

ECONOMIC AND SOCIAL COUNCIL

**Ninth United Nations Regional Cartographic
Conference for the Americas
New York, 10-14 August 2009
Item 5(b) of the provisional agenda
Country Reports**

**National Land Agency of Jamaica -
Cartographic Report ***

* Prepared by the National Land Agency of Jamaica

NATIONAL LAND AGENCY OF JAMAICA
CARTOGRAPHIC REPORT



PREPARED FOR THE 9TH UNITED NATIONS REGIONAL
CARTOGRAPHIC CONFERENCE OF THE AMERICAS 2009

July 2009

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Summary

Mapping activities within the island of Jamaica are carried out by the National Land Agency through its Mapping Services Branch. Since 2005 the emphasis has been on improving the process applied to map production by greater use of technology such as GPS. The focus has also been shifted from one of maintaining older maps to that of creating new map products.

The direction of the Agency's mapping operation is now customer driven and through this approach, more products which are acceptable to the ever increasing map reading population within the country has been produced. Partnerships have also been forged which have allowed for the cartographic processes to be tested, ultimately leading to the creation of better map products.

Throughout the period, there were challenges, most of which was related to cost. Notwithstanding this, much was achieved and there are significant plans to continue the movement towards improving mapping operations in general. With the increasing spread of the internet locally and the global village which it has created, the ultimate goal is to reach and maintain a stage where digital maps are embraced and a wider audience can source and use such maps via the web.

1. BACKGROUND

The National Land Agency is an Executive Agency within Jamaica which has as its core responsibility, administering and managing all land-related activities. This is effectively done through the four (4) core divisions. These divisions are the Surveys and Mapping Division, the Land Valuation Division, the Land Titles Division and the Estate Management Division.

The structure of the Surveys and Mapping Division is indicative of the varied nature of mapping and the inescapable fact that it has to be done by multiple units. The Division therefore, contains units which focus on topographic mapping and cadastral mapping both of which heavily involve ground surveying methodologies. Photogrammetric mapping, which involves the extensive use of aerial photography/imagery, is also done. The common thread for all these operations is that in most instances, the end product requires the input, in some shape or form, of cartographic processes. As such, an intricate link continues to exist between the works of these varied units and that of the Cartographic Unit.

Mapping for the National Land Agency also means constantly creating new features, which can be used on maps from various sources, and maintaining currency of the captured data. The recognition of the need

to have all new map data generation and map maintenance related activities closely aligned has led to a restructuring of the Agency's operations to ensure that such activities can be carried out by the Agency's Mapping Branch. This report seeks to provide an update on the work and achievements in the area of mapping over the past 5 years by the Agency.

2. TOOLS AND PROCESSES

In around 2005 Cartographic activities within the National Land Agency had started to undergo a shift in approach in terms of its focus and processes. Up until that time the focus had been primarily on updating old and established mapping series, some dating as far back as the 1960's. The processes applied then, worked for what was being done. The data source was mostly in house media, which were hard copy maps and aerial photographs. These had to be converted to digital form in order to facilitate a proper response to the change in demand for mapping products by the public. The process worked but there were obvious deficiencies. As a result some significant steps have since been made to change the mode of operation. This move has been supported, as best as possible, by the provision of improved tools and source material which are key ingredients to a successful mapping operation.

One of the most significant and far reaching operational changes has been the acquisition and incorporation of IKONOS satellite imagery as a source of base information for maps. This type of imagery was acquired as part of a joint initiative involving multiple government entities and used for the first time in mapping activities in 2004. Its use has served to significantly reduce the reliance on other sources of base information which were becoming outdated or too costly to acquire.

The Agency continues to use ESRI's suite of applications for cartographic work. However, to properly integrate the use of imagery also required changes in how the cartographic application was used. This led to a gradual migration from the use of coverage files as the default file format in feature creation by Cartographers in the Mapping Branch, to the use of the shapefile format which was being widely used and seen as much more flexible. This change meant that ESRI's ArcInfo had to be phased out as the main map creation and editing application interface and replaced with the more intuitive ArcMap. It also meant that Cartographers had to be trained so as to develop their competence in the creation and use of this type of file and application. All this was done successfully and the cartographic process has now become much more efficient and modern as a result.

The period also saw a gradual shift in terms of the reliance on sources external to the Mapping Branch for field verification and the capture of new data which may not necessarily be available on satellite imagery. This shift was again made possible through the application of technology. In this new instance Cartographers were empowered with the opportunity to do their own field verification and data capture through the introduction and use of handheld GPS devices. Yet again, training had to be provided but the resulting efficiency far outweighed the cost of having to do so. Reference will be made in the ensuing stages of the report of projects where this technology was applied. It is sufficient to state at this stage however, that this change resulted in positive cost effective returns.

3. PRODUCT DEVELOPMENT & OTHER CARTOGRAPHIC ACHIEVEMENTS REALIZED

The years following 2006 saw changes in the area of concentration for mapping which was made possible in part by implementation of the previously mentioned revised processes and tools. The decisions on the products to be prepared were now guided by an assessment of the needs of customers. The decision was made to alter the concentration

from that of solely maintaining maps of older mapping series and concentrate more effort on the creation and delivery of new and innovative mapping products to the growing map reading population within the country. This was clearly a much more viable option. Other considerations which led to such a decision were:

1. The potential which now existed to respond quickly to ad hoc mapping needs within the population via customized mapping.
2. The opportunity to engage in partnership arrangements to create mapping products for public or private use.

The Master Map Series

A decision was made in 2006 to respond to feedback from the map users to produce a master map series. The aim was to produce a set of series maps all at a scale no greater than 1: 4,000 and each set covering one from a select group of major towns within the country (namely Portmore, Kingston, Spanish Town, Montego Bay, Ocho Rios, Port Antonio). This was to be a continuous project and since it started in 2007, cartographic work has been completed on the Portmore series which comprises 7 sheets. A sample of this can be found in **Appendix**

1. Creation of the Kingston series followed that of Portmore. All the field data verification and most of the cartographic work for this area have been done. At the time of writing this report the Kingston series was awaiting quality checking while the Spanish Town series was being

prepared and is expected to be completed by the early part of the year 2010.

The master mapping series however, because of its intended far reaching application that is, it is designed not just for use by the casual map reader but also for those who need to use it as part of their work (such as surveyors), meant that there had to be coordinated input from multiple divisions and units within the Agency.

The map incorporates features such as:

- street centerline,
- parcels,
- control points,
- building footprints and
- contours

The acquisition of this information could not be left solely to the Cartographer but required contribution from Surveyors, Cadastral Mapping and Photogrammetric Mapping personnel.

1:250,000 Topographic Map Update

The master mapping project continued in 2007 but was carried out in conjunction with what was primarily a map updating exercise. Even though the thrust was for the development of new maps in response to the needs of clients there was the recognition that the updating of the older maps could not be disregarded. In keeping with the mandate to

keep the older map series updated, the existing 1:250,000 scale map which covers the entire island of Jamaica on one map sheet and which remained popular among map users, was updated. This exercise too can be reported as a significant mapping product achievement for the period under review because the end product was the first map to be fully updated, through to completion, using the cartography tools available in the ArcMap interface of ArcGIS and involved working extensively with the shapefile format (**See Appendix 2**).

Tourist Road Map

In 2008 a partnership agreement was entered into with the Jamaica Tourist Board which resulted in what can be described as the most significant cartographic achievement for the period under review.

Tourism is a major industry within the country and making available maps which would allow for easy navigation around the island, was a worthwhile activity to support the industry. The Agency was required to provide the technical expertise and resources for the project. The project proved to be a thorough test of the all the processes and tools including the ability of the Cartographer to independently engage in field data capture and verification. Its successful completion is a testimony to the positive impact which the changes are having on

mapping. It can be referred to as a landmark achievement which culminated in the island's official road map (**See Appendix 3**).

The creation of this map was made possible due to the successful updating in 2007 of the previously mentioned 1:250,000 scale map which covers the entire island on one sheet. This map was used to form the base of the road map. Additionally, the use of satellite imagery and the use of handheld GPS devices featured heavily in this project, as was the case in all other post 2006 projects. An assessment of the mapping landscape shows that the use of such equipment is increasingly becoming common place in all mapping activities even within entities outside of the National Land Agency, which has official responsibility for mapping within Jamaica. As an example, disaster mapping which was done within the country's post hurricane Ivan period was achieved primarily through the extensive use of such devices. The features captured could be easily integrated on existing base maps allowing for the quick production of maps which gave an idea of the extent of the impact and the areas which demanded attention through the provision of resources.

1:50,000 Topographic Map Update

It must be reiterated that despite the thrust to respond to the desires of the public through the creation of new map products, the responsibility to maintain older maps has not been lost. As a result

following up on the successful updating of the 1:250,000 scale all island topographic map, work has now begun to update the country's 1:50,000 topographic map series. The first metric edition of this series was published in the 1980's. The update being done now to the series is the first since that time and is seen as overdue for a product which has remained one of the most widely used maps within the country. It is anticipated that the update will be fully completed by the middle of 2010.

Global Map

During the period under review the Agency through its mapping branch was required to play a role in the creation and provision of map layers to be used as part of the global map initiative. The creation of such files was accomplished in a relatively short time through the use of the available satellite imagery. The delivery of these to the Global Map Consortium is still outstanding. However, it will be done pending the finalization of a policy to govern the provision and use of such data at the international level. This policy is now at an advanced stage.

Up to 2009 the major task has been and will continue to be the completion of the Master mapping series. This exercise, up until its completion, will be shared with the preparation of pocket sized map derivatives of some major towns previously captured on the road map.

This is primarily being done to achieve even greater ease of use on the part of the map reading clientele served by the Agency. All the towns which are to be addressed under the master mapping series project will also have a handy book version of the area created. This too is being done in an effort to respond to the preferences of the map using population.

4. OTHER ACHIEVEMENTS

An extensive digital feature data store is now available (deemed the largest within the island). All datasets which were created through work done on the various mapping projects since 2006, most of which have extensive island wide coverage, are stored within this central geodatabase. These include map layers or features such as:

- a. Parcels (island wide coverage)
- b. Street centerline (island wide coverage)
- c. Railways
- d. Contours (at 2m, 20m, and 40m intervals)
- e. Rivers and other water bodies
- f. Civic features
- g. Building footprints (major towns)

The above listing by no means exhaust what is presently maintained in a usable form in the central storage area. This available data store

carries significant benefits and it has been leveraged to some extent in recent times in dealing with the growing demand for customized mapping. Additionally, most of the mapped features have been used in interactive mapping applications specific to the Agency and more generally to a wide array of other public and private companies who have acquired the data for use in their entrepreneurial activities.

The Agency continues to be a major provider of maps and map data in both paper and digital form to schools from primary through to the tertiary level. The aim is to deliberately foster increased map use and encourage research which may have a far reaching positive impact on the Jamaican economy. The Agency sees this as a corporate responsibility and makes such products available at significantly reduced costs and in many cases completely free.

5. DEFICIENCIES

Despite the many achievements over the period there were and still are challenges in meeting the mapping objectives. The cost of software stands out as one of the most prominent. In order to get the result required the best tools are needed and this includes software. However, whenever this comes with a high price tag it serves only to delay and in some instances eliminate the desired progress. This is an

issue which is prevalent in developing countries such as Jamaica and is one which may require a rethink of pricing strategies on the part of major providers of software and hardware which is needed for use in mapping. There is also the challenge of acquiring new and more up to date satellite imagery which possesses the quality that can bring greater efficiency when used as a base in mapping. Not having high quality and up to date imagery is a problem which is also created in part due to the high cost associated with acquiring imagery. Any alternate avenue which could result in a more cost effective mode of acquisition which would be beneficial to the country as a whole would be welcomed.

Another significant problem has to do with finding local training in the field of Cartography. The same is true for other intricately linked areas such as Photogrammetry. Not many institutions exist within our region which offer training in these areas at a level that would allow for the rapid production of specialists in the field. Not having this can have a stifling effect on the future development of mapping within the country. In the past there was a dependence on external training provided in countries within Europe. The opportunity to use this avenue has decreased gradually over the past years but based on the growing need to build upon the pool of practitioners within the field,

going forward, attention must be paid to equipping local training institutions to provide this kind of training at a reasonable cost.

6. WHAT'S NEXT - LOOKING TO THE FUTURE

Despite the challenges it is the intention of the National Land Agency, Jamaica's local mapping authority, to continue to embark on a path of improvement. The plan for the coming years is to upgrade the base applications to take advantage of new cartographic tools which can make the work easier. Added to this is the desire to work at greater centralized management of all mapped features. It is felt that doing this will extend the use of such features beyond the operations of the mapping unit and allow infiltration of simple map production and GIS analysis within other units in the organization. This will allow for more time to be spent by the Cartographer on creating new map products to serve a wider map using public.

There is also the plan to integrate more of the work of surveyors into the operation. To achieve this, to some extent, requires achieving acceptance of a data file format which is usable to all. It also requires settling on a standard reference frame. At present much has been achieved in migrating to a new reference frame referred to locally as JAD2001. This system which is referenced to the WGS84 spheroid was

implemented recently and has gained wide acceptance. All mapping, post 2001, has been done to this datum and work is gradually progressing to move all previously created maps to the new system. It is expected that full conformance from all within the field will be achieved within the next five years.

Additionally, basic discussions have begun to put in effect a place names registry for the country and re-activate the new place names review committee. This is of particular importance especially with the rapid pace with which new residential developments are occurring within the island and the need to eliminate duplication. When established, all new roads and place names created would be able to be properly reviewed and checked for conformance to set standards before acceptance. All newly accepted names along with all previously established names would be stored in the registry for ease of reference.

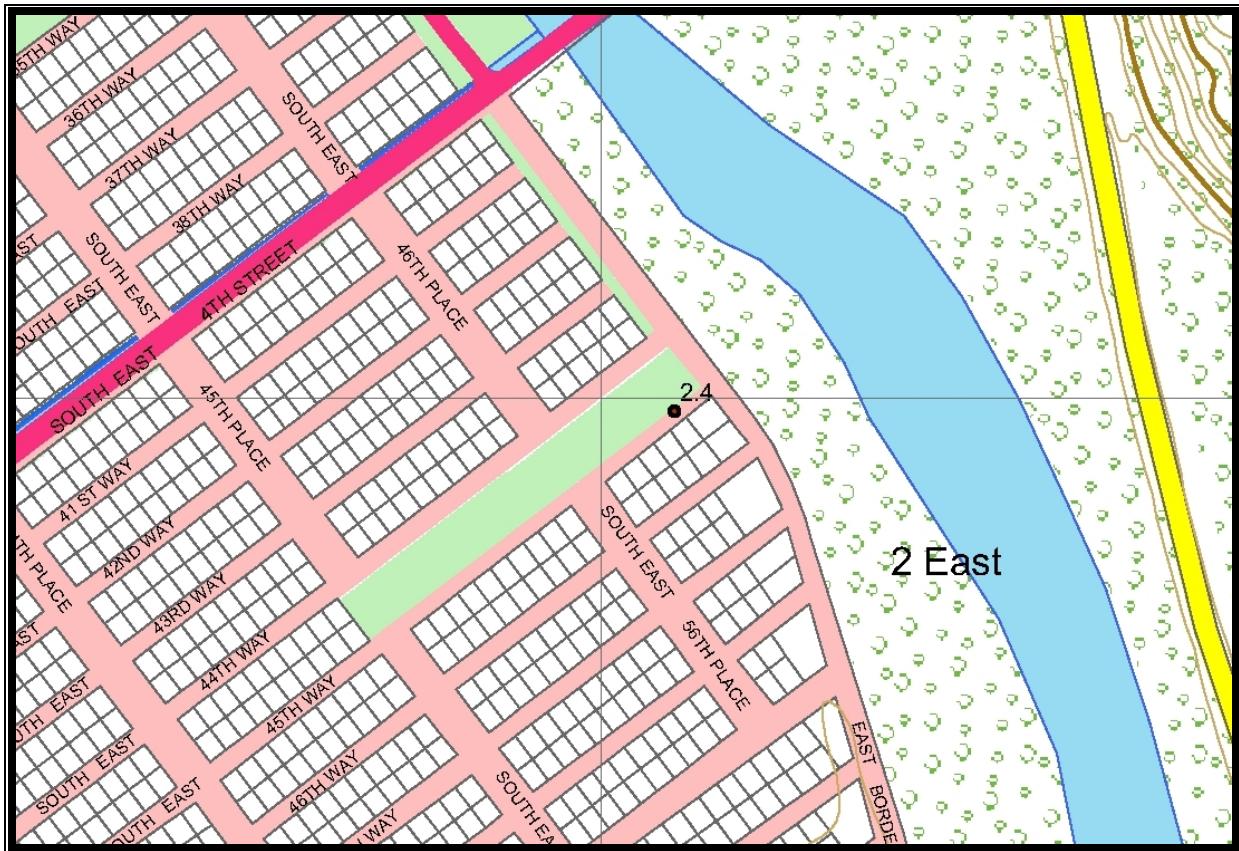
It is the intention of the Agency to continue to produce new mapping products at a pace of at least one each year. It is also expected that within the next five years all the new mapping projects which are presently underway would be fully completed.

There is also the push to make maps available digitally via the internet for those who may want to interact with it in that way.

Technology now allows for this to happen with relative ease. To this end there are advanced plans afoot to improve the Agency's *elandjamaica* offering on the World Wide Web. *elandjamaica* is the Agency's web portal through which information specific to land is made available to the wider public. It has however, been extended to also incorporate interactive mapping functionalities by taking advantage of the extensive digital dataset available for multiple features. All of this is being done with the aim of making the users' experience much better. With the developments planned a person inside or outside of the country, with a desire to acquire a map or map related information, will be able to do so with great ease by going online.

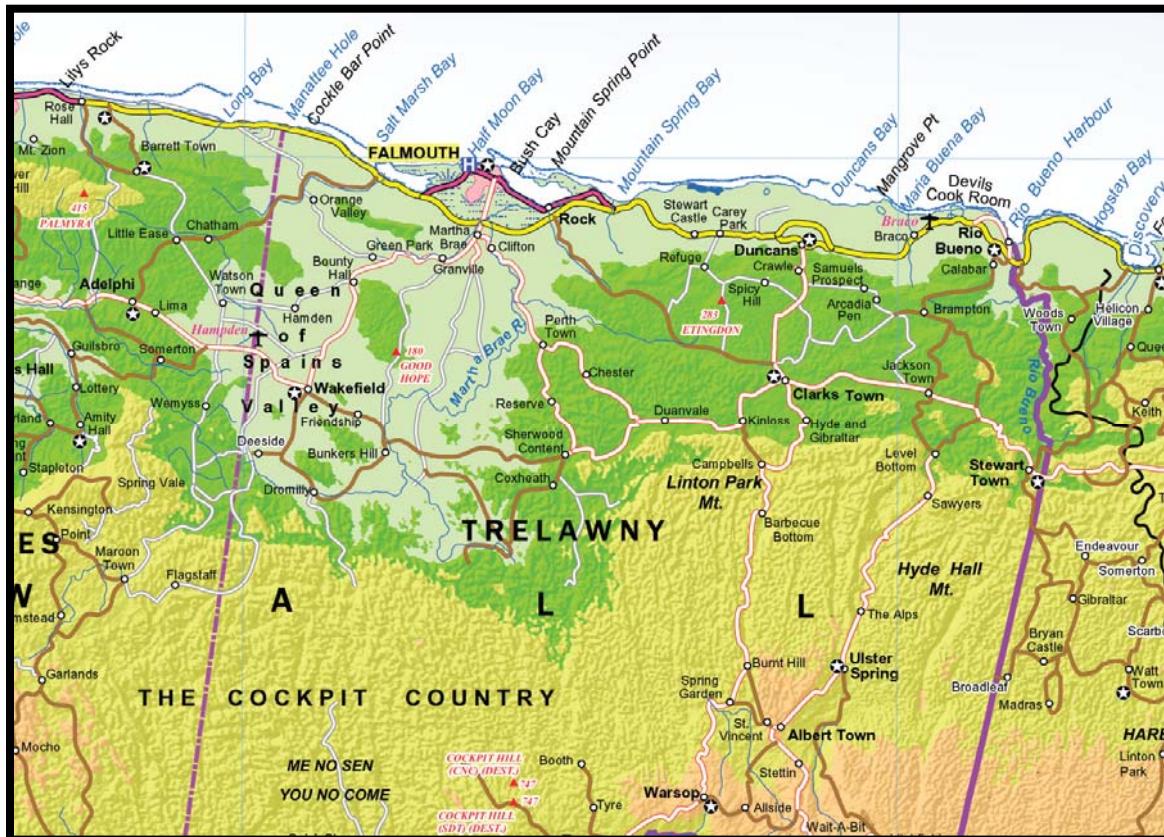
Appendix 1

Excerpt from one of the new master map series



Appendix 2

Excerpt from recently updated 1:250:000 topographic map of Jamaica



Appendix 3

Excerpt from a section of the new tourist road map

