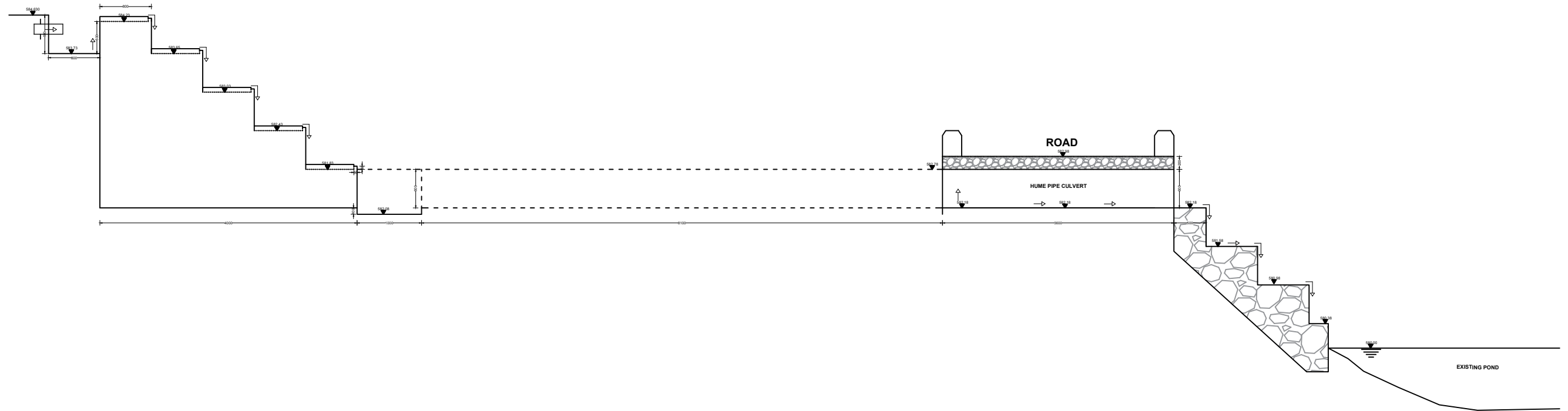
PRICED BILLS OF QUANTITIES - SUMMARY (STP 01)

Note: The term "STP 1" has been used as STP here.

Item	Description	Qty	Unit	Rate- LKR.	Amount- LKR.	Rate- US \$.	Amount- US \$.	Remarks
	<u>SEWER TREATMENT PLANT</u>							
1	SEWER TREATMENT PLANT				25,564,424.00		152,707.00	
	<u>CIVIL WORKS</u>							
2	CIVIL CONSTRUCTION FOR STP 1				22,889,617.48			
	<u>MEP WORKS</u>							
3	MEP WORKS				55,385,325.50		9,158.00	
4	ELECTRICAL WORK				1,125,000.00		-	
5	ROAD CONSTRUCTION WORK				1,070,057.00		-	
6	PIPE LAYING & OTHER WORKS				0.00		-	
	TOTAL				106,034,423.98		161,865.00	
7.0	<u>ADDITIONAL ITEM</u>							
7.1	Supply and install of Sludge Screw Press,Dosing, pumps, FOB Damnotech				1,574,334.00		13,727.00	
7.2	Supply and install of Automatic Coarse Screen				933,861.00		8,143.00	
7.3	Allow for the Initial Environmental Examination (IEE) report				1,062,500.00			
	Total for Additional Item				3,570,695.00		21,870.00	
	GRAND TOTAL				109,605,118.98		183,735.00	

ANNEXURE S : CASCADE DETAILS

Note: The term "STP 1" has been used as STP in the layout.



PROJECT
STP FOR SABARAGAMUWA UNIVERSITY
STP - 01
 24/06/2022/STP1/SG/V003

TITLE
 CASCADE ELEVATION
 DETAILS
 (BASIC DIMENSION DRAWING)

NOTE
 1. ALL DIMENSIONS ARE IN
 MILLIMETERS

 288

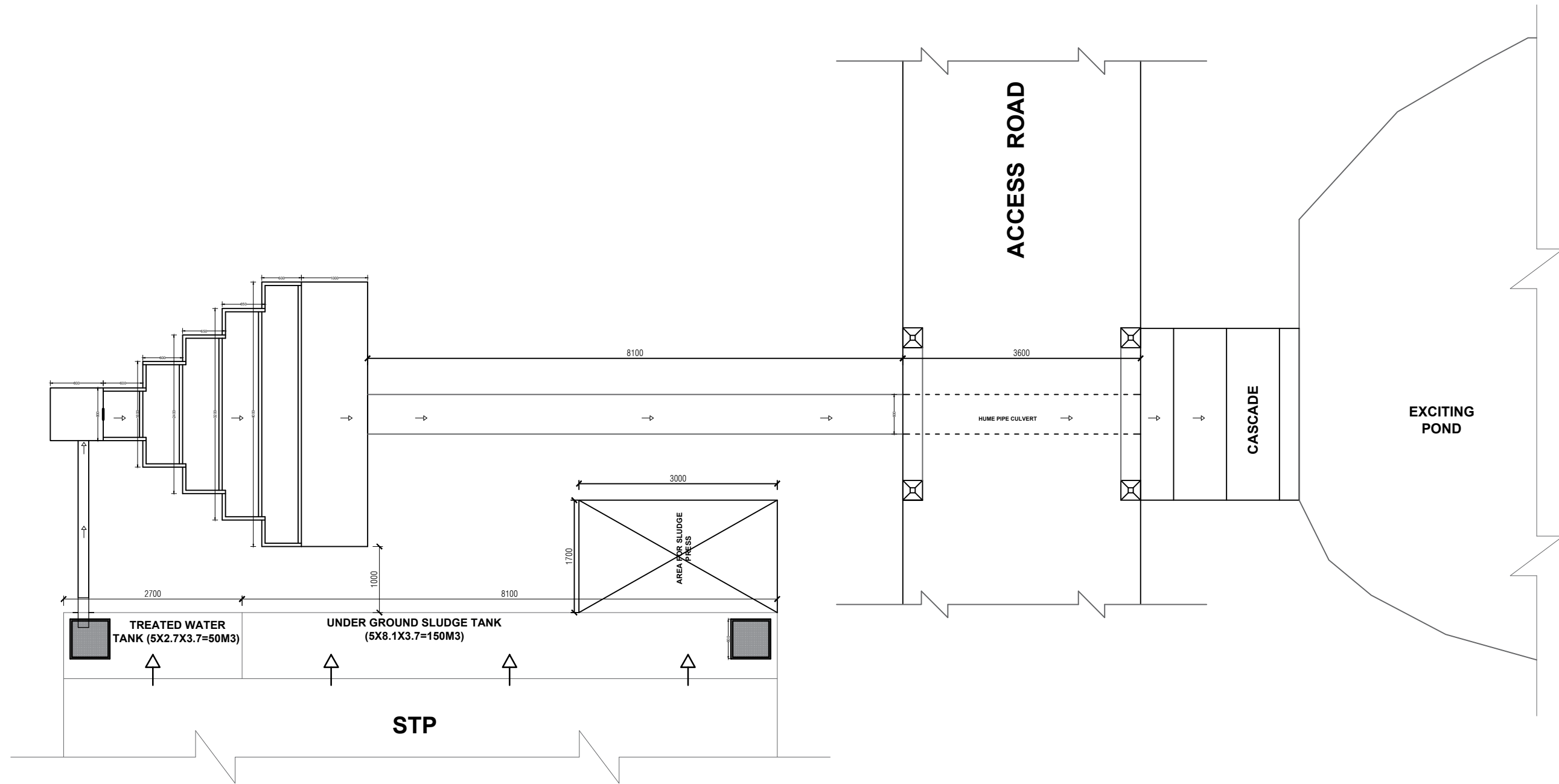
NO.	REVISION	DATE



ICC SMART ECO SOLUTIONS.
 No 57, S de S Jayasinghe Mawatha,
 Kohuwala, Nugegoda, Sri Lanka.

Tel : 0112 814204,
 Email : smarteco@icc-construct.com
 Web : www.icc-construct.com

DESIGNED	ICC SMART ECO SOLUTIONS
DRAWN	M.S
SCALE	NTS
DWG NO	SE/STP1/SG/PL/PF/V003
DATE	24/06/2022
CAD FILE	SE/STP-1/PLAN/SG
CHECKED	C.B.S
SHEET NO	01 OF 01



PROJECT
STP FOR SABARAGAMUWA UNIVERSITY
STP - 01
 24/06/2022/STP1/SG/V003

TITLE
 CASCADE - PLAN VIEW
 (BASIC DIMENSION DRAWING)

NOTE
 1. ALL DIMENSIONS ARE IN MILLIMETERS
 289

NO.	REVISION	DATE
01	ADD A TREATED WATER TANK	18/10/2021

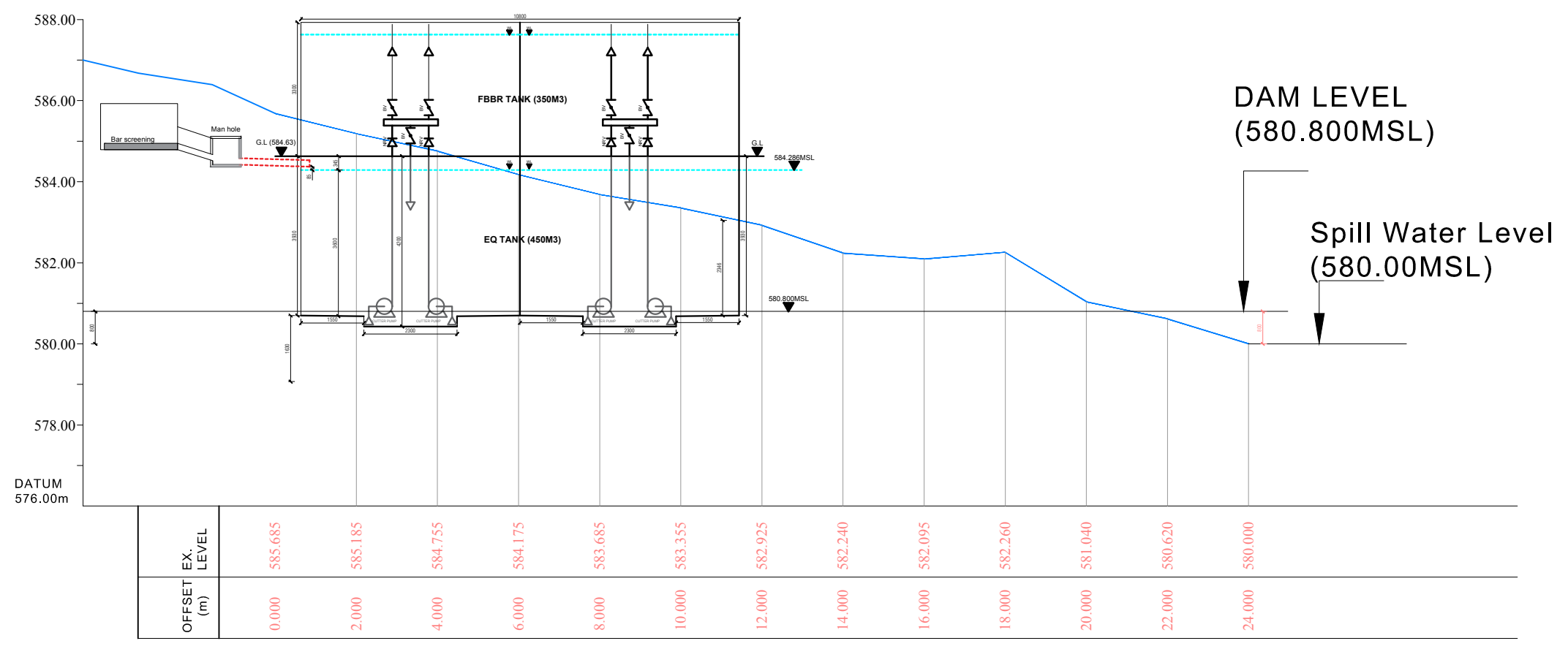


ICC SMART ECO SOLUTIONS.
 No 57, S de S Jayasinghe Mawatha,
 Kohuwala, Nugegoda, Sri Lanka.

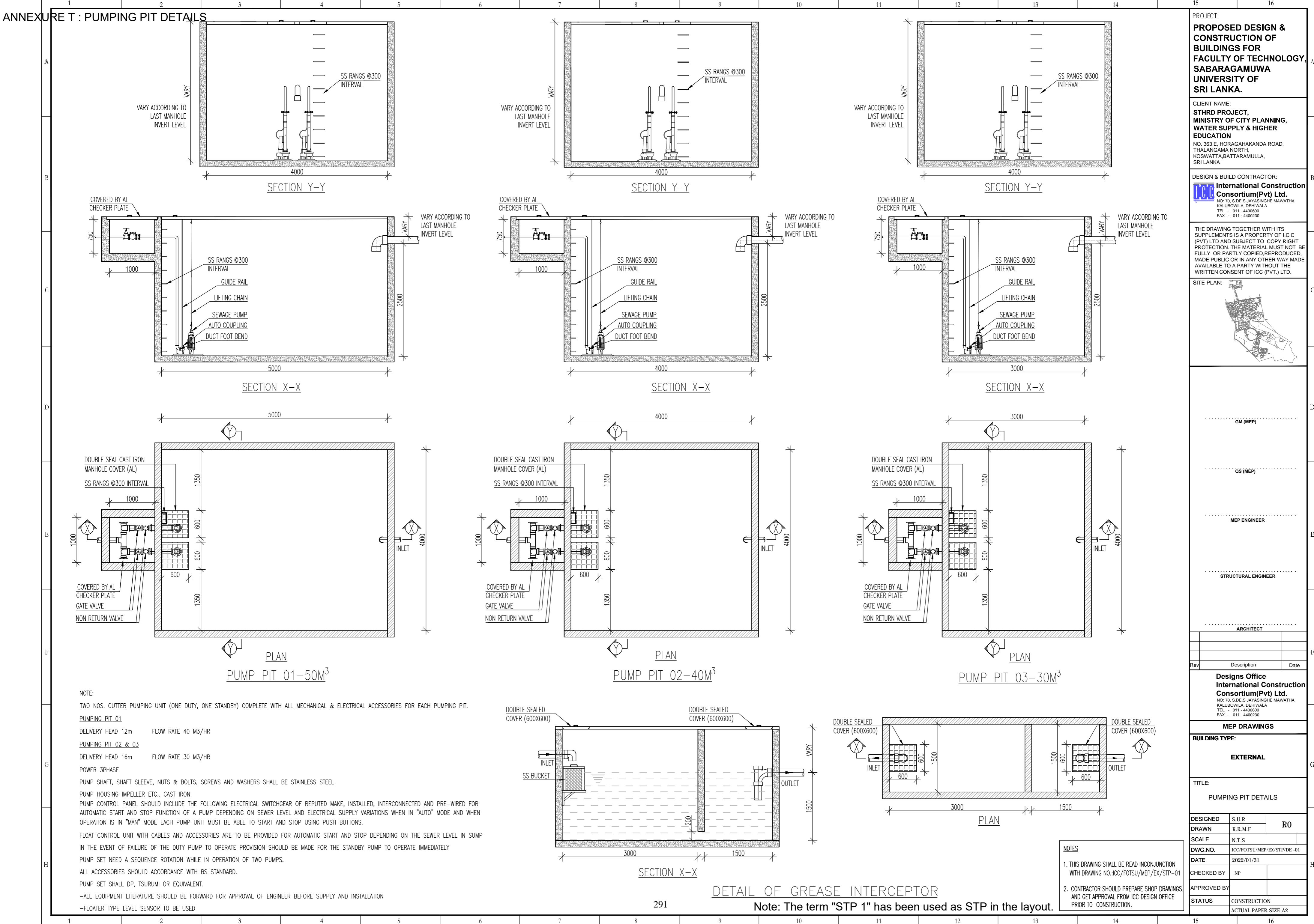
Tel : 0112 814204,
 Email : smarteco@icc-construct.com
 Web : www.icc-construct.com

DESIGNED	ICC SMART ECO SOLUTIONS
DRAWN	K.E
SCALE	NTS
DWG NO	SE/STP1/SG/PL/PF/V003
DATE	24/06/2022
CAD FILE	SE/STP-1/PLAN/SG
CHECKED	C.B.S
SHEET NO	01 of 02

2



ANNEXURE T : PUMPING PIT DETAILS

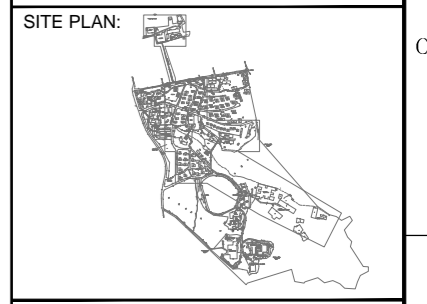


PROJECT:
PROPOSED DESIGN & CONSTRUCTION OF BUILDINGS FOR FACULTY OF TECHNOLOGY, SABARAGAMUWA UNIVERSITY OF SRI LANKA.

CLIENT NAME:
STHRD PROJECT, MINISTRY OF CITY PLANNING, WATER SUPPLY & HIGHER EDUCATION
 NO. 363 E. HORAGAHAKANDA ROAD, THALANGAMA NORTH, KOSWATTA, BATTARAMULLA, SRI LANKA

DESIGN & BUILD CONTRACTOR:
International Construction Consortium (Pvt) Ltd.
 NO. 70, S. DE. S. JAYASINGHE MAWATHA KALUBOWILA, DEHIWALA
 TEL - 011 - 4400800
 FAX - 011 - 4400230

THE DRAWING TOGETHER WITH ITS SUPPLEMENTS IS A PROPERTY OF I.C.C (PVT) LTD AND SUBJECT TO COPY RIGHT PROTECTION. THE MATERIAL MUST NOT BE FULLY OR PARTLY COPIED, REPRODUCED, MADE PUBLIC OR IN ANY OTHER WAY MADE AVAILABLE TO A PARTY WITHOUT THE WRITTEN CONSENT OF ICC (PVT.) LTD.



GM (MEP)
QS (MEP)
MEP ENGINEER
STRUCTURAL ENGINEER
ARCHITECT

Rev	Description	Date

Designs Office International Construction Consortium (Pvt) Ltd.
 NO. 70, S. DE. S. JAYASINGHE MAWATHA KALUBOWILA, DEHIWALA
 TEL - 011 - 4400800
 FAX - 011 - 4400230

MEP DRAWINGS

BUILDING TYPE:

EXTERNAL

TITLE:

PUMPING PIT DETAILS

DESIGNED	S.U.R	R0
DRAWN	K.R.M.F	
SCALE	N.T.S	
DWG.NO.	ICC/FOTSU/MEP/EX/STP-01	
DATE	2022/01/31	
CHECKED BY	NP	
APPROVED BY		
STATUS	CONSTRUCTION	
	ACTUAL PAPER SIZE-A2	

NOTE:
 TWO NOS. CUTTER PUMPING UNIT (ONE DUTY, ONE STANDBY) COMPLETE WITH ALL MECHANICAL & ELECTRICAL ACCESSORIES FOR EACH PUMPING PIT.

PUMPING PIT 01
 DELIVERY HEAD 12m FLOW RATE 40 M3/HR

PUMPING PIT 02 & 03
 DELIVERY HEAD 16m FLOW RATE 30 M3/HR

POWER 3PHASE

PUMP SHAFT, SHAFT SLEEVE, NUTS & BOLTS, SCREWS AND WASHERS SHALL BE STAINLESS STEEL

PUMP HOUSING IMPELLER ETC.. CAST IRON

PUMP CONTROL PANEL SHOULD INCLUDE THE FOLLOWING ELECTRICAL SWITCHGEAR OF REPUTED MAKE, INSTALLED, INTERCONNECTED AND PRE-WIRED FOR AUTOMATIC START AND STOP FUNCTION OF A PUMP DEPENDING ON SEWER LEVEL AND ELECTRICAL SUPPLY VARIATIONS WHEN IN "AUTO" MODE AND WHEN OPERATION IS IN "MAN" MODE EACH PUMP UNIT MUST BE ABLE TO START AND STOP USING PUSH BUTTONS.

FLOAT CONTROL UNIT WITH CABLES AND ACCESSORIES ARE TO BE PROVIDED FOR AUTOMATIC START AND STOP DEPENDING ON THE SEWER LEVEL IN SUMP IN THE EVENT OF FAILURE OF THE DUTY PUMP TO OPERATE PROVISION SHOULD BE MADE FOR THE STANDBY PUMP TO OPERATE IMMEDIATELY

PUMP SET NEED A SEQUENCE ROTATION WHILE IN OPERATION OF TWO PUMPS.

ALL ACCESSORIES SHOULD ACCORDANCE WITH BS STANDARD.

PUMP SET SHALL DP, TSURUMI OR EQUIVALENT.

-ALL EQUIPMENT LITERATURE SHOULD BE FORWARD FOR APPROVAL OF ENGINEER BEFORE SUPPLY AND INSTALLATION

-FLOATER TYPE LEVEL SENSOR TO BE USED

NOTES

- THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING NO. ICC/FOTSU/MEP/EX/STP-01
- CONTRACTOR SHOULD PREPARE SHOP DRAWINGS AND GET APPROVAL FROM ICC DESIGN OFFICE PRIOR TO CONSTRUCTION.