Faecal Sludge and Septage Co-Treatment Design Guidebook

Volume II: Operationalization and Management

Recommendations for co-treatment of faecal sludge and septage with sewage at Kargi Chowk STP in Dehradun

MARCH 2021

National Institute of Urban Affairs

SCBP
Sanitation Capacity Building Platform

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TITLE

Faecal Sludge and Septage Co-Treatment Design Guidebook - Volume II: Operationalization and Management Recommendations for co-treatment of faecal sludge and septage with sewage at Kargi Chowk STP in Dehradun

RESEARCH PROJECT

Sanitation Capacity Building Platform (SCBP), National Institute of Urban Affairs (NIUA), New Delhi

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DISCLAIMER

This is a draft report on the co-treatment project at the Kargi Chowk STP in Dehradun. It is prepared under the NIUA-UDD, Govt. of Uttarakhand engagement to support the state in mainstreaming decentralised solutions. This report provides sample documents that will be useful for the operating and maintenace team of the co-treatment facility. The findings of the study 'Co-Treatment of Septage at STPs of Ganga Towns in Uttarakhand' done by IIT Roorkee has also been referred during preparation of this document.

THE FULL REPORT SHOULD BE REFERENCED AS FOLLOWS

NIUA (2021), Faecal Sludge and Septage Co-Treatment Design Guidebook - Volume II: Operationalization and Management Recommendations for co-treatment of faecal sludge and septage with sewage at Kargi Chowk STP in Dehradun

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ABBREVIATIONS

BIS	Bureau of Indian Standard
BOD	Biological Oxygen Demand
CAPEX	Capital Expenditure
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health & Environmental Engineering Organization
DPR	Detailed Project Report
DWPE	Dewatering Polyelectrolyte
FGD	Focus Group Discussion
FSS	Faecal Sludge and Septage
FSSM	Faecal Sludge and Septage Management
GoI	Government of India
GoUK	Government of Uttarakhand
KII	Key Informant Interview
LPCD	Litres per Capita per Day
MIS	Management Information System
MLD	Million Liters per Day
MoHUA	Ministry of Housing and Urban Affairs (Formerly known as MoUD)
MSL	Mean Sea Level
NFSSMP	National Faecal Sludge and Septage Management Policy
NIC	National Informatics Centre
NIUA	National Institute of Urban Affairs
NMCG	National Mission for Clean Ganga
NUSP	National Urban Sanitation Policy
OD	Open Defecation
OPEX	Operational Expenditure
OSS	Onsite Sanitation System
OU	Open Urination
PPE	Personal Protective Equipment
SBM	Swachh Bharat Mission
SLRM	Solid Liquid Resource Management
TSS	Total Suspended Solids
UDD	Urban Development Department
UK	Uttarakhand
UKEPPCB	Uttarakhand Environment Protection and Pollution Control Board
UJS	Uttarakhand Jal Sansthan
UPJN	Uttarakhand Pey Jal Nigam

1

INTRODUCTION

The concept of co-treating faecal sludge and septage with sewage in sewage treatment plant is one of the treatment techniques in Faecal Sludge and Septage Management (FSSM) that has gained importance in the state of Uttarakhand. This report is the second volume of the Faecal Sludge and Septage Co-treatment Design Guidebook first released in May 2020.

This report gives a set of working documents for the engineers from the parastatal bodies of Uttarakhand namely, Uttarakhand Pey Jal Nigam and Uttarakhand Jal Sansthan. These personnel can use this document as toolkit for implementing co-treatment facilities in their jurisdiction where the STPs have spare capacity for treatment. The topics covered under this report are:

A) Terms of reference (ToR) document for design consultancy of the co-treatment plant

This section lists out the topics to be covered while hiring of consultants for designing of co-treatment plant. It provides an idea regarding the information to be provided to a consultant that will help in designing a safe and technically sound co-treatment solution. Furthermore, it provides different aspects that a consultant needs to consider while preparing the design. Finally, it lists down the deliverables from the consultant for that can form the part of tender document for parastatal bodies to proceed further with the implementation of the co-treatment project. The format of the ToR chapter is drafted as a ready template which can be referred for preparing ToR by UJS or UPJN. The design details of the co-treatment facility at Kargi Chowk STP are provided to UJS under the SCBP state support programme for FSSM under volume 1.

B) Protocol for trial runs and Monitoring of co-treatment plant

For a mechanical-based co-treatment plant implemented at a STP, there are certain steps that needs to be undertaken before starting the operation of the plant. This section gives a comprehensive overview of the steps to be taken for developing the operation team, set of checks to be performed on equipment installed in the co-treatment plant, conduct monitoring of co-treatment plant operations, etc. Additionally, certain monitoring protocols are also provided for reference.

C) Sample bidding document for procurement of works

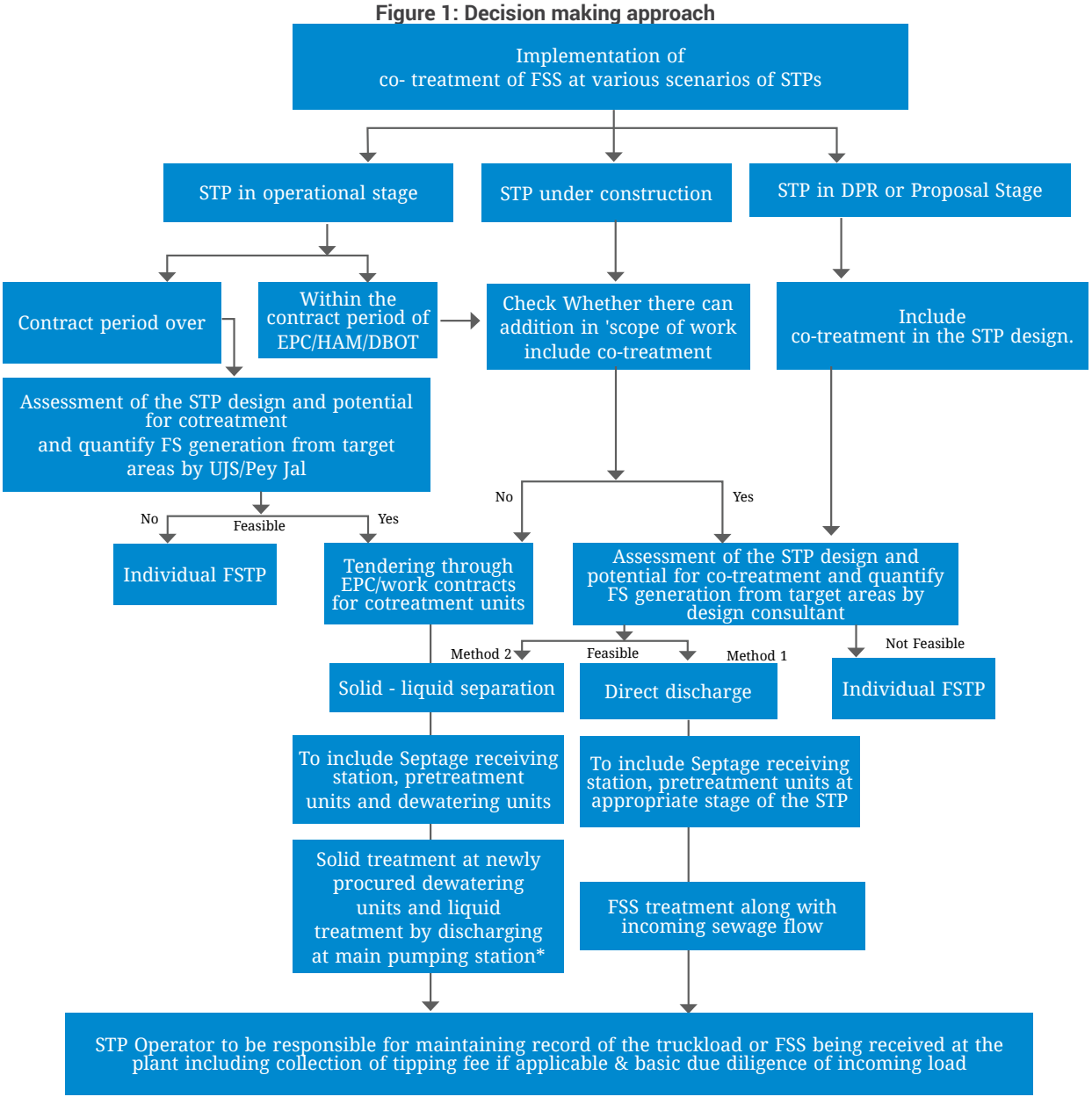
This section is a sample document representing the tender floated for implementing co-treatment within a sewerage project in Uttarakhand. It gives a clear picture for parastatal bodies as well as ULB officials about the FSSM aspects and the way to include it in their sewerage management plans.

1.1 Decision making approach for enabling co-treatment of Faecal Sludge and Septage

In the Uttarakhand state, the rise in number of toilets under Swachh Bharat Mission has been matched with the rise in number of on-site sanitation (OSS) systems such as septic tanks and twin-pit systems. This has resulted in over 806 KLD of faecal sludge and septage from 91 towns. However, only 22% is having some level of treatment through the sewage treatment plants. On the other hand, half of the total installed capacity (445 MLD) of sewage treatment plants (STPs) in the state is currently receiving sewage. This indicates a major potential for treating the FSS where STPs with spare capacities exist. In view of this, the state government has enabled implementing co-treatment facilities at the STPs with spare capacity through the Protocol for Septage Management released in 2017.

A decision making approach presented below provides different situations of STP where co-treatment can be introduced. The flow chart is indicative and factors like local conditions, capacity of the ULB/parastatal bodies and socio-economic parameters also have to be considered while making decision for co-treatment as a city-wide FSSM solution.

Figure 1: Decision making approach



**Main pumping station here is referred to as the inlet point of a municipal STP. It is considered to be located before the screen chambers or mechanical screening units.*

2

TERMS OF REFERENCE

Project name: Design of co-treatment plant handling faecal sludge, septage and sewage at the designated STP.

Project reference number: Identification number as per the Client's record of project proposal

Subject: Design engineering consulting firm/agency/organization/individual consultant for the 'Project Name'

Client name: Name of the client

1. Organizational background

This portion will entail a brief (4-5 lines) description of the client raising this ToR document.

2. Project background

The content under this heading will introduce the reader/s to the specific project situation; focus shall be on the context of sanitation leading to the FSSM/sanitation service chain, especially the treatment aspect.

3. Basic information

The basic information will be a tabulated presentation of data related to sanitation including STP data where the co-treatment facility is envisaged.

Table 1: Data pertaining to basic information

Description	Data
Population	
Number of households	
Number of government buildings	
Number of commercial buildings	
Number of public toilets	
Number of community toilets	
Number of vehicles for faecal sludge and septage collection (government operated)	
Number of trips made by the vehicle in a day from point of collection to discharge (government operated)	
Capacity of vehicles (government operated; in KL)	Here, the capacities can be mentioned either individually or a cumulative figure.
Number of vehicles for faecal sludge and septage collection (privately operated)	

Description	Data
Number of trips made by the vehicle in a day from point of collection to discharge (privately operated)	
Capacity of vehicles (privately operated; in KL)	Here, the capacities can be mentioned either individually or a cumulative figure.
Treatment capacity of STP	This will be the design capacity of the wastewater treatment plant (in KLD or MLD) where the co-treatment facility is proposed.
Daily average wastewater inflow into the STP	
Daily peak wastewater inflow into the STP	
Scheme of treatment in the WWTP	Here, the treatment philosophy adopted in the WWTP shall be mentioned. For example, sequential batch reactor (SBR) system, extended aeration (EA) system, moving bed bio-reactor (MBBR) system.

Specific details such as design data and operational data of the STP will only be provided by the client after appointing the design consulting firm/agency/organization/individual consultant for this assignment. Similarly, the characteristics of the faecal sludge and septage to be considered in this assignment shall be provided by the client after appointing the design consulting firm/agency/organization/individual consultant for this assignment.

(In case tge client is not able to perform FSS characterisation, it should be performed by the design firm/agency/organisation/individual consultant. This change will also be reflected in the earlier paragraph. Under no circumstances shall the design consultancy proceed without the correct characterisation of FSS.)

4. Objectives of this consultancy assignment

To prepare a detailed engineering design of a co-treatment facility for the safe treatment and disposal/reuse of faecal sludge and septage at the designated STP. This design is expected to provide a detailed insight and analysis of the current situation and practices related to faecal sludge and septage treatment and disposal. Additionally, a preliminary evaluation of the STP functioning based on the operational data and design documents provided by the client is also to be provided. This should form the basis of justifying that the STP has the potential to co-treat faecal sludge and septage without causing any process upset or violation of discharge standards for both effluent and biosolids.

5. Scope of work

The scope of work to be considered for this consultancy assignment shall include but not be limited to the following:

a. Review the current data/practices followed with regards to the faecal sludge and septage collection and transportation to the designated disposal site. Also, suggest any changes appropriate to ensure complete and safe collection and transportation of faecal sludge and septage to the co-treatment facility proposed under this consultancy assignment.
b. Review the design and operational data of the STP where the co-treatment facility is being proposed, suggest any changes appropriate to operationalize co-treatment at the STP using technical basis, and conduct process and hydraulic analyses of the proposed treatment facility.
c. Prepare the detailed designs, technical specifications, bill of quantities, financial cost estimates, and engineering drawings namely, process flow diagram, hydraulic flow diagram and plant layout for the proposed work under this consultancy assignment.
d. During the design and adoption of a particular treatment technology, consideration should

be given for the technical and financial capacities of the client to build, install and operate the proposed co-treatment facility.

e. Particular attention should be placed on:
   i. Effluent and bio-solids discharge standards to be followed as per the concerned pollution control authorities after the implementation co-treatment facility.
   ii. Safety in handling the faecal sludge and septage treatment as per the standards stipulated by name of applicable agencies whose protocol needs to be followed such as the CPHEEO, etc.

c. Ensure availability for technical support and respond to design queries, if any, upon the completion of this consultancy assignment. The maximum turnaround time (TAT) for any queries related to this consultancy assignment is 30 days. In case the queries cannot be sufficiently clarified through telephonic discussion or email correspondence, then the consulting firm/agency/organization/individual consultant will be required to be present for a meeting in person. Any expense incurred in this process shall be borne by the client.

d. Carry field visits to the project location as required to assess the faecal sludge and septage management practices, STP operations, etc. However, any visit to the site shall require the prior approval of the client. Also, a designated person from the client's side shall be present during the site visits pertaining to this consultancy assignment. The consultancy firm/agency/organization/individual consultant shall present the expenses incurred during the site visits in the form of original invoices for seeking reimbursement.

e. (If required, the client can do a basic cost estimation of a 3-day site visit and cap the amount that one can seek as reimbursement for the site visit).

6. Issues to be considered

This section will enlist pointers giving the interested consulting firm/agency/organization/individual consultant issues to be kept in mind while applying for this consultancy assignment. Information can be (but not limited to) regarding the source of faecal sludge and septage to be considered for designing the co-treatment facility as waste from households and institutions like hospitals etc. do not have similar characteristics. Additionally, information about the STP like the space available for installing the co-treatment facility near the wastewater treatment plant, any specific treatment philosophy which the client wishes to support, etc. can also be listed here.

7. Timeframe

The total assignment should be completed within number of days after signing the contract. The consultancy firm/agency/organization/individual consultant will submit a work plan clearly defining the key milestones within 5 working days of signing the contract. The work plan along with milestones will be reviewed and approved by name of the client. It is anticipated that first draft design report will be submitted after number of days of signing the contract. The final report alongwith the requisite design engineering drawings will be submitted after number of days of receiving the feedback. The consulting firm/agency/organization/individual consultant will take into consideration the time required for meetings to acquire information pertaining to the wastewater treatment plant operations considered for designing the co-treatment facility. Furthermore, the meetings required at any stage for discussing the progress of the consultancy assignment will be organized as necessary within the timeframe mentioned above.

8. Deliverables

The deliverables of this consultancy assignment will include but not be limited to the following:

a. Inception report giving the initial design basis of the co-treatment facility to be installed at the designated STP, including the design calculations for each treatment unit catering to the receiving of faecal sludge and septage, treatment of faecal sludge and septage, and final disposal of treated effluent and biosolids. Here, the final disposal of treated effluent shall involve the mixing of liquid from the co-treatment facility with the wastewater entering the STP. However, the design basis should clearly indicate the mixing of these waste streams shall be in line with the scheme of treatment at the existing wastewater treatment plant.
b. Final report addressing all objectives and scope of work mentioned in this ToR and incorporating the feedback provided on the inception report. The final report shall also include the design engineering drawings namely, process flow diagram, hydraulic flow diagram, and plant layout for the co-treatment facility. Furthermore, any relevant data or photographs received as hardcopy or captured digitally during site visit/s shall be included in the final report.
c. Presentation of the final report along with design drawings to the client.
d. Presentation of key findings and recommendations to the client.

9. Contents of the proposal

The proposal should include the details of the methodology followed for the design of co-treatment facility catering to the faecal sludge and septage generated in the name of the location where this project is targeted. Furthermore, it should also include the documents/data/information gathered from the client or otherwise to achieve the safe co-treatment and disposal of faecal sludge and septage as well as sewage. Finally, the list of activities and milestones, budget details, time frame and curriculum vitae of persons involved in this assignment should be submitted as part of the proposal.

10. Qualifications and experience of the design consultant

a. A Bachelor or higher-level degree in civil engineering or environmental engineering.
b. A minimum of 7 years' experience in:
    i. planning and designing of centralized and decentralized wastewater systems, including primary, secondary, and tertiary wastewater treatment system, passive and active systems, pumping systems, and sludge and effluent management including safe treatment and disposal or reuse, in situations and context similar to India;
b. preparation of technical specifications, cost estimates, tender documents, etc.; and
c. preparation of detailed design engineering drawings including process flow diagram, hydraulic flow diagram, piping and instrumentation diagram, and reports accompanying the engineering design.
d. Experience in wastewater management and design including faecal sludge management in comparable situations in India.
e. Familiarity with AutoCAD, Adobe, Microsoft Office and other computer-based applications.
f. Excellent English speaking and writing skills.

11. Submission of application

Based on this ToR, interested consulting firm/agency/organization/individual consultant are requested to submit their proposal within the stipulated timeframe as specified by the client.

12. Submission guideline

a. The proposal needs to be submitted electronically within the stipulated timeframe and at the designated email address as specified by the client.
b. Any proposal received after the deadline shall be deemed invalid.
c. Proposals submitted to any other email address other than above shall be deemed invalid.
d. The proposal should include the information mentioned in section 10 of this ToR. These documents should be placed in a zip folder with the name of the consultancy firm/agency/ organization/individual consultant.

The client can specify the limit for number of pages to be considered for the submittal.

13. Payment terms or financial proposal

This section will be solely giving the payment terms against the scope of work mentioned in this consultancy assignment. This can be a lumpsum contract wherein the client releases the payment at the end of contract i.e. after submission and acceptance of the requisite documents. Alternately, it can also be a milestone-based payment which will include release of payment after the completion of each milestone that client stipulates at their discretion.

The payment terms can also be modified to financial proposal which shall require the person/s or agency applying for this assignment define their own payment terms.

14. Contact person

Here, the contact details (Name, designation in the client's organization, and email address) will be provided.

15. Terms and conditions

a. Name of the client reserves the right to accept or reject any proposal without giving any verbal and/or written explanation whatsoever.
b. Name of the client reserves the right to monitor the progress and quality of the work during the assignment.
c. Name of the client will reserve the copyright to any document or information produced during this assignment.
d. Name of the client reserves the right to reject or cancel the assignment at any time if it determines that the selected person/s or agency have engaged in corrupt or fraudulent practices either in competing for this assignment or during execution of this assignment.

The points mentioned here under the T&C are generic and will require client specific points to be included while preparing the official ToR document.

3

PROTOCOL FOR TRIAL RUNS & MONITORING OF CO-TREATMENT PLANT

A. Introduction

For newly built treatment plants handling faecal sludge and septage, it is necessary to provide a transition period at the beginning of operation in order to assess the preliminary procedures. This transition period is defined as the trial period for operationalizing the co-treatment plant, after the completion of construction of the plant in supervision of designated organization/ agency responsible for faecal sludge and septage management.

Trial runs allow defining the frequency, safety measures, and communication lines for the operation, maintenance and monitoring activities. During this time period, it is advisable to have a frequent communication amongst the operating and administrative employees involved in the starting-up of the treatment plant as well as troubleshooting any problems. The troubleshooting of issues and problems while operation should be recorded in the monitoring sheet.

Before conducting a trial run of a treatment plant, it is important to take into consideration various administrative and operational procedures. This is helpful to eliminate any problems or the potential for problems to arise while starting-up the treatment plant. **The final standard operating procedure for running the plant include important documents such as operation manual, information sheets, monitoring sheets, logbooks, etc. will be prepared based on the information collected during the trial run.**

B. Protocol for trial run of a co-treatment plant

The activities to be followed to conduct a successful trial run is given below as a sequence of events. Table 2 provides a sample timetable of activities for conducting a trial run for the proposed co-treatment plant for treating faecal sludge and septage at the Kargi Chowk STP in Dehradun. The following activities are suggestive and can be reduced or altered to the required capacity or type of treatment plant, process or unit.

Table 2: Timetable of activities

Sr. No.	Activities	Description/ Responsibilities	Sub-activities	Required time (days)	Reference/ Annexure
1.	Conduct initial site meeting to coordinate the trial run schedule with construction schedule.	Uttarakhand Jal Sansthan who is spearheading this co-treatment project shall organize meetings/ orientation programme with key stakeholders - Municipal corp. of Dehradun, registered emptiers, STP operator (contractor) and factories /industries, farmers if any; reusing wastewater and biosolids	▪ The agenda of the consultation meeting/orientation programme should involve – apprising the upcoming plant – State septage protocol- city specific FSSM bye-laws ▪ Sharing of roles and responsibilities among the stakeholders ▪ Discussion of benefits and limitations ▪ Creating framework of grievances redressal mechanism	2	-
2.	Deploy/appoint treatment plant supervisor and staff	Job description of the Supervisor and the staff. Existing supervisor – AE/JE, Sewage Treatment plant. List out the responsibilities of permanent and temporary staff/ contractual staff.	▪ Employ assistant treatment plant supervisor, plant operator, and chemist to assist the Treatment Plant Supervisor with trial run preparations ▪ Deploy/appoint plant operators, mechanics, and electricians as per the required qualifications and criteria defined by the client/ agency/organization responsible for operating the treatment plant ▪ Identify the clerical and/or laboratory personnel required for handling miscellaneous activities including endues/ disposal of biosolids	3	Table no.3

3.	Gather inventories including equipment manuals, tools, and consumables as listed in the operation and maintenance manual and as specified by equipment manufacturer's recommendations and undertake step by step runs	Undertake dry-run inspection to ensure	▪ Installation of plant equipment is checked and corrected, if necessary. ▪ Construction of the plant structure is checked and corrected, if necessary	1	Table 4
		Conduct on-site dry-run operator training using	▪ The operation and maintenance (O&M) manual of equipment and tools ▪ The laboratory sampling and testing procedures ▪ The layout and start-up responsibilities ▪ Safety of treatment plant	1	
		Conduct wet-run inspection of	▪ The equipment for proper operation using the O&M manual ▪ The piping and valves for leakages ▪ The laboratory testing equipment ▪ The monitoring and flow measuring instruments	3	
		Conduct on-site wet-run operating training	▪ Instructing plant operating personnel regarding the operation of equipment under different loading conditions ▪ Identifying and recording the capabilities and limitations of the equipment and instruments ▪ Visit similar facilities and undertake hands-on operation and maintenance of those facilities (if possible) to gain hands-on experience	1	
		Organize final plant start-up site meeting	▪ Review the sequence of events and activities for starting-up the treatment plant ▪ Finalize the responsibilities of the operating personnel and important stakeholders ▪ Prepare the list of personnel to be involved for the start-up of treatment plant ▪ Prepare the list of personnel required to be present for any trouble shooting during the start-up of treatment plant ▪ Discuss emergency action procedures and build pre-emptive action plans	3	
4.	Develop Standard Operating Procedures (SOP) for the treatment plant	Based on the trial runs, final SOP to be drafted	▪ Plant record keeping procedures ▪ Laboratory sampling and testing schedules ▪ Shift schedules for plant operating personnel	5	Table 4
5.	Start-up day for treatment plant				

As the plant is supplement to STP hence it is prefereable to have present operating staff to be engaged at the co-treatment plant. This will provide complete understanding of the operation and will help in lack of co-ordination issues in case of external personanel are hired for the plant.

Annexure 1 - List of plant operating staff at co-treatment plant

Table 3: Plant operating staff at co-treatment plant

Sr. No.	Personnel	Minimum Experience	Main Task of the Personnel
1.	Plant Manager (Diploma in Civil/Environmental Science Engineering OR B.Sc. in Chemistry	3 years	Co-ordination of activities for satisfactory performance of the STP and reporting to the Engineer-in-Charge and responsible for the proper functioning & maintenance, data collection of STP
2.	Operators (ITI)	3 years	Responsible for overall operation for STP
3.	Electrician (ITI)	3 years	Responsible for overall operation of electrical equipment
4.	Fitter (ITI)	3 years	Responsible for overall operation of mechanical equipment
5.	Sweeper/Casual labour/ Sewerman	Literate	Responsible for keeping STP premises clean, cleaning of sewer lines and assisting the operators in day to day plant operations
6.	Security guard cum Gardener	Literate	To maintain the garden / landscaping of the plant and for security.

The checklist is suggested based on the current practice of FSS disposal at Kargi STP. This ckecklist shall be revised based on the trial runs of the co-treatment plant.

Annexure 2 – Documents for record keeping at a co-treatment plant

A. Checklist for monitoring of day-to-day operation of co-treatment plant

Table 4: Checklist for monitoring

Check list: Operational procedures		Tick (✓)
1.Truck arrival and faecal sludge decanting at receiving station		
i	Working hours to decant FS shall be 7 am to 4.30 pm all days	
ii	Record of collection, transport & disposal of FSS should be duly filled and signed by the STP operator before allowing tanker to enter the STP; see table 6)	
iii	Connect truck's outlet with the screening chamber through hose pipe	
iv	Discharge the faecal sludge with half of the opened valve into the screening chamber	
v	In case of spillage sprayer (preferably with disinfectant) should be used to clean tanker and surrounding area	

Check list: Operational procedures		Tick (✓)
vi	Screens along with receiving chamber should be cleaned on daily basis at EOD	
2. Homogenisation tank		
i	Tank should not retain FSS for more than 4 days	
ii	FS accumulated for 2 days in tank should be pumped to centrifuge on every 3rd day	
iii	Bottom sludge either with the help of pump if required or by gravity should be discharged into dedicated sludge drying beds every 10 days	
3. Pumps		
i	Pumps should be checked routinely basis to ensure for their proper functioning as per the maintenance recommended by the service provider	
4. Centrifuge		
i	Air floatation and DWPE dosing should be checked routinely basis to ensure for their proper functioning as per the maintenance recommended by the service provider	
ii	Filtrate should be mixed incoming sewage at the inlet chamber of STP	
5. Sludge drying beds		
i	Schedule of loading, turning and emptying of FSS should be marked on each bed	
6 Re-use of by-products from FSS treatment		
i	Dried sludge should be co-compost with municipal organic waste to produce manure	

B. Forms for monitoring the faecal sludge and septage received at a co-treatment plant

a. Format for information collection by the vacuum tanker operators

i. This form should be translated in local context and should be filled by operator and household owner jointly. A copy of information collected should be submitted to STP operator at the gate.

Table 5: Forms for monitoring the faecal sludge and septage receiving at co-treatment plant

Sr. No.	Name of the property owner and contact no.	Household or Commercial	Area and location	Date of request for desludging	Type of containment system	Age of the containment system	Quantity of FSS desludged	Containment system connected to open drain/ septic tank

ii. Format for information collection by plant operator

Table 6: Sample form for data collection at the co-treatment plant

Date and time	Name of the operator and contact no.	Capacity of the tanker	Distance travelled

C. Laboratory sampling and testing schedules

i. Information to be recorded during sampling

Table 7: Sample information

Serial number of sample	
Location of sample	
Type of sample	Grab or Composite
Person collecting sample	Name and signature of person
Date and time of collection	
Analysis of	Characteristics to be tested
Test to be conducted	Name of test/s
Person performing tests	Name of the person
Date and time of test	

ii. Testing schedules

Table 8: Testing schedule

Sr. No.	Location of sample collected	Type of sample	Date of sample collection	Time of sample collection	Monitoring frequency	Parameters to be tested						Remarks
						COD	BOD^	TSS	pH	Fecal coliform	Percent solids	
-	-	-	-	-	-	mg/L	mg/L	mg/L	-	MPN/g of TS	%	-
1.	Inflow of faecal sludge and septage	Composite			Daily*		--				--	
2.	Outlet of homogenisation tank#	Grab			As required		--			--	--	
3.	Sludge stream from outlet of Centrifuge	Grab			As required	--	--	--	--	--		
4.	Liquid stream from outlet of Centrifuge	Grab			Daily						--	
5.	Filtrate from Sludge Drying Beds	Grab			As required					--	--	
6.	Final treatment unit in STP	Grab			Twice a week	--	--	--	--		--	

** - The sampling of faecal sludge and septage entering the co-treatment plant should be done daily and every time there is a fresh batch of faecal sludge and septage being disposed at the inlet point of the plant. This is important to prevent the entry of industrial waste into the co-treatment plant.*

 # - The sampling of faecal sludge and septage at the outlet of homogenisation tank is to ensure that the complete homogenisation of the faecal sludge and septage. During the start-up of the co-treatment plant, the frequency of testing at this point will be daily. Once the start-up period is successfully completed, the frequency of testing at this point can be reduced to every alternate day

^ - The BOD test applicable for co-treatment plant is similar to the testing procedure followed for the laboratory analyses manual of the sewage treatment plant

D. Co-treatment plant operating personnel schedule

The daily shift-wise schedule for co-treatment plant is generally similar to the schedule used during the operation of the sewage treatment plant. For the added information of operating personnel managing the co-treatment plant, the details need to be added with the existing operating schedule being used in the sewage treatment plant.

4

SAMPLE BIDDING DOCUMENT

This chapter is the " Bidding document for procurements of works" for development of sewerage system in Raipur, Dehardun. This portion is a part of the main bidding document which includes procurement of works related to the co-treatment plant.

Procurement of Works

Single-Stage: Two-Envelope Bidding Procedure

BIDDING DOCUMENT
for
Procurement
of

"Development of Sewerage System involving STP, Trunk Sewer and Allied Works including 5 Years Operation and Maintenance, at Raipur, Dehradun, in Uttarakhand."

Volume – 2(A)

Issued on: 1st January 2021

Invitation for Bid No: UIUDP/OCB - N/WW - DDN - 02/2020-21

OCB No: N/ WW - DDN - 02/2020-21

Employer: Uttarakhand Urban Sector Development Agency (UUSDA), Government of Uttarakhand

Country: India

5.4. Septage Management and Co-Treatment System

The proposed project will promote a sustainable environment and provide basic urban infrastructure and sanitation facilities to all citizens of the project area. The area is divided in 5 sewerage zones and in the 1st phase only first two zones will be taken up for execution.

The proposed Septage system has been designed to cater the requirements of the project area and adjoining wards till year 2036. A total of 40 kld septage has been estimated for Project area & adjoining area (zones 8A, 8B,8C, 8D and 8E, 9 and 10) for the year 2036. Contractor shall provide sufficient number of vacuum trucks and suction machines for de-sludging of septic tank from the project area, and transport the same upto STP. A series of dedicated required nos. of Vacuum Trucks with adequate capacity are required for Septage collection from community septic tank.

There shall be adequate unloading space for septage collected from the adjoining areas by any other agency authorized by the Employer and septage treatment will be provided.

5.4.1. Description of Works

The Septage Collection System and Septage Treatment Plant (SeTP) shall comprise the following components:

- Components and unit processes as described in Employer's Requirements of this section of bid document.
- All functional buildings, structures, equipment, and any and all other items, accessories, and ancillaries required for proper functioning and operation of the above components and unit processes are mainly to be covered under main Sewage Treatment Plant (STP)
- Civil Works for

    - Structures for afore mentioned processes
    - Pipeline Systems and Channels

- Complete Electrical Equipment and Systems
- Complete Mechanical Equipment and Systems
- Complete Instrumentation, Control, and Automation Equipment and Systems
- Civil, Mechanical, Electrical, and Instrumentation, Control, and Automation for successful Erection, Installation, Testing, and Commissioning Services

5.4.2. Scope of Work

The scope of this bid document is Septage Management of Raipur area, Uttarakhand Dehradun - including:

a) Design and construction of community septic tanks and soak pits for 20, 50 and 100 users as per specification and drawing ;
b) Procurement of equipment's and provision of services for collection and transportation of septage from households & community from project area ;

c) Collection and conveyance of septage from project area (Zone 8A and 8B) to proposed STP site.
d) Design, Supply, construction, installation, testing and commissioning of Co- Treatment unit of 40 kld with main Raipur STP (For project area and adjoining area)
e) Operation and Maintenance of cotreatment septage facility with main STP for 1825 days

The detailed scope of work is as follows:

Civil Works:

Construction of 40 KLD capacity Septage Treatment Plant including:

a. Inlet / Receiving Chamber
b. Screen Chamber (Coarse and fine screen)
c. Homogenization cum Equalization Tank
d. Centrate Collection Tank
e. Sludge Sump and Pump House
f. Dewatering unit (from main STP)
g. Sludge drying beds
h. Storage Shed for dried sludge

Mechanical Works:

a. Trailer mounted sewage suction machine (Vacuum trucks)
b. Backhoe Loader
c. Flow measurement devices:
d. Ultrasonic type Flowmeter at inlet of Equalization Tank
e. Mechanical Screens with Conveyor Belt System
f. Mixing arrangement for Equalization Tank (Submersible mixers)
g. Centrifuge feed pumps (Screw Pumps)
h. Centrate Transfer Pumps (Submersible Pumps)
i. Lime Dosing System
j. Polyelectrolyte Dosing System
k. In addition to above, all necessary pipes and associated valves / gates required for the proper functioning of SeTP are to be covered.

Electrical & Instrumentation Works:

a. Supply, installation, testing and commissioning of complete electrical system as required for providing power to all the equipment's and accessories of SeTP.
b. Installation of flowmeters as required in the design.
c. Installation of other necessary equipment's like pressure switches, level transmitters, etc. as per good engineering practice.

1. Septage Collection System

Vacuum Trucks:

Vacuum Trucks shall collect the septage at the household/community level and transport it to Sewage treatment plant. The vacuum trucks are available in different capacities of from 2,000 up to 12,000 litres, a series of dedicated Vacuum Trucks are proposed for septage collection from each household. However, as per actual requirement and availability, the adequate capacity trucks can be deployed in areas where access roads are narrow. The proposed project will promote a sustainable environment and provide basic urban infrastructure and sanitation facilities to all citizens of the project and adjoining peripheral area. The town is divided in 5 zones and in the 1st phase only first two zones will be taken up for execution.
Each of these vehicles should be equipped with GPS tracking devices for proper monitoring. All necessary safety equipment's should be provided in each of these vehicles in sufficient quantity and in workable condition.
A septage treatment Plant (Co – Treatment unit) area is earmarked in the main STP layout plan. Please refer drawing number TCE.10375A-CV-3009-STP-300560 for detail.

2. Septage Treatment Plant

Employer's requirements for the following SeTP is included in this contract and is described herein "Employer's Requirements":

Sl. No.	SeTP Name	Design Capacity	Treatment Process
1	Raipur, Dehradun Uttarakhand	40 kld	Pretreatment followed by Mechanical Dewatering of Septage ; Stabilization of dewatered sludge by sludge drying beds for proper disposal. Supernatant/ Centrate to be transferred to the main STP for further treatment.

3. Influent Characteristics

The typical influent septage characteristics used as the basis of design are listed in Table 11. However, bidder should carry out sampling on his own to establish the actual characteristics. After award of work, it is mandatory for contractor to conduct tests on at least 3 samples to establish the raw septage characteristics, before proceeding for design stage.

Table 11 Typical characteristics of Influent Septage for Co-Treatment

No.	**Source**	**Septage**
	Characteristics	**Faecal Sludge of low concentration, usually stored for several years, more stabilized than Type- "A"**

1	COD (mg/L)	<15000
2	COD / BOD	5:1 to 10:1
3	NH_4N (mg/L)	< 1000
4	TS (%)	< 3%
5	SS (mg/L)	7,000 (approx.)
6	Helminth Eggs	4,000 (approx.)

Source: CPHEEO, 2013

4. Dewatered Sludge Quality Requirements

The dewatered sludge quality requirement to be met is listed below:

Minimum sludge TSS (dry solids)	% w/w	20%

5. Septage Treatment Process

The septage brought by Vacuum Trucks shall be emptied into the Inlet Chamber of the SeTP. In this facility, the septage shall be treated and the parameters shall be brought down to permissible levels. Pre-treatment (fine and coarse screenings) shall be provided. It will be followed by Homogenisation cum stabilisation Tank and then pumping the septage to dewatering unit and dewatered sludge to sludge drying beds for drying. This centrate from dewatering unit shall be treated further in Main STP to achieve final treated water. In case the parameters of cent rate are higher than the design inlet parameters of main Sewage treatment plant, a part of treated water shall be recirculated to dilute it as per Contractor design. The dried sludge from sludge drying beds can either be treated with compost or can be disposed off to landfill site as per prevailing norms of pollution control board.

Basic steps involved in Septage Treatment are:

Septage → Pre Treatment → Septage Dewatering → Disposal of Dried Sludge

For Liquid portion (filtrate resulting from dewatering of septage):

Filtrate → Treatment in main STP → Reuse / Disposal to river

A peak factor of 3 has been considered for pre-treatment units (up to Equalization tank). This is based on the fact that the total septage estimated for a day will be received at the SeTP in the working shift of 8 hours only. Hence the factor of 24/8 = 3.

Average Daily flow (Cum/day): 40
Hourly flow (Cum/Hr): 1.67
Total Septage/day: 40,000 Litres

The Contractor shall ensure that the layout submitted as part of the Contractor's bid shall accommodate the Co Treatment unit along with the main STP in the same premise and on the

available land only. The contractor shall also comply with the following specific constraints and all other requirements described in the Bid Documents:

- For all structures containing water or process liquid, the minimum freeboard (distance by which top of wall is higher than the maximum water surface level at peak plant flow with one unit of each unit process out of service) shall be 0.5 m unless specified otherwise.
- Contractor shall provide at Co-Treatment all necessary facilities for manual bypass of the process liquid at various locations in the flow path as indicated below. These facilities are included in this contract and shall be provided regardless of whether or not they are shown in any drawings included in the contract document, shall be fully functional in all respects, and shall include any and all components necessary to safely and efficiently accomplish the intended bypass. Each bypass facility shall include, but not be limited to: (I) downward opening overflow weir gates installed in the appropriate channel or structure from which the bypass is to be effected, (ii) an RCC channel or structure to receive the bypass flow over the weir gate, (iii) an appropriately sized buried (above ground piping will not be acceptable) cement mortar lined and coal tar epoxy coated ductile iron pipe or RCC pipe (NP3 class) to carry the bypass flow from the channel or structure in (ii) above to a manhole or junction box in the SeTP's main outfall pipe through chlorine contact tank.
- Bypass facilities as described above shall be provided at the following location:
    - Outlet of screen channel to nearest drain.

PRE-TREATMENT OF SEPTAGE

- **Receiving Chamber:** To receive the collected septage.
- **Pumps:** To pump the septage from storage tank to the screens (if required).
- **Mechanical (Fine) /manual screens (Coarse)**: To remove large size particles, such plastic, rag from the septage and protect downstream treatment facilities.
- **Homogenisation cum stabilisation Tank –** To store and homogenize the collected septage. Lime dosing shall be provided here.
- **Mixer –** For proper mixing to make a homogeneous septage collected from different location
- **Pumps:** To pump the septage from equalisation tank to the dewatering unit.

In addition, lime stabilization is also practiced to stabilize, control odor, vector and pathogen destruction. Lime stabilization involves adding and thoroughly mixing lime (alkali) with each load of septage to ensure that the pH is raised to at least 12. Lime addition could be done at any of these three points:

1. In the hauler truck (vacuum truck) before or while the septage is pumped.
2. In septage storage tank (Receiving Chamber) where septage is discharged from the hauler truck.
3. In the Homogenisation cum stabilisation Tank.

In this case, it is proposed to add lime through suitable lime dosing pumps into the Homogenisation cum stabilisation Tank.

6. Plant Layout

The Co-Treatment components shall be laid out and fully contained within the respective designated site boundaries so as to logically interface with any and all existing infrastructure at the site and that must remain in service. Contractor's proposed site layout shall clearly show the space allocated for all plant components, including those components and/or unit processes that may be designated for future construction or installation.

The plant layout shall adhere to the following general rules:

- Minimum clear distance provided to permit safe and convenient access for operation and maintenance shall be 5 m between adjacent treatment units or fixed structures and 1.5 m between pieces of equipment
- An area adjacent to all mechanical equipment shall be provided as a maintenance lay down area
- All electrical equipment (except for motors) shall be located above the plinth level at the site or for the effluent receiving water body, whichever is higher.

7. General Design Requirements

The following general design requirements shall be met for Co- Treatment unit. These requirements shall be fully met regardless of whether or not such requirements or any related components are shown in any drawings included in the contract documents.

- The Contractor shall perform a complete Hazardous Area Classification analysis per IS 5572 for Co- Treatment unit in this contract and shall submit a complete report of such analysis as well as Hazardous Area Classification Drawings that delineate boundaries of all classified areas and indicate the classification of each area. All electrical or other powered equipment, instrumentation, or components shall fully comply with all requirements of IS 5571.
- All components (including but not limited to equipment such as pumps, blowers, screens, diffusers, inline devices; instruments such as flow meters; and distribution and collection channels or pipes) shall be provided with appropriate isolation devices such as valves, gates, or other devices in order to allow isolation, drainage, cleaning, calibration, servicing, and maintenance of such components. In-line instrumentation can be isolated and removed for calibration and maintenance without interrupting the flow.
- Where necessary, equipment shall be provided with acoustic, sound-dampening enclosures to limit ambient noise during normal operation to the limits detailed in the General Requirements.
- All equipment shall be arranged and buildings and structures designed to permit safe and easy access to and removal of all equipment.
- Fixed runways, lifting eyes, cranes, hoists, or other appropriate devices and means shall be provided to permit safe and easy removal of all equipment for maintenance or any other purpose
- All liquid or sludge flow distribution shall be accomplished using at least one of the following options only:

    - non-submerged (i.e. with a positive free fall limited to 50mm from weir invert to the water surface on the downstream side) overflow weirs,
    - non-submerged downward opening overflow weir gates, or
    - automatic feedback flow control using inline flow measurement and modulated flow control valves with electrical actuators.
- All structures, whether liquid-holding or not, shall be designed such that they can be fully and completely drained and will not float or move when empty, because of groundwater buoyancy or any other reason. The structures shall be designed to counteract any possible floatation without the use of any type of groundwater pressure relief valves.
- All channels carrying process liquid shall be fully covered with solid non-skid FRC/GRP cover plates (not grating) designed for human traffic live loads at a minimum and heavy vehicle live loads wherever the channel crosses traffic paths.
- Inlets into tanks, reactors, or other structures via pipes, channels, valves, or gates shall be designed such that the incoming flow does not cause any damage or excessive wear whatsoever to the structure or any equipment in the vicinity under any hydraulic condition, including but not limited to the condition when the structure is empty.
- All piping shall be of corrosion–resistant material appropriate for the service and shall be provided with interior lining, exterior coating, and other corrosion protection as appropriate. All piping shall be fully and adequately supported and braced to comply with all applicable codes and standards. All supporting hardware shall also be of corrosion-resistant material. The design of pipe supports and anchors shall fully account for static and dynamic vertical, lateral, longitudinal, and seismic loads, fluid flow, and thermal expansion. Seismic bracing, thrust restraints and/or thrust blocks, and appropriate expansion joints or loops shall be provided as needed. Pipe lengths and joints shall be assembled and arranged for ease of removal in such a way that individual runs can be changed without dismantling adjacent pipes, by providing dismantling joints at regular intervals.
- For liquids and sludge, the minimum pipe flow velocity shall be no less than 0.5 m/s and the maximum pipe flow velocity shall be no more than 1.5 m/s for pumped suction and no more than 2.0 m/s for pumped discharge or gravity flow. All mixed liquor and sludge lines shall be minimum 150 mm diameter and shall be provided with appropriate cleanouts and flushing arrangements for safe and easy flushing using high-pressure water.
- All liquid service pipes shall be provided with appropriate means for safe and easy drainage of the pipes when not in service.
- All pipes shall be colour banded and suitably labelled with the stream designation and direction of flow to enable individual lines to be identified throughout their run.
- Particular attention shall be paid to the layout of the chemical piping, which shall be arranged without clutter and shall be functional and neat in appearance. Generally, where piping is installed in ducts, it shall be supported not less than 150 mm clear of the floor.
- All piping routed under any type of structure or equipment shall be fully and completely encased in reinforced cement concrete, with the encasement thickness beyond the outer diameter of the pipe being at least 200 mm on all sides or d/4 whichever is higher. The encasement shall extend along the pipe length for a minimum horizontal distance of 1500 mm in each direction beyond the footprint of the overlying structure or equipment.
- All piping connecting to, entering, or exiting any and all structures shall be provided with appropriate restrained flexible connections and/or joints at all such interfaces with

structures to allow for differential movement between pipe and structure in all directions without stressing or breaking the pipes.

- Appropriate restrained flexible connections and/or joints shall be provided for all pipes where they connect to any and all of the following:
  - Equipment such as pumps, blowers, or inline devices
  - Valves
  - Wall, floor, or roof penetrations
- Where piping or other materials susceptible to damage from ultraviolet radiation are employed, they shall be protected from such radiation through the use of appropriate additives and/or coatings and shall be physically shielded from direct sunlight at all times in their normal service location using enclosures, covers, canopies, roofs, and/or other similar means.
- Platforms, handrails/guardrails, ladders, and stairs shall be provided where necessary for proper, safe, and easy access to and/or operation of valves, gates, instruments, control panels, and other devices, equipment, or structures.
- Appropriate sampling ports and/or sampling valves shall be provided to allow easy, safe sampling of all process streams without spillage or contamination and without the need to interrupt normal operation.
- The influent flow meter and influent sampling location shall be selected such that the true influent flow and characteristics will be measured without inclusion of in-plant recycles or other extraneous streams. Separate flow measurement and sampling shall be provided for the recycle streams.
- Foam, scum, fats, oil, grease, or any other floating material from any location in the Co-Treatment unit shall be completely removed from the process flow path along with waste, dewatered solids leaving the Co- Treatment unit and shall under no circumstances be recycled or returned to any location in the plant.

8. Process and Facilities Description

This Process and Facilities description is intended to provide a general indication of the processes and types of facilities that the Contractor shall be required to design, construct, operate & maintain and applies to Co- Treatment unit in this contract unless specifically indicated otherwise. The Contractor shall use this description together with other specific information for Co- Treatment unit provided elsewhere in bid document.

i. Receiving (Inlet) Chamber

This is designed to receive the septage from Vacuum Trucks. The arrangement shall be such that the vacuum truck can be conveniently emptied into this. The level of this chamber should be designed in a way that the septage should be able to flow through gravity through the following units – screen channel, grit chamber and equalization tank. Size of the tank should be such that it is able to empty two trucks at a time (e.g. for 4 cum capacity vacuum truck, the volume of this chamber should be 8 cum minimum).

ii. Coarse Screens

The raw septage received in the inlet chamber shall be screened using Coarse Screens placed in deep concrete channels. The screenings removed by the screens shall be discharged at the appropriate elevation above ground on to a conveyor. A screw or belt conveyor positioned above ground level shall convey the screenings through a galvanized steel chute to a truck/tractor-trolley positioned at ground level. The screenings compacting is part of scope of tender.

iii. Fine Screens (Mechanical)

The Fine Screens shall receive coarse-screened septage. An electronically controlled automatic jam removal system shall be provided in addition to the safety devices specified elsewhere in the document. The screenings removed by the screens shall be discharged at the appropriate elevation above ground on to a conveyor. A screw or belt conveyor positioned above ground level shall convey the screenings through a galvanized steel chute to a truck/tractor-trolley positioned at ground level. The screenings compacting is part of scope of tender.

iv. Homogenization cum stabilization Tank

An Homogenization and Stabilization tank shall be provided to store and homogenize the collected septage. Lime dosing shall be provided here.

Design Considerations:

- Holding time : Minimum 36 hours
- Mixing arrangement : Submersible mixers
- Dosing arrangement : Lime dosing system

v. Sludge sump and pump house

The homogenized septage shall be pumped through screw pumps to the centrifuge for further treatment. There shall be a sludge sump for this. The sump may be equipped with Agitator assembly to facilitate mixing of sludge content.

vi. Centrate Collection Tank

The cent rate produced from sludge dewatering shall be collected in this tank. The holding time should be sufficient enough to handle the intermittent flow being released from the centrifuge. From this tank, the cent rate would be supplied for 20 hours (say) to the Main Sewerage treatment plant for further treatment.

vii. Lime Dosing System

Lime dosing arrangement shall be considered for the Homogenization and Stabilization tank.

viii. Polyelectrolyte Dosing System

To enhance the dewatering process, poly electrolyte will be dosed online at the centrifuge inlet. The strength of the dosing solution shall be 0.1%. There shall be minimum 2 no. of P.E. solution dosing tank, each designed for minimum 8 hrs/day operations.

Each P.E. solution dosing tank shall be equipped with slow speed mixer (100 RPM) to prepare Poly electrolyte solution. The solution will be fed using metering type dosing pumps. There shall be dedicated dosing pumps to each centrifuge with one common standby. The pumps shall be interlocked with centrifuge so that it can only be running in auto when centrifuge is on and should shut down when centrifuge stops.

Disposal / Reuse of sludge:

ix. Sludge Disposal

Dewatered and dried sludge from sludge drying beds can either be reuse after composting or can disposed be at identified landfill site near Dehradun which is located about 20 km from proposed STP as per prevailing norms by pollution control board.

9. Design/Sizing Criteria and Other Requirements

Item/ Parameter/ Description	Units	Septage Co-Treatment at Raipur
Avg design Capacity	KLD	40
Influent Septage Flow		
Maximum daily peaking factor (PF)		3.00 upto Homogenization Tank (Based on 8 working hours of septage collection per day)
Inlet Chamber		
Min No of Units		1
Type		Rectangular or tapered
MOC		RCC
Sizing Criteria		Should be able to empty two trucks at a time (e.g. for 4 cum capacity vacuum truck, the volume of this chamber should be 8 cum minimum)
Min Freeboard	M	0.50
Coarse Screen Channels		
Screen type		Coarse bar screen with manual cleaning
Minimum clear opening size		20 mm

Item/ Parameter/ Description	Units	Septage Co-Treatment at Raipur
Min No of Units – Working (Peak flow)		1
Min No of Units – Standby (Peak flow)		1
MOC – Channel		RCC
MOC – Screens		SS 316 L
Fine Screen Channels		
Screen type		Bar screen with mechanical cleaning
Minimum clear opening size		6 mm
Min No of Units – Working (Peak flow)		1
Min No of Units – Standby (Peak flow)		1
MOC – Channel		RCC
MOC – Screens (all screen components)		SS 316 L
Centrate Collection Tank		
Min No of Units		1
MOC		RCC
Max SWD	M	1.5
Min freeboard	M	0.50
Homogenization Tank		
Minimum no of tanks		2
Holding Time (Minimum)	hrs	36
Min. no. of mixers per basin – Working		2 +1 (spare)
Mixer type		Submersible/ (Open to Bidder) to ensure proper DO as per process requirement
Lime Dosing Arrangement		Required
Dewatering Feed Pumps		
Centrifuge operation schedule	hrs/day	8

Item/ Parameter/ Description	Units	Septage Co-Treatment at Raipur
Min no of pumps – Working		1
Min no of Pumps – Standby		1
Type of Pump		Progressing Cavity
Min. pump efficiency within flow-head operating envelope (η)	%	35.0
Min. motor Efficiency (Ve)	%	95.0
Sludge Sump and Pump House (Dewatering Feed Pumping Station)		
Min no of units		1
MOC – Roof, columns, beams		RCC
MOC – Side walls		230 mm thick brick masonry
Polymer System		
Type		Dry polymer with batch tanks
Minimum polymer dose	kg/ton dry solids	1.5 – 2.5
Dry Polymer Feeder		
Type		Gravimetric or volumetric "atomizing" educator
Min no of units		1
Batching period	days/batch	1
Operating time	min/batch	30
Min capacity per feeder	kg/min	2.47
Polymer Batch Tanks		
MOC		GRP/RCC
Poly solution strength	% w/w	0.1%
Solution storage volume safety factor		1.50
Min no of tanks - Working	tanks/batch	1
Min no of tanks - Standby	tanks/batch	1
Minimum capacity per tank	cum	2

Item/ Parameter/ Description	Units	Septage Co-Treatment at Raipur
Polymer Batch Tank Mixers		
Min no of mixers per tank		1
MOC - Impeller and shaft		SS316
Type		Turbine
Polymer Metering Pumps		
Type of Pump		Hydraulic double diaphragm
Min no of pumps - Working		1
Min no of pumps - Standby		1
Sludge Drying beds		
Minimum no of Beds		6
Depth of sand media		450 mm
Sludge application depth		300 mm
Sludge drying cycle		10-15 days
Sludge consistency at outlet		Min 30%
Solar roofing on drying beds		180 Sqft

6. PROPOSED KC DRAINS UNDER THIS PACKAGE

6.1. General

It is proposed to construct the Kerb channels (KC) alongside the roads in identified roads to facilitate smooth draining of storm water coming on the roads into the nearby drains thereby preventing the erosion of road top surface during rains and stagnant of water on road during monsoon. KC shall be proposed on both sides of identified roads as per site condition and as directed by Employer's representative.

The KC drains can be either precast or cast in situ at site having section 300mm wide and 250mm high as per drawing of KC drain. KCs are proposed as per relevant IS and PWD specifications.

6.2. Operations and Maintenance

6.2.1. Maintenance of KC Drains

The drainage system is in its best when it is maintained as properly as designed. For this purpose it is necessary that the drains keep their shape and slope in the designed manner

4

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Notes:

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About SCBP

Sanitation Capacity Building Platform (SCBP) is an initiative of the National Institute of Urban Affairs(NIUA) for addressing urban sanitation challenges in India. The 3 year programme(starting 2016) is supported by a Gates Foundation grant. It is aimed at promoting decentralised urban sanitation solutions for septage and waste water management. The Platform is an organic and growing collaboration of universities, training centres, resource centres, non-governmental organizations, consultants and experts. The Platform currently has on board CEPT University, CDD Society and BORDA, ASCI, AIILSG, UMC, ESF, CSE, WaterAid, CPR, iDECK, CSTEP and WASHi. The Platform works in close collaboration with the National Faecal Sludge and Septage Management Alliance(NFSSMA).

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