

## 5.0 CONCLUSION AND RECOMMENDATIONS



### 5.1 Conclusions

Based on the results of this study the following conclusions are made

1. Septage emptied in and around Colombo City areas had 0.12% of silt (v/v) and 0.23% (v/v) of garbage. These amounts are comparatively much higher than the sewage collected by a collection sewer net-work. Disposing septage into the man holes of the sewer net-work had caused frequent blockages and heavy siltation in the sewer collection net-work. In addition to this, septage disposal had created odour nuisance at the places where it was disposed.

The model plant which was constructed at the Madampitiya pumping station to receive the septage was found to be an appropriate method of eliminating the silt and garbage from getting into the sewerage system.

The most suitable location for septage disposal is the junction box. However due to the practical difficulties in maintaining the model plant at the junction box, terminal pumping stations were identified as the most practically feasible location. One of the advantages in siting a septage disposal facility at a terminal pumping station is that odorous gases coming from the pumping station could be treated together with similar gases released by the septage disposal plant.

2. In Colombo City the need for septage disposal is steadily increasing. At present the need of septage collection and emptying is much greater than the capacity the CMC is able to provide. In addition the level of service provided by CMC was not to the users level of expectation.

Many of the on-site treatment systems required emptying more than the designed frequency. These were mainly because there were a higher number of users than the designed population, non-suitable disposal systems, structural failures due to poor construction and lack of required maintenance. The septic tanks had no proper effluent disposal arrangements. People had very little knowledge about the other systems. A few systems used by a large number of people could have easily been connected to the existing sewerage system.

If a full survey carried out and proper attention given to the above factors then a considerable amount of the septage that is presently being emptied could be reduced.

3. BOD and COD loads of effluent from up-flow filter system showed slightly higher values than those of gazetted effluent standards for disposal. However the inland water

bodies in and around the city show a much higher values of BOD and COD than the effluent of the up-flow filter. Hence it is some basis for justification to operate existing up-flow filter systems until the quality of these water bodies is improved to a level better than the effluent of up-flow filters.

In addition to the above, the quality of the effluent with regard to faecal coliform levels was found to be above  $1.8 \times 10^6$  counts and thus was not acceptable for discharge into inland water bodies. To achieve the standard suitable for bathing (1000N/100 ml) the cheapest way recommended is to disinfect the effluent using chlorine pellets.

4. **Odour Treatment Plant:** Obnoxious smell was another problem of septage which was handled separately using a bio-filter. Coconut fibre was used as the growth medium showed 50-70% efficiency in reducing the strength of hydrogen sulphide at a bed height of 800 mm and a retention time of 48 sec. Also, during this study it was proven that coconut fibre can be a good supportive media for the micro organism *Thiobacillus thiooxidans* which produces sulphuric acid and maintains a pH range of 1-3.

Since the pH of the filter was found to be in the range of 1.5 to 3.0, the removal of other gases present in the wet-well gas was not very successful. This could be overcome by introducing another bio-filter or an activated carbon filter in series with this plant.

## 5.2 Recommendations

It is recommended that a detailed survey be carried out for the un-sewered areas of the city and that improvements be made for the on-site waste water disposal systems. Some systems which can be easily connected to the sewerage system should be so connected. By doing this, the amount of septage that needs to be emptied could be reduced by a considerable amount. This in turn will reduce the work load of the CMC Drainage Division, improve the service to the people and will reduce a significant amount of money now being spent on this operation.

Where the water table is high instead of septic tanks, Up-flow systems are recommended with chlorine pellets as disinfectants.

The siting of septic tanks should be chosen so that the vacuum trucks can have easy access to them. Also a permanent pipe (150 mm dia. 600 type) with a proper plug could be fixed to a wall so that the cleaning operation (by suction) can be made through this pipe without opening the cover slabs. By doing so, damage to the tank and the cover slabs can be reduced to a minimum. In addition to this, it will avoid septic tanks becoming the breeding

grounds for mosquitoes. Also foreign matter entering the tank in case of flooding too can be thus avoided.

The workers involved in emptying operations should be educated about septage handling and the problems that arise from careless disposal methods. They also should be motivated to do a satisfactory level of service to the rate payers.

The CMC must charge a reasonable amount (Rs.400/= per 3000 litres. is recommended) from septic tank users for providing emptying services. Users should be given necessary advice on how to improve the systems to minimise the frequency of emptying. These will in turn reduce the opportunity for workers to charge illegal "fees" and will improve the level of service.

It is recommended that two more septage disposal tanks be constructed, one at the Wellawatte pumping station and the other at the Tickell Road pumping station.

The total number of vacuum trucks in use should be increased from the present 6 to at least 10 operational vehicles. The recommended operating stations for these trucks are as follows.

District - 1	( Mattakuliya Area )	- 02 Nos
District - 2A	( Colombo Central )	- 01 No.
District - 2B	( Colombo 02 & 10 )	- 01 No.
District - 3	( Colombo 07 & 08 )	- 01 No.
District - 4	( Kirulapone Area )	- 02 Nos
District - 5	( Wellawatte Area )	- 01 No.
Maligakanda	( Head Office )	- 02 No.

It is recommended that a total gas analysis be carried out for effluent at the inlet and the outlet of the odour treatment plant and find out what the efficiency would be at 1.0m filter media height.

Coconut-fibre used as Bio-Filter media was kept under dark and acidic condition. Hence the growth could usually have taken under autotrophic and chemotrophic conditions. Previous studies have shown that *Thiobaccili* can grow well under phototrophic conditions. Thus it is suggested that a future study be undertaken to determine the behaviour of the bio-filter media under phototrophic conditions.

## 6.0 REFERENCES

1. Clair N. Sawyer (1960). Chemistry For Sanitary Engineers, Mc Graw-Hill Inc. New York. pp. 350-353
2. C Karunatilaka (1990). The Performance of Septic Tanks , M.Eng. Thesis Report, University of Moratuwa
3. Engineering Science Inc. (1992). Greater Colombo Wastewater and Sanitation Master Plan World Bank, UNDP. pp. 3-1 - 3-2.
4. Kubota Ltd Export Department II.(1972). Kubota Pump Hand Book Vol -1, Technical Manual pp. 97-105.
5. Metcalf and Eddy (1991). Wastewater Engineering , Treatment, Disposal, Reuse , Mc Graw-Hill Inc. New York.
6. N.Ratnayake and S.Sandanam, Some characteristics of Domestic Wastewater, Engineer- March 1985 pp22-23
7. Office of Research and Development (Sept. 1994). Guide To Septage Treatment&Disposal Washington. pp. 35-43.
- 8.. Roche International (1993). Beira Lake Restoration Study - Final Report for UDA. pp. 30-34.
9. Yagoda K. Thamara Damayanthi (1990). Self Purification Process In Sewerage System, Msc.Thesis Report., IHE. Delft. Netherlands.

## 7.0 BIBLIOGRAPHY

1. Gerald J Tortora. (1968). Microbiology An Introduction . The Benjamin/Cummings Publishing Company, Inc.
2. Lawrence C.C Koe and Derer K.Brady (1985). Assessment of Odorous Emissions from sewage pump stations. Gordon and Breach. Science Publishers, Inc.- UK.
3. Proceedings 5th WEF/JSWA. Joint Technical Seminar. (June 24 1992). Water Pollution Control , Yokohama. Japan.
4. Proceedings 2nd WEF Asia/Pacific Rim Conference. (June 25-27 1992). Water Pollution Control , Yokohama. Japan.
5. Roger Y Stenier and John L Ingraham (1981). General Microbiology . Macmillan.
6. William Bowen Sarles. William Carroll Frazier (1979). Microbiology General and Applied Saunders Company W.B. , London.



## **Annexe**

### **1. Survey of On-Site Sewage Disposal Facilities**

### **2. Addresses of On-Site Sewage Facilities Available in CMC Areas:**

- I. District 3**
- II. District 2B**
- III. District 1**



University of Moratuwa, Sri Lanka.  
Electronic Theses & Dissertations  
[www.lib.mrt.ac.lk](http://www.lib.mrt.ac.lk)

Detail of On Site Sanitation Facility

Address: **Kallipulle Watte, Perth Road, Dematagoda**

Number of occupants: **750**

Date : 12-02-96

Type of System In Use:

( \* )Septic Tank : Single Ch. L:            W:            H:            Dia:  
                         Two Cham. L:            W:            H:            Dia:  
                         Three Ch. L: 15'      W: 9'        H: 8'6"

( )Cess Pool

( )S/T Bio Filter

( )Any Other

Effluent Disposal: Vacuum Truck: a) **Size: 7000 litres** b) Frequency : Once in Two months

Otherwise receiving Water Body: \* **Drain** \* Canal \* Lake

Soil Absorbent Test : not done

Water Level Drop : 30 min.  60 min. University of Kelaniya, Sri Lanka  
Electronic Theses & Dissertations  
www.lib.mrt.ac.lk

Water Table : Dry Weather ;                      Rainy Days ;

Flooding Frequency : \_\_\_\_\_ Times per \_\_\_\_\_ Year.

Water Facility : \* Pipe Born \* Well \* Stand Post \* Any Other

Overall Sanitary Condition : Not Good

Any Notable Pollution : **Stagnant sewage in storm water drains.**

Design By : Not Known

Constructed By : U.D.A-1980





## Detail of On Site Sanitation Facility

Address: E-3 Seewalipura Wanatamulla

Number of occupants: 150 Date : 29/01/1996

Type of System In Use:

(\* )Septic Tank : Single Ch. L: W: H: Dia:  
Two Cham. L: 12' W: 10' H: 6' ( Elevated Type)  
Dia: 5' Depth : 6' ( Soakage Pit)

( ) Cess Pool


( ) S/T Bio Filter

( ) Any Other

Effluent Disposal: Vacuum Truck : a) Size: 3000 litres b) Frequency : 2 times/year

Otherwise receiving Water Body: \* Drain \* Canal \* Lake

Soil Absorbent Test :

Water Level Drop : 30 min.  60 min \_\_\_\_\_  
University of Moratuwa, Sri Lanka  
Electronic Theses & Dissertations  
www.lib.moratuwa.lk

Water Table : Dry Weather ; Rainy Days ;

Flooding Frequency : \_\_\_\_\_ Times per \_\_\_\_\_ Year.

Water Facility : \* Pipe Born \* Well \* Stand Post \* Any Other

Overall Sanitary Condition :

Any Notable Pollution : none

Design By : Not Known

Constructed By : Not Known

**Detail of On Site Sanitation Facility -**

Address: **265/10 Sri Saddarma Mawatta ( Leemolawatta),  
Maligawatta.**

Number of occupants: **325** Date : 03/02/1996

Type of System In Use:

(\*)Septic Tank : Single Ch. L: W: H: Dia:  
Two Cham. L: W: H: Dia:  
Three Ch. L: 15' W: 5' H: 5' Dia

( )Cess Pool

( )S/T Bio Filter

( )Any Other

Effluent Disposal: Vacuum Truck : a) Size: 7000 lit. b) Frequency : 3 times/month

Otherwise receiving Water Body: \* Drain \* Canal \* Lake

Soil Absorbent Test :

Water Level Drop : Between 30 min. & 90 min Dissertat 240mm  
University of Moratuwa, Sri Lanka  
www.lib.mrt.ac.lk

Water Table : Dry Weather ; 5' Rainy Days ; 3'

Flooding Frequency : 2 Times per 1 Year.

Water Facility : \* Pipe Bored \* Well \* Stand Post \* Any Other

Overall Sanitary Condition : **Poor**

Any Notable Pollution : **Open drains were polluted with sewage**

Design By : Not Known Constructed By : **Colombo Municipal  
Council**

**Detail of On Site Sanitation Facility**

Address: Henamulla Camp, Mattakulia

Number of occupants: 120

Date : 9/02/1996

Type of System In Use:

- ( ) Septic Tank : Single Ch. L:            W:            H:            Dia:
- Two Cham. L:            W:            H:            Dia:
- Three Ch. L:            W:            H:            Dia:
- ( \*) Cess Pool    L: 5'    W: 6'    H: 5'    --- 4 nos.

( ) S/T Bio Filter

( ) Any Other

Effluent Disposal: Vacuum Truck : a) Size: 3000lit    b) Frequency : once in two days

Otherwise receiving Water Body: \* Drain    \* Canal    \* Lake

Soil Absorbent Test :

Water Level Drop : 30 min. \_\_\_\_\_ 60 min \_\_\_\_\_

Water Table : Dry Weather ; \_\_\_\_\_ Rainy Days ; \_\_\_\_\_

Flooding Frequency : \_\_\_\_\_ Times per \_\_\_\_\_ Year.

Water Facility : \* Pipe Born \* Well \* Stand Post \* Any Other

Overall Sanitary Condition : Not good

Any Notable Pollution :

Design By : Not Known

Constructed By : Not Known



## Detail of On Site Sanitation Facility

Address: **Printing Co-operation , Stanley Wijesundara Mawatha**

Number of occupants: **20**

Date : **20-02-96**

Type of System In Use:

( \* )Septic Tank : Single Ch. L:        W:        H:        Dia:  
                         Two Cham. L: 6'    W: 5'    H: 4'    Dia:  
                         Three Ch. L:        W:        H:        Dia:

( ) Cess Pool

( ) S/T Bio Filter

( ) Any Other

Effluent Disposal: Vacuum Truck : a) Size: 7000 litres    b) Frequency : Once in a month  
Otherwise receiving Water Body: \* *Drain*    \* Canal    \* Lake    \* Land

Soil Absorbent Test :

Water Level Drop : 30 min. - 200mm    60 min- 300mm

Flooding Frequency : 4 Times per 1 Year.

Water Facility : \* Pipe Born \* Well \* Stand Post \* Any Other

Overall Sanitary Condition : good

Any Notable Pollution : none

Design By : Not known

Constructed By : Private contractor

## Detail of On Site Sanitation Facility

Address: Udyanapura Kirulapona

Number of occupants: 45

Date : 30/01/1996

Type of System In Use:

( ) Septic Tank : Single Ch. L: W: H: Dia:  
Two Cham. L: W: H: Dia:  
Three Ch. L: W: H: Dia:

( ) Cess Pool


( \* ) S/T Bio Filter :

( ) Any Other

Effluent Disposal: Vacuum Truck : a) Size: 7000lit b) Frequency : Once in six months

Otherwise receiving Water Body: \* Drain \* Canal \* Lake

Soil Absorbent Test :

Water Level Drop : 30 min.  60 min \_\_\_\_\_

University of Moratuwa, Sri Lanka  
Electronic Theses & Dissertations  
www.lib

Water Table : Dry Weather ; Rainy Days ;

Flooding Frequency : \_\_\_\_\_ Times per \_\_\_\_\_ Year.

Water Facility : \* Pipe Born \* Well \* Stand Post \* Any Other

Overall Sanitary Condition : good

Any Notable Pollution : Polluted Canal

Design By : NHDA

Constructed By : SLLR&DC

Address - ON-SITE SEWAGE FACILITIES  
Drainage Division - CMC

DISTRICT - 03

NO.	ROAD
261/5	Serpentine Road
E4, E2	Seevalipura
181	64Watta, Aramaya Road
896	Maradana Road, Cadar Nanage Watta, Serpentine Road Kalipulle Watta, Perth Road Gnanawimala Road, Stanley Wijesundera Mawatha (Govt.Press)
21	Albert Chandrawankaya
684 Watta	Dematagoda Road
25/1	Sangikrama Road
20/5, 9	Fairfield Garden Bullers Road - Film Corporation
109/31	Gorakagaha Road Campbell Place, Borella -Fuel Station Kuppiyawatta - Clensing depot
50/1	Kent Road
1071	Maradana Road
105	Aramaya Road
52/62	Kent Road
288/126	Baseline Road
96	Sri Dharmarama Road Commissioner's Quarters

DISTRICT - 2B

	Nawam Mawatha - Laundry Vauxhall Street - J.E.D.B.
67/3	Parsans Road
93 Watta	Mogan Road
151 Watta	Maligawatta Place
70 Watta	Maligawatta Lane Jumma Masjid Road - behind Kaleel Garden
141	Vauxhall Street Maclum Road - behind U.D.A

DISTRICT - 01

- 401 Garden Sirimavo Bandaranayaka Mawatha, Stadiumgama  
-do- , Edirisinghe Watta  
-do-, Stadiumgama Community Centre
- 59 Garden Mahawatta Road
- 49 Garden -do-  
Hemamulla Camp - Public Toilets 5 male & female  
Ferguson Rd.-Blockgalwatta-Public toilet male & female  
Ferguson Rd.-Bakery Watta -do-  
Ferguson Rd.-near Bio tree -do-
- 59 Garden Ferguson Rd. -do-  
Valley Watta (350) houses  
Samagipura Public Toilet male & female (01)  
Sammitpura Public toilet (12) male & female  
Gamunupura Public toilet (4) male & female  
St.Mary's Lane Public Toilet (01) male & female  
De La Sal Street Public Toilet (01)  
Pokunuwatta Public toilet (2) male & female
- 106 Garden Vystwyke Road Public Toilet  
Vystwyke Market Public toilet  
Alli Watta, Mattakkuliya Public Toilet (1)  
France Watta, Mattakkuliya- Public Toilet (4)  
Sri Wickramapura Public Toilet (1)-Mattakkuliya  
Mattakkuliya- Community Centre
- 16th Lane Mattakkuliya -Public Toilet (2)  
Kadirana Watta, Mattakkuliya -Public Toilet (5)  
Kusumsevana, Mattakkuliya -Public Toilet (1)

