

Coastal Water Quality Improvement Project

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GUIDELINES TO ACHIEVE COMPLIANCE TO EFFLUENT DISCHARGE REQUIREMENT

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Prepared for the:

Government of Jamaica's
National Environment and Planning Agency/Natural
Resources Conservation Authority

And the

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1.0 BACKGROUND

The National Water Commission (NWC), a statutory organization responsible for the provision of potable and wastewater services in Jamaica, presently operates forty-nine wastewater facilities island-wide, serving approximately 15% of Jamaica's population. Wastewater services include the operation of central systems in Kingston and St. Andrew, Southeast St. Catherine, Ocho Rios, Montego Bay, and Negril. In addition, the Company has responsibility for package plants associated with housing developments in locations throughout the country. Approximately 50% of sewage treated by the NWC is done to the secondary level, using a mix of treatment processes through the use of oxidation ditches, stabilization ponds, and activated sludge. Treatment to the primary level is done in some locations. Generally, treated effluent is discharged into gully courses, drainage canals, and rivers, with eventual disposal to the sea.

Apart from a few private systems outside the purview of the NWC, disposal of sewage by the remainder of the population is done through variations of on site systems such as septic tanks, soak-away pits, tile fields, and pit latrines.

Notwithstanding, poor attention to wastewater services generally over the years, coupled with under-funding of the sector has largely been responsible for poor operations and maintenance practices at the various wastewater facilities with the attendant discharge of poor quality effluent to the nation's waterways. The inability of many of these plants to operate properly and to meet minimum discharge guidelines specified by the NRCA/NEPA results from the fact that these plants are in poor physical shape because of lack of maintenance, and many are operating beyond design capacity.

Over the years, the NRCA/NEPA has been engaging the NWC in discussions to create an Action Plan that would demonstrate NWC's commitment and resolve to a program that would ensure the proper treatment of sewage, and compliance to NRCA/NEPA's standards for effluent quality. The NWC presented a "Rehabilitation, Operations and Maintenance Plan" to the NRCA dated September 17, 1999 to fulfill NRC/NEPA's request for an Action Plan. This Plan was, however, found to be deficient by the NRCA/NEPA. The main problem was associated with the non-submission of a monitoring plan that would demonstrate the NWC's compliance to NRCA/NEPA's effluent standards. The document was returned to the NWC for refinement, along with comments on December 7, 1999, with a date of December 22, 1999 set as a deadline for responses to be received. To date, a revised Plan has not yet been received by the NRCA/NEPA.

This document is intended to appraise NWC of NRCA/NEPA's compliance requirements and to serve as a guide for putting together an Action/Compliance Plan.

2.0 NWC'S WASTEWATER SYSTEMS DEVELOPMENT PLANS

The NWC views waster quality and environmental compliance issues as among its critical success factors associated with that Company's Mission and Vision, as stated in their Corporate Business Plan published March, 2000. This document alludes to NWC's recognition that sustainability is dependent on ensuring that impacts on the natural environment do not result in irreversible harm, and that effluent from wastewater treatment' plants must comply with acceptable standards, and that general system expansion and operation activities must minimize environmental impacts. NWC acknowledges in the Corporate and Business Plan that it will be necessary to ensure that all major towns are properly sewered in order to minimize health risks and environmental degradation.

Approximately twenty towns have been identified as requiring major additional sewerage infrastructure. These towns have been prioritized according to this need and a practical schedule

for sewerage them has been developed in accordance with meeting the Company's objective of sewerage all major towns by the year 2020.

Table 1 lists the facilities presently operated by the NWC as stated in the Corporate and Business Plan, and Table 2 describes the wastewater system development projects.

Table 1: Sewage treatment facilities presently operated by the NWC (NWC's Corporate and Business Plan – March 2000)

Red Hills Pen	St. Thomas	Extended Aeration	300
Yallahs Housing Estate	St. Thomas	Waste Stabilization Ponds	700
Acadia	KSA	Extended Aeration	200
Barbican Mews	KSA	Extended Aeration	300
Bay Farm Villa	KSA	Contact Stabilization	500
Boone Hall	KSA	Extended Aeration	400
Elletson Flats	KSA	Contact Stabilization	1,000
Greenwich	KSA	Primary Treatment	22,700
Grove Manor	KSA	Extended Aeration	300
Harbour View	KSA	Contact Stabilization	4,500
Hughenden	KSA	Contact Stabilization	1,600
Oakwood	KSA	Extended Aeration	200
Port Royal	KSA	Sand Filter	
Western	KSA	Primary Treatment	9,100
White Hall	KSA	Extended Aeration	400
Widcombe	KSA	Contact Stabilization	400
Blackwood Gardens	St. Catherine	Waste Stabilization Pond	700
Bridgeport	St. Catherine	Contact Stabilization	9,100
Caymanas Gardens	St. Catherine	Waste Stabilization Pond	1,200
	St. Catherine	Oxidation Ditch	700
St. Catherine	St. Catherine	Waste Stabilization Pond	
Charlemont	St. Catherine	Contact Stabilization	2,300
De la Vega City	St. Catherine	Oxidation Ditch	900
Housing	St. Catherine	Oxidation Ditch	5,700
Ensorn City Housing	St. Catherine	Contact Stabilization	15,900
Hamilton Gardens	St. Catherine	Slow Sand Filter	100
Horizon Park	St. Catherine	Aerated Lagoon	500
Independence City	St. Catherine	Slow Sand Filter	100
Knollis Housing	St. Catherine	Oxidation Ditch	500
Lime Tree Grove	St. Catherine	Oxidation Ditch	200
New Works	St. Catherine	Contact Stabilization	300
Nightingale Grove	St. Catherine	Extended Aeration	1,100
Red Ground Housing	Clarendon	Aerated Lagoon	700
Tawes Pen Housing	Clarendon	Waste Stabilization Ponds	300
Twickenham Park	Clarendon	Waste Stabilization Ponds	900
Bushy Park Housing	Clarendon	Oxidation Ditch	200
Hayes No. 1 Housing	Clarendon	Oxidation Ditch	200
Hayes No. 2 Housing	Clarendon	Aerated Lagoon	200
Paisely Pen Housing	Clarendon	Contact Stabilization	1,600
Crofts Hill	Clarendon	Oxidation Ditch	
Lionel Town Housing	Westmoreland	Extended Aeration	4,500
Mineral Heights	Westmoreland	Trickling Filter	6,800
Housing	St. James	Oxidation Ditch	
Llandilo Housing	Trelawny	Oxidation Ditch	
Shrewsbury	St. Ann	Oxidation Ditch	200
Montego Bay	St. Ann	Oxidation Ditch	200
Vanzie Lands	St. Mary	Septic Tank/Tile Field	
Moneague Housing	St. Mary	Oxidation Ditch	200

Steer Town Stockholm Boscobel Anchovy Woodstock	Portland Portland	Oxidation Ditch	400
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Table 2: NWC Wastewater Systems Development Projects (NWC's Corporate and Business Plan – March 2000)

Category	Projects	Implementation Period
1	<ul style="list-style-type: none"> ▪ KSA ▪ Savannah La Mar ▪ Port Antonio ▪ Rehabilitation and Expansion of existing plants 	2001- 2010
2	<ul style="list-style-type: none"> ▪ May Pen ▪ Port Maria ▪ St. Ann's Bay ▪ Old Harbour 	2005 - 2012
3	<ul style="list-style-type: none"> ▪ Buff Bay ▪ Annatto, Bay ▪ Runaway Bay ▪ Falmouth ▪ Mandeville 	2008-2015
4	<ul style="list-style-type: none"> ▪ Morant Bay ▪ Lucas ▪ Black River ▪ Santa Cruz 	2010-2018
5	<ul style="list-style-type: none"> ▪ Oracabessa ▪ Linstead 	2015-2020

3.0 IMPROVEMENT OF THE OPERATION AND MAINTENANCE FUNCTION

NWC acknowledges in their Corporate Business Plan that the need to make extensive rehabilitation to their various water and wastewater facilities resulted from the absence of proper operation and maintenance (O&M) practices over many years. The Company contends that efforts to achieve O&M improvements were constrained by the absence of adequate funding, documented operating procedures, and sufficient training, and expects that all rehabilitation works will be completed within 10 years from March 2000.

4.0 NWC WASTEWATER OPERATIONS AND MAINTENANCE PLAN

In 1995 the then Natural Resources and Conservation Authority (NRCA) promulgated two sets of National Sewage Effluent Standards intended for us as guidelines to wastewater service providers. One set was "immediate technology" based and targeted facilities approved, built, or commissioned prior to January 1, 1997. The other set was directed to facilities approved after that date.

In an effort to seek compliance from the NWC in meeting these standards, the NRCA/NEPA requested of the NWC a Wastewater Compliance Plan complete with a schedule to demonstrate how that Company would be meeting the published standards, albeit without a permitting or licensing program in place, or a set of Sewage Regulations. Such a plan was presented to the NRCA on September 17, 1999 but was considered inadequate as it failed to address certain elements considered by the NRCA/NEPA to be critical to a compliance plan.

The Plan, which was reviewed by an interagency team, was recognized as a good first effort but it had certain omissions. These omissions related to effluent quality monitoring, prioritization of plants to be rehabilitated, human resources and training, monitoring of the rehabilitation implementation plan, and a plan to administer privately owned plants or plant owned by central government or government agencies, upon turnover of these systems by these entities to the NWC.

NRCA/NEPA determined that an effluent quality monitoring program would assist in determining the performance of NWC's rehabilitated efforts, once the rehabilitation program was completed, considering that selected plants that were already rehabilitated were already out of compliance with the standards. A post rehabilitation monitoring program could determine the degree of compliance. A trained work force could more ably address process modifications to ensure adherence to the standards.

5.0 NRCA/NEPA SEWAGE REGULATIONS (DRAFT)

NRCA/NEPA has completed a final draft of their National Sewage Effluent Regulations, which is expected to be in effect by late 2001. A copy of this document is contained in the appendix.

The document identifies entities covered by the regulations and requires conformance to permit and licensing conditions. Guidelines are outlined on effluent discharge requirements, and operations and maintenance issues are addressed, in addition to monitoring and reporting requirements, also penalties and incentives.

With respect to compliance, the proposed Regulations state the following:

1. Existing plants are exempt from meeting the Sewage Effluent Standards and are considered in compliance for a period of five years from January 1, 1997 when the new sewage effluent

standards are issued by the NRCA/NEPA. As of January 1, 2002 all existing plants at January 1, 1997 must at least meet the Technology Based Standards

2. All new plants must meet the new Sewage Effluent Standards;
3. All existing plants as of January 1, 1997 must meet the new Sewage Effluent Standards by January 1, 2005;
4. A work plan to bring each existing plant into compliance is to be submitted by the owner/operator to the NRCA/NEPA within one year of the issue of the regulations;
5. All sewage treatment plants in operation as of January 1, 2005 shall comply with the Sewage Effluent Standards.

Information providing a more comprehensive treatment of the Sewage Regulations generally, and the treatment of sections dealing with effluent quality and effluent discharges, Operations and Maintenance, Personnel, Monitoring, Reporting, and penalties are found in the Appendix. The promulgation of clear guidelines for the wastewater sector in the form of the National Sewage Regulations stated in unambiguous terms provides for a clear understanding of NRCA's requirements to mitigate against pollution episodes where wastewater generated from permitted facilities are concerned. The adherence to these guidelines will significantly contribute to Jamaica's sanitation program.

In order to ensure effective implementation of these Regulations, however, a review should be done as necessary of provisions within the NWC Act which addresses NWC's responsibilities and obligations with respect to sewage generally, and the sanitary disposal of sewage effluent, and the NRCA Act which addresses this subject, so that interpretational ambiguities can be eliminated and agreements made at the policy level on a path to effect compliance.

6.0 WASTEWATER COMPLIANCE PLAN – SUGGESTED GUIDELINES

In addition to complying with the provisions of the Sewage Regulations, the following provisions are suggested

1. NWC should update the status of their rehabilitation program by doing a review of the rehabilitation program presently underway.
2. Before any additional work is attempted by the NWC, a meeting should be convened with the relevant NRCA/NEPA personnel to agree on a prioritized schedule after the list is rationalized. Rationalization should take into account factors relating to health, ecological, and economic impacts, as a function of associated rehabilitation costs. A permit, as applicable, should then be sought and secured from the NRCA to continue with the rehabilitation program. A license should also be secured from the NRCA, as applicable, for the discharge of effluent. The rehabilitation program should have a schedule describing implementation and completion dates;
3. The rationalized list should then be integrated with NWC's water quality program, which should take responsibility for ensuring that the monitoring and reporting requirements are met on a set schedule as described in the Sewage Regulations or as determined by the NRCA. Care should be taken to differentiate between those plants complying with the older technology based standards, and those adhering to the newer standards. Provisions should be made for planned sewage infrastructure, so that these systems once commissioned, can be included into the program. Provisions should also be made to ensure adherence to the Regulations by operators engaged by the NWC in any privatization arrangement;

4. NWC should demonstrate to the NRCA/NEPA how that organization intends to address take over requests from private and other governmental wastewater service providers;
5. A defined operation and maintenance program supported by a defined budget should be in place to attend to problem situations as they arise. This program should be supported by the recently NWC developed Occupational Standards for Wastewater Treatment Operators, and later by a certified operations staff as the program for the certification of wastewater operators become available;
6. Periodic meetings based on an agreed upon schedule should be held between the NWC and the NRCA/NEPA to review NWC progress in complying with NRCA/NEPA requirements. During these reviews, corrections and modifications can be made to the agreed compliance plan as warranted, and with the guidance of NRCA/NEPA;
7. A review should be done as necessary at the relevant senior levels within the NWC and the NRCA/NEPA and associated ministries, of provisions within the NWC Act which addresses NWC's responsibilities and obligations with respect to sewage generally, and the sanitary disposal of sewage effluent, and the NRCA Act which addresses this subject, so that interpretational ambiguities can be eliminated and agreements made at the policy level on a path to effect compliance.

NATIONAL SEWAGE EFFLUENT REGULATIONS

Natural Resources Conservation Authority

Draft Final Document 16 February 2000

Revised 9 August 2000

Revised 3 November 2000

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1.0 TITLE

These Regulations may be cited as the Natural Resources Conservation (Sewage Effluent Discharge) Regulations, 2001 and shall come into operation on the first (1st) day of _____, 2001.

2.0 INTERPRETATION

In these Regulations:

- | | |
|--------------------------|---|
| 'sewage' | shall mean wastewater comprised primarily of water and organic waste, produced from domestic sources including residences. It shall not include trade effluent. |
| 'trade effluent' | shall mean any liquid, other than sewage effluent, which is discharged from premises used for carrying on any trade or industry or any premises mainly used for agricultural purposes or for scientific research or experiment. |
| 'sewage effluent' | shall mean that liquid discharges from a sewage treatment plant. Effluent quality will be determined at a point beyond no further treatment shall occur. |
| 'sewage treatment plant' | shall mean any facility which is intended to receive sewage and change the quality of such sewage whether by natural or imposed means. |
| 'existing plant' | shall mean any sewage treatment plant which was in operation or approval for its construction was given prior to January 1, 1997. |
| 'new plant' | shall mean any sewage treatment plant approved for construction or constructed after January 1, 1997. |
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'outfall'	shall mean any appurtenance or structure, approved by the NRCA, intended for the ultimate discharge of sewage effluent from the sewage treatment plant.
'sewage effluent standards'	shall mean the sewage effluent standards of the NCA as issued on January 1, 1997.
'municipal sewage system'	shall mean any sewage collection system which is operated to collect the sewage from several housing units and convey the sewage to be a central treatment plant.
'Permit'	shall mean a Permit to construct or modify an existing sewage treatment works as is required by the Natural Resources Conservation (Permit and License) Regulations, 1996.
'License'	shall mean a license, as required by the Natural Resources Conservation (Permit and License) Regulations, 1996, to discharge sewage effluent from a point source into the environment and/or construction or reconstruction any works intended for the discharge sewage effluent as defined in Section 12 of the NRCA Act, 1991.
'NRCA'	shall mean the Natural Resources Conservation Authority.
'WRA'	shall mean the Water Resources Authority.
'EHU'	shall mean the Environmental Health Unit of the Ministry of Health.
'Competent'	shall mean trained in the general principals of Wastewater Treatment, received training from an approved institution and obtained documentation verifying competence following training.

3.0 ADMINISTRATION

The Natural Resources Conservation Authority (NRCA) is the Authority charged with the administration and enforcement of these Regulations.

4.0 General Provisions

- 4.1 Any person who desires to discharge sewage effluent into any water course, drain, the ground, the sea or any place which will cause the effluent to impact upon the environment shall apply for and obtain from the NRCA a License to discharge sewage effluent. However, these regulations do not apply to domestic onsite disposal to soil absorption systems.
- 4.2 Discharge of sewage effluent to the municipal sewage system shall not require a License under these Regulations.
- 4.3 Discharge of sewage effluent from plants with capabilities of less than 20m³/d (5,300 usgpd) are not required to meet those limits established in the NRCA Sewage Effluent Standards and annexed to these Regulations as in Schedule 1 but shall be subject to those reduced monitoring parameters as listed in Clause 7.3.3.
- 4.4 Owners must have applied for and received a permit to construct or modify a sewage treatment plant as required under the Natural Resources Conservations

(Permit and License) Regulations, 1996. The design of the sewage treatment plant shall conform to the terms and conditions of the Permit and the License to discharge effluent from any such plant shall apply only to those plants for which a Permit has been issued or for which exemptions have been granted by the NRCA.

- 4.5 Plants which were in operation or had received approval for construction prior to January 1, 1997 are exempted from the requirement of a Permit but not from the requirement to have a License to discharge effluents.
- 4.6 A complete set of 'as-built' plans of the plant for both new and existing plants are described in the Permit are to remain at the treatment plant permanently.
- 4.7 Flow Measurement:
- (i) An approved flow-measuring device is to be installed at the inlet to all treatment plant. Such devices shall include a flume, weir or other approved device. Such a device is to be maintained in good working condition.
 - (ii) An approved flow-measuring device is to be placed at the outlet from the facility for all plants with capabilities equal or in excess of 375 m³/day (99,100 usgpd). Such devices shall include a flume, weir, automatic flow meter or other approved device. Such device is to be maintained in good working condition.
- 4.8 Every application for a License shall include the following:
- (i) A completed application form.
 - (ii) A copy of the relevant Permit where such permit was required.
 - (iii) A location map showing the location of the plant, the location of the proposed sampling points and the location of the outfall(s) from the plant.
 - (iv) A set of the 'as built' plans for the plant reproduced on 280 mm x 430 mm (11" x 17") sheets.
- 4.9 All quantities shall be stated in metric format and the following units of measure shall be used:
- | | | |
|-------|----------------------|--------------------------|
| (i) | Flow | m ³ /d or l/s |
| (ii) | Capacities of plants | m ³ /d |
| (iii) | Linear measure | m |
| (iv) | Mass | g or kg |
- 4.10 All sewage treatment plants shall post signs and notices in accordance with Schedule VII.

5.0 TREATMENT OF SEWAGE

- 5.1 The sewage treatment process shall conform to the terms of the Permit.
- 5.2 Where sterilization is necessary to reduce coliform levels, only the following three approved methods shall be employed:

- (i) Chlorination
 - (ii) Ultraviolet irradiation
 - (iii) Ozonation
- 5.3 The approved methods for sterilization listed in Clause 5.2 may be amended to include additional methods as recommended by the Environmental Health Unit (EHU) or other relative regulatory agency of the Ministry of Health.

6.0 Treatment of Sewage

6.1 General Requirements

- 6.1.1 The sewage effluent quality must conform to the limits established in the NRCA Sewage Effluent Standards and annexed to these Regulations as in Schedule I, except as provided in Clause 4.3.
- 6.1.2 All owners/operators of sewage treatment plants must have a License to discharge sewage effluent in accordance with the NRCA Act Section 12 and Natural Resources Conservation (Permit and License) Regulations, 1996.
- 6.1.3 Discharge of the effluent must be in accordance with the terms and conditions of the License.
- 6.1.4 The point of discharge of sewage effluent is to be clearly identified as a warning to the public and as depicted in Schedule VIII.

6.3 Surface Water Discharge

- 6.3.1 Discharge of sewage effluent into rivers or streams shall not occur within 2,000m (6,600 ft.) of any potable water intake works and in no case shall the discharge render the river or stream an unsuitable source for potable water, domestic uses, irrigation or for recreation where those activities were occurring prior to the discharge of the effluent.
- 6.3.2 Discharge of sewage effluent shall not occur within 100m (330 ft.) of a recreational site or an area known to be used for recreational purposes, which include areas used for swimming, boating and other activities that take place in or on the water.
- 6.3.3 Discharge to the rivers or streams shall occur below the surface of the water and there shall be no free discharge of sewage except where such discharge is into an intermittent watercourse. Where 'free discharge' means discharge from a pipe or other conduit which falls openly.
- 6.3.4 Notwithstanding Clauses 6.3.1 and 6.3.2, and in order to prevent biased conditions, independent samples from the treatment plants shall be collected by NRCA, EHU and or any third party trained in sample collection (verified/certified by NRCA), to prove that the discharge shall not negatively affect the users of the surface water. Operators shall submit supporting evidence including calculations of downstream pollution with respect to stream flow rates.

6.3.5 Where there are intermittent flows in the water course or there are discharges into storm drains, Clauses 6.3.1 and 6.3.2 shall apply to any river or stream to which there is an ultimate discharge.

6.3.6 Discharges into watercourses shall not create an odour nuisance.

6.4 Marine Discharge

6.4.1 In general, discharges shall occur offshore of inshore reefs, but in all cases must meet the minimum requirements of Clauses 6.4.2 and 6.4.4.

6.4.2 Discharge of sewage effluent shall occur a minimum distance of 150m (490 ft.) from the shoreline.

6.4.3 Discharge of sewage effluent shall occur below the surface of the water and there shall be no free discharge of sewage effluent.

6.4.4 No discharge of sewage effluent shall occur within 150m (490 ft.) of any coral except where effluent quality has been improved to the level where the effluent quality at an interface with the reef does not exceed the levels shown in Clauses 6.4.7.

6.4.5 Outfall pipelines shall be buried and/or armoured for a minimum distance of 50m (165 ft.) from the shoreline. Where physically possible, discharge from outfall pipelines shall be beyond the reef and directed toward the open sea.

6.4.6 Outfall pipelines shall not interfere with the passage of marine vessels.

6.4.7 In addition to those monitoring parameters listed in Clause 7.3.2, the owner/operator shall carry out such investigations to ensure that the effluent quality at the along shoreline (within 150m as defined in Clause 6.4.2) and at the coral reefs meet the following standards:

- (a) Shoreline Coliform <200 MPN/100 ml
- (b) Reef Nitrate <0.081 mg/l
Phosphate <0.055 mg/l

6.5 Discharge as Irrigation

6.5.1 Treated sewage effluent to be used for irrigation, including but not limited to agricultural applications, must receive prior approval from NRCA.

6.5.2 Treated sewage effluent shall conform to the NRCA Interim Irrigation Standards as listed in the following table:

Natural Resources Conservation Authority (NRCA) Interim Irrigation Standards

Parameter	Standard Unit
Oil and Grease	10 mg/l
Total Suspended Solids (TSS)	15 mg/l
Residual Chlorine	0.5 mg/l

Parameter	Standard Unit
Biochemical Oxygen Demand (BOD)	15 mg/l
Chemical Oxygen Demand (COD)	,100 mg/l
Faecal Coliform	12 MPN/100ml

6.6 Effluent Quality

- 6.6.1 The sewage effluent quality shall comply with the limits established by the NRCA Sewage Effluent Standards (1997). The effluent quality shall be measured at the discharge of the ultimate outfall from the treatment works.
- 6.6.2 The applicant must provide relevant data to prove that the effluent shall not cause the ambient water quality to deteriorate below the quality established by the NRCA.

7.0 OPERATIONS AND MAINTENANCE

7.1 Procedures

- 7.1.1 All treatment plants are to be maintained in good working order to the satisfaction of the NRCA and/or EHU designated inspector.
- 7.1.2 The owner/operator of the treatment plant shall keep daily, weekly, monthly and additional records as may be required by the NRCA and/or EHU designated inspector.
- 7.1.3 The data to be recorded on a daily basis in a daily operating log is shown in Schedule IV and the forms for monthly, weekly and annual reporting are shown in Schedule V, VI and VII, respectively.
- 7.1.4 As indicated in Schedule II, plants shall sample and test certain parameters daily, weekly, bimonthly or monthly depending on the parameter and the size of the plant.
- 7.1.5 Daily sampling which indicates influent flow rate, chlorine residual and pH and should be recorded in a daily operating log as indicated in Schedule IV. The operator should attempt to make these measurements within the same hour of each day. This data should be referenced to calculate monthly averages when preparing monthly reports to NRCA per Schedule V.
- 7.1.6 Weekly (4 samples per month), bimonthly (2 samples per month) and monthly (1 sample per month) should be recorded on the Schedule V Monthly Reporting Form. These measurements should be made at approximately the time of day and same day of the week. Monthly average shall be calculated where indicated.
- 7.1.7 Where additional records are required, a minimum of two weeks notice shall be given for the start of collection of data.

- 7.1.8 Where an emergency occurs, additional records may be requested with immediate effect.
- 7.1.9 Where any malfunction of the treatment plant occurs which results in inability to meet effluent limits shall be reported to NRCA within 48 hours.
- 7.1.10 An operations manual is to be kept at the treatment plant permanently. The manual is to include:
- (i) A description of the plant.
 - (ii) A description of the operating procedures, including details of the process operations.
 - (iii) A list of equipment, including specifications of the equipment.
 - (iv) Maintenance requirements and procedures for the equipment and plant components.
 - (v) Any other information pertinent to the good operation of the plant.
 - (vi) A schedule of maintenance activities to be carried out by operations staff.
- 7.1.11 Copies of the 'as-built' drawings for the plant are to be kept at the plant permanently.
- 7.1.12 All plants shall be monitored daily. For plants less than 200 m³/day (52,800 usgpd) capacity, the plant must be visited by the operator at least once every 12 hours (twice daily). For plants greater than or equal to 200 m³/day (52,800 usgpd) capacity, an operator must be onsite at all times and monitoring conducted continuously.
- 7.1.13 All plants shall have a standby power supply (i.e. standby generator) for use during power outages, or equipment malfunction and/or maintenance in accordance with the following schedule:
- | <u>Plant Size</u> | <u>Compliance Date</u> |
|---|------------------------|
| (i) <200 m ³ /day
(<52,800 usgpd) | January 1, 2006 |
| (ii) 200 – 1000 m ³ /day
(52,800 – 264,200 usgpd) | January 1, 2003 |
| (iii) >1000 m ³ /day
(>264,200 usgpd) | January 1, 2002 |
- 7.1.14 In addition to the monitoring and reporting requirements of Section 7.3, the treatment plant shall be monitored for operational purposes in accordance with good engineering practice to achieve the best operating performance.

7.2 Personnel

- 7.2.1 All operators shall be trained in the general principles of wastewater treatment. They shall receive such training from an approved training institution.
- 7.2.2 All operators shall be certified as having attained the components to operate the treatment plant. Operators will be certified as Operator I, II or III in accordance with levels of certification to be agreed between NRCA and the Ministry of Health that define the various levels of competence.
- 7.2.3 Competent operators shall be employed to operate the plant. Such operators shall be in place within two years of the date of these regulations.
- 7.2.4 Competent personnel shall be employed to maintain the plant.
- 7.2.5 The training and staffing levels for operating the sewage treatment plants and their associated capabilities shall be in accordance with the following schedule:

<u>Plant Size</u>	<u>Certification</u>
(iv) <200 m ³ /day (<52,800 usgpd)	Operator 1
(v) 200 – 399 m ³ /day (52,800 – 105,400 usgpd)	Operator II, Engineer Part Time
(vi) 400 – 1000 m ³ /day (105,700 – 264,200 usgpd)	Operator III, Engineer Part Time
(vii) >1000 m ³ /day (>264,200 usgpd)	Operator II or II, Engineer Full Time

Such engineers shall also be certified to operate a sewage treatment plant and shall have a minimum two years of experience in operations.

7.3 Monitoring

- 7.3.1 The effluent from the treatment plant shall be tested in accordance with Schedule III.
- 7.3.2 The parameters to be monitored are:
- (i) Influent Flowrate (Q_{in} , all plant)
 - (ii) Effluent Flowrate (Q_{out} , plants > 375 m³/day)
 - (iii) Bio Chemical Oxygen Demand (BOD₅)
 - (iv) Total Suspended Solids (TSS)
 - (v) Chemical Oxygen Demand (COD)
 - (vi) Total Nitrogen
 - (vii) Total Phosphorus
 - (viii) Residual Chlorine
 - (ix) Faecal Coliform or

- (x) Any other parameters the NRCA may periodically request
- 7.3.1 Discharge of sewage effluent from plants with capacities of less than 20 m³/d (5,300 usgpd) are not required to monitor all parameters listed in Clause 7.3.2. Reduced monitoring and sampling which includes only Flowrate and faecal coliform is required to be submitted to NRCA and EHU on an annual basis to insure capacity of the plant has not been exceeded. If plant capacity is increased to 20 m³/d (5,300 usgpd) or greater, requirements will be expanded as listed above in Clause 7.3.2 and must comply with the NRCA Sewage Effluent Standards (1997).
- 7.3.2 Confirmation testing by an independent source shall be carried out twice per calendar year. This testing shall be conducted at a minimum of three months apart. When sewage effluent is discharged into a river or stream, this testing shall also include measurement of streamflow. Streamflow measurements will be taken for the effluent and/or the stream.
- 7.3.3 Results from an NRCA approved laboratory, for the monitoring exercise shall be submitted to the Authority as defined in the Permit and License.

8.0 REPORTING

- 8.1 Monthly and annual reports shall be sent to the NRCA and the EHU.
- 8.2 Reports shall be received by the NRCA no later than the 15th of the month following the reporting month.
- 8.3 Monthly reports shall include (Schedule V):
 - (i) Collated data for the week/month.
 - (ii) Listing of repairs.
 - (iii) Problems at the plant and proposed corrective actions with a corresponding time schedule.
 - (iv) Improvements to the plant.
 - (v) Analysis of anomalies
 - (vi) Any modifications to staffing and whether or not a shift system had been implemented.
- 8.4 Annual reports shall include (Schedule VI):
 - (i) Collated data (obtained from daily operating log and monthly reports) for the year.
 - (ii) Listing of repairs.
 - (iii) Problems at the plant and proposed corrective actions with a corresponding time schedule.

- (iv) Improvements to the plant.
 - (v) Process modifications at the facility.
 - (vi) Analysis of any anomalies.
 - (vii) Calculated average daily flow for the year based on periodic readings throughout the year.
 - (viii) Sludge volumes removed for the year.
- 8.5 A copy of all reports shall be retained by the owner/operator for a minimum of ten years.

9.0 APPLICATIONS FOR PERMIT AND LICENSE

- 9.1 Permits are to be obtained in accordance with the Natural Resources Conservation (Permit and License) Regulations, 1996.
- 9.2 Licenses are to be obtained in accordance with the Natural Resources Conservation Authority (Permit and License) Regulations, 1996.

10.0 COMPLIANCE

- 10.1 Existing plants are exempted from meeting the Sewage Effluent Standards and are considered in compliance for a period of five years from January 1, 1997, when the new sewage effluent standards were issued by the NRCA. As of January 1, 2002 all existing plants at January 1, 1997 must at least meet the Technology Based Standards listed in Table 1 of Schedule I of these regulations.
- 10.2 All new plants must meet the sewage Effluent Standards listed in Table 2 of Schedule I of these regulations.
- 10.3 All existing plants as of January 1, 1997 must meet the Sewage Effluent Standards listed in Table 2 of Schedule I of these regulations by January 1, 2005.
- 10.4 A work plan to bring each existing plant into compliance is to be submitted by the owner/operator to the NRCA within one year of the issue of these regulations.
- 10.5 All sewage treatment plants in operation as of January 1, 2005 shall comply with the Sewage Effluent Standards as shown in Table 2 of Schedule I of these regulations.

11.0 FEES AND PENALTIES

- 11.1 Each applicant shall pay a License Application Fee.
- 11.2 Upon approval of the License Application, the owner/operator shall pay the initial License fee.

- 11.3 The owner of each sewage treatment plant shall pay an annual Effluent Discharge Fee.
- 11.4 TH owner of each sewage treatment plant shall pay a License Renewal Fee for five years or whenever a suspended or revoked license is being reinstated.
- 11.5 The value of the above fees shall be as set in Schedule 11-1.
- 11.6 The fees set out in Schedule 11-1 are applicable of April 1, 2001 and will increase 5% in each successive year.

Schedule 11-1

Fee	Category	Amount
License Application (one time payment)	All treatment plants	\$1,000.00
License Fee (renewal once every five years)	All treatment plants	\$5,000.00
Effluent Discharge (annual payment)	Capacity of plant m ³ /d (usgpd)	
	(i) 20-199 (5,300-52,600)	\$25,000.00
	(ii) 200-399 (52,850-105400)	\$55,000.00
	(iii) 400-1000 (105,700-264,200)	\$75,000.00
	(iv) >1000 (264,,200)	\$95,000.00

- 11.7 Where the sewage effluent limits as established in these Regulations are not being met by the treatment plant, the owner/operator of the said treatment plant shall pay a fine to the NRCA in the amount as shown in Schedule 11-2.

Schedule 11-2

Breach (any parameter)	Amount			
	20-199 m ³ /d	200-399 m ³ /d	400-1000 m ³ /d	>1000 m ³ /d
<100% above limit	\$25,000.00	\$25,000.00	\$25,000.00	\$25,000.00
100% - 500% above limit	\$37,500.00	\$56,250.00	\$112,500.00	\$225,000.00
>500% above limit	\$75,000.00	\$112,000.00	\$225,000.00	\$450,000.00

- 11.8 Where the sewage effluent limits have been exceeded for more than one day, the owner/operator of the said treatment plant shall pay a daily fine to the NRCA in accordance with the amounts shown in Schedule 11-3. These fines shall accrue for each day that the breach continues.

Schedule 11-3

Breach (any parameter)	Amount			
	20-199 m ³ /d	200-399 m ³ /d	400-1000 m ³ /d	>1000 m ³ /d
<100% above limit	\$1,200.00	\$2,000.00	\$4,000.00	\$10,000.00
100% - 500% above limit	\$1,200.00	\$2,000.00	\$4,000.00	\$10,000.00
>500% above limit	\$2,400.00	\$4,000.00	\$8,000.00	\$20,000.00

11.9 Such fines are specified in Schedule 11-2 and Schedule 11-3 and are based on the capacity of the plant and the degree to which the limits were exceeded.

12.0 INCENTIVES

- 12.1 Where existing treatment plants as of January 1, 1997 are not immediately brought into compliance and penalties accrue, the dollar value if the penalty may be discounted to the extent of the value of the upgrading work done to the plant to bring it into compliance.
- 12.2 To qualify for consideration for discounting of the penalties, the owner/operator must apply to the NRCA, and submit a detailed plan of the proposed upgrade to the facility. The NRCA and EHU must approve this plan.
- 12.3 The detailed plan must include an engineering report refining the present status of the plant, the design of the upgrade, the clear rationale showing how the upgrade will meet the effluent standards, a schedule of implementation and a cost estimate of the works.

SCHEDULES

SCHEDULE I – EFFLUENT STANDARDS

(Extracted from the National Sewage Effluent Standards, 1997)

Table 1 – Immediate Technology Based Sewage Effluent Standards

Parameter	Effluent Limit
BOD ₅	20 mg/l
TSS	30 mg/l
Nitrates (as Nitrogen)	30 mg/l
Phosphates	10 mg/l
COD	100 mg/l
pH	6-9
Faecal Coliform	1000 PMN/100ml
Residual Chlorine	1.5 mg/l

Table 2 – Sewage Effluent Standards

Parameter	Effluent Limit
BOD ₅	20 mg/l
TSS	20 mg/l
Nitrates (as Nitrogen)	10 mg/l
Phosphates	4 mg/l
COD	100 mg/l
pH	6-9
Faecal Coliform	1000 PMN/100ml
Residual Chlorine	1.5 mg/l

SCHEDULE II – TOLERANCES TO EFFLUENT STANDARDS

1.0 Use of Marine Outfalls

Where marine outfalls are used, an application may be made to the NRCA to have effluent limits relaxed. However, such application shall be reviewed on a case-by-case basis and the applicant must provide the data, studies and calculations that show that the proposed outfall will allow for an effluent quality which is till acceptable and will not affect the marine environment beyond the levels already established for the ambient water quality.

2.0 Effluent Limits and Sampling Frequency

(Extracted from the National Sewage Effluent Standards, 1997)

Sewage Effluent Standards with Maximum Limit

Parameter	Effluent Limit	Maximum Allowable	Minimum Annual Sampling Frequency ⁽³⁾		
			20-199 m ³ /d	200-1000 m ³ /d	>1000 m ³ /d
BOD ₅	20	45	12	24	52
TSS	20	40	12	24	52
Total Nitrogen (mg/l)	10	35	12	12	52
Phosphates	4	8	12	12	52
COD	100	150	12	24	52
pH	6-9 ⁽¹⁾	-	365	365	635
Faecal Coliform	1000 ⁽²⁾	1500	15	24	52
Residual Chlorine	1.5	2.5	365	365	365

⁽¹⁾ pH is an dimensionless parameter.

⁽²⁾ MPN is most probable number. This parameter is measured based on a 100ml sample and is designated MPN/100ml.

⁽³⁾ Samples to be taken once per month for 12 months, twice per month for 12 months, once per week for 52 week, daily for 365 days per year, respectively.

3.0 Periods of Maintenance of Malfunction of Treatment Plants

Where major maintenance of upgrade of treatment plants occur, then effluent quality during this period subject to the following conditions:

- (i) Such period of suspension is for periods not exceeding three months in all cases.
- (ii) The NRCA and the Ministry of Health are to be informed a minimum of two months in advance of major maintenance or upgrade in order to quality for suspension of meeting standards.

SCHEDULE III – APPROVED TEST METHODS

(Extracted from the National Sewage Effluent Standard, 1997)

Whereas the Test Methods listed in Appendix 2 of the National Sewage Effluent Standards, 1997 are internationally accepted methods of analysis; the specific tests for NRCA compliance purposes are to be done by the methods recommended here.

Parameter	Standard Methods for the Examination of Water and Wastewater Test Method(s)	ISO Test Method(s)
Biochemical Oxygen Demand (BOD ₅)	5210 B, 5-day BOD Test	ISO 5815:1989, Dilution and seeding
Total Suspended Solids	2450 D, Total suspended solids dried at 103 – 105 °C	
Total Nitrogen	4500-N	ISO 10048:1991
Phosphates	4500-P E, Colormetric	ISO 6878-1:1886, Colormetric
Chemical Oxygen Demand	5220 D, Closed reflux, Colormetric	
pH	4500-H* B, Electrometric	
Faecal Coliform	9221 C, Multiple tube fermentation	ISO 9308-2:1990
Residual Chlorine	4500-Cl, DPD Colormetric	ISO 7393-2:1985, DPD Colormetric

Recommended test methods for analytical analyses of effluent samples used to assess for compliance with NRCA's National Trade and Sewage Effluent Standards.

The test methods are as illustrated in the following references:

1. Clesceri, L; Greenberg, Arnold and Trussel, R. (Editors), 1989, Standard Methods for the Examination of Water and Waste Water, 17th Edition, APHA-AWWA-WPCF, Publication Office: APHA, 1015 Fifteen Street NW, Washington, DC 20005.
(APHA = American Public Health Association. AWWA = American Waste Water Association. WPCF = Water Pollution Control Federation)
2. ISO, 1994, ISO Standards Compendium, Environment, Water Quality, Vol. 2 – Chemical methods, 1st Edition.
ISO, case Postale 56, CH-1211 Geneve, Switzerland. (ISO = International Organization for Standardization)
3. ISO, 1994. ISO Standards Compendium, Environment, Water Quality, Vol. 3 – Physical, biological and microbiological methods, 1st Edition, ISO, Case Postale 56, CH-1211 Geneve, Switzerland.

SCHEDULE IV – INFORMATION FOR DAILY RECORDS

Whereas the owner is not required to make daily reports available to the NRCA, they are required to maintain a daily operating log of the treatment plant which shall be made available to the NRCA upon request. The format of the log is not defined by these regulations but the information which must be collected is listed below.

1. General Information

- (i) Name of Plant
- (ii) Location of Plan
- (iii) Name of Operator(s)
- (iv) Date

2. Weather Conditions

- (i) Precipitation
- (ii) Temperature
- (iii) Wind

3. Operating Parameters\

- (i) Average Daily Inflow
- (ii) Effluent Chlorine Residual
- (iii) pH

Any unusual events which maybe significant to environmental effect or public health should be recorded (e.g. flooding of the plant, fishing in pond, etc.)

SCHEDULE V – FORM FOR MONTHLY REPORT

The Natural Resources Conservation Authority Act
 The Natural Resources Conservation Authority
 Sewage Effluent Regulation 2000

Monthly Reporting Form

Date: _____ Reporting Period _____ to _____

Name of Plant: _____

Location of Plant: _____

NRCA Permit No.: _____ NRCA License No.: _____

Monitoring

Sampling and Testing

Week of Sample	Date of Sample	Time of Sample	Inflow, Q (m ³ /d)	Test Results (mg/l) ^a								Comments
				BOD ₅	TSS	COD	N	P	pH	F. Coli-form	CL ₂	
Week 1												
Week 2												
Week 3												
Week 4												
Monthly Average												

^a F. Coli. Is reported as MPN/100 ml and pH as a dimensionless number.

Chlorine Residual

No. of tests: _____ No. > 1.5 mg/l _____ No. < 1.5 mg/l _____

Other Tests

Type: _____ No. _____ Comments: _____

Type: _____ No. _____ Comments: _____

Type: _____ No. _____ Comments: _____

Regulatory Inspections Visits

NRCA: Yes No. _____ No

EHU: Yes No. _____ No

Operations and Maintenance

Average daily flow per month of reporting period: _____ m³/d _____ m³/d
(Influent) (Effluent, if >375 m³/d)

Peak daily influent flow per month of reporting period: _____ m³/d

Sludge removed per month: _____ m³, _____ m³, _____ m³

List any equipment failures including periods of power outages:

Date	Nature of Problem	Duration
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

List any treatment process problems:

Date	Nature of Problem	Duration
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Maintenance Inspection: Yes Date: _____ No

List any rehabilitation or upgrades to the plant

Description	Start Date	End Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Comments:

Plant Operator Signature

Date: _____

Owner Signature

Date: _____

SCHEDULE VI – FORM FOR ANNUAL REPORT

The Natural Resources Conservation Authority Act
 The Natural Resources Conservation Authority
 Sewage Effluent Regulation 2000

Annual Reporting Form

Date: _____ Reporting Year: _____

Name of Plant: _____

Location of Plant: _____

NRCA Permit No.: _____ NRCA License No.: _____

Month	30-day Avg Inflow, Q_{in} (m ³ /d)	30-day Avg Inflow, Q_{out} (m ³ /d)	Test Results (mg/l) ^a								Comments
			BOD ₅	TSS	COD	N	P	pH	F. Coli-form	CL ₂	
JAN											
FEB											
MAR											
APR											
MAY											
JUN											
JUL											
AUG											
SEP											
OCT											
NOV											
DEC											

Monitoring

Sampling and Testing

^a F. Coli. Is reported as MPN/100 ml and pH as a dimensionless number.

Chlorine Residual

No. of tests: _____ No.> 1.5 mg/l _____ No.< 1.5 mg/l _____

Other Tests

Type: _____ No. _____ Comments: _____

Type: _____ No. _____ Comments: _____

Type: _____ No. _____ Comments: _____

Regulatory Inspections Visits

NRCA: Yes No. _____ No

EHU: Yes No. _____ No

Operations and Maintenance

Average daily flow per month of reporting period: _____ m³/d _____ m³/d
(Influent) (Effluent, if >375 m³/d)

Peak daily influent flow per month of reporting period: _____ m³/d

Sludge removed per month: _____ m³

List any equipment failures including periods of power outages:

Date	Nature of Problem	Duration
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

List any treatment process problems:

Date	Nature of Problem	Duration
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Comments:

Plant Operator Signature

Date: _____

Owner Signature

Date: _____

SCHEDULE VII – PARAMETERS TO BE MONITORED

The parameters for which the standard establishes limits and for which monitoring is to be done are:

BOD ₅	Biochemical Oxygen Demand
TSS	Total Suspended Solids
Total Nitrogen	Nitrogen in Nitrate, Nitrite and Ammonia
Phosphates	Phosphorus in Phosphates
COD	Chemical Oxygen Demand
pH	Acidity or Alkalinity
Faecal Coliform	
Residual Chlorine*	

* Where natural treatment are designed to reduce coliform levels without the use of chlorine then the residual criteria would not apply.

SCHEDULE VII – SIGNS AND NOTICES

HT signs and notices depicted shall be of the minimum size stated and shall be posted in a visible position at the location specified at the respective notices.

1. Plant Name

The sign shall be a minimum dimension of 2m wide, 1.5 m high with title lettering 100mm high and secondary lettering 50mm high.

<p>PUREWATER SEWAGE TREATMENT PLANT</p> <p>Owned by: My Hotel NRCA Permit No. 000000 NRCA Permit Expiration Date: ___/___/___</p>
--

2. Sewage Outfall Marker for Outfalls Offshore and/or Average Volume >375 m³/d.

<p>SEWAGE OUTFALL MARKER</p> <p>A sewage plants outfall (outlet) pipe is located _____ meters below this marker.</p> <p>No swimming is recommended within _____ meters of this marker</p>
--

3. Sewage Outfall Marker for Outfalls at Inshore Locations

<p>DANGER</p> <p>No swimming is recommended within _____ meters of this marker</p>

4. Sewage Pond Marker

<p>SEWAGE PONDS</p> <p>Absolutely no swimming or fishing is allowed in this pond</p>
