



**Pan American  
Health  
Organization**  
*Regional Office of the  
World Health Organization*



# MOH Wastewater Treatment Plants Assessment Project

**Leonard Smith  
Environmental Engineer**

**Rose Hall Resort, Montego Bay  
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# Outline

- Background
- Aim & Objectives
- Methodology
- Results
- Discussion
- Limitations
- Conclusion
- Way forward
- Acknowledgment



# Background

## Ministry of Health – Mission/Vision

- The MOH is the pre-eminent government organization whose mandate is to “**ensure the provision of quality services and to promote healthy lifestyles and environmental practices**”. The Ministry, together with its Regional Health Authorities (RHAs) and related organizations make up the public health system and are responsible for health care across the island.



# Background

- An assessment of the complete status of wastewater treatment plants (WWTPs), effluent quality and the impact of effluent on the environment is difficult to make with current data.



# Background

- Therefore it is not possible to fully and determine the compliance by the Government of Jamaica with the Protocol concerning Pollution from Land-Based sources and Activities in the Wider Caribbean Region (LBS Protocol) of the Cartagena Convention. The Government of Jamaica ratified the Cartagena Convention on 1987.



# Background

- There are presently more than 170 WTPs in Jamaica, 61 owned by the National Water Commission (NWC). Within the NWC system, plant capacities range from 0.0528 MLD (Million Litres per day) - 52.8 MLD with about 90% of plants less than 2.65 MLD.



# Background

- There are a variety of plants within the NWC such as Contact Stabilization, Oxidation Ditch, Aerated Lagoons and Waste Stabilization Ponds. In addition to the NWC, sewage treatment plants are owned by hotels, strata corporations and public housing development agencies. This sector is dominated by mechanical aerated plants, particularly the hotels.



# Background

One of the Programmes within the MOH to ensure the health of the population is the monitoring of the Wastewater Treatment Plants (WWTP) in Jamaica with major emphasis on the Sewage Treatment Plants (STP).



# Background

Base on the MOH responsibility, we embarked on the project “Assessment of Wastewater Treatment Plants in Jamaica by the Ministry of Health”.



# Aim and Objectives

## Aim

- This project aimed to assess the nation's sewage treatment systems and their impact on the environment.



# Aim and Objectives

## Objectives:

- Assess the efficiency and the effluent water quality of Jamaica's WWTPs;
- Assess the environmental and health impacts of effluents on water bodies;
- Assess the level of compliance with the Protocol concerning Pollution from Land-Based sources and Activities in the Wider Caribbean Region;



# Aim and Objectives

## Objectives:

- Build the capacity and quality assurance systems of the Laboratory;
- And to identify constraints to effective wastewater treatment and recommend measures for improvement in the short, medium and long-term.



# Methodology:

1. Regional workshops were conducted to determine the number of WWTPs. This included:
  - discussing the inspection form;
  - schedule of sampling,
  - methodology
  - and to obtain the GPS coordinates of the Influent and Effluent of the plant.



# Methodology:



**Regional  
Workshops**





MINISTRY OF HEALTH											
Wastewater Facility Evaluation Form											
Name of Plant			Owner		Category		Inspector Name		Critical Sc		
Address and Parish			Population Served		Inspection Date day month year		Inspector Code		Overall Sc		
Type of Plant		Age of Plant	Permit # / Identification #		Sample taken <input type="checkbox"/> Yes <input type="checkbox"/> No		Compliance Results Satisfactory <input type="checkbox"/> UnSatisfactory <input type="checkbox"/>				
Purpose of Visit <input type="checkbox"/> Routine <input type="checkbox"/> Compliance <input type="checkbox"/> Re-inspection			Complaint <input type="checkbox"/>		Registration Status <input type="checkbox"/> Valid <input type="checkbox"/> Invalid		Action <input type="checkbox"/> Closure <input type="checkbox"/> NAI <input type="checkbox"/> Follow-up <input type="checkbox"/> Notice				
Samples <input type="checkbox"/> Yes <input type="checkbox"/> No			Bar Code(s)								
Item		Wt.	Sc.	Item		Wt.	Sc.	Item	Wt.	Sc.	
<b>SITE ITEMS</b>				<b>EFFLUENT QUALITY ITEMS</b>				<b>STAFF ITEMS</b>			
01	Condition of landscaping	1		27	BOD Compliance	4		40	Functional communication system	1	
02	Condition of roads	1		28	TSS Compliance	4		41	Adequately staffed	2	
03	Condition of fencing	1		29	Faecal Coliform Compliance	4		42	Staff trained	3	
04	Condition of drying beds	3		30	Phosphates Compliance	2		<b>DOCUMENTATION ITEMS</b>			
05	Cleanliness of site	1		33	Chlorine residual	4		43	Current operation and maintenance manual	2	
<b>BUILDING ITEMS</b>				31	Nitrates Compliance	3		44	Current maintenance records	2	
06	Condition of equipment building	1		32	Absence of noticeable foul odours	2		45	Current design plans of the facility available	1	
07	Condition of other buildings	1		34	Absence of solids, scum, grease, floating oils or suspended materials or weed growth in the treatment units	2		<b>OPERATION AND MAINTENANCE ITEMS</b>			
<b>HYDRAULIC STRUCTURE ITEMS</b>				<b>SAFETY / HEALTH ITEMS</b>				<b>OPERATION AND MAINTENANCE ITEMS</b>			
08	No significant leakage from Structure or Pond	2		35	First Aid and Safety Equipment available for the staff	2		46	Operation of the Wastewater Treatment Processes	4	
09	Overall condition of the structure	2		36	Emergency Plan for injuries	2		47	Maintenance proper and current	2	
10	Overall condition of the lagoons	2		37	Facility secure	2		48	Necessary supplies & spare parts available	2	
11	Condition of the Wet Well	2		38	Adequate supply of potable water	2		49	Required tools available	1	
12	Condition of the Disinfection Chamber	2		Inspector's Comments:							
13	Condition of the Discharge Structure	2									
<b>CONDITION OF MECHANICAL ITEMS</b>											
14	Piping	2									
15	Valves	2									
16	Pumps	2									
17	Weirs	1									
18	Gates	2									
19	Bar Screens	2									
20	Clarifier equipment	2									
21	Aeriation equipment	2									
22	Disinfection equipment	2									
<b>CONDITION OF ELECTRICAL ITEMS</b>											
23	Emergency Generator	1									
24	Control panels	2									
25	Instrumentation	2									
26	Motors	2									



# Inspection Form



Inspector's Signature: \_\_\_\_\_

Rec'd By: \_\_\_\_\_

# Methodology:



Ministry of Health

Wastewater Treatment Plants  
Assessment Project  
**SAMPLING AND  
TESTING  
METHODOLOGY**



## Documented Programme Methodology



# Methodology:

2. Equipments and supplies were acquired.



**Autoanalyzer  
III  
(Nutrient  
Analysis)**



# Methodology:

2. Equipments and supplies were acquired.



**Sample  
Collection and  
Field Testing  
Supplies**

# Methodology:

3. One sampling exercise was conducted over a three-month period for each plant, Samples were collected for testing of the effluent and receiving water bodies where applicable.



# Methodology:

Parameters Tested were:

- Faecal Coliform (FC),
- Biochemical Oxygen Demand (BOD<sub>5</sub>),
- Chemical Oxygen Demand (COD),
- Nutrients (Total Nitrogen and Total Phosphorus),
- Oil and Grease and Total Suspended Solids (TSS).



# Methodology:

- These results were compared with existing government standards.
- The compiled data collected was placed on a national data base.



Water Resources Authority - WebMap Application - Windows Internet Explorer

http://webmapjam.dyndns.org/App/db/hydroEN/all1.php?viewquery=Sewage\_Treatment\_Plant;&viewraster=1

Press F1 for help


Search

Raster: Jamaica Coastline

All Layers

Layers:  
(All Points displayed)

Sewage Treatment Plant



Map Table Report Chart File Statistics Inventory

Layer: Raster Object: Long: -78.37° Lat: 17.98° Tip: Left Click: Select, Right Click: Select & Open Object Relationships Browser

Done Internet 100%

start Welcome to Water R... http://webmapjam.d... Water Resources Aut... 09:08 AM

# Number of Samples by Plants

Region	Total No of Plants on record	Total No of Plants Suitable for Inclusion in the Project	Total No of Plants used in the Project	Percent of Suitable plants used	Total No of Analyses (Test)
<b>SERHA</b>	128	59	51	86%	342
<b>SRHA</b>	52	31	28	90%	186
<b>NERHA</b>	62	45	45	100%	294
<b>WRHA</b>	64	45	41	91%	271
<b>Jamaica</b>	306	176	165	<b>94%</b>	1,093



# Number of Tests by Plant Types

Region	Total No of Analyses (Test)	Old Plants		New Plants		Irrigation	
		Plants	Test	Plants	Test	Plants	Test
<b>SERHA</b>	342	30	196	21	146	-	-
<b>SRHA</b>	186	13	86	15	100		
<b>NERHA</b>	294	20	133	15	106	10	55
<b>WRHA</b>	271	16	112	8	87	17	72
<b>Jamaica</b>	<b>1,093</b>	<b>79</b>	<b>527</b>	<b>59</b>	<b>439</b>	<b>27</b>	<b>127</b>



# Percent of Tests Compliant by Tests Parameter

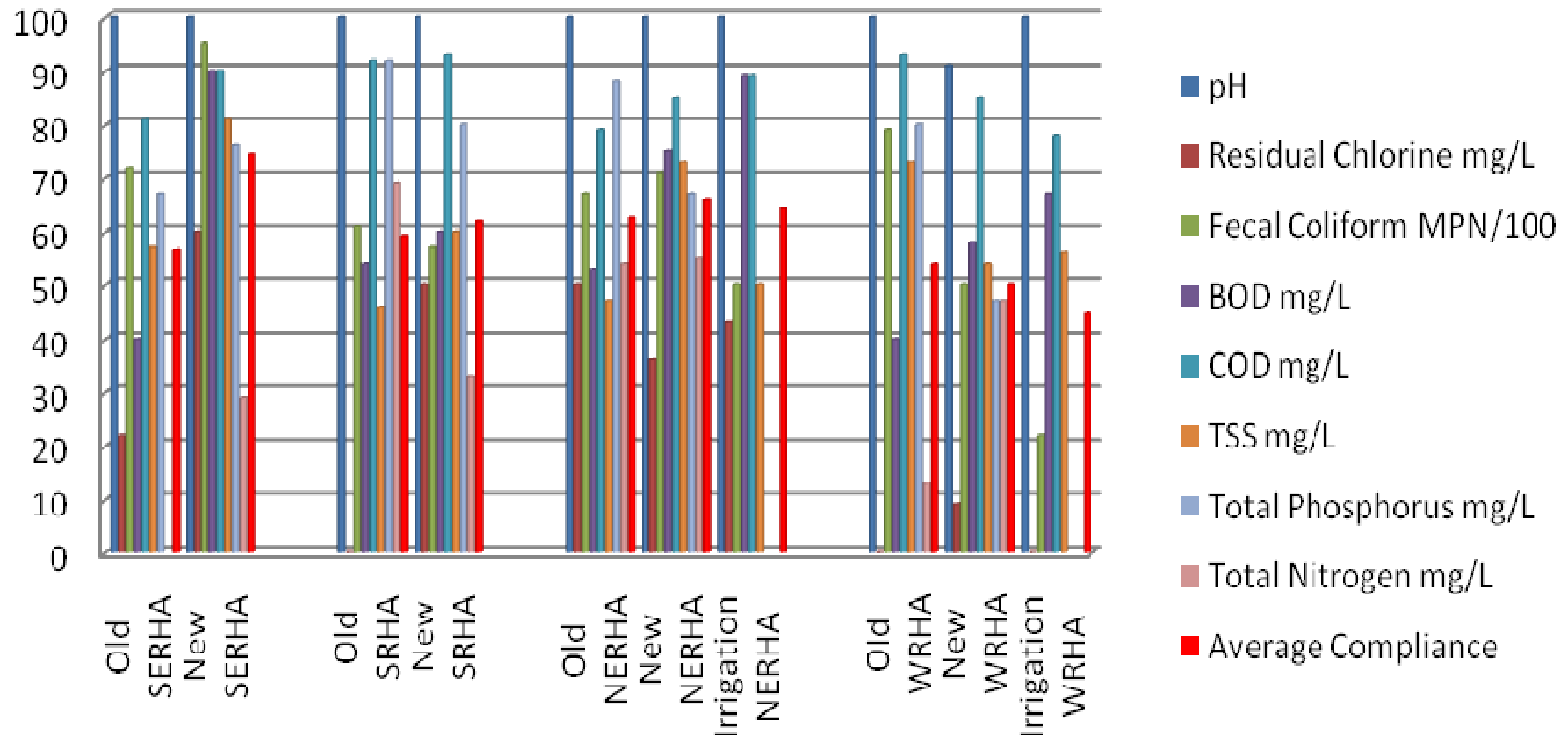
Parameter	Average				% Compliant			
	Std	Old	Std	New	Std	Old	Std	New
<b>BOD<sub>5</sub></b>	30mg/L	32.1	20mg/L	19.0	30mg/L	44.6	20mg/L	75.8
<b>TSS</b>	30mg/L	60.6	20mg/L	27.6	30mg/L	40.5	20mg/L	58.0
<b>COD</b>	100mg/L	61.0	100mg/L	43.0	100mg/L	85.0	100mg/L	44.8
<b>Ph-T</b>	-	-	4mg/L	3.3	-	-	4mg/L	81.0
<b>N-T</b>	-	-	10mg/L	15.5	-	-	10mg/L	32.0

# Percent of Tests Compliant by Region

Region	Category of Plants	Total No. of Tests	pH	Residual Chlorine, mg/L	Fecal Coliform, MPN/100mL	BOD, mg/L	COD, mg/L	TSS, mg/L	Total Phosphorus, mg/L	Total Nitrogen, mg/L	Average Compliance
SERHA	Old	196	100	22	72	40	81	57	67		57
	New	146	100	60	95	90	90	81	76	29	74
SRHA	Old	86	100	0	61	54	92	46	92	69	59
	New	100	100	50	57	60	93	60	80	33	62
NERHA	Old	133	100	50	67	53	79	47	88	54	63
	New	106	100	36	71	75	85	73	67	55	66
	Irrigation	55	100	43	50	89	89	50	NA	NA	64
WRHA	Old	112	100	0	79	40	93	73	80	13	54
	New	87	91	9.1	50	58	85	54	47	47	50
	Irrigation	72	100	0	22	67	78	56	NA	NA	45

# Percent of Tests Compliant by Region

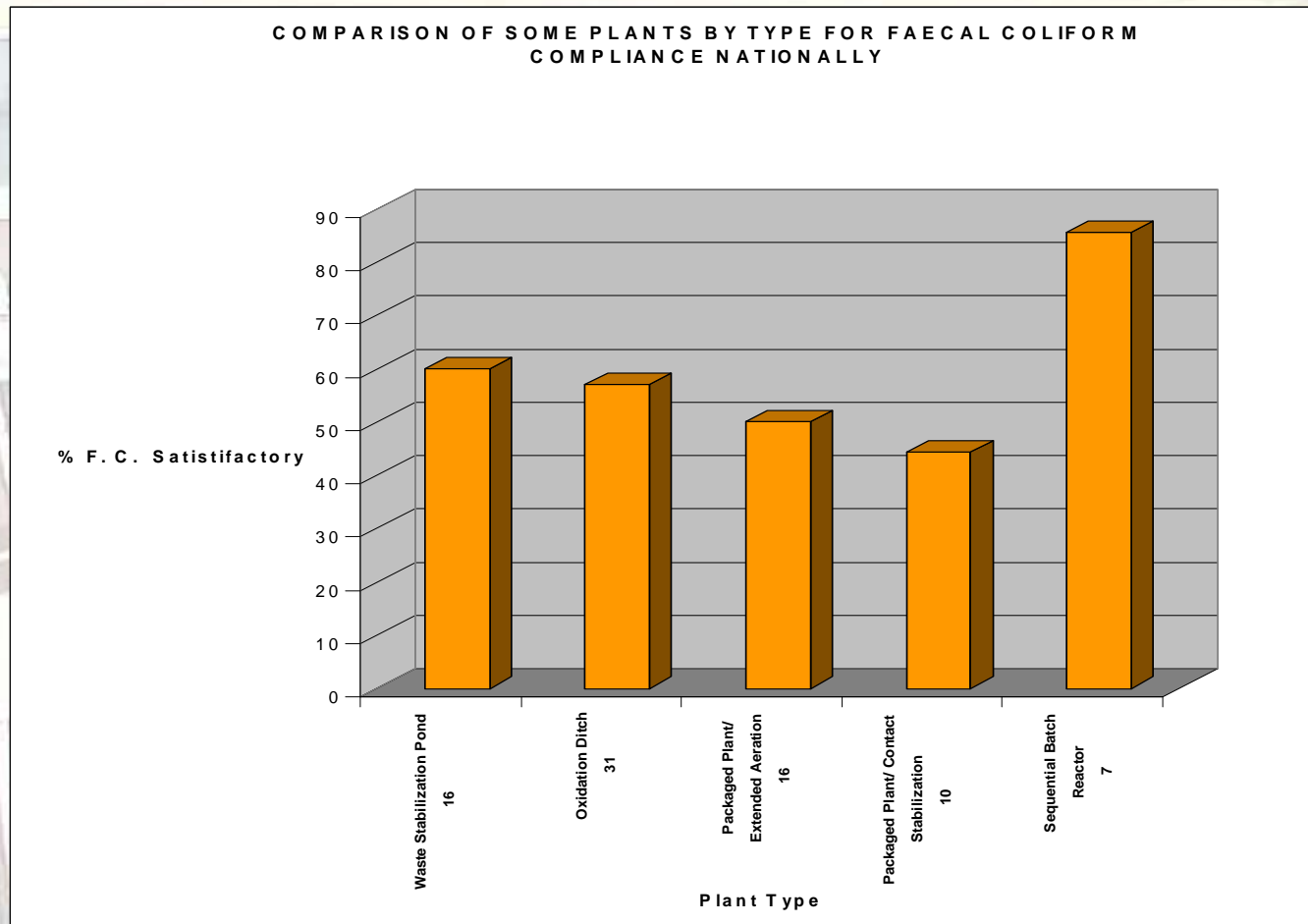
## Percent Test Compliance By Region



# Comparison of Plant Compliance by Type

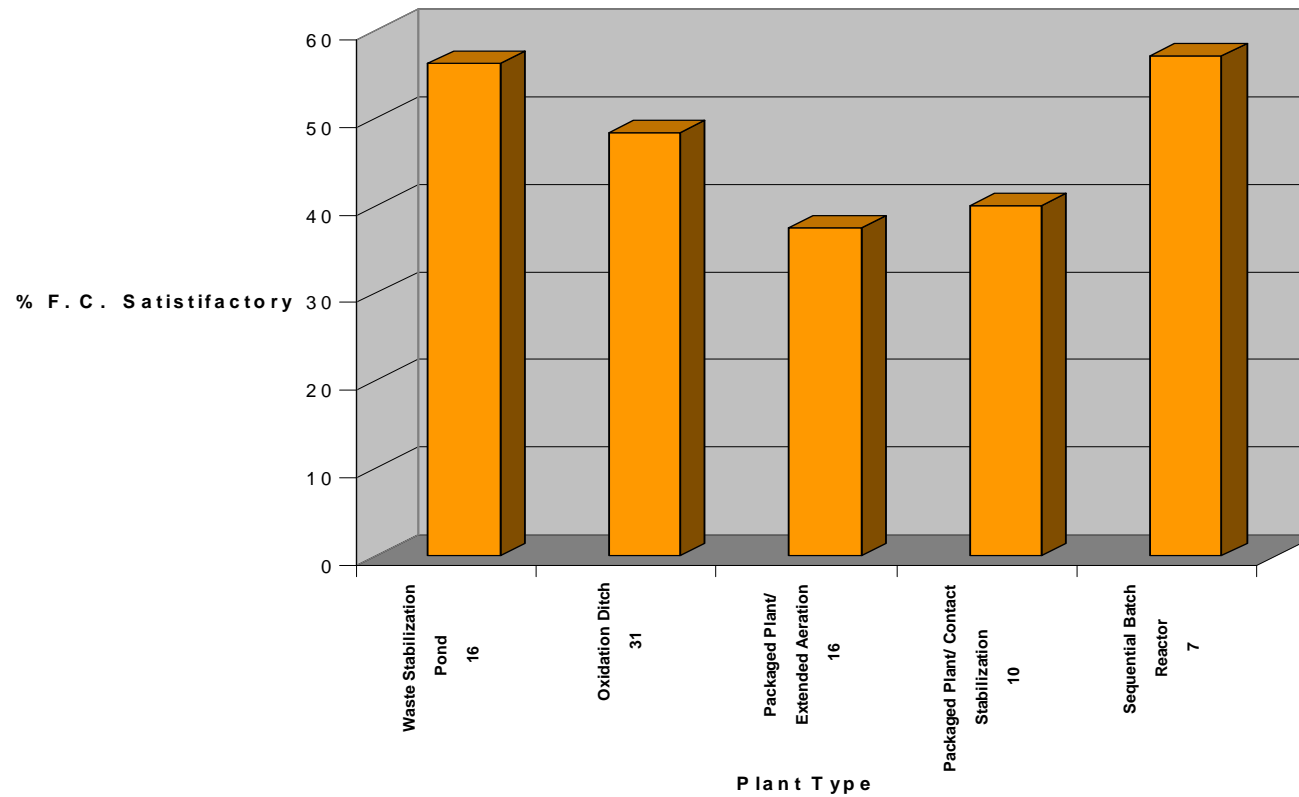
Plant type	Percent Satisfactory for Select Parameters				
	FC	BOD	COD	Total Phosphorus	Total Nitrogen
Waste Stabilization ponds	60	56	100	81	53
Oxidation Ditch	57	48	88	72	34
Packaged Plant/Extended Aeration	50	38	69	69	27
Packaged Plant/Contact Stabilization	44	40	87	50	0
Sequential Bach Reactor (SBR)	86	57	100	80	20

# Faecal Coliform Compliance by Plant Type



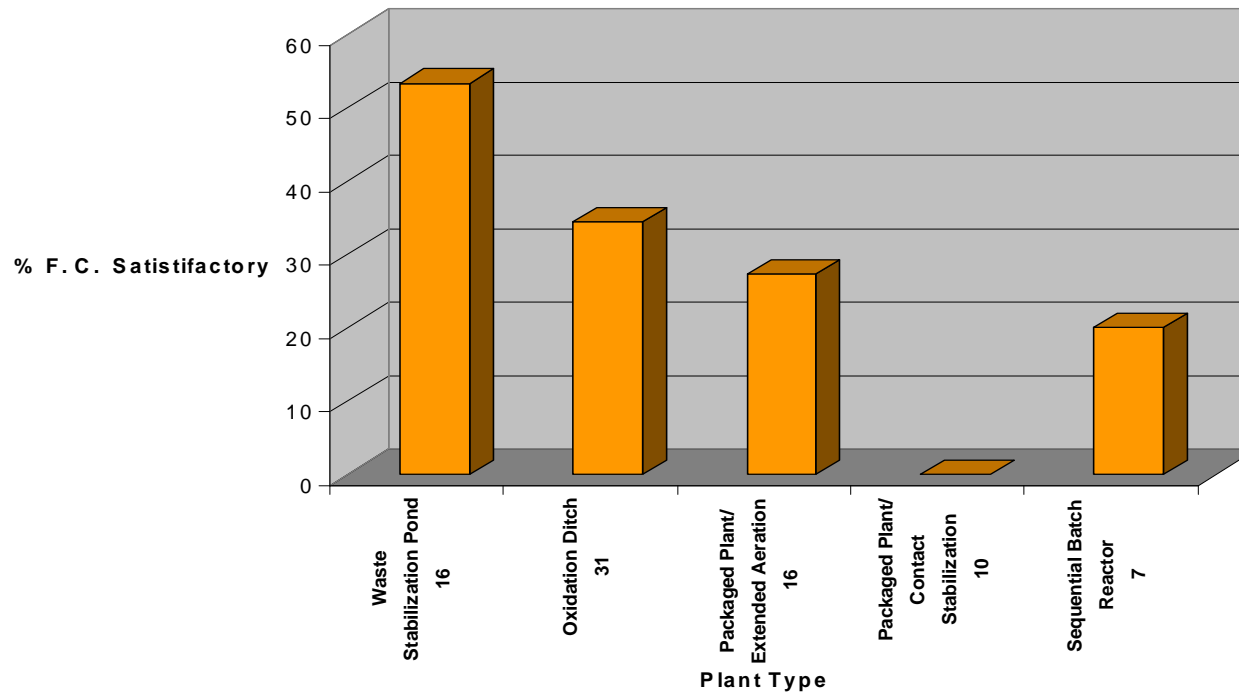
# BOD Compliance By Plant Type

COMPARISON OF SOME PLANTS BY TYPE FOR BOD COMPLIANCE (AGAINST THE NEW STANDARD) NATIONALLY



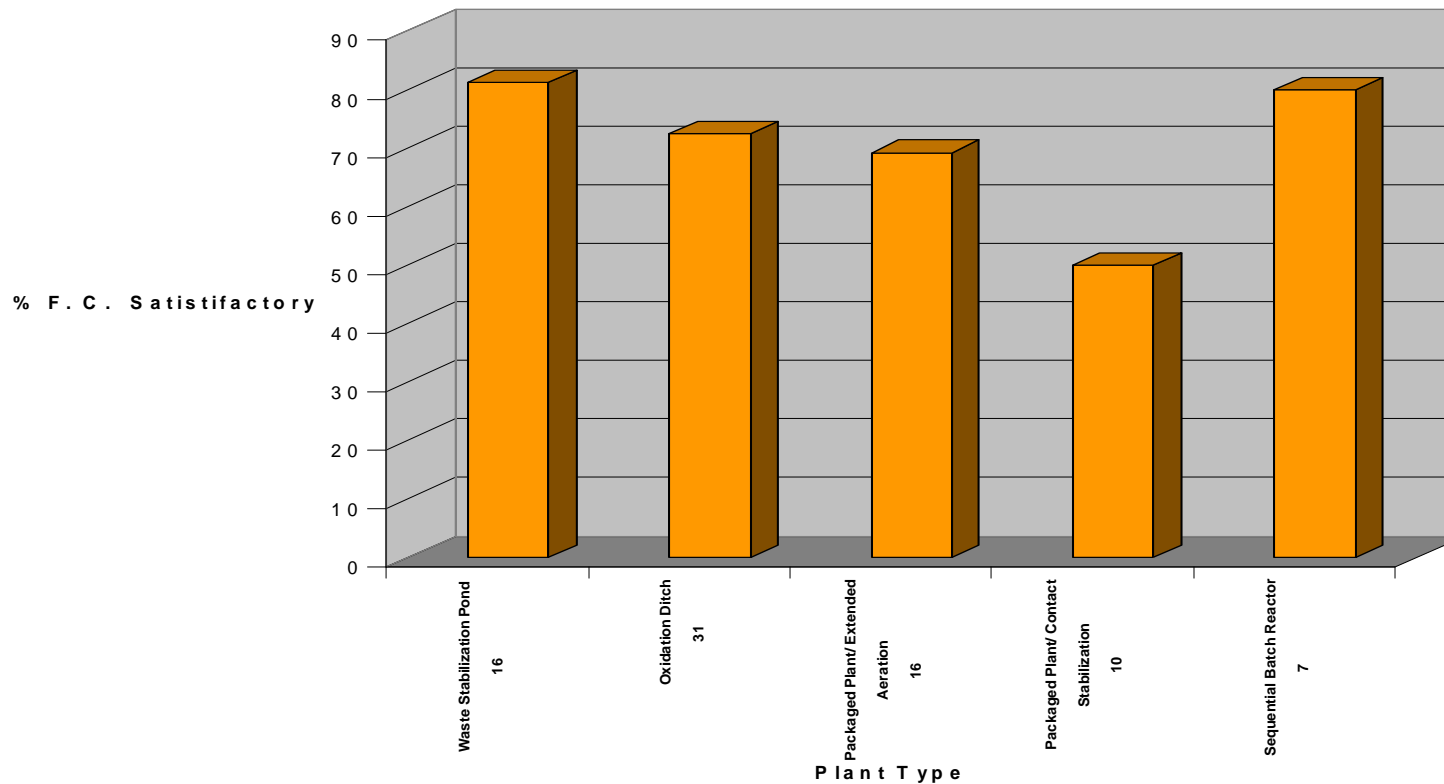
# Total Nitrogen Compliance by Plant Type

COMPARISON OF SOME PLANTS BY TYPE FOR TOTAL NITROGEN COMPLIANCE (AGAINST THE NEW STANDARD) NATIONALLY



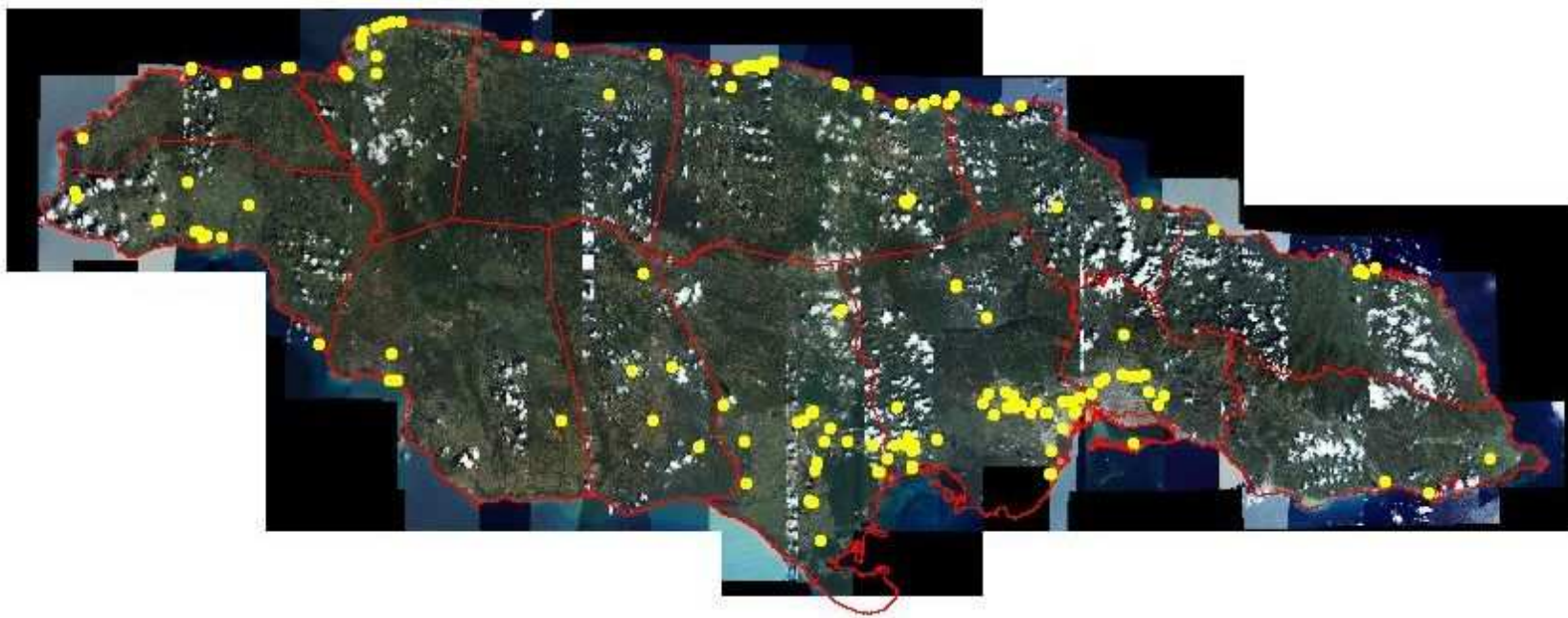
# Total Phosphorus Compliance by Plant Type

COMPARISON OF SOME PLANTS BY TYPE FOR TOTAL PHOSPHORUS COMPLIANCE (AGAINST THE NEW STANDARD) NATIONALLY



# LBS Protocol Compliance

To date 171 WWTPs have been Geo-referenced



# LBS Protocol Compliance

## Class I impacting STP

Number of Plants	pH Compliant %	BOD Compliant %	TSS Compliant %	FC Compliant %	LBS Compliant %
11	100	82	82	82	<b>64</b>

## 2. Discharges into Class I Waters

Each Contracting Party shall ensure that domestic wastewater that discharges into, or adversely affects, Class I waters is treated by a new or existing domestic wastewater system whose effluent achieves the following effluent limitations based on a monthly average:

Parameter	Effluent Limit
Total Suspended Solids	30 mg/l*
Biochemical Oxygen Demand (BOD <sub>5</sub> )	30 mg/l
pH	5-10 pH units
Fats, Oil and Grease	15 mg/l
Faecal Coliform (Parties may meet effluent limitations either for faecal coliform or for <i>E. coli</i> (freshwater) and enterococci (saline water).)	Faecal Coliform: 200 mpn/100 ml; or a. <i>E. coli</i> : 126 organisms/100ml; b. enterococci: 35 organisms/100 ml
Floatables	not visible
* Does not include algae from treatment ponds	



# LBS Protocol Compliance

## Class II impacting STP

Number of Plants	pH Compliant %	BOD Compliant %	TSS Compliant %	LBS Compliant %
7	100	100	100	100

### 1. Discharges into Class II Waters

Each Contracting Party shall ensure that domestic wastewater that discharges into, or adversely affects, Class II waters is treated by a new or existing domestic wastewater system whose effluent achieves the following effluent limitations based on a monthly average:

Parameter	Effluent Limit
Total Suspended Solids	150 mg/l*
Biochemical Oxygen Demand (BOD <sub>5</sub> )	150 mg/l
pH	5-10 pH units
Fats, Oil and Grease	50 mg/l
Floatables	not visible
* Does not include algae from treatment ponds	

# Discussion:

- An analysis of the plant compliance to test parameters by region showed the average compliance for most regions falling below 70%. The most significant public health parameter, Faecal Coliform showed greatest compliance in the South East Region with the Southern Region showing the least.



# Discussion:

- Analysis of plant compliance by selected plant types showed that Waste Stabilization Ponds demonstrated greatest compliance, with Packaged plants (both those with Extended Aeration and Contact Stabilization) being the least compliant of those compared.



# Discussion:

- The performance of Packaged Plant/Extended Aeration is poor in relation to FC, BOD and COD. While the Bach Sequential Plants have the best performance for the same parameters.
- All treatment plants have a poor performance in the removal of nitrogen. The worst being the Packaged Plant/Contact Stabilization, these are not removing any nitrogen. This condition may be contributing to the eutrophication conditions and hence the creation of mosquitoes breeding sites, in quiescent waters.

# Discussion:

- Most of the 11 plants directly impacting Class I waters (Bathing or ecologically sensitive) are not meeting LBS requirements
- All of the 7 plants directly impacting Class II waters appear to meet these requirements (O&G and floatable not assessed)



# Limitations:

- We would like to create a link to the database so that we could have views in Google Earth, however, the lack of funds is not making this possible and we are considering other options.
- There was an under reporting of field pH and Residual Chlorine.
- A proper assessment of the impact on the receiving waters is still pending due to the lack of collection of some receiving water samples as well as delays in setting up the Autoanalyzer.



# Conclusion

- This preliminary assessment was sufficient in its coverage of plants and showed average compliance rates by test parameter to not exceeding 75%.
- Pond and sequential batch sewage treatment systems generally perform better than packaged ones



# Conclusion

- Newer plants seem marginally, to be more compliant to their standards that older ones are to theirs. This could indicate a potential problem when these plants are required to meet the newer standards.
- Preliminary indications are that most of the plants impacting LBS protocol Class 1 waters are not meeting the protocol guidelines.



# The Way Forward

- Secure more funds for the project.
- Purchase other equipment and materials needed.
- Obtain the capacity of other STPs.
- Continue with the GIS mapping.
- Write the final Report
- Conduct a final workshop



# The Way Forward

- Continue with the development of the WW National Data Base
- Prepare the Final Report
- Conduct the Stakeholders final seminar



# Demonstration

PICS



# Acknowledgment

- Dr. Ernest Pate (PAHO/WHO) and Mr. Nelson Andrade Colmenares (UNEP), for your kind support.
- Dr. Homero Silva (PAHO) and Christopher Corbin (UNEP) – Technical advisors to the project.
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# Acknowledgment

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- The Staff of the EHU/EHL, for your support and encouragement.



# What is LAJ & How it can Help you?



Laboratories Association of  
Jamaica

- Training
- Networking
- Lobbying

Upcoming event: Presentation on June 17, 2010  
“Checklist for Accreditation”



# The work continues

