



WATER RESOURCES AUTHORITY
MINISTRY OF WATER AND HOUSING



ANNUAL REPORT
2004 - 2005

***MINISTRY OF WATER & HOUSING
WATER RESOURCES AUTHORITY***



***ANNUAL REPORT FOR
PERIOD***

1ST APRIL 2004 - 31ST MARCH 2005

***WATER RESOURCES AUTHORITY
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Our Mission

To ensure sustainability of Jamaica's water resources through

- *Continual assessment and proper management...*
- *The promotion of conservation and protection...*
- *Optimal development...*

...of the resources.

To ensure rational and equitable allocation of the nation's resources, to reduce conflicts among water users.

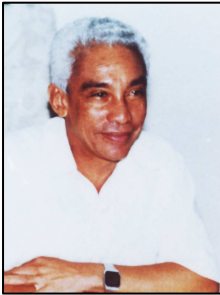


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MESSAGE FROM THE CHAIRMAN



Water has become a major concern because of declining quantum and quality for public and industrial uses, as well as, the damage it causes during natural disasters and in the spread of diseases and pollution. Because of this, the responsibilities of the Water Resources Authority (WRA) have become more demanding, as it seeks to protect the island's water resources and ensure its proper distribution.

The Authority during this period was forced to intensify its proactive role in directing decisions about construction of housing schemes, business complexes, highways and other major edifices, to ensure the protection of aquifers and the maintenance of natural flows for domestic water supplies and drainage.

Recent hurricanes and storms have reconfirmed that water on land and from the sea is a most destructive force. In this regard, the WRA is therefore called upon to coordinate all local bodies whose work and services influence water systems on the island. The monitoring and risk assessment work of the WRA, and its comprehensive advice, regarding the management, protection and use of water, have become even more crucial in coping with the effects of current and expected climatic change.

Arnaldo Ventura PhD
Chairman

MESSAGE FROM THE MANAGING DIRECTOR



This year has seen the loss of several of our most senior and experienced technical and professional staff members. They have all taken the choice to migrate in order to expand their experience and knowledge. There is no doubt that the loss will have a significant impact on our capacity and ability to execute certain projects, maintain the high quality of assistance to the public and provide the water resources management expertise that is critical for us to maintain our good position with regards to availability of resources. However the WRA can be proud that the foundation laid with these 5 persons will be useful in their new environment. It is now up to the older and more experienced few to mould the younger and less experienced professional to take up the additional responsibilities and ensure that the Authority still retains a high level of professionalism. We will attempt to recruit within the terms of the Public Sector MOU and the availability of qualified personnel. The first graduates from the post graduate course in Water Resources Management at the University of the West Indies, established with the assistance of the Authority and the Jamaica Bauxite Institute, will be available shortly and the Authority is hoping to fill a number of positions from these graduates.

The management of water resources takes a highly trained cadre of professionals and technicians who are in high demand around the world. The capability of the Authority to provide the required expertise in water resources management depends on the quality of staff and the retention of this staff. This must be given priority within the Public Sector. In fact the development of scientific and technical skills should be a part of the MOU training component. No significant development can be without the requisite scientific base and technological innovations-science and technology must be the basis for development.

This year we will also fully continue our preparations for the Fifth Inter-American Dialogue in Water Management. This hemispheric meeting, the premier event of the Inter-American Water Resources Network (IWRN), will bring together over 200 experts from the region to trade experiences, discuss technology and plan for meeting the Millennium Development Goals (MDGs) all of which either directly or indirectly require adequate water resources for success. The entire WRA will be required to participate in the meeting as we put the Authority and Jamaica on show. I know that you can be counted on.

Let me again thank all staff members for their support over the past year. It has been a difficult one but we have risen to the challenge. Nothing less was expected.

Basil P. Fernandez
Managing Director

FUNCTION OF THE AUTHORITY

The Water Resources Authority became operational on April 1, 1996 as a result of the promulgation of the Water Resources Act 1995. The Act provides for the management, protection and controlled allocation and use of the water resources of Jamaica.

The Authority, under Section 4 of the Act, carries out the duties listed below:-

1. It shall be the duty of the Authority to regulate, allocate, conserve and otherwise manage the water resources of Jamaica.
2. Subject to the provisions of this Act, the Authority may, for the purposes of performing any of its functions under this Act, do anything and enter into any transaction which, in the opinion of the Authority, is necessary to ensure the proper performance of its functions.
3. In particular, and without prejudice to the generality for the provisions of subsections (1) and (2), the Authority may –
 - a. obtain, compile, store and disseminate data concerning the water resources of Jamaica;
 - b. exercise planning functions as provided in this Act in relation to the Master Plan and Water Quality Control Plans;
 - c. allocate water resources in conformity with the provisions of this Act;
 - d. control the quality of water resources in accordance with the provisions of this Act;
 - e. provide to any department or agency of Government, at its request, technical assistance in respect of any projects, programmes or activities which relate to the development, conservation and use of water resources;
 - f. perform such other functions relating to the management, conservation and use of water resources as may be assigned to it by or under this Act or any other enactment.

THE EXECUTIVE

Board of the Authority

The Board of the Water Resources Authority remained unchanged, having been reappointed on 2003 March 10. The Board consisted of the following nine appointees:

Dr. Arnaldo Ventura C.D.	Chairman
Mr. Basil Fernandez O.D.	Secretary/Managing Director
Mr. Parris Lyew-Ayee O.D.	Member
Dr. Conrad Douglas	Member
Mr. Donovan Stanberry	Member
Mr Errol Gentles	Member
Dr. Carol Archer	Member
Mrs. Sonia Rickards	Member
Miss Tasha Manley	Member

The term of the present Board will expire on 2006 March 09.

Mrs. Maureen Clarke continued as the Recording Secretary and Miss Sharon Wood, Hydrogeologist, as Technical Advisor.

Meetings of the Board

The Board of the Authority meets once per month on the third Wednesday. A total of ten (10) meetings were held in 2004/2005. Average attendance at the meetings was seven (7) members. The Board held no meeting in July 2004 and January 2005. The December meeting was held on the fifteenth of December to allow for the Christmas holidays and the unavailability of members after that date. Decisions regarding the granting of permits/licences during the months of July 2004 and January 2005 were taken by the Secretary and later ratified by the Board.

Management of the Authority

A three (3) person team had the responsibility for the management of the Authority. They are listed below:

- Basil Fernandez O.D., Managing Director
- Herbert Thomas, Director, Resource Management
- Miss Hermine Downer, Director, Finance and Accounts

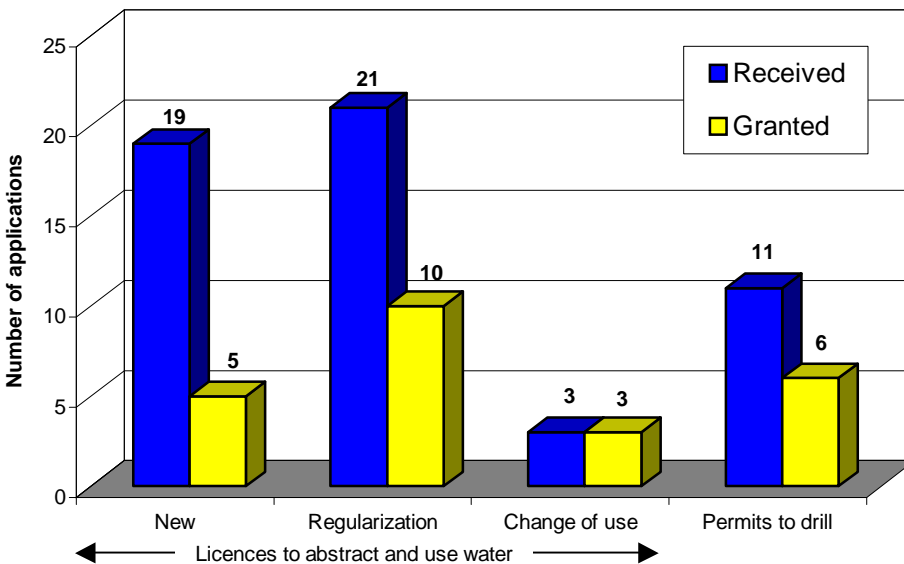
Two positions, that of the Director, Planning and Investigation and Director Administration and Human Resource Development remained vacant.

ALLOCATION OF WATER

Applications and Abstraction

The Water Resources Authority received eleven [11] applications for permits to drill wells and forty-three [43] applications to abstract and use water during the 2004/2005 financial year.

Two [2] applications for permission to drill were granted for the establishment of wells in the Black River basin, one of which was for a replacement and of such would not result in the allocation of new water. The remaining four [4] applications for permission to drill were granted for the establishment of wells in the Rio Cobre basin. Two [2] such licences were for exploratory drilling in the Worthy Park area (one well has since been drilled and abandoned), one [1] was for a replacement well, while the other was granted for a well to be used for irrigation purposes at Colbeck. The water for this last well was reserved from a 1995 water resources assessment of the area. It should be noted that of the four permits, only two would ultimately result in the allocation of new water from the basin, which is highly stressed at the present time. Five [5] of the applications for permits to drill were not granted as they either required submission of additional data by the applicant or arrived too late for processing to be completed within the financial year.



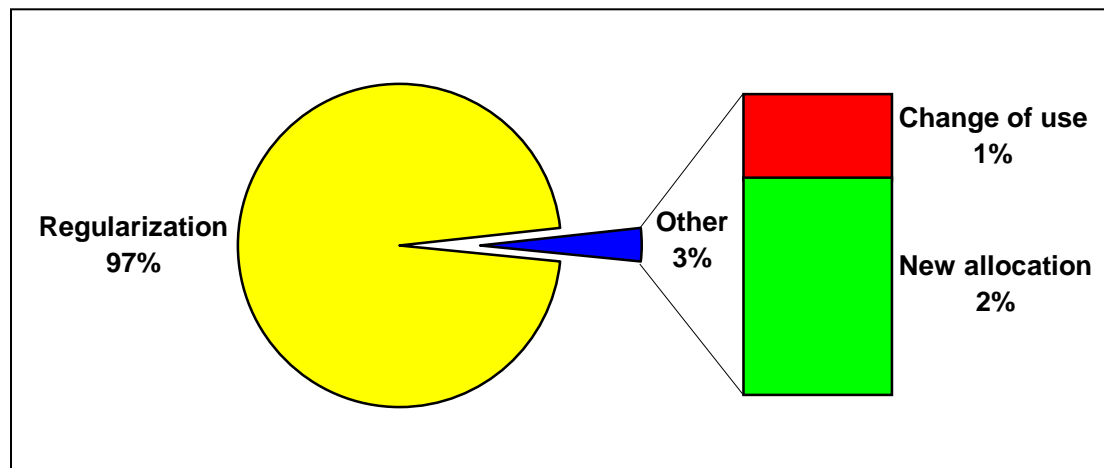
Eighteen [18] applications to abstract and use water were granted; five [5] represented new sources, ten [10] were for regularization of existing sources and three [3] represented a change of water usage. One [1] application was refused, as the well was in such poor condition that rehabilitation was not deemed feasible; a replacement well was recommended. The remaining twenty-four [24] applications were pending due to a number of reasons, which include:

- Requirement for applicant to advertise their intent to abstract and use water, and submit proof of same, as required under the Water Resources Act 1995
- Failure of applicant to prove right of access to the property on which the water source occurs
- Requirement for additional technical investigation and data analysis to be undertaken by the Authority
- Non-submission of relevant data as requested by the Authority, such as yield test results, water quality analytical data and water demand calculations.

The eighteen [18] licences granted resulted in the allocation of 203,340 cubic metres of water per day. Of the total volume allocated for abstraction, 93.4% [190,015 cubic metres per day] represented allocation from rivers and springs while 6.6% [13,325 cubic metres per day] represented groundwater abstraction from wells. It should however be noted that a significant proportion of surface water flow is sustained by groundwater discharge.

Water Allocation by Hydrologic Basin

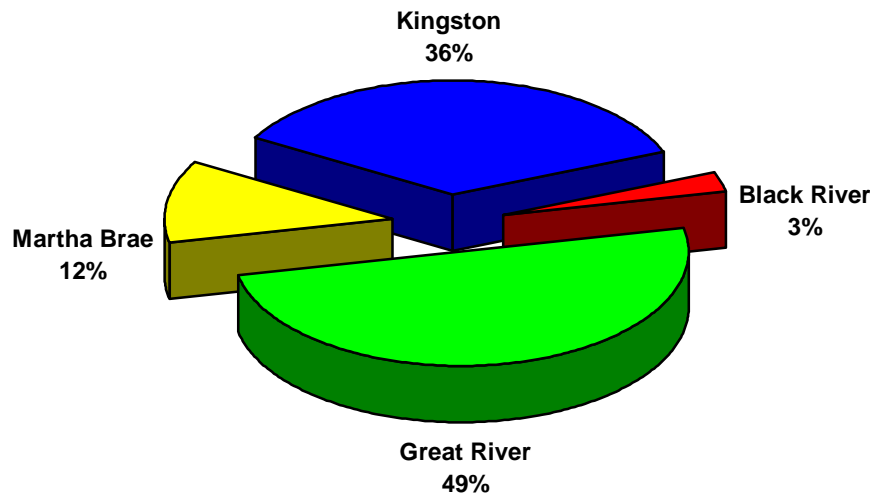
Of the total volume of water allocated, 96.6% [196,498 cubic metres per day] represents regularization of existing sources, and as such does not reflect the allocation of new resources. New sources represented only 2.4% [4,884 cubic metres per day] of the allocation, with change of use from irrigation to domestic purposes accounting for the remaining 1% [1,958 cubic metres per day].



a) Regularization of existing abstractors

Allocation of water was not confined to a particular basin as in the previous year, but distributed across the Kingston [35.5%], Black River [2.8%], Great River [50.1%] and Martha Brae [11.6%] Hydrologic Basins. The regularization of eight [8] sources currently used by the National Water Commission accounted for 99.2% of the allocation or 194,862 cubic metres of water daily.

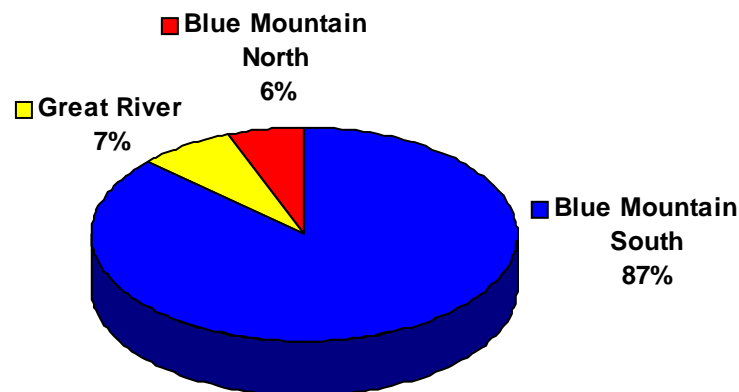
Water Allocation by Hydrologic Basin (Regularization)



b) New allocation

The new resources allocated amounted to some 4,884 cubic metres of water daily or 2.4% of total allocation. Allocation from the Blue Mountain South basin accounted for 87.0% of this amount, with the Great River basin [7.2%] and the Dry Harbour Mountains basin [5.8%] accounting for the remainder. The allocation was for domestic and industrial purposes only.

Water Allocation by Hydrologic Basin (New Sources)



c) Other allocation

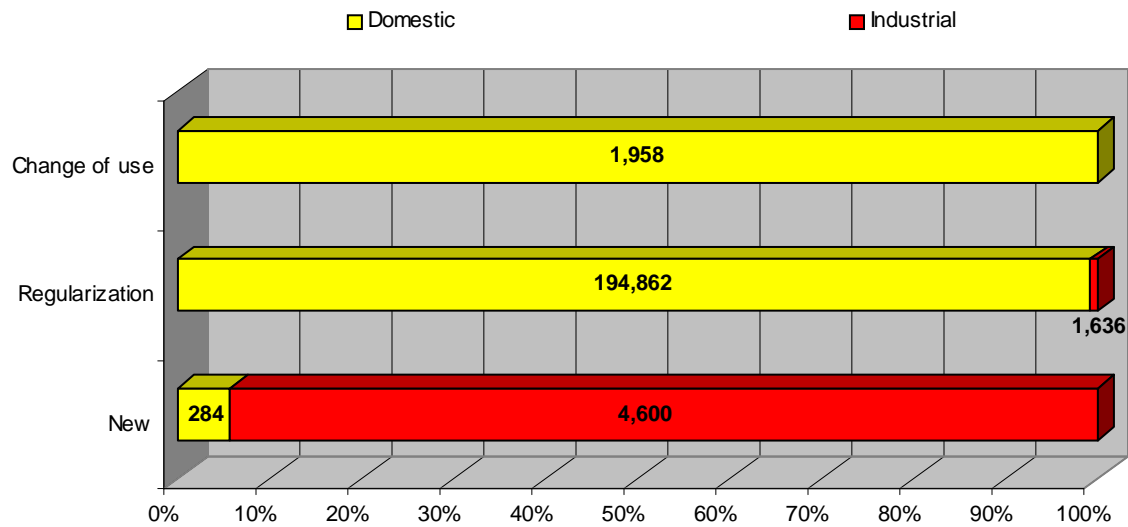
The change of water usage from irrigation to domestic purposes appears to be a growing trend, not confined only to the Rio Cobre basin. This allocation of 1,958 cubic metres of water daily was apportioned between the Black River basin [41.8%] and the Rio Cobre basin [58.2%].

These do not reflect the allocation of new water.

Water allocation by Sector

The industrial sector saw the largest allocation of water [94.2%] from new sources, but the smallest allocation for regularized sources. These allocations were primarily for aggregate (sand and gravel) washing and usage in banana boxing plants, while that for regularization was for usage in a distillery. Although the domestic sector accounted for only 5.8% of new allocation, it accounted for 99.2% of the regularized abstraction. With the change of usage of irrigation wells to domestic supply sources, the domestic sector saw a total allocation of 96.9%.

Water allocation (m³/day) by sector



SPECIAL CELEBRATIONS / EXHIBITIONS

World Water Day and Launch of Dialogue V



World Water Day (WWD) was celebrated on March 22, 2005 under the theme “Water for Life”.

The Fifth Inter-American Dialogue on Water Management and the International Decade for Action on Water was launched on World Water Day 2006 at the Pegasus Hotel. The day’s event consisted of the following:

- Launch of the Dialogue with keynote speakers from the Organization of American States, UNESCO and the Ministry of Water and Housing.
- An exhibit of books and projects on the management and development of the water resources of Jamaica being executed by the water sector agencies (NWC, NIC, CECL, Rural Water), PAHO, NEPA and the Met Office.

Dialogue V is the major event of the Inter-American Water Resources Network (IWRN) a network of agencies, persons and NGOs in the hemisphere. The Dialogue is one event in the Americas preparation for the Fourth World Water Forum to be held in Mexico in March 2006.

The hosting of the Dialogue by Jamaica is historical as it is the first occasion that an English speaking country will be hosting the Dialogue. The Dialogue will be held over the period October 9th to 14, 2005 at the Half Moon Conference Centre in Montego Bay. The major sponsors of the Dialogue are:

- Inter-American water Resources Network (IWRN)
- Organization of American States
- UNESCO

- The Ministry of Water and Housing; and
- The Water Resources Authority

The theme for the fifth Inter-American Dialogue on Water Management is “*Strengthening Local Capacity to Achieve Global Challenges*”.

The objectives of the Dialogue are:

- Strengthening of the dialogue process as a mechanism for hemispheric cooperation in water management.
- Identify common factors on water management in the hemisphere to formulate the policies, plans and programmes on international and multi-lateral institutions.
- Develop a framework for water management in the Americas, including directives and mechanisms to achieve the Millennium Development Goals (MDGs) and other Global targets.
- Bring to the foreground the special circumstances of Caribbean Small Island Developing States.
- Promote investment opportunities in water management and development in the hemisphere.
- Plan the participation of the Americas in the Fourth World Water Forum.

ADMINISTRATION AND HUMAN RESOURCE DEVELOPMENT

On 31st March 2005 there were fifty (50) members on the Water Resources Authority's Staff. Two persons resigned.

Resignation

- Miss Christine Campbell, Senior Hydrologist resigned effective 31 January 2005.
- Mr. Hopeton Ferguson, GIS Specialist, resigned effective December 31, 2004

Seminar/Training/Workshop

- Mr. Basil Fernandez, Managing Director, attended
 - The Leadership Awareness Workshop – Leading From Above the Line – at the Forum (MIND) – 22 June 2004.
 - The Executive Geographic Information Systems (GIS) Seminar at the Ministry of Land and Environment - 8th September 2004.
 - Meeting of the Inter-American Water Resources Network (IWRN) Executive in Washington DC to discuss issues related to Jamaica's hosting of the Fifth Inter-American Dialogue on Water Management in October 2005-20-24 September 2004.
- Mr Andreas Haiduk, Water Resources Engineer, successfully completed
 - The Geographic Information Systems (GIS) Introduction to Database Design and Development Course at the Land Information Council of Jamaica, Geo-Informatics Training Centre – 25-29 October 2004.
- Miss Anika Sutherland, Assistant Hydrogeologist, attended
 - South West Research Institute (SwRI) Technical Exchange Programme – “*Regional Evaluation of Saltwater Intrusion of Coastal Carbonate Aquifers on Caribbean Islands Project*” – San Antonio, Texas – 25 April to 9 May 2004.

- Applied Modeling of Groundwater Flow and Contaminant Transport in Saturated and Unsaturated Porous Media workshop – Cave Hill Campus, Barbados – 15-17 June 2004.
- The IAEA Training Course “*Isotope Hydrology*” in Vienna, Austria – 30 August to 1 October 2004.

- Mr Herbert Thomas, Director Resource Management, attended
 - Flood Simulation Seminar at the Caribbean Institute of Meteorology and Hydrology (CIMH), Barbados – 13 May 2004
 - International Workshop on “*Water and Disasters*” – London, Ontario, Canada – 13-14 December 2004.
 - The 3rd Regional Seminar on Flood Hazard Mapping and Its Use for Community Disaster Planning in the Caribbean.

COMPUTER AND GIS UNIT

During the period under review, the GIS/Computer unit achieved the following:

Water Resources Authority Management Information System (WRAMIS)

- Further enhancement to the capabilities of the WRAMIS in particular the management tools and Dataset:-
 - Increase the Internet access speed by installing ADSL system (Telephone line and Modem.)
 - Windows 2000 operating system updated with new service packs – Service Pack 4
 - Acquired topographic sheet at 12,500 scales that is 190 of 200 base map sheets with new coordinate system (JAD2001) – Digital.
 - One computer acquired under the UNDP/GOJ RADAR Project
 - Upgrade the Early Warning System software to monitor flood events in the Rio Cobre basin.
 - Purchased replacement parts which include monitors, processors, hard drives, keyboards and mouse
- For period under review the Local Area Network was up 99% of the time.
- At the beginning of the fourth quarter the unit had had the resignation of the GIS Specialist, Mr. Hopeton Ferguson

Training

- One Technical officer received introductory GIS ArcView training at The Land Information Council of Jamaica (LICJ) GIS Lab.

Meetings and Seminars

- The Systems Manager represented the Authority at the monthly LICJ meetings.
- The Systems Manager and GIS Specialist represented the Water Resources Authority at a number of workshops and seminars throughout the year .

Provided Technical Support for Capital Projects

Technical support in the form of GIS, Cartographic and System Support was provided for following in house projects.

- Provide GIS support for IDB/GOJ Water Resources Development Master Plan – (1) Vectorize and Analyse population Data by Enumeration District (2) GIS Analysis of Landuse (3) GIS Analysis of Irrigation Data
- Produce hydrologic maps to the general public
- Provide GIS support for hurricane Ivan
- Created Metadata for WRA Spatial Dataset
- Developed WRA Map Standards

Assistance to External Agencies

The unit assisted several agencies, both public and private, through the provision of map scanning and other GIS and cartographic services. These include:

- Provided GIS Assistance to Highway 2000
- Flood plain mapping of Rio Minho Areas – involved 3D modeling and integrating ArcView (GIS) and Hec-Ras (hydraulic) software to produce 10, 25, 50 and 100-year flood boundaries
- Produce landuse map for the Rio Minho flood Plain Area – IKONOS Image Classification, Interpretation, and Vectorization
- National Environment and Planning Agency
- Planning Institute of Jamaica
- National Water Commission
- National Irrigation Commission
- Urban Development commission
- Ministry of transport and Works
- Office of Disaster Preparedness and Emergency Management
- Forestry Department

- Mines & Geology Division
- Jamaica Bauxite Institute
- University of The West Indies
- University of Technology

In providing assistance to tertiary students and other external agencies the unit scanned over 150 maps, drawings and photographs.

The unit participated in GIS Day activities hosted by the Land Information Council of Jamaica (LICJ).

This year GIS Day was held on the 17th November 2004.

The GIS Specialist delivered a presentation on “**Use of GIS, GPS and Remote Sensing Technologies in Flood Damage Assessment – Hurricane Ivan Scenario.**” At the presentation segment of the GIS day activities.

Projections (April 1, 2005 – March 31, 2006)

The unit is projecting that for the next financial year the following will be accomplished:

- To further enhance the capabilities of the WRAMIS in particular the printing, website and network access.
- To develop database driven web site, and increase the number of visit to the web site.
- Facilitate greater use of GIS processes and tools in Water Resources Management by technical staff.
- Acquire updates to existing software to improve data analysis
- Continue the design and development of GIS applications for water resources management
- Provide on-going GIS and Computer training to technical and professional staff
- Acquire GIS and Image Processing software modules for WRA digital dataset

PERMITS AND LICENCES UNIT

The Permits and Licences Unit continues to play its part in the management of the islands water resources through the processing of permits to drill wells and licences to abstract and use water. Of the forty-three [43] applications received to abstract and use water, twenty-one [21] were for the regularization of existing sources; eighteen [18] of these were received from the National Water Commission for a number of major surface water abstraction systems islandwide. The high percentage [48.8%] of applications submitted for regularization of sources underlines the Authority's thrust towards having all abstractors (both government and private) operating in compliance with the Water Resources Act (1995).

A number of core functions have continued unabated despite the shortage of staff for the Unit. The well lists (lists of wells, well owners and well status) and database of well records have been 100% completed. These are currently updated as new information is supplied to the Authority or generated from field and in-house investigations. The collection and computerization of monthly abstraction data and update of the licence register is an on-going process. The licence register is a public document.

The Unit continued to provide advice on, and conduct monitoring of, well drilling activities and yield testing of five [5] wells for the public and private sector, as well as conduct technical investigations for private and governmental organizations.



Water level monitoring during testing of St. Jago #2 well, Clarendon



Water quality sampling during testing of St. Jago #2 well, Clarendon

The Permits and Licences Unit operates the down-the-hole video camera, a diagnostic tool used to evaluate the condition of wells and recommend measures for rehabilitation in support of well applications. The camera was in operation for 10 out of 12 months of the financial year, logging a total of thirty-three [33] wells, more than twice the number logged in the previous year. The unit logged 1,021 metres [3,350 feet] of well for the National Water Commission under the

Kingston Metropolitan Area Water Supply Project; this amounted to a total of 15 wells. An additional 820 metres [2,692 feet] of well was inspected for ten [10] public sector entities and seven [7] private sector organizations and individuals. The Authority also logged its Hartlands Expl. #1 well, a key groundwater level and water quality monitoring point, to a depth of 27 metres in order to determine its status after being damaged due to Highway 2000 construction. The deepest well logged was 162 metres located at Bog Walk, St. Catherine within the Rio Cobre basin, while the shallowest was 11 metres located near Wallywash Great Pond, St. Elizabeth in the Black River basin. The logging of these sixteen [16] wells earned J\$0.47 million to date, with J\$0.31 million in outstanding payments. It should be noted that a number of wells were inspected more than once as a result of turbidity problems and blockage.

The execution of the abovementioned tasks will continue into the next year.

RESOURCE MANAGEMENT / DATA COLLECTION UNIT

The objective of the Data Collection and Resource Management Unit is to provide timely and accurate hydrological data to guide decisions with regard to the allocation, conservation and protection of the island's water resources as well as to mitigate the impact of flood disasters and drought conditions. The primary responsibilities of the Unit are as follows:

- a) To collect, analyze, compile, store and disseminate hydrological data
- b) To monitor the status of the island's surface and groundwater resources
- c) To update and maintain an accurate and reliable hydrological database
- d) To maintain the national hydrometric network
- e) To monitor and report on extreme hydrological events such as floods and droughts

The Unit was involved in the following activities during the financial year 2004/2005:

- The Routine monitoring of surface and groundwater under normal and extreme conditions
- The Maintenance, rehabilitation, upgrade and expansion of the national hydrometric network
- Preparation of the 1999 hydrological yearbook
- Investigations of long-term trends in hydrological data
- Improved licensing and control of water resources
- Response to requests for data and technical assistance
- Response to requests for technical training and educational support
- Strengthening technical capabilities through subject-specific training
- Participation in local/international seminars/workshops/conferences
- Celebration of special water/environment days
- Rio Minho River Floodplain Mapping and Flood Warning Projects.
- Update of the Water Resources Development Master Plan.
- A regional pilot project 'Adapting to Climate Change in the Caribbean – Water and Climate Change'

Routine Monitoring of Surface and Ground Water under Average and Extreme Conditions

The WRA, through its Data and Resource Management Unit, monitors the island's surface and groundwater resources with monthly visits to each monitoring point (stream gauging stations and monitoring wells) under both normal and extreme conditions. During extreme hydrological conditions, the frequency of monitoring may be increased to capture data for the analysis of the hydrological event and to advise the government and the general public as to the status of the event. In addition to the monitoring of the surface and groundwater resources, the WRA monitors nine (9) rainfall stations and five (5) Flood Warning Systems across the island. The island is divided into three monitoring areas, as depicted in Table (a), with each area, except for Area 2, having a team of four technicians that collects and compile hydrological data. Area 2 operated with only three technicians.

In relation to the monitoring of surface water (collection of stream flow data) including the monitoring of Flood Warning Systems, the Unit was assisted by fifty four (54) local observers across the island.

Table (a) Monitoring Areas and Hydrometric Network

Monitoring Areas	Parishes	Stream Flow Gauging Stations (+ Spot Measurements)	Groundwater Monitoring Wells	Rainfall Gauges	Flood Warning Systems
Area 1	St. Catherine, Clarendon, St. Ann Manchester	24 (+7)	136	4	1
Area 2	St. Elizabeth, Westmoreland, Hanover, St. James, Trelawny	28 (+3)	74	Nil	Nil
Area 3	St. Thomas, St. Ann, Kingston & St. Andrew, St. Mary, Portland	31 (+22)	53	5	4
	JAMAICA	83 (+32)	263	9	5

The routine monitoring of surface and groundwater resources in the 2004/2005 financial year was reduced to once every two months from the normal monthly monitoring due to government

budgetary constraints. Because of this scaling down of the monitoring programme, a maximum 50% of the projected number of visits to the monitoring stations (stream gauging stations and monitoring wells) was possible. As such, the performance of the Unit, as it relates to the routine data collection and programme, fell below its performance targets of 75% visits to the surface and groundwater monitoring stations set at the beginning of the year. Considering the reduction in the monitoring programme as stated above, the performance of the Unit was satisfactory in the monitoring of the surface water resources but was less than satisfactory in the monitoring of groundwater resources for the financial year 2004/2005. Table (b) shows the Unit's performance in the collection, analysis and compilation of hydrological data in the 2004/2005 financial year

Table (b) Unit's performance in the collection of hydrological data

Activity	Performance Standard	Area 1	Area 2	Area 3	Data Unit
Stream flows					
Monthly flow measurements	75% completion	50%	36%	47%	45%
Medium/high flow measurements		0	20	0	20
Gauge height of zero flow	3 per unstable control/year	0%	0%	0%	0%
Gauge height reviews	3 per manual gauge/year	33%	67%	100%	67%
Gauge height charts and cards	75% completion	25%	53%	24%	34%
Annual pages	75% completion	75%	97%	57%	76%
Computerization		No record	45%	No record	>45%
Groundwater levels					
Monthly water level measurements	75% completion	46%	31%	35%	37%
Water level folders	75% completion	100%	100%	100%	100%
Computerization		100%	100%	100%	100%

With regards to the monitoring of the surface water resources, the performance of the Unit in Areas 1 and 3 were particularly high with Area 1 achieving the maximum possible 50% visits to its stream gauging stations while the Area 3 performance was 47%. The low performance of Area 2 with only 36% visits to its stream gauging stations was due to the fact that Area 2 constitutes the western part of the island and was more costly to monitor which resulted in more of their fieldtrips being cancelled. The processing of gauge height charts and cards far exceeded the performance standard in Area 2 but fell below performance standards in Areas 1 and 3 resulting in a low overall performance for the Unit. The completion of annual pages of daily

stream flows was very high in Area 2 at 97% completion but fell well below standard in Area 3 at 57% completion. Overall, the Unit's performance met performance standard at 76% completion. No gauge height of zero flow was done over the 2004/2005 financial year, which is a weakness in the Unit's quality assurance via gauge height of zero flow. This weakness in the Unit's quality assurance has continued from the previous financial year and needs to be addressed.

With regards to the monitoring of groundwater resources, the overall performance of the Unit at 37% was unsatisfactory. This unsatisfactory performance was due to the low performances in Areas 2 and 3 at 31% and 35% respectively. The low performance of Area 2 was again due to the cancellation of field trips due to financial constraints as discussed above while the low performance of Area 3 was due to various factors such as the lack of access to the well sites as a result of blocked roads, flooding etc. The performance of Area 1 was satisfactory at 46%. The processing and computerization of monthly groundwater level measurements were well above the performance standards with a 100% completion record.

Monitoring of the Rio Cobre Flood Warning System resulted in two warnings that led to two closures of the Bog Walk Gorge following rainfall in November and December 2004. Hurricane Ivan damaged the infrastructure of the Flood Warning System at Bog Walk in September 2004, which was subsequently repaired. Problems of compatibility between a new shaft encoder and old transmitting equipment, which arose after the construction of a new stream flow gauging station on the Rio Cobre at Bog Walk, were resolved. Daily rainfall totals were supplied to CVM TV for broadcast on 351 days.

With regard to the Rio Grande Flood Warning System, the two rain gauges performed satisfactorily, however, one was decommissioned for repairs in the latter part of the financial year. Problems with the water level loggers were unresolved as the inadequacy in the design of the infrastructure that house the loggers were not corrected. There were no major problems with the other Flood Warning Systems at Cave River and Pedro River in St. Ann and Annotto Bay in St. Mary.

Staffing problems have continued to affect the Data and Resource Management Unit. The Head of the Unit resigned in February 2005 and Mr. Lawrence Barrett, Engineering Hydrologist from the Planning and Investigation Unit, has been acting in that position since March 2005. Area 2 continued to operate with only three technicians as mentioned earlier. Study leave was also granted to one technician, on a part-time basis, to read for a Bachelor of Science (BSc.) Degree in Geology at the University of the West Indies (UWI).

Requests for Technical Training and Educational Support

The unit received and responded to more than 27 requests for data, information, and technical assistance twelve of which were from government Agencies and 15 from other sectors including the private sector, NGOs, schools etc. The number of request received and responded to between

October 2004 and January 2005 is not included because of the unavailability of the record of those requests. Details of the requests are presented in Table (c)

Table (c) Requests for data, information and technical assistance

Organization	Type of request	Description of work
National Irrigation Commission	Technical Services	Measurements of inflow to St. Catherine and Clarendon irrigation schemes
Mr. R. Harry Carey, Consultant	Data/Information	Records/lithological logs for 55 NIC wells island wide
National Water Commission KMA Water Supply & Rehabilitation Project	Technical Services	Blanket water sampling in St. Catherine
National Water Commission KMA Water Supply & Rehabilitation Project	Technical Services	Telelogging of one well in St. Catherine
National Water Commission KMA Water Supply & Rehabilitation Project	Technical Services	Telelogging of one well in St. Catherine
Miss Smallings Social Development Commission	Data/Information	Storm hydrographs for the Montego River in St. James and the Martha Brae River in Trelawny
Postgraduate student, U.W.I.	Technical Services	Well reconnaissance for water sampling in Kingston & St. Andrew
Carlton Baxter, Mines & Geology SEBRA Project	Data/Information	Stream flow data for Rio Minho in Clarendon and Yallahs River in St. Thomas, photocopy of a report on water quality analysis of the Hope River in St. Andrew
Keren Monroe & Sylvester Chastenet St. Lucian Water Resources Management Unit	Technical Services	One week training in hydrological data collection, computation, storage and analysis
Ministry of Local Government	Data/Information	Hydrostratigraphic map with wells in southwest St. Andrew
Chloe Hosang Friends of the Sea	Data/Information	Well records/lithologies; stream flow, groundwater level, abstraction and water quality data for the White River watershed in St. Ann
Mr. Nagee Mines & Geology	Data/Information	Locations and records/lithological logs of wells in the Rio Minho watershed, Clarendon

Organization	Type of request	Description of work
Mr. Craig Foreman U.W.I. Postgraduate Student	Data/Information	Well list, well records/lithologies, groundwater level, abstraction and water quality data for the Cabarita River basin (Westmoreland)
Mr. Ricardo Smalling U.W.I. Postgraduate Student	Data/Information	Well records/lithologies, groundwater levels, maps of the major roadways and hydrostratigraphy for Kingston & St. Andrew
Mr. Philip Warner Smith Warner International	Data/Information	Location maps, records/lithologies for selected wells island wide
Mr. Paul Wilson Advanced Farm Technologies Ja. Ltd.	Data/Information	Records/lithologies, groundwater level and water quality data for the Tilston wells in Trelawny
Mr. Eugene Folkes	Data/Information	Hydrostratigraphic map and explanatory notes; well records/lithology; stream flow, groundwater level, abstraction and water quality data for Trelawny
Ministry of Water & Housing Gender Mainstreaming project	Technical Services	Attended meeting and reviewed and prepared comments on project documents
Office of Disaster Preparedness & Emergency Management	Technical Committee	Attended meeting of the Drought Management Committee
Ms. Tashane Boothe – Student, Glen Muir High School	Data/Information	(1) Rainfall over 4 days during a flood, (2) Average cross-sectional area and location of the Rio Minho (3) frequency of flooding, (4) flood mitigation measures
National Environment & Planning Agency (NEPA)	Data/Information	(1) Daily flow data for Rio Cobre (above Dam Head) and (2) Duhaney River.
Mr. Stephen Hanna – Student, UTECH	Data/Information	(1) Velocity of Flow, (2) variation in Water levels and (3) Water Quality of Rio Cobre at Flat Bridge
Environmental Solutions Ltd (ESL)	Data/Information	Intensity Duration Frequency (IDF) Curves for rainfall at Soapberry for the 5, 15, 50 and 100yr rainfall in order to compute drainage capacity for the area.
Mr. Edwardo Planos – Cuba	Data/Information	Long-term stream flow data on the Rio Cobre River
Forestry Department	Data/Information	Report on the Effect of Deforestation on Runoff in the Swift River Watershed
Jamaica Public Service Company Ltd (JPS)	Data/Information	Monthly stream flow data at Hydro stations at Maggoty/Black River, Rio Bueno, Roaring River, Upper and Lower White River.

Rehabilitation, Upgrade and Expansion of the National Hydrological Network

The rehabilitation and expansion of the national hydrometric network did not receive funding under the Capital Budget in 2004/2005 however minor repairs were done on five (5) stream gauging stations from the recurrent budget.

Publication of Hydrological Yearbooks

Progress on the 1999 and 2000 hydrological yearbooks in the past financial year was limited by staff availability and a focus on higher priority tasks.

Investigation of Long-term Trends in Hydrological Data

Progress on the Investigation of Long-Term Trends in Hydrological Data during the past financial year was also limited by staff availability and a focus on higher priority tasks.

Requests for Technical Training and Educational Support

Table (d) lists the requests for technical training and educational support responded to by the Unit in 2004/2005.

Table (d)
Requests for technical training and educational support

Organisation	Nature of request	Description of work
Caribbean Institute for Meteorology and Hydrology (CIMH)	Technical training	Practical experience for two (2) CIMH students in streamflow measurement and computation of streamflow data to satisfy the CIMH curriculum for students participating in the General Technician's Course in Hydrology and Meteorology.

Strengthen Technical Capabilities through Subject-Specific Training

The strengthening of technical capabilities through subject-specific training was very limited in the 2004/2005 financial year due to budgetary constraints. The enrolment of a technician in the six-months General Technician's Course in Hydrology and Meteorology at the Caribbean Institute for Meteorology and Hydrology (CIMH) in Barbados was not possible due to lack of funding.

Participation in Local/International Seminars/Workshops/Conferences

Participation in local/international seminars/workshops/conferences was also very limited in the 2004/2005 financial year. One officer, a Senior Assistant Hydrologist, attended the National Disaster Management Conference that was organized by the Office of Disaster Preparedness & Emergency Management (ODPEM).

Celebration of Special Water/Environment Days

The Unit participated in the following events:

- Green Expo'
- World Water Day
- World Meteorological Day Expo

PLANNING AND INVESTIGATION UNIT

The Planning and Investigation Unit functions in the discharge of the Authorities mandate to guide the assessment, management and development of the island's water resources. In this regard the unit had responsibilities in the following areas;

- Capital Projects
- Hydrological Assessments
- Technical Assistance/ Technical Support
- Data Provision

Capital and Special Projects

The Capital and special projects that the unit was involved in 2004 - 2005 were;

- Investigation into declining production at wells (Dry Harbour Mountain /Martha Brae Basins).
- Rio Minho River Floodplain Mapping Project.
- Update of the Water Resources Development Master Plan.
- Aquifer Vulnerability Mapping (Island Hydrostratigraphic mapping).
- Evaluation of Saltwater Intrusion into Coastal Karstic Aquifers on Caribbean Islands.
- Vulnerability Reduction for the Rio Grande Valley in Portland, Jamaica.
- Characterization of Groundwater in the Vicinity of Bauxite/Alumina Plants for the Optimal Use of Water Resources

The project which seeks to investigate the declining production at wells in Dry Harbour Mountains/Martha Brae Basins has been put on hold as a result of the reassignment of the staff members who were assigned to this project. It is expected that a final report will be drafted and this should be ready during the third quarter of the 2006-2007 fiscal year.

The project output of the Rio Minho Floodplain Mapping is the development of the 5, 10, 25, 50, and 100-year return period floods for the Rio Minho River from May Pen to the sea to guide development and planning. The HEC-RAS Model is the software that is used to generate the water surface profiles. This model is being calibrated and the economic and flood damage assessment is currently being done.

Brace Centre for Water Resources Management was awarded the contract to update the Water Resources Master Plan. The project is slated to last for 24 months. Under the period under review a workshop was held on April 27, 2004, which presented the background, approach, draft table of contents and progress report on the Water Resources Development Master Plan.

The first draft of the Master plan was presented to the WRA. The document was reviewed and the comments and recommendations were sent to the Consultants.

The Aquifer Vulnerability mapping for the island has been put on hold and no additional work has been done during the period under review. 12 map sheets of the island hydrostratigraphy at a scale of 1:50,000 have been completed to date.

The Evaluation of saltwater intrusion into coastal karstic aquifers is a regional project, which seeks to model the situation that exists in the limestone aquifers in Jamaica, Antigua and Barbados. Based on this modelling exercise a management plan with operational strategies to contain the problem of salt-water intrusion into these aquifers is to be developed. A critical part of the project is technology transfer and training. One staff member from each participating country is to read for a postgraduate degree using data generated from the project as the basis for the thesis. In the case of Jamaica one member of the WRA staff will read for the MPhil degree.

Data collection at the pilot site has been ongoing over the period and the compilation and interpretation of water quality and water level data collected is currently being done.

The member of staff was registered into the second year of the Mphil programme at UWI- Mona. A draft of some chapters of the MPhil thesis was submitted and has been reviewed by the thesis supervisor.

The WRA staff assigned to the project participated in several training courses such as:

- Geophysical surveys in Antigua from April 1- 17, 2004.
- Technical exchange programme at SWRI, Texas from April 25- May 9, 2004 where the preliminary data interpretation report on the geophysical survey conducted in Jamaica was produced.
- HYDRUS groundwater and contaminant transport course at UWI, Cave Hill Campus, Barbados.

Water quality equipment such as data loggers, meters, computer software and hardware were procured for use under the project.



Staff Undergoing Training in Water Quality Sampling Techniques in support of the “Evaluation of Saltwater Intrusion into Coastal Aquifers” Project.

The Characterization of Groundwater in the Vicinity of Bauxite/Alumina Plants for the Optimal Use of Water Resources is a collaborative Government of Jamaica (GOJ) and International Atomic Energy Agency (IAEA) approved project that seeks to characterize the source of contamination in the groundwater using isotope hydrology. The use of isotope techniques will facilitate the understanding of the hydrodynamics of the aquifer system and determination of salinity from various sources.

Under this project the first sampling session at JAMALCO-Halse Hall, Clarendon was conducted over the period February 28, 2005 to April 1, 2005. The area sampled extends from Curatoe Hill in the North to Raymonds in the South. (Fig. 1). The wells in the southern area have been contaminated by the intrusion of saltwater along the south coastal fault. The analysis for stable isotopes will determine the source of the recharge to the aquifer and the contribution seawater and possibly caustic enriched water makes to the aquifer. The results will enable the determination and development of strategies and policies to reduce contamination of water resources while optimizing the use of groundwater.

The WRA was assisted in the sampling programme by the staff at JAMALCO and the Scientific Research Council (SRC). The 24 sample points sampled consist of 21 wells, 1 river and 2

surface effluent ponds. At each point, parameters such as the Temperature, pH, EC, DO and Alkalinity were measured. In addition the colour and odour of the water were noted. Water samples were collected at each point and submitted to the IAEA laboratory in Austria for analysis.

The WRA was the recipient of several pieces of scientific equipment from the IAEA. The equipment includes meters, hand-operated vacuum/pressure pump, water quality photometer and test kits, water level probes, data loggers, a submersible pump set and computer software. This equipment was used in the sampling of the wells in the vicinity of the JAMALCO Plant at Halse Hall and facilitated the collection of water samples at each sample point and enabled the field measurement of several parameters, such as EC, pH and Alkalinity.

A Memorandum of Understanding (MOU) was signed between the Scientific Research Council and the WRA for collaboration on the project. The SRC would perform the chemical analyses of the samples collected while the WRA would provide, through the IAEA, laboratory equipment from the project funds. This will result in the reduced shipping costs for samples to the IAEA Laboratory in Vienna, Austria for analyses.

One staff member was trained in Isotope Hydrology in Austria. The training programme is a joint effort between the International Atomic Energy Agency (IAEA) Isotope Hydrology Section and the Joanneum Research. Training has resulted in a better understanding of the principles, applications and interpretation of isotope hydrology. Staff members assigned to the project have benefited from the transfer of knowledge.





Data loggers, Submersible Pump Set, Water level Probes, Water Purification System, Water Quality Meters, Water Analysis Photometer and Test kits received from the IAEA.

The unit conducted several hydrological assessments on behalf of the Authority. These requests were primarily from the private and public sectors where assessments were made on the water development potential of sites and the evaluation of existing surface and groundwater sources. Over the year a total of 20 such assessments were conducted with the input time lasting up to six months in some cases.

Technical Assistance/ Technical Support

The Unit offered Technical Assistance/Technical Support to several government and private sector agencies in support of national development. In some instances long-term support was required from the WRA staff. One such instance the assistance offered to the Jamaica Social Investment Fund (JSIF) projects, where potential domestic water supply sources were assessed, over periods sometimes in excess of 3 months. These community based projects are a collaborative effort where good water governance is practiced and communities across the island are assisted in the identification, development, operation and maintenance of their own water supply systems.

During the passage of Hurricanes Ivan and Charley the unit worked with the Office of Disaster Preparedness and Emergency Management (ODPEM) and several communities in the parishes of

Trelawny, St. Elizabeth and Manchester in response to reported cases of flooding and upwelling of water. A Hydrological and Damage Assessment report was prepared.

On going technical support 2004/2005

- KMA Water Supply Project-providing technical assistance in the field, reviewing reports on the hydrogeology and telelogging of wells. The WRA is also represented on the Project Steering Committee.
- Development of a National Minerals Policy-providing technical input into the policy and reviewing drafts of policy document.
- Coastal Erosion Assessment.

Technical Assistance 2004/2005

Organization	Nature of Task/Request	Description of Task/Request
CECL	Technical Assistance	Conducted Assessment at Warwick Castle and Silver Spring, St. Mary.
JPSCo. Ltd	Technical Assistance	Evaluated suitability of well sites at Hunts Bay- St. Andrew.
JPSCo. Ltd	Technical Assistance	Supervision of well testing at Colbeck- St. Catherine.
JAMALCO	Technical Assistance	Hydrological assessment of South Manchester
NHT	Technical Assistance	Provided assistance in the evaluation of wells to supply a proposed housing development at Anchovy, St. James.
JSIF	Technical Assistance	Conducted Assessment at 6 potential water sources at of St. Thomas, St. Ann, Westmoreland, Portland and St. Catherine.
TNC	Technical Assistance	Hydrological assessment of the Cockpit Country
NWC/ KMA Project	Technical Assistance	Provide hydrogeological support and data for KMA water supply project.
NWC	Technical Assistance	Supervision of well construction and testing at Granville, St.James.
NWC	Technical Assistance	Supervision of well testing Cookson well – St. Catherine.
Ministry of Water and Housing	Technical Assistance	Hydrogeological evaluation of water resources in St. Elizabeth and Manchester
Highway 200	Technical Assistance	Provision of Water Quality and Water Supply in St.Catherine and Clarendon.

Organization	Nature of Task/Request	Description of Task/Request
UWI	Technical Assistance	Assisted in Geophysical Field work in Yallahs , St. Thomas
Agricultural Support Services Project	Technical Assistance	Conducted Investigation into the assessment of a well on Stanton Estates- St. Thomas.
UDC	Technical Assistance	Hydrological assessment of Mt. Edgecombe, Westmoreland
ODPEM	Technical Assistance	Investigation of Flooding in Crooked River, St. Mary
Ministry of Land and Environment	Technical Assistance	Review of the National Land/Agricultural Policy
Manchester Parish Development Committee	Technical Assistance	Conducted hydrological assessment of several sites in South Manchester.

Data Provision

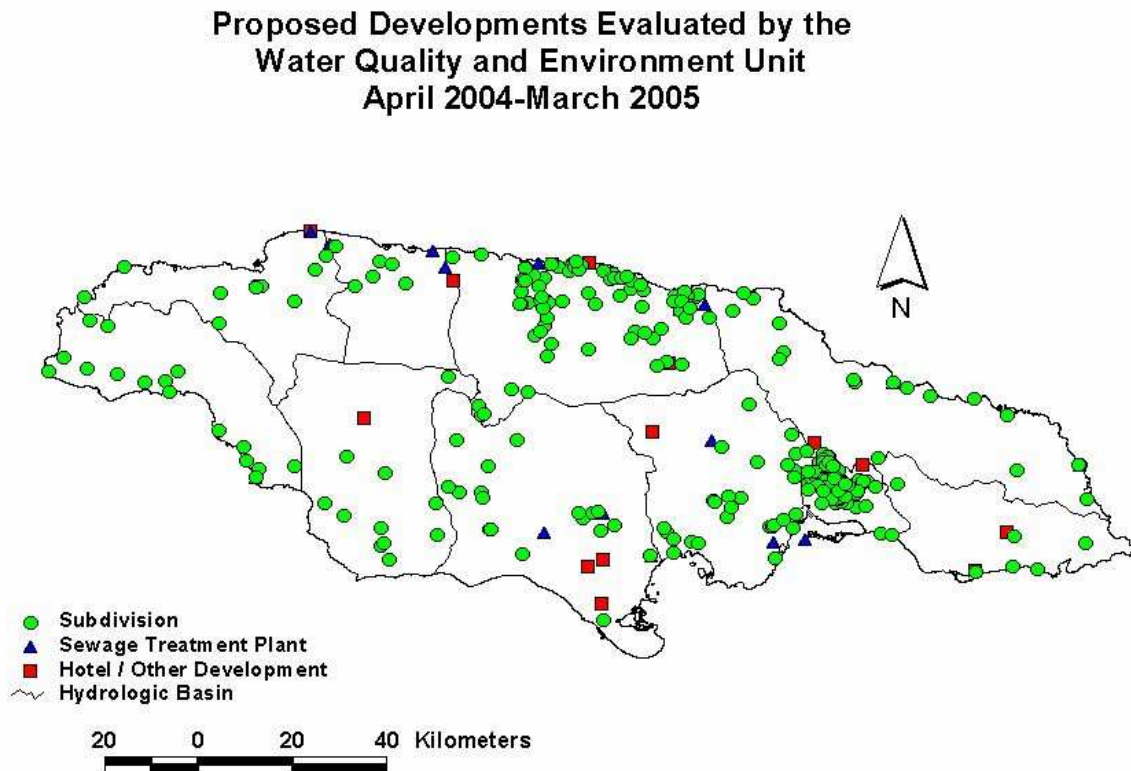
The unit provided hydrologic data to a number of agencies and students. Many data requests were dealt with via telephone or Internet. The table below summarises the data made available:

Organisation	Request
Hydrology Consultants Ltd.	Provided water level data for South St. Catherine
Hood- Daniel Well Company Ltd	Provided data on wells located in the vicinity of Sandy Bay, Clarendon and Santa Cruz, St. Elizabeth
Private	Provided data for the assessment of a site for well development at Webbers Valley, Westmoreland.
Private	Provided data for the assessment of a site for well development at Ballards Valley, St. Elizabeth.
UWI Student	Provided data on Water Resources Management
UTECH Student	Provided data on the geology and hydrology of Mavis Bank- St. Andrew
UWI Student	Compile hydrogeological and geological data on the Rio Minho Basin.
UTECH Student	Provided data on pollution and hydrologic basins

WATER QUALITY AND ENVIRONMENT UNIT

The work of the Unit continued to focus on evaluating the potential impact (on surface and groundwater quality) of a number of major developments including several large and intensive resort complexes, a large sewage treatment facility proposed to serve Kingston and St Andrew, wastewater management systems for five rum distilleries and approximately 300 housing subdivision applications. See Figure 1. *Proposed Developments Evaluated By Water Quality and Environment Unit (April 2004-March 2005)*

Figure 1.



The absence of financial resources to support strategic water quality assessments, has limited the data support for our recommendations. In one case, the impact of wastewater from the sugar/rum

industry could only be confirmed with data dating back to the 1960's, giving our requirement for treatment of the wastewater in 2005, less than adequate support.

The Unit continues to provide technical support to a number of Parish Councils as they routinely request our recommendations on the selection of appropriate sewage treatment systems for subdivision applications and other developments.

The Unit was active in providing technical assistance to the Ridge To Reef Project in Rio Grande, as staff led the process of designing a water quality monitoring programme i.e. Establishing the monitoring network, selecting the parameters to be tested and determining the frequency of sampling. The unit also assisted with the collection of water samples.

The critical need to have current and continuous water quality data on both surface and groundwater, has led the Unit to develop a strategy in collaboration with the Permit and Licensing Unit to have licensed abstractors conduct quality assessments of the licensed sources. The Unit will be working with the Permit and Licensing Unit to inform abstractors of this requirement and collect this water quality data.

In the continuous effort to support the education sector, the Unit was involved with supervising the preparation of research papers of three final year students from University of Technology. During the year several students were assisted with information for school based assignments and projects, and several lectures /presentations were delivered, including one to the Pre-clinical Medical Programme at the University of the West Indies, Mona.

No special water quality projects could be undertaken, since no funds were allocated to water quality related projects this year.

WATER RESOURCES REVIEW

Water Quality

The Authority continues to work closely with other government regulatory agencies such as the Ministry of Health, NEPA and the Jamaica Bauxite Institute to improve water resources quality across the island and reduce the risk to health. This collaborative effort has led to improvements in water quality with a reduction in contamination from industrial effluents. There is still however cause for concern as the public education programme to sensitise persons that water is a finite resource and is easily polluted while achieving success still has a far way to go.

The main sources of water pollution are:

- Saline intrusion caused from over pumping of the coastal karstic limestone aquifers. This has primarily affected the south coastal areas of St. Catherine and Clarendon and results from the pre-1961 lack of control on groundwater abstraction. The studies to date have indicated that the reduction in abstraction brought on by the high energy cost of pumping coupled with the above average rainfall over the past 2 years has led to an improvement in water quality. The implementation of artificial recharge to the aquifers using wet season flow could significantly further reduce the salinity levels within the groundwater. The KMA Water Supply Project will have an artificial recharge component that will ensure reliability in terms of both quantity and quality.
- Industrial effluent from the bauxite/alumina industry, the sugar/rum industry and agro-processing centres. The work of the WRA and the JBI with the bauxite/alumina companies has led to improvements in water quality and the contamination plumes associated with the red mud disposal sites have been reduced. The sugar/rum industry has demonstrated a great reluctance in investing in the technology that can lead to improved waste treatment and disposal. Instead they would prefer to utilize the waste for irrigation in areas where the soil and rainfall is not favourable resulting in an increase of area contaminated. One distillery has identified and will implement a system that will reduce contamination of water resources. The WRA is working with the distillery and hopes that others will utilize the technology to improve environmental management of their waste product. Some improvement has been noted in the discharge from agro-processing plants especially the new ones that have to meet the NEPA effluent standards. However the older plants continue to discharge waste into river systems that contaminate both ground and surface waters. The Rio Cobre River is one such system that continues to show a degradation of water quality.
- Sewage effluent from poorly constructed and maintained treatment plants. There is large number of housing developments all with small mechanical treatment plants that don't work effectively. In many instances while the design indicate that the plant will meet the NEPA discharge standards the actual operations indicate that the enforcement of standards to ensure the plants are constructed to design is woefully lacking. Most of

these systems discharge into gullies that have limestone exposed with the result that rapid infiltration to the groundwater takes place. It is most critical that the relevant Ministries address these issues. The WRA, along with the Central Health Committee of the Ministry of Health, is developing a Sanitation Policy and Guidelines for the handling of Septage (collected primarily from Cesspool Operators). The implementation of these guidelines and the policy framework will go a far way in reducing the incidents of contamination of our rivers, streams and coastal waters from inappropriate waste disposal practices. The Authority continues its efforts to protect Jamaica's ground and surface water quality through the selection of appropriate sewage treatment systems. The increasing number of onsite sewage systems and private sewage treatment plants for hotels and housing complexes, present a challenge for developers and regulators to work more closely as more stringent requirements are being imposed by the regulators to ensure the cumulative effect of these systems does not compromise water quality. In order to explain the need for more stringent treatment requirements, the Authority has met with developers and the local parish authorities to explain the process and the vulnerability of our water systems at some locations.

- Inappropriate use of agricultural chemicals such as fertilizers and pesticides also may contaminate water resources. There is no definite data that points to this but the database is sparse and irregular. The WRA will be seeking to collaborate with the Pesticide Control Authority (PCA) on the Caribbean Agro-Chemical Management Project (CAMP) that will attempt to describe the fate of agrochemicals in the land-water interface.

Despite the existence of water pollution laws and trade (industrial) standards, there are waste discharges from some industries that continue to flow to the environment contaminating both ground and surface water. The Authority has been working and encouraging these companies to develop effective waste management systems, with varying levels of success.

Although water quality assessments were curtailed significantly this year due to financial constraints, many of the water quality management policies and procedures applied are expected to go a far way in reducing contamination of groundwater and protecting our surface waters.

Significant time and resources were however put into public education and raising public awareness of water quality and pollution issues, particularly through the Project WET programme where a number of practical simulation and demonstration exercises were taught to several schools and adult audiences. It is anticipated that the continued use of these teaching tools will serve to change attitudes and behaviour for better water quality management.

Overall water quality continues to be excellent and except where mans interference has occurred the water is suitable for all purposes. A review of the water resources of the island indicates that less than 10% of the islands water resources have been contaminated to the point where it is restricted in use i.e. not suitable for public supply purposes. However the water is still suitable for agricultural and industrial uses and in many instances have been so allocated to reduce the use by these sectors of high quality domestic water supplied by the NWC.

**WATER RESOURCES AUTHORITY
FINANCIAL STATEMENTS
YEAR ENDED MARCH 31, 2005**

WATER RESOURCES AUTHORITY

FINANCIAL STATEMENTS

YEAR ENDED MARCH 31, 2005


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AUDITOR GENERAL'S REPORT
ON THE FINANCIAL STATEMENTS OF
THE WATER RESOURCES AUTHORITY

I have audited the Balance Sheet of the Water Resources Authority as at March 31, 2005 and the related statements of Income and Cash Flows for the year then ended. These Financial Statements are the responsibility of the Authority's Directors and Management. My responsibility is to express an opinion on these Financial Statements based on my audit.

I conducted my audit in accordance with the auditing standards issued by the International Organization of Supreme Audit Institutions (INTOSAI). Those standards require that I plan and perform the audit to obtain reasonable assurance about whether the Financial Statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the Financial Statements. An audit also includes assessing the accounting principles used and significant estimates made by management as well as, evaluating the overall Financial Statements presentation. I believe that my audit provides a reasonable basis for my opinion.

In my opinion, proper accounting records have been kept and the Financial Statements mentioned above which are in agreement therewith give a true and fair view of the financial position of the Water Resources Authority as at March 31, 2005 and of the results of its operations and cash flows for the year then ended in accordance with Generally Accepted Accounting Standards and comply with the provisions of Section 11(1) of the Water Resources Act 1995.


Auditor General
11/4/2006

STATEMENT II

WATER RESOURCES AUTHORITY

Income Statement

YEAR ENDED MARCH 31, 2005

	NOTE	2005 \$	2004 \$
Subventions	(2e)	68,297,861	86,856,151
Other operating income	(13)	3,638,288	3,269,683
		<u>71,936,149</u>	<u>90,125,834</u>
Administrative and other expenses		(72,886,296)	(95,085,326)
		<u>(950,147)</u>	<u>(4,959,492)</u>
Operating Deficit for the Year		<u>(950,147)</u>	<u>(4,959,492)</u>

The attached notes on Statement IV form an integral part of these financial statements.

STATEMENT III
WATER RESOURCES AUTHORITY
Statement of Cash Flows
YEAR ENDED MARCH 31, 2005

	2005	2004
	\$	\$
Cash flows from operating activities:		
Operating (deficit)/surplus for the year	(950,147)	(4,959,492)
Prior year adjustment	168,017	-
	<u>(782,130)</u>	<u>(4,959,492)</u>
Adjustments to reconcile operating (deficit)/surplus for year to net cash provided by operating activities:		
Depreciation	1,667,842	1,127,715
Depreciation transferred from capital grant	(499,731)	(520,472)
	<u>385,981</u>	<u>(4,352,249)</u>
Increase/(decrease) in current assets:		
Receivables	(213,195)	1,161,966
Prepayments	58,016	(8,390)
Short-term Investment	(237,016)	(246,922)
Increase in current liabilities		
Payables and accruals	<u>5,277,367</u>	<u>296,415</u>
Net cash (used in)/provided by operations	<u>5,271,153</u>	<u>(3,149,180)</u>
Cash flows from investing activities:		
Purchase of property, plant and equipment	(3,411,570)	(458,107)
Refund on returned fixed assets	-	153,867
	<u>(3,411,570)</u>	<u>(304,240)</u>
Net Cash Used in Investing Activities	<u>(3,411,570)</u>	<u>(304,240)</u>
Cash flows from financing activities:		
Increase/(decrease) in capital projects subventions	1,320,355	(1,219,116)
Decrease/(increase) in other projects fund	(66,971)	259,807
	<u>1,253,384</u>	<u>(959,309)</u>
Net cash provided by/(used in) financing activities	<u>1,253,384</u>	<u>(959,309)</u>
Net (decrease)/increase in cash and cash equivalents	<u>3,112,967</u>	<u>(4,412,729)</u>
Cash and cash equivalent at beginning of year	<u>7,121,816</u>	<u>11,534,545</u>
Cash and cash equivalent at end of year	<u>10,234,783</u>	<u>7,121,816</u>

The attached notes on Statement IV form an integral part of these financial statements.

STATEMENT IV**WATER RESOURCES AUTHORITY****Notes to Financial Statements****YEAR ENDED MARCH 31, 2005****1. IDENTIFICATION AND FUNDING**

The Water Resources Authority was established under the Water Resources Act of 1995. The Act became effective as of April 7, 1996.

Water Resources Authority assumed the operations of the Underground Water Authority. The Underground Water Authority was established in April 1962 pursuant to the Underground Water Control Act (1959). Its main objectives were to promote the conservation and proper use of underground water resources and to control the exploitation of such water resources.

Until April 1, 1985, the work of the Authority was carried out by the Water Resources Division of the Ministry of Public Utilities and Transport, which was then integrated into the Authority. These financial statements do not reflect some fixed assets of the Water Resources Division, which are now being used by the Authority. No official transfer of these assets was executed at balance sheet date.

In July 1985 the functions and duties of the Authority were transferred from the Ministry of Public Utilities and Transport to the Ministry of Agriculture. However, in 1989, the Ministry of Public Utilities and Transport again assumed responsibility for the Authority and provided it with funding by way of subventions.

Except where otherwise stated, these financial statements are expressed in Jamaican Dollars.

2. ACCOUNTING POLICIES**(a) Accounting Convention**

These financial statements have been prepared under the historical cost convention.

(b) Basis of Preparation

These financial statements have been prepared under the accrual basis of accounting and in accordance with general accepted accounting principles.

(c) Depreciation

Depreciation is provided on the straight line basis at such rates as will write off the various assets over the period of their expected useful lives. The useful lives approximate to ten (10) years for furniture and fixtures, five (5) years for motor vehicles, forty (40) years for buildings and four (4) years for computer equipment and software. A full year's depreciation is charged in the year of purchase and none in the year of disposal.

STATEMENT IV(Continued)
WATER RESOURCES AUTHORITY
NOTES TO FINANCIAL STATEMENTS
YEAR ENDED MARCH 31, 2005

2. ACCOUNTING POLICY (CONT'D.)

(d) Foreign Currencies:

- (i) Foreign currency balances at balance sheet date have been translated at rates of exchange ruling at that date.
- (ii) Transactions in foreign currencies are converted at the rates of exchange ruling at the dates of those transactions.
- (iii) Gains/losses arising from fluctuations in exchange rates are included in the Income Statement.

(e) Revenue Recognition

The authority is funded by subvention from the Ministry of Water. These funds are recognized on the accrual basis.

(f) Cash and Cash Equivalents

This represents cash in hand and demand deposits.

3. TAXATION

The Authority is not subject to Income Tax.

STATEMENT IV (Continued)
WATER RESOURCES AUTHORITY
NOTES TO FINANCIAL STATEMENTS
YEAR ENDED MARCH 31, 2005

4. PROPERTY, PLANT AND EQUIPMENT COMPRISE:

	Building	Furniture & Fixtures	Computer Software	Computer Hardware	Technical & Scientific Equipment	Motor Vehicles	Total
	\$	\$	\$	\$	\$	\$	\$
At Cost:							
March 31, 2004	5,383,635	5,178,009	2,489,135	7,264,618	1,943,630	3,188,540	25,447,567
Additions	-	478,580	10,540	67,080	92,300	2,855,370	3,503,870
March 31, 2005	<u>5,383,635</u>	<u>5,656,589</u>	<u>2,499,675</u>	<u>7,331,698</u>	<u>2,035,930</u>	<u>6,043,910</u>	<u>28,951,437</u>
Depreciation:							
March 31, 2004	924,212	3,646,870	2,489,134	6,902,763	1,066,864	3,174,098	18,203,941
Charge for the year	134,591	565,659	2,635	175,855	203,593	585,509	1,667,842
March 31, 2005	<u>1,058,803</u>	<u>4,212,529</u>	<u>2,491,769</u>	<u>7,078,618</u>	<u>1,270,457</u>	<u>3,759,607</u>	<u>19,871,783</u>
Net Book Values:							
March 31, 2005	<u>4,324,832</u>	<u>1,444,060</u>	<u>7,906</u>	<u>253,080</u>	<u>765,473</u>	<u>2,284,303</u>	<u>9,079,654</u>
March 31, 2004	<u>4,459,423</u>	<u>1,531,139</u>	<u>1</u>	<u>361,855</u>	<u>876,766</u>	<u>14,442</u>	<u>7,243,626</u>

STATEMENT IV (Continued)
WATER RESOURCES AUTHORITY
NOTES TO FINANCIAL STATEMENTS
YEAR ENDED MARCH 31, 2005

5. RECEIVABLES AND PREPAYMENTS COMPRISE:

	2005	2004
	\$	\$
(i) Receivables:		
(a) Motor Vehicle Repair Loans	236,900	304,527
(b) Computer loan	140,152	60,043
Tax recoverable	96,137	100,380
Interest receivable	303,878	199,070
GCT refundable	185,273	156,846
Other receivables	89,549	89,549
Salary advance	71,720	-
	1,123,609	910,415
(ii) Prepayments:		
Insurance	325,467	422,247
Other	80,066	41,302
	405,533	463,549
(a) Motor Vehicle Repair Loan Comprise:		
Horace Roper	-	8,928
Errol Douglas	35,000	34,467
Clyde Blake	2,303	-
Clive Lobban	3,984	26,574
Francis Murphy	45,000	36,199
Bernard Williams	55,000	31,845
Angella Graham	-	8,872
Donald Hardware	-	11,903
Natalie Ferguson	-	5,174
Michelle Watts	43,750	128,750
Gilmore Fraser	8,708	11,815
Anika Sutherland	33,156	-
Michael Wilson	9,999	-
	236,900	304,527

STATEMENT IV (Continued)
WATER RESOURCES AUTHORITY
NOTES TO FINANCIAL STATEMENTS
YEAR ENDED MARCH 31, 2005

5. RECEIVABLES AND PREPAYMENTS COMPRISE (CONT'D.):

	2005	2004
	\$	\$
(b) Computer Loan Comprise:		
Clyde Blake	25,099	-
Felix Miller	42,210	-
Herbert Thomas	-	15,965
Basil Fernandez	28,332	-
Michelle Watts	8,308	22,553
Gilmore Fraser	-	21,525
Delroy Solomon	29,547	-
Michael Samuels	6,656	-
	140,152	60,043

6. SHORT-TERM INVESTMENT

This represents amounts invested in Government of Jamaica variable rate Locally Registered Stock at an interest rate of 14.75% per annum.

7. CASH AND CASH EQUIVALENTS COMPRISE:

	2005	2004
	\$	\$
Bank of Nova Scotia – Current Account	3,428,921	2,572,884
Bank of Nova Scotia – Savings Accounts:		
Motor Vehicle Repairs Loan Account	1,100,994	925,523
Capital Projects Account	3,580,911	1,948,840
Petty Cash	5,000	5,000
Foreign Currency Savings Account	1,398,532	934,252
Computer Loan – Savings Account	707,273	722,645
TCC Savings	13,152	12,672
	10,234,783	7,121,816

STATEMENT IV (Continued)
WATER RESOURCES AUTHORITY
NOTES TO FINANCIAL STATEMENTS
YEAR ENDED MARCH 31, 2005

		\$	\$
8.	CAPITAL PROJECTS		
		\$	\$
(a)	Balance of Subvention Funds at March 31, 2004		721,425
	Add: Fund received		<u>2,000,000</u>
			2,721,425
	Less: Projects Expenditure for year		
	OAS Regional Project	125,384	
	WRA/IDB Master Plan	259,742	
	International Atomic Energy	<u>294,466</u>	
			<u>(679,592)</u>
	Balance for Capital Fund – Projects		<u>2,041,833</u>
(b)	Cash Balance on Capital Projects:		
	Subvention Fund		2,721,425
	Less: Research Projects listed above		<u>(679,592)</u>
	Cash Available		<u>2,041,833</u>
9.	CAPITAL PROJECT GRANT		
		\$	\$
	Balance at beginning of year – as previously reported		5,676,674
	Add: Assets transferred		92,299
	Less: Transfers to other income:		
	Other assets	(385,881)	
	Hubert Chin Building	<u>(134,591)</u>	
			<u>(499,731)</u>
	Capital grant balance March 31, 2005		<u>5,269,242</u>

These represent the value of assets transferred to the Authority, which were purchased and used by various projects and also includes capital grant received for the construction of the Hubert Chin Building. This account is being written down by an amount equivalent to the depreciation charged on these assets, and is included in other operating income.

STATEMENT IV (Continued)
WATER RESOURCES AUTHORITY
NOTES TO FINANCIAL STATEMENTS
YEAR ENDED MARCH 31, 2005

10. OTHER PROJECTS FUND COMPRISE:

	\$	\$
Row lands field water	49,974	-
JSIF-Bog water supply	31,549	-
Nature conservancy project	13,589	-
Document Project	-	(13,053)
JPS Co.	81,960	90,860
NHT	52,400	52,400
UNDP/GOJ Project	512,993	546,734
National Water Quality Project	-	(4,292)
Dunns River Water Shed Project	174,668	226,132
Sedimentary Basin Resource Assessment	91,876	91,876
Black River Watershed Project	112,079	203,916
ACCC	101,246	101,246
Carib Engineering Co.	9,850	-
OAS/CCST/WRA Project	-	-
UNDP Radar	(3,336)	-
	<u>1,228,848</u>	<u>1,295,819</u>

11. ACCUMULATED FUND

	2005 \$	2004 \$
Balance at beginning of year – as previously reported	8,835,174	13,869,339
Less: Prior year adjustment	<u>168,017</u>	<u>(74,673)</u>
As restated	<u>9,003,191</u>	<u>13,794,666</u>
Operating deficit for the year	<u>9,003,191</u> <u>(950,147)</u>	<u>13,794,666</u> <u>(4,959,492)</u>
Balance at end of year	<u><u>8,053,044</u></u>	<u><u>8,835,174</u></u>

STATEMENT IV (Continued)

**WATER RESOURCES AUTHORITY
NOTES TO FINANCIAL STATEMENTS
YEAR ENDED MARCH 31, 2005**

12. PAYABLES AND ACCRUALS COMPRISE:

	2005	2004
	\$	\$
(a) Payroll Deductions Payable		
Income tax	2,737,614	-
Education tax	247,573	-
Insurances	18,530	39,755
Credit Union	1,000	1,000
	<u>3,001,717</u>	<u>40,755</u>
(b) Accruals		
Consultants' and professional fees	313,544	66,479
Subsistence, overtime and salaries	374,896	126,298
Accounting fees	73,000	80,000
Public services and insurance	17,102	217,069
Others	2,527,005	491,213
	<u>3,305,547</u>	<u>981,059</u>
(c) Other payables	<u>55,660</u>	<u>63,743</u>
	<u><u>6,362,924</u></u>	<u><u>1,085,557</u></u>

13. OTHER OPERATING INCOME COMPRISE:

	2005	2004
	\$	\$
Transfer from capital grant to off-set related depreciation	499,731	520,472
Investment income	309,600	358,072
Other income	58,589	727,466
Well application fees	860,000	830,000
Reimbursements	1,363,885	833,673
Interest income	546,483	-
	<u>3,638,288</u>	<u>3,269,683</u>

STATEMENT IV(Continued)
WATER RESOURCES AUTHORITY
NOTES TO FINANCIAL STATEMENTS
YEAR ENDED MARCH 31, 2005

14. FINANCIAL INSTRUMENTS

(a) ***Fair Value***

The carrying value of each class of financial instrument approximates to fair value.

(b) ***Interest Rate Risk***

Interest rate risk is the risk that the value of a financial instrument will fluctuate due to changes in market interest rates. The Authority minimizes this risk by maintaining net interest earning assets.

(c) ***Financial Asset***

The Authority has investment in Government of Jamaica Variable Rate Locally Registered Stock at interest rate of 14.00% per annum. Included in cash and cash equivalents are savings accounts at an average interest rate of 7.09% per annum.

(d) ***Financial Liabilities***

Financial liabilities are non-interest rate sensitive.

(e) ***Credit Risk***

The Authority maintains its cash and cash equivalents with licensed and secure financial institutions. Its receivables are due mainly from staff.

(f) ***Foreign Currency Risk***

The Authority is exposed to foreign currency risk due to fluctuations in exchange rates in transactions and balances that are denominated in currencies other than the Jamaican Dollar. A foreign currency bank account is maintained at a level, which will meet foreign currency obligations, which may occur from time to time.

At balance sheet date the Authority held foreign currency asset of US\$22,850 (Note 7 & 10).

STATEMENT IV(Continued)

**WATER RESOURCES AUTHORITY
NOTES TO FINANCIAL STATEMENTS
YEAR ENDED MARCH 31, 2005**

15. STAFF COSTS

	2005	2004
	\$	\$
Salaries and related costs	47,883,498	67,299,118
Staff benefits	2,871,323	3,078,287
Pension – employer’s contributions	<u>5,975,602</u>	<u>8,200,465</u>
	<u>56,730,423</u>	<u>78,577,870</u>

At March 31, 2005 and 2004 the Authority had fifty-two (52) employees.

16. PENSION SCHEME

Water Resources Authority participates in a defined contribution pension scheme. All permanent employees who have completed three (3) months of service are eligible to join. Employees contribute at a mandatory rate of five percent (5%) of salaries but may make voluntary contributions not exceeding a further five percent (5%). The Authority contributes at ten percent (10%) of pensionable salaries.

**WATER RESOURCES AUTHORITY
ADDITIONAL INFORMATION
YEAR ENDED MARCH 31, 2005**

SUPPORTING SCHEDULE OF EXPENSES

WATER RESOURCES AUTHORITY
Supporting Schedule of Expenses
YEAR ENDED MARCH 31, 2005

	2005	2004
	\$	\$
ADMINISTRATIVE AND OTHER EXPENSES:		
Salaries and related costs	47,883,498	67,299,118
Staff benefits	2,871,323	3,078,287
Pension – employer’s contributions	5,975,602	8,200,465
Machine rental and miscellaneous	302,700	364,810
Telephone	612,807	670,728
Utility expenses	1,545,840	1,370,879
Motor vehicle operations	1,699,409	1,431,625
Repairs, materials and related expenses	670,112	850,684
Drilling wells	19,210	4,272
Security	774,047	681,402
Postage, stationery and printing	666,527	570,995
Donations and subscriptions	45,122	28,163
Consultants fees	469,803	353,071
Accounting fees	102,000	80,000
Foreign travel	94,286	306,304
Travel and subsistence	6,857,989	7,898,066
Bank charges	12,867	8,611
Miscellaneous purchases	189,992	276,563
Depreciation	1,667,842	1,127,715
Insurance – property	496,132	490,837
Advertising	35,987	78,723
Gain on foreign exchange	(106,799)	(85,992)
	<u>72,886,296</u>	<u>95,085,326</u>

WATER RESOURCES AUTHORITY
Emoluments for Directors
FOR FINANCIAL YEAR
2004/2005

POST	SALARY	UPKEEP	TOTAL EMOLUMENTS
	\$	\$	\$
Managing Director	3,284,546.00	170,610.00	3,455,156.00
* Deputy Managing Director	2,482,506.00	341,220.00	2,823,726.00
Director Resource Management	2,138,774.00	341,220.00	2,479,994.00
** Director Administration and Human Resources	2,138,774.00	341,220.00	2,479,994.00
Director Finance and Accounts	2,138,774.00	341,220.00	2,479,994.00
* Director Planning and Investigation	2,138,774.00	341,220.00	2,479,994.00

* Vacant post for F/Y

** Vacant post since September 2003