7A BARBADOS AVENUE
KINGSTON 5
JAMAICA
TEL: 876.754.2154 .5
876.754.2158
FAX: 876.754.2156
MAIL@FCSCONSULTANTS.COM
WWW.FCSCONSULTANTS.COM
FCS CONSULTANTS LTD

PROPOSED RESIDENTIAL DEVELOPMENT,

CORAL SPRINGS TRELAWNY

FCS #: 1124/76/C

OPERATION AND MAINTENANCE MANUAL FOR SEWAGE TREATMENT PLANT

PREPARED FOR
Gore Developments Limited
2c Braemar Ave,
Kingston 10

FEBRUARY 2012

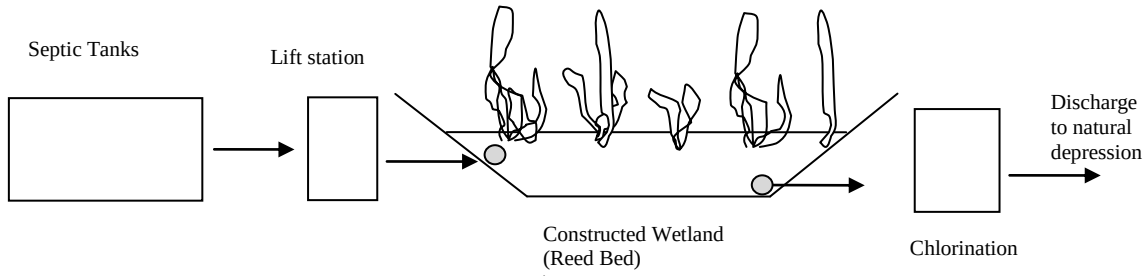
Table of Contents

OVERVIEW

Gore Developments Limited acquired 72.4 ha (178.90ac) at Coral Springs, Trewlany, and proposes to construct 342 two-bedroom detached houses on the property. The proposed development aims to satisfy the demand for housing along the North Coast stretch between Falmouth and Duncans and will support the housing needs for staff for the current and future hotels, resorts and villas. In addition to the homes the development will include a basic school.

The proposed waste water treatment plant (WWTP) consists of constructed wetlands and chlorination chambers. They will provide tertiary level treatment of the wastewater generated by the residential development. The collection system will consist of on-lot septic tanks and 200mm diameter PVC sewer mains. These pipes will gravity feed the sewage flow to four separate constructed wetland clusters. One Cluster has a lift station which will then pump the sewage to the constructed wetland.

The proposed WWTP is a biological system which includes on lot septic tanks, constructed wetlands, and a chlorination chamber with final disposal into the central depression or pond area as shown in the flowchart below. This operations and maintenance manual describes the plant treatment requirements, the operations of the various treatment processes, equipment maintenance and safety.



OPERATIONS AND MAINTENANCE

The operations and maintenance plan includes activities that cover the lift station including the electrical and mechanical equipment, reed beds, chlorination equipment and the testing required to maintain a reliable sewage treatment service for the subdivision. The operation and maintenance of the septic tanks will be handled by individual home owners.

OPERATION

The operator of the lift station and chlorine contact chamber must be a Secondary School graduate and must be trained as an operator by the equipment suppliers.
The following are general requirements for the WWTP as a whole:

- All equipment on site must be operated in accordance with the suppliers' manuals.
- The weigh scales and other measurement devices must be calibrated once every six months by the Bureau of Standards Jamaica.
- The plant site must be kept orderly and cleaned regularly.

Lift Station

The lift station for the SW treatment plant is designed with the following characteristics:

Pump Station Size for Coral Springs Housing Development

Project Pump Station Flows		Qty	Unit
1	Average flow	**198**	cu m/d
2		2	Lps
3	Peak flow factor	2.1	
4	Peak flow	416	cu m/d
5	Infiltration is 10% of average flow	20	cu m/d
6		5	Lps
7	Minimum flow 12.5% of average flow	25	cu m/d
8		0.29	Lps
9	Maximum flow	436	cu m/d
10	**Minimum pump rate**	302	Lpm
11		5.0	Lps

The pumps chosen have the capacity to lift 5 l/s to 4.1m. As part of the operation of the lift station the following is required.

- The trash basket is to be inspected at the beginning of each shift and cleared prior to the morning and evening peak flow
- The waste collected in the basket is to be stored for collection and disposal at a solid waste landfill
- Pumps are to be started according to the directions in the manufacturers manual

- The pump operating curve and extracts from the operations and repair manual is to be on site in the operations booklet.
- The sewage flow meters are to be read daily at the same time, and the amount of sewage pumped is to be recorded.

Reed Beds / Constructed Wetland

Constructed wetlands are designed to be passive and low maintenance, thereby not requiring continual upkeep. This wetland is designed as a horizontal sub surface flow wetland.

- For commissioning the water levels need to be controlled so that the plants will not drown.
- When the plants are established the water levels need to be raised to design levels.

Operational control required for effective performance includes the following.

- Replacing plants as required (seedlings are planted 400mm apart);
- Maintaining the embankments;
- Removing litter and debris;
- Checking the water flow rate to a constructed wetland to determine if it is in accordance with the design;
- Removing any blockages in the inlet and outlet works;
- Removing any unwanted weed species from the constructed wetland;
- Checking the plants for any sign of diseases;
- Correcting erosion and slumping; and
- Checking for any signs of over-flooding.

Chlorination Chamber

The chlorination chamber is designed to reduce fecal coliform levels to acceptable standards prior to discharge into the storm water drain and natural wetland. The following is necessary for operation of the chlorination chamber.

- Maintain one full chlorine tank in storage unconnected to the chlorination equipment. Three 45kg cylinders must be on site at all times.
- Connect two chlorine tanks with only one in use until depleted.
- Calculate the chlorine usage, and order further chlorine stocks when necessary.
- Cleaning the equipment room weekly.
- Check the chlorine residual levels in the effluent daily and, as necessary, adjust the rotameter to increase the feed rate if they are too low and decrease it if they are too high.
- Check and record the effluent quality monthly.

The appendix contains daily and monthly condition report forms as well as forms to report malfunctions. All records must be available for inspection by the Health Inspector for their review at all times in the office at the plant site.

Septic Tanks

The primary treatment component of the WWTP consists of on lot septic tanks each with a capacity of two (2) days retention equivalent to 2.1 m^3. Septic tanks are anoxic system designed to settle out solids and reduce oxygen demand through anaerobic conditions.

- The inlet chamber to the septic tanks is to be inspected every 6 months and cleared of any blockages.
- The septic tank is to be cleared when the solid level is high, approximately every two years.

MAINTENANCE

Septic Tanks – Home owner responsibility

The septic tanks require emptying every other year. Each septic tank holds 21 m^3 (550 gallons) and requires 0.25 trips with a cesspool emptier (2000 gallons each). Home owners can organize to empty four septic tanks in one trip.

Lift Station

The lift station components should be inspected every 3 months. The pumps should be removed and cleaned; the level switches should also be cleaned. After cleaning, the pump should be rinsed out with clear water and a number of automatic pumping cycles carried out.

Before commencing any maintenance work the pump should be completely disconnected from the electricity.

Reed Beds / Constructed Wetland

The maintenance of the reed beds primarily involves the inspection of inlet and outlet structures to ensure adequate water levels are maintained in the wetland. It will also include removal of unwanted species. The wetland has been designed as three wetlands in parallel in order to ensure continued operation of the WWTP during maintenance and repairs,

At the end of its design life (15-20 yrs), a wetland will be either be refitted, or decommissioned if no longer required. Refitting may be required when the accumulation of wetland sediments is adversely affecting wetland performance. Major refits may include the removal of accumulated peat, and replacements of substrates.

SAFETY

Safety precautions must be adhered to by all personnel and visitors to the WWTP. These can be in the form of clearly marked signs throughout the plant site. Safety precautions should be discussed in relation to testing wastewater and other hazardous substances. First aid procedures for dealing with accidents involving personal injury should be available through adequate training and the maintaining of a first aid handbook and kit on site.

Rubber gloves must be worn with the direct handling of sewage or sludge and if there is direct contact hands must be washed and rinse in a bactericidal solution. Food and drinks should be kept in office areas and measures taken to prevent contamination.

CLOSURE PROCEDURES

Septic Tanks

The on lot septic tanks may be left in-place for continued use. If an alternate method of treatment is to be implemented each septic tank can be decommissioned. At this point the septic tanks will be taken out of operation and any remaining sewage and or sludge will be pumped out and trucked to an approved sewage treatment facility for treatment. The tanks will then be washed clean; filled with appropriate material; and the entry points secured. The locations and sizes of all tanks should be clearly documented as well the type and quantity of fill material used.

Constructed Wetlands

Once the lift station or terminal manhole has been closed there will be no more flow of effluent into the wetlands. The remaining wetland materials can either be: disposed of in a landfill; land-farmed; or left onsite. The option of redesigning the wetland to be land-farmed on site, composted, or tilled into the current site, is advantageous in that this would cancel out the need to transport the soils to another area. New fill would not have to be brought in to restore the site, since the wetland material would be used as current fill. Decommissioning the reed beds by remediating the materials onsite not only reduces impacts from transportation but also the use of additional diesel equipment.

Other Equipment

All pumps and equipment containing motors are to be properly drained after closure. Where reuse of any of this equipment is deemed satisfactory, this should be done. Otherwise they should be disassembled and stored appropriately. Pumps and motors should be carefully and adequately wrapped with waterproof material and properly stored.

Equipment such as the chlorine chamber and grit chamber should also be satisfactorily cleaned and stored appropriately. The control system should be disassembled and properly stored. Power to the control building at the sewage treatment facility should also be terminated.

ENVIRONMENTAL MONITORING

Monitoring of the effluent at the point of discharge from the facility will be undertaken during closure. This is to ensure compliance with the NRCA standards for sewage effluent. Post-closure monitoring of any collected waters in the Florence Hall wetland, which is the discharge point, should be done weekly for a period of one month. Ground water monitoring should also be done for at least three sample locations in the vicinity of the discharge point. This should be done bi-monthly for the first month of closure and monthly for two succeeding months. The parameters to be monitored include BOD_5, TSS, total nitrogen, phosphates, COD, pH, faecal coliform and floatables. Test methods approved by the NEPA should be employed in the analyses of the parameters.

NOTIFICATION PROCEDURES

Prior to the closure of the facility, the regulatory agencies will be informed of the intent of the operators of the facility to close. These regulatory agencies primarily include the National Environment and Planning Agency (NEPA), the Environmental Health Unit (EHU) of the Ministry of Health, the Water Resources Authority (WRA) and the Trelawny Public Health Department (TPHD). A one-month notification period shall come into effect.

ACTIVITY SCHEDULE

The timeframe for complete closure of the sewage treatment plant should be four months from the issue of notification.

APPENDIX

- Malfunction Reporting Form
- Daily Plant Condition Form
- Monthly Scheduled Maintenance Form

Malfunction Reporting Form

THIS FORM TO BE COMPLETED AND SENT TO THE MINISTRY OF HEALTH ENVIRONMENTAL HEALTH DIVISION WITHIN 24 HOURS OF MALFUNCTION

Coral Springs Subdivision WWTP
Trelawny

Process Type: Wastewater tertiary level treatment

Malfunction Reporting Form

Date of malfunction:	**Staff on duty at time of malfunction**
Time of malfunction:	
Date of report:	**Report prepared by:**

Description

Nature of Malfunction

Immediate actions

Further actions required

Plant restored to satisfactory operations

Name of officer/s:

Date and time:

Send to:

1) Manager:

2) Manager Ministry Of Health
Environment Health Department
Spanish Town
Tel:
Fax:

Daily Plant Condition Report Form

Coral Springs Subdivision WWTP **Trelawny**		**Process Type: Wastewater tertiary level treatment**
Daily Plant Condition Report Form		
Date:		**Staff schedule**
Insert 'Y' for yes or 'N' for no beside question if component is OK		
General description of plant		
OK		
Repairs required		**Report prepared by:**
Description		Name of Inspector / comments
Wet Well		
Pump flow rate		
OK		
Repairs required		
Pressure reading		
OK		
Repairs required		
Operator action, repair or changes required:		
Pumping equipment		
Operator action, repair or changes required:		
Reed Bed		
Operator action, repair or changes required:		
Chlorinator		
Chlorine regulator and scale OK		
Operator action, repair or changes required:		
Residual Chlorine Measurements		
Location 1		
Location 2		
Location 3		
Operator action, repair or changes required:		

Monthly Maintenance Form

Coral Springs Subdivision WWTP **Trelawny**	**Process Type: Wastewater tertiary level treatment**
MONTHLY SCHEDULED MAINTENANCE FORM	
Date:	**Report prepared by:**
Scheduled Inspections	
Description of equipment/location	**Serial number**
Parts to be replaced and date for scheduled replacement	
-	
Regular maintenance Please list activity and dates to be carried out	
-	
-	
-	