



IHO Capacity Building Programme

The State of Hydrography and Nautical Charting in The Republic of Mauritius



September 2012

Intentionally blank

Contents

Contents.....	3
Abbreviations	5
Executive Summary	7
1. Introduction.....	10
2. Background.....	10
3. Technical Visit Programme	10
4. General Assessment	11
4.1 <i>National Hydrographic Awareness.....</i>	11
4.2 <i>National Hydrographic Structure</i>	11
4.3 <i>Maritime Safety Information</i>	12
4.4 <i>Hydrographic Surveying.....</i>	13
4.5 <i>Nautical Charting.....</i>	13
4.6 <i>Hydrographic Resources.....</i>	14
5. The Way Ahead.....	14
5.1 <i>National Hydrographic Surveying.....</i>	14
5.2 <i>Bilateral Arrangements for Surveying and Charting.....</i>	15
5.3 <i>National Hydrographic Authority.....</i>	15
5.4 <i>National Hydrographic Committee</i>	16
5.5 <i>National Maritime Safety Information Coordinator</i>	16
5.6 <i>Temporary Hydrographic Advisers.....</i>	17
6. Technical Visit Conclusions.....	17
7. Recommended Actions.....	18
Annex A – List of Contacts	20
Annex B – Mauritius’ Dependency on Hydrography and Charting	22
1. Introduction.....	22
2. Ports and Harbours.....	22
3. Inter-Island Communication Routes.....	23
4. Cruise Ship Operations.....	23
5. Shipping Routes including Navigable Channels.....	23
6. Offshore Banks and Vigias.....	23
7. Offshore Oil and Gas.....	23
8. Maritime Claims.....	23
9. Defence including Coastguard.....	25
10. Environment.....	25
11. Fishing.....	25
12. Tourism and Coastal Recreational Amenities	26
13. Education and Science	26
14. Planned Maritime Developments in Mauritius Waters	26

Annex C – Existing Hydrographic Data for Mauritius.....	27
1. General	27
2. National Data.....	27
3. India.....	27
4. United States of America.....	28
5. United Kingdom Hydrographic Office	28
6. Summary of Current State of Surveys.....	28
Annex D – Charting Analysis of Mauritius’ Waters.....	29
1. Mauritius Chart Coverage.....	29
2. British Admiralty Charts	29
3. Indian Naval Hydrographic Department	30
4. Review of Current Charting.....	30
4.1 <i>Primary Charting Authority - UKHO.....</i>	<i>31</i>
4.2 <i>Indian Naval Hydrographic Department Charts.....</i>	<i>32</i>
4.3 <i>INHD/UKHO Charting Comparison</i>	<i>33</i>
Annex E – IHO Yearbook Revision.....	34

Abbreviations

ALB	Airborne Laser Bathymetry
AtoN	Aids to Navigation
BA	British Admiralty [Chart]
dwt	Dead Weight Tonnage
Ed	Edition
EEZ	Exclusive Economic Zone
ENC	Electronic Navigational Chart
FAD	Fish Aggregating Device
GLOSS	Global Sea Level Observing System
grt	Gross Registered Tonnage
ICZM	Integrated Coastal Zone Management
IHB	International Hydrographic Bureau
IHO	International Hydrographic Organization
IMO	International Maritime Organization
INHD	Indian Naval Hydrographic Department
INHD	Indian Navy Hydrographic Department
JICA	Japan International Cooperation Agency
Lidar	Light Detection and Ranging
LOA	Length overall
MBES	Multi Beam Echo Sounder
MESD	Ministry of Environment and Sustainable Development
MFR	Ministry of Fisheries and Rodrigues
MHL	Ministry of Housing and Lands
MOI	Mauritius Oceanographic Institute
MoT	Ministry of Tourism
MoU	Memorandum of Understanding
MPA	Mauritius Ports Authority
MPI	Ministry of Public Infrastructure, National Development Unit, Land Transport and Shipping
MRC	Mauritius Research Council
MSDI	Marine Spatial Data infrastructure
MSI	Maritime Safety Information
MSP	Maritime Spatial Planning

NOG	National Coast Guard
NE	New Edition (of a navigational chart)
NOHC	North Indian Ocean Hydrographic Commission
NM	Notice to Mariners
PCA	Primary Charting Authority
PNM	Preliminary Notice to Mariners
RHC	Regional Hydrographic Commission
RNC	Raster Navigational Chart
SAIHC	Southern Africa and the Islands Hydrographic Commission
SANHO	South African Navy Hydrographic Office
SBES	Single Beam Echo Sounder
SOLAS	[United Nations] Convention of the Safety of Life at Sea
ToR	Terms of Reference
TTW	Territorial Waters
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environmental Programme
WMO	[United Nations] World Meteorological Organization

Executive Summary

Mauritius became a State Party to the SOLAS Convention on 1 May 1988. In general there is an awareness of Mauritius' treaty hydrographic obligations with this being heightened by the current programme of IMO state audits for compliance with SOLAS provisions. Awareness is sharpest within the Shipping Division of the Ministry of Public Infrastructure, National Development Unit, Land Transport and Shipping (MPI), the ministry with responsibility for SOLAS, it is not necessarily shared by other ministries not directly connected with SOLAS.

The technical visit increased the understanding and visibility of national hydrography, the undesirable state of hydrography and varying states of nautical charting in Mauritius and its potentially adverse impact on economic growth, safety of navigation and protection of the marine environment within non-SOLAS ministries and organizations.

In recent years systematic surveys of Mauritian waters have been conducted by the Indian Navy Hydrographic Department (INHD) under the provisions of a MoU between India and Mauritius. These surveys have been used as source data for the production of an INHD series of seven new nautical charts. However, there is no formal mechanism in place to determine local priorities for charting or for surveys other than an annual letter from MPI to stakeholders asking for their requirements for the following year. Surveys are determined jointly between INHD and MHL. There is little communication between the Mauritian authorities and the Primary Charting Authority (PCA), the United Kingdom Hydrographic Office (UKHO), nor understanding of UKHO's role as the current PCA for Mauritius.

There is no established Maritime Safety Information organization in Mauritius. This means that mariners arriving from overseas are not necessarily aware of new navigational significant information before they arrive in Mauritius nor do the existing charts published and maintained by the PCA (UKHO) or the INHD contain the latest navigational significant information.

Hydrographic surveying within Mauritius is conducted by the Ministry of Housing and Lands (MHL) and the Mauritius Oceanographic Institute (MOI). MHL has trained hydrographic surveyors but does not have any functioning hydrographic equipment.

Mauritius and India signed a hydrographic MoU in August 2005 and the following year saw the start of an annual surveying programme conducted by the INHD. Whilst this welcome development has improved the safety of navigation in Mauritian waters by the publication of INHD charts of Mauritius and through the updating of PCA (UKHO) charts based on the published INHD charts, final bathymetric data sets have not been passed to MHL for the wider use of the Mauritian government nor to the PCA for charting. This omission does not fully improve the safety of navigation under IHO principles and seriously hampers a number of government projects and will result, if not satisfactorily resolved, in additional Mauritian government financed survey data gathering operations to provide the needs of such organisations as the Ministry of Environment, Ministry of Fisheries and Rodrigues, Mauritius Oceanographic Institute, Ministry of Tourism and the National Coast Guard.

Mauritius' hydrographic surveying requirements may be viewed as large area surveying for the updating of nautical charts and the small area surveying for national uses and the maintenance of nautical charts. The Indo-Mauritian hydrographic MoU provides for the former whilst the Mauritian government should make provision for the latter requirement for which it will require a suitably equipped small hydrographic trained team.

Mauritius has no national capability for nautical chart production. Until the Indo-Mauritian MoU of 2005 the sole producer of nautical charts of Mauritius was the UKHO as the Primary Charting Authority and International Chart producer nation. Since 2006, when the INHD commenced surveys in Mauritian waters a modern series of seven charts, based solely in INHD data, has been published by the INHD. In discussions with the Mauritius Port Authority and the Director of Shipping the IHO technical team was informed that the main nautical charts used by ships entering Mauritius were those published by the UKHO.

Mauritius is very fortunate in having the support of two major hydrographic offices, India and the United Kingdom and it is strongly recommend that this support is encouraged.

It is vital that where there is no in-country chart production or maintenance facility, a coastal State must establish and maintain close liaison with its PCA. In the case of Mauritius this is currently the UKHO. It is recommended that continuing support from UKHO with Mauritius benefiting from UKHO's worldwide chart production, maintenance and distribution network should be through a MoU or Cooperative Arrangement. The Indo-Mauritian hydrographic MoU is extremely valuable to Mauritius for both surveying and nautical charting and in particular it

should be used to strengthen charting of Mauritian waters as required under SOLAS. Such arrangements relieves Mauritius of a particularly difficult task whilst at the same time makes it compliant with SOLAS Regulation 9 Chapter 5.

It was readily apparent to the IHO technical team that the lack of effective coordination of hydrographic activity in Mauritius is having a significant impact on the efficient operation and management of Mauritian water space. The IHO recommends that every coastal State should designate a National Hydrographic Authority responsible for coordinating hydrography and charting in the country. The function of the National Hydrographic Authority is to be, on behalf of the government, the national and international point of contact for all hydrographic matters and to ensure that the State meets its international obligations for the collection and dissemination of MSI, hydrographic surveying and nautical charting services. To coordinate hydrographic effort for the effective discharge of SOLAS responsibilities and the efficient management of a State's water space the IHO recommends the establishment of a National Hydrographic Committee to provide input to and coordination of the hydrographic programme and setting national charting and surveying priorities.

Recommended Actions

The following recommended actions are provided for consideration by the relevant authorities:

- (1) **The Government of Mauritius** should:
 - a. formally designate a **National Hydrographic Authority** to be responsible for coordination and ensuring the provision of appropriate nautical charting services for Mauritius in accordance with the requirements of the International Convention on the Safety of Life at Sea (SOLAS), and in accordance with the principles established by the IHO;
 - b. allocate regular funding and travel support for the **National Hydrographic Authority** to fulfil the duties of the Office and to represent Mauritius in appropriate forums, and in particular, to attend relevant meetings of the SAIHC, NOIHC and IHO;
 - c. ensure that a **Maritime Safety Information (MSI) Coordinator** position is established as soon as possible to fulfil Mauritius' treaty obligations under SOLAS V/4 - *navigational warnings*;
 - d. ensure the development and execution of a **National Maritime Safety Information Plan** – by ensuring that field checks are carried out on the current charts and publications and the results are forwarded promptly to the current PCA (UKHO) and eventually to the Indian Naval Hydrographic Department;
 - e. Negotiate with the Indian Government for the release of Indian Naval Hydrographic Department (INHD) data from the Indian Navy surveys of Mauritius past and in the future;
 - f. to provide INHD data to the Primary Charting Authority (UKHO) for use in the compilation or revision of the existing INT charts of Mauritius;
 - g. actively promote cooperation with the hydrographic offices of India and the United Kingdom to assist with a successful handover of PCA responsibilities
- (2) **The National Hydrographic Authority** should:
 - a. liaise with the Regional Team 3 at the UKHO to ensure that new navigationally significant information is forwarded and included in existing charts of Mauritius;
 - b. apply, through the SAIHC, for training for the MSI Coordinator under the IHO Capacity Building Program;
 - c. apply, through the SAIHC, for the short term assistance of an established hydrographic office to develop a National Hydrographic Structure for Mauritius;
 - d. organise an urgent national programme of review of all the published charts of Mauritius and inform the PCA (UKHO) of all detail that is incorrectly shown on these charts. Such a national programme should encourage all mariners and other interested parties to report discrepancies on existing charts together with as much information as possible on what should actually appear in the charts;
 - e. conclude a MoU or a Cooperative Arrangement with the Primary Charting Authority (UKHO);

- f. establish and chair a **National Hydrographic Committee** or forum that coordinates national hydrographic requirements including input to a **National Charting Plan**, a **National Hydrographic Survey Plan** and a **National Maritime Safety Information Plan**. This group should include representatives from all stakeholder sectors, including but not be limited to: shipping, environmental protection, survey and mapping, national infrastructure development, coastal zone management, marine exploration, resource exploitation – minerals, fishing, maritime boundary delimitation, maritime transport, maritime defence and security, disaster management and tourism.

(3) **The Government of Mauritius** should

- a. actively support existing hydrographic surveyors in the enhancement of national hydrographic surveying; provide funding to re-equip the Ministry of Housing and Lands Hydrographic Unit with modern, portable survey equipment, including sidescan sonar, to conduct surveys in up to 100m depth;
- b. provide on-going funding for the regular maintenance and routine replacement of equipment and for the training and requalification of operators;
- c. establish and fund a national marine cartographic capability such that Mauritius can provide specialist chart products for national use and to be sufficiently informed to participate in decisions regarding chart coverage and availability;
- d. engage overseas hydrographic advice to guide and assist the **National Hydrographic Authority** and stakeholders to enhance in-country hydrographic data gathering capability and to foster close liaison and possible support from recognized national hydrographic authorities in other countries.



REPORT



1. Introduction

The International Hydrographic Organization (IHO) is an intergovernmental technical organization, currently comprising 81 Member States. The IHO seeks to ensure that all States with coastlines and maritime interests provide adequate and timely hydrographic data, products and services, thereby advancing maritime safety and efficiency in support of the protection and sustainable use of the marine environment. The IHO is the recognised competent authority of the United Nations for hydrography and nautical charting. The International Hydrographic Bureau (IHB), based in Monaco, is the secretariat of the IHO.

A proposal for a technical and advisory visit to Mauritius to help assess the current status of charting and hydrography in the country and to provide advice to the government and to stakeholders on a way ahead was raised at the 11th meeting of the NIOHC in 2011. As a result the NIOHC gained approval from the Capacity Building Sub Committee for funded technical visit to Mauritius to assess the current status of hydrography and to raise awareness in the country of the importance of hydrography and nautical charting.

Through an arrangement of the Capacity Building Coordinator of NIOHC, Captain Abri KAMPFER SAN from the South African Navy Hydrographic Office (SANHO) and Mr Bob WILSON, seconded from the United Kingdom Hydrographic Office (UKHO) carried out a hydrographic awareness and technical assessment visit to Mauritius between 12 and 15 September 2012. Captain KAMPFER remained in Mauritius to chair the 9th SAIHC Meeting.

This resulting report has been written with the express intention of assisting the government of Mauritius to arrange and strengthen its hydrographic effort to meet its current and future needs and in turn, to meet its international maritime obligations under the UN Convention on the Safety of Life at Sea (SOLAS). The report comprises a description of the visit, a detailed analysis of the current status of maritime safety information, hydrography and charting, major conclusions and a number of recommended actions for consideration by the relevant authorities.

2. Background

Although under the administration of the United Kingdom government until Mauritius gained its independence on 12 March 1968 very little hydrographic surveying was done in and around Mauritius. In 2002 a Hydrographic Unit was established within the Ministry of Housing and Lands utilizing the experience already available from the land surveyors and cartographers employed by the ministry. The main objectives of the Hydrographic Unit are defines as: conducting hydrographic surveys of harbours and lagoon entrances; producing nautical charts; providing nautical information to the international marine community for safe navigation; provide hydrographic and geodetic data for the delimitation of maritime zones.

Several hydrographic surveyors were trained to IHO Cat B level and the unit was equipped in 2003 under a Japanese International Cooperation Administration (JICA) programme. Two years later Mauritius signed a hydrographic MoU with India for hydrographic surveys and nautical charting. Despite training courses and the provision of equipment the Hydrographic Unit has not flourished and relies almost totally on the Indian Naval Hydrographic Department (INHD) for surveying and the United Kingdom Hydrographic Office and INHD for charts.

3. Technical Visit Programme

The IHO Technical Team arrived in Port Louis, Mauritius, on Wednesday 12 September from the Seychelles to conduct the IHO hydrographic awareness and technical assessment visit. In-country arrangements for the visit were arranged by Miss K. APPADOO, Assistant Secretary at the Ministry of Housing and Lands (MHL). The technical visit programme opened with a call on the Minister of Housing and Lands, Dr the Hon. Abu Twalib KASENALLY who expressed great interest in and support for national hydrography in Mauritius. A stakeholders

meeting, chaired by Mr A.N. OOZEER the Senior Chief Executive at MHL followed the call. The meeting was a useful forum for the technical team to explain the visit, its aims and to development of a programme of working meetings. The details of those attending the stakeholders meeting and subsequent working meetings are shown in Annex A – List of Contacts

The national economic benefits of reliable charting and hydrography were presented at each of the working meetings together with discussions on the current status of hydrography and charting in Mauritius and the needs of the various stakeholders. From these meetings various options to improve the current situation were explored. Initial impressions from the visit were provided to Miss K. APPADOO, in verbal and written form, at a meeting on Saturday 15 September for transmission to the Minister.

Amongst other relevant IHO documents the team passed an electronic copy of the IHO *Inter-Institutional Agreement for the Establishment of a Hydrographic and Oceanographic Committee* to the interim committee for consideration to formalize the workings of the committee.

4. General Assessment

The following is a general assessment of the situation in Mauritius regarding hydrography and nautical charting services. A discussion of available options, several conclusions and recommended actions, supported by a number of Annexes then follows.

4.1 National Hydrographic Awareness

In general there is an awareness of Mauritius' treaty obligations under SOLAS and the provisions under Chapter V Regulations 4 and 9 to ensure that appropriate hydrographic and charting services are made available: Mauritius became a State Party to this Convention on 1 May 1988. Awareness has been heightened by the current programme of IMO state audits for compliance with SOLAS provisions. However this awareness is sharpest within the Shipping Division of the Ministry of Public Infrastructure, National Development Unit, Land Transport and Shipping (MPI), the ministry with responsibility for SOLAS. This awareness has been heightened of late due to the process of International Maritime Organisation (IMO) State party audits for SOLAS compliancy. This awareness is not necessarily shared by other ministries unconnected with SOLAS.

The Government of Mauritius, through its various agencies, is aware of the current state of hydrography and nautical charting in Mauritius and the benefits of modern hydrography on economic growth, safety of navigation and protection of the marine environment.

In recent years systematic surveys of Mauritian waters have been conducted by the Indian Navy Hydrographic Department (INHD) under the provisions of a MoU between India and Mauritius. These surveys have been used as source data for the production of an INHD series of seven new nautical charts. There is no formal mechanism in place to determine local priorities for charting or for surveys other than an annual letter from MPI to stakeholders asking for their requirements for the following year. Surveys are determined jointly between INHD and MHL. There is little communication between the Mauritian authorities and the Primary Charting Authority (PCA), the United Kingdom Hydrographic Office (UKHO), nor of its current role as the PCA for Mauritius.

An explanation of the many benefits that hydrography provides to a coastal State such as Mauritius is contained in IHO Publication M-2 – *The Need for National Hydrographic Services* a digital copy of which was handed to the MHL. Stakeholders were reminded that M-2 can be downloaded from the IHO website.

Mauritius is a party to two key international conventions: the SOLAS Convention and UNCLOS which it ratified on 4 November 1994. The country signalled its international commitment to hydrography through membership of the IHO, by being a member and current vice-chair of the Southern Africa and the Islands Hydrographic Commission (SAIHC) and associate membership of the North Indian Ocean Hydrographic Commission (NIOHC). During the technical visit Mauritius was preparing to host the 9th SAIHC conference commencing on 18 September 2012.

4.2 National Hydrographic Structure

Three agencies within Mauritius have responsibility for or take active participation in hydrographic matters. The Ministry of Public Infrastructure, National Development Unit, Land Transport and Shipping (MPI) has the overall responsibility for marine affairs representing the country at IMO and for implementing the SOLAS convention; it does not have any specific hydrographic duties or staff. The Mauritius Ports Authority (MPA) manages the main port and has responsibility for hydrographic surveying within the port limits. Whilst not formally established as a hydrographic authority, the Ministry of Housing and Lands (MHL) has, historically, assumed this role. The

hydrographic unit has had mixed fortunes over the years and is currently lacking equipment and trained and experienced personnel.

Senior staffs at MPI and MHL are well aware that there is an urgent need to formalize a national hydrographic structure with the first step being the formation of a National Hydrographic Committee; both ministries have expressed a desire to implement such a body.

4.3 Maritime Safety Information

Maritime Safety Information (MSI) consists of the promulgation of navigational and meteorological warnings, search and rescue information and other urgent safety-related information, including urgent information related to charts. IHO Publication S-53 - *Joint IMO/IHO/IMMO Manual on Maritime Safety Information* provides detailed information about MSI. In addition MSI in its broadest sense includes navigational chart and publication maintenance.

There is no established Maritime Safety Information (MSI) organization in Mauritius. This means that the existing charts published and maintained by the PCA (UKHO) or the INHD do not necessarily contain the latest navigational significant information, nor are mariners arriving from overseas necessarily aware of new navigational significant information before they arrive in Mauritius.

The Mauritian authorities are well aware of the existence of and the need to pass information to the NAVAREA VIII Coordinator. A NAVTEX station is situated in Mauritius and broadcasts NAVAREA VIII warnings. Local warnings are also broadcast on VHF.

The routine maintenance of charts and publications, including changes in buoyage and wrecks for example, is as important as new survey data if charts are to be maintained to the standard required for safe navigation. This information has to come from the nation State and be passed to the PCA for action. In the case of Mauritius, little local information has been provided since the charts produced by the PCA were published. Corrections by Notices to Mariners (NMs), based on local knowledge and information passed to the UKHO, average only about one every two years. The following table shows the current publication date of charts covering the Republic of Mauritius, together with a reference to the last NM issued and the total number of NMs that have been applied to each chart since its publication. The table is correct to 17 September 2012.

BA Chart INT Chart	Title	Scale	Year of Chart Publication (Latest NM/Year)	NMs issued since Publication
711 INT 7737	Mauritius	125,000	3 Ed 12 Jul 2012 NM - 2003/16	0
713 INT 7738	Port Louis and Grand Rivière Noire Bay		5 Ed 14 Aug 2008 NM - 3838/12	12
	Port Louis	12,500		
	Approaches to Port Louis	50,000		
	Grand Rivière Noire Bay	20,000		
715	Rodriguez Island		NE 22 Apr 1999 NM - 2352/09	4 plus one PNM
	Rodriguez Island	No scale		
	Mathurin Bay	24,212		
	Port South East	48,424		
1881	Cargados Carajos Shoals		LC 31 Jan 1941 NM - 3330/12	16 + 4 revised print editions
	Cargados Carajos Shoals	121,000		
	Agalega Islands	163,700		
	St James Anchorage	25,000		
3048	Grand Port		3 Ed 6 Sep 2012 -	0
	Grand Port	30,000		
	Southern Approaches to Grand Port	12,500		

It was not possible to determine the liaison between Mauritius and the INHD for chart correcting information, however, inspection of the INHD website shows that no NMs have been issued for the charts covering Mauritius since publication.

Mauritius needs to establish as a matter of utmost urgency an MSI point of contact and educate all stakeholders on the need to pass information to the MSI Coordinator for onward transmission to the NAVAREA VIII coordinator and the two charting authorities, UKHO and INHD.

The 2012 SAIHC Capacity Building Work Programme allows for the provision of support for the delivery of, and attendance at a Phase 1 Skills training course with the objective of giving participants a highly practical introduction to the assessment and promulgation of navigationally significant information. The training course will be held at Fish Hoek, South Africa from 26 to 30 November 2012.

4.4 Hydrographic Surveying

Hydrographic surveying within Mauritius is conducted by the Ministry of Housing and Lands (MHL) and the Mauritius Oceanographic Institute (MOI). MHL has ten officers who have completed IHO Cat B hydrographic course but does not have any functioning hydrographic equipment. In contrast the MOI has no trained hydrographic staff but does have and regularly operates a portable hydrographic system gathering data in the inshore waters around the island of Mauritius. MOI's surveys are not conducted to IHO orders of survey nor are they passed for the improvement of nautical charts.

Mauritius and India signed a hydrographic MoU in August 2005 and the following year saw the start of an annual surveying programme conducted by the Indian Navy Hydrographic Department. Whilst this welcome development has improved the safety of navigation in Mauritian waters by the publication of INHD charts of Mauritius, and through the updating of PCA (UKHO) charts based on the published INHD charts, the detailed processed bathymetric data sets have not been passed to MHL for the wider use of the Mauritian government. This omission is seriously hampering a number of government projects and will result, if not satisfactorily resolved, in other government financed survey data gathering operations to provide the needs of such organisations as the Ministry of Environment (MoE), Ministry of Fisheries and Rodrigues (MFR), Mauritius Oceanographic Institute (MOI), Ministry of Tourism (MoT) and the National Coast Guard (NCG).

Under the terms of the Indo-Mauritian MoU the Eighth Indo-Mauritian Joint Hydrographic Committee Meeting is due to be held in Dehradun in November 2012. This annual meeting sets the priorities for the coming survey season based on a trawl of requirements from Mauritian ministries.

There are tide gauges installed at Port Louis, Rodrigues and Agalega. At Port Louis, there is a gauge operated by the Port Authority and another in the fishing harbour operated by the Meteorological Office. The gauges in the fishing harbour at Port Louis and at Rodrigues are managed by the Meteorological Office and part of the GLOSS programme. The Meteorological Office also provides tidal predictions and publishes tide tables although these were not seen during the IHO visit nor was a visit paid to the Meteorological Office.

4.5 Nautical Charting

Mauritius has no national capability for nautical chart production. Until the Indo-Mauritian MoU of 2005 the sole producer of nautical charts of Mauritius was the UKHO as the Primary Charting Authority (PCA) and International Chart producer nation. Since 2006, when the Indian Navy Hydrographic Department (INHD) commenced surveys in Mauritian waters a modern series of five charts, based solely in INHD data, has been published by the Indian Naval Hydrographic Department (INHD). In discussions with the Mauritius Port Authority and the Director of Shipping the IHO team was informed that the main nautical charts used by ships entering Mauritius were those published by the UKHO.

In its report to SAIHC7 in 2009, Mauritius stated that the nautical charts from all the surveys undertaken by the Indian Navy are produced by India and it was a matter for some concern as to whether this survey information was also being incorporated in the UKHO charts other than that derived from the published INHD charts.

Concerns were expressed to the IHO team regarding the availability of both INHD and UKHO charts in Mauritius. The nearest INHD chart agency is in Mumbai, the nearest UKHO chart agent is at Durban, South Africa. A full analysis of current charting is at Annex D – Charting Analysis of Mauritius' Waters.

4.6 Hydrographic Resources

The government of Mauritius has a variety of hydrographic resources which are discussed below.

- a. Ministry of Housing and Lands (MHL) has ten officers who have completed IHO Cat B hydrographic courses in India and Japan although not all of these officers are now practising surveyors. Japan, through JICA, has in the past provided hydrographic equipment, however, this equipment is now obsolete and is possibly non-operational. Either way it is cumbersome and not easily deployed on a vessel of opportunity. An inspection report on the equipment by the Commanding Officer of INS *Darshak* concluded that the equipment needs upgrading/replacing to establish a fully functioning survey capability for minor surveys. MHL does not have a dedicated survey launch, this is not considered a problem as modern portable systems are specifically designed to be fitted to any vessel from a canoe to a large launch and thus MHL should consider deploying any new equipment from craft of opportunity as is routinely carried out by MOI. NCG has a number of craft available for short term survey work.
- b. The Mauritius Oceanographic Institute has an operational hydrographic survey system which it regularly deploys on craft of opportunity.
- c. Ministry of Fisheries and Rodrigues (MFR) operating research vessels, shown below, which could be used as craft of opportunity by MHL or MOI.



- d. Permanent recording tide gauges are installed at Port Louis (one each operated by MPA and the Meteorological Office), at Rodrigues and Agalega (managed by the Meteorological Office). The Meteorological Office also provides tidal predictions.
- e. The United Kingdom Hydrographic Office as the current Primary Charting Authority publishes, maintains and distributes nautical charts of Mauritius (paper and ENC) and supporting publications.
- f. The Indian Naval Hydrographic Department makes several valuable contributions to hydrography in Mauritius. These include modern SBES surveys (without, it is understood, the use of side scan sonar) in Mauritius and its outlying islands, MBES surveys in the approaches to Port Louis and modern nautical charts from data gathered, IHO Cat B hydrographic courses and practical survey experience onboard Indian Navy survey ships and boats when deployed to Mauritius.

5. The Way Ahead

5.1 National Hydrographic Surveying

Mauritius' hydrographic surveying requirements may be viewed as large area surveying for the updating of nautical charts and the small area surveying for national uses and the maintenance of nautical charts. The Indo-Mauritian hydrographic MoU provides for the former requirement and given the relative stability of the seafloor around Mauritius and its outlying islands there is little likelihood that the surveys conducted by and planned for the Indian Navy will need to be repeated for many years. The Mauritian government should make provision for the latter requirement for which it will require a suitably equipped small hydrographic trained team.

An in-country deployable hydrographic surveying capability could be established using a relatively simple and unsophisticated outfit of equipment costing approximately US\$100K - US\$150K plus on-going maintenance. Although some surveys may take longer using such equipment, the use of a single beam echo sounder and side scan sonar can be as equally effective as much more sophisticated and expensive technology such as multibeam

echo sounders (MBES). This is especially true in shallow water, such as is the case for Mauritius and its islands and anchorages.

Using portable equipment in craft of opportunity avoids the capital cost of dedicated boats and significantly reduces deployment/mobilisation expenses. Under such an arrangement, all hydrographic data collected would then be forwarded to the PCA for charting action.

There are limited opportunities for internationally recognised hydrographic training. A list of courses is contained in IHO publication C-47 - *Training Courses in Hydrography and Nautical Cartography, 6th Edition*. This can be downloaded from the IHO website. Short courses in the fundamentals of hydrographic data gathering are available through the IHO Capacity Building Programme and should be bid for through SAIHC. In the case of Mauritius training opportunities may be covered in the Indo-Mauritian MoU.

5.2 Bilateral Arrangements for Surveying and Charting

Mauritius is very fortunate in having the support of two major hydrographic offices, India and the United Kingdom and it is strongly recommended that this support is encouraged.

It is vital that where there is no in-country chart production or maintenance facility, a coastal State must establish and maintain close liaison with its PCA. In the case of Mauritius this is currently the UKHO. It is recommended that continuing support from UKHO with Mauritius benefiting from UKHO's worldwide chart production, maintenance and distribution network should be through a MoU or Cooperative Arrangement. Such an arrangement relieves Mauritius of a particularly difficult task whilst at the same time makes it compliant with SOLAS Regulation 9 Chapter 5. However, if the PCA is to publish and maintain charts of Mauritius successfully there is a fundamental requirement for Mauritius to ensure that the PCA is provided with all the relevant information required for inclusion in charts and publications covering Mauritius. Currently, this is not happening.

The Indo-Mauritian hydrographic MoU is extremely valuable to Mauritius for both surveying and nautical charting and in particular it should be used to strengthen charting of Mauritian waters as required under SOLAS. There does not appear to be a mechanism within the MoU whereby processed survey data is passed to the Mauritian government for both national use and for the use of the PCA. Regarding the latter, SOLAS Chapter 5 Regulation 9 has two specific references to 'Contracting Governments', in this case Mauritius:

3. Contracting Governments undertake to ensure the greatest possible uniformity in charts and nautical publications and to take into account, whenever possible, relevant international resolutions and recommendations.
4. Contracting Governments undertake to co-ordinate their activities to the greatest possible degree in order to ensure that hydrographic and nautical information is made available on a world-wide scale as timely, reliably, and unambiguously as possible.

5.3 National Hydrographic Authority

The IHO recommends that every coastal State should designate a National Hydrographic Authority responsible for coordinating hydrography and charting in the country. The function of the National Hydrographic Authority is to be, on behalf of the government, the national and international point of contact for all hydrographic matters and to ensure that the State meets its international obligations for the collection and dissemination of MSI, hydrographic surveying and nautical charting services. The National Hydrography Authority is the first point of contact for in-country stakeholders and for maintaining relations with relevant international organisations. In the case of Mauritius, these contacts would include the IHO, NIOHC, SAIHC, the PCA (UKHO), the Indian Naval Hydrographic Department and other countries and agencies that might support hydrographic development and assistance in Mauritius.

In Mauritius the SOLAS ministry is Ministry of Public Infrastructure, National Development Unit, Land Transport and Shipping with hydrographic surveying and nautical charting being delegated to the Ministry of Housing and Lands. It is for the Mauritian government to decide which of these two bodies should be the National Hydrographic Authority.

5.4 National Hydrographic Committee

It was readily apparent to the IHO technical team that the lack of effective coordination of hydrographic activity in Mauritius is having a significant impact on the efficient operation and management of Mauritian water space. As an example NCG and MoT both expressed a need for hydrographic data in the numerous passes around the island of Mauritius. In subsequent discussions with MOI it was seen that not only had MOI acquired hydrographic data for some of the passes it was trying to determine a priority order for the remaining surveys. All three agencies are currently working in isolation and not in mutual support with a consequent reduction in their effectiveness. A further example apparent to the IHO technical team is that activity under the current Indo-Mauritian MoU could be made more effective with greater understanding between Mauritian stakeholders.

Ensuring that a State's nautical charts and publications contain all relevant information requires the support of all in-country stakeholders. Similarly, to ensure that the national charting coverage and associated services meet the needs of the all stakeholders requires wide input.

To coordinate hydrographic effort for the effective discharge of SOLAS responsibilities and the efficient management of a State's water space the IHO recommends the establishment of a National Hydrographic Committee to provide input to and coordination of the hydrographic programme and setting national charting and surveying priorities. In this way, the stakeholders are in a position to assist in the continuing maintenance of the charts, longer term planning and perhaps also to the programme budget. The specimen agreement produced by IHO (http://www.iho.int/mtg_docs/CB/CBA/Model_Decree_creation_Committee.pdf) was passed to MHL at the end of the IHO technical visit.

A National Hydrographic Committee should include representatives from all relevant stakeholder sectors, including, but not limited to:

- Coastal zone management
- Disaster management
- Environmental protection
- Marine exploration
- Maritime boundary delimitation (UNCLOS)
- Maritime defence and security
- Maritime transport
- National infrastructure development
- Resource exploitation – minerals, fishing
- Shipping
- Survey and mapping
- Tourism

All hydrographic stakeholders need to be involved in contributing to Mauritius' national hydrographic programme. This is not only to identify and prioritise national requirements, but also to contribute to the execution of the programme. This could be through help in-kind, such as the provision of boats, or personnel or through contributions to enlist contract support – for example for surveys of areas targeted for development. A key role for the stakeholders is to educate and encourage everyone to forward all relevant new or changed hydrographic information to the national coordinator for hydrography and charting.

5.5 National Maritime Safety Information Coordinator

The IHO recommends that every coastal State should designate a national Maritime Safety Information (MSI) coordinator. In the absence of a Maritime Safety Administration and a lack of maritime experience within the Ministry of Housing and Lands it is recommended that the Ministry of Public Infrastructure, National Development Unit, Land Transport and Shipping under the Director of Shipping assumes the role of MSI coordinator, it is logical for that organisation also to be formally appointed as the national MSI coordinator.

5.6 Temporary Hydrographic Advisers

The IHO recommends that it is highly desirable to engage hydrographic advisers when an in-country hydrographic capability is being established. There are few local personnel in Mauritius with current hydrographic expertise. Thus it is considered that the participation of hydrographic advisers from IHO member states would assist in establishing an in-country hydrographic capability and would help foster close liaison and potential assistance from recognized hydrographic services in other regional countries. It is understood that Mauritius has been offered the services of one hydrographic officer and two survey assistants from the Indian Navy (IN) to assist in the development of MHL's hydrographic section. The IN secondment would be invaluable in developing an operational hydrographic data gathering capability.

To assist in the development of a wider national hydrographic strategy and structure for Mauritius it is recommended that Mauritius seek the short term assistance of an established hydrographic office, this could be requested under the auspices of the SAIHC or through bilateral arrangements.

6. Technical Visit Conclusions

Based on discussions and the facts obtained, the following principal conclusions have been reached:

- (1) The current lack of coherent MSI services could be having an adverse impact on Mauritius economy as well as putting the safety of life at sea and protection of the marine environment at increased risk.
- (2) Whilst the cooperation of the Indian government through the provision of hydrographic services to Mauritius is applauded, the failure of the INHD to pass hydrographic data - other than printed charts - to the Government of Mauritius for national use and the updating of charts provided by the Primary Charting Authority (UKHO) is seriously hampering the improvement of the safety of navigation of Mauritian waters and the business of national hydrographic stakeholders.
- (3) The improvement of charts covering Mauritius should be a matter of particular concern to the national government. Every effort should be made to work with the Primary Charting Authority (UKHO) to enable an effective charting service to be delivered.
- (4) The release of INHD bathymetric data to the Primary Charting Authority (UKHO) for the immediate improvement of nautical charts.
- (5) An urgent local review of existing charts is required to identify discrepancies and to provide up to date information to the PCA (UKHO) and INHD.
- (6) The re-establishment and enhance the in-country hydrographic capability to provide local input to the Primary Charting Authority (UKHO) and INHD to assist in the maintenance of the existing charts is important to enable the provision of appropriate and up-to-date nautical charts of Mauritius.
- (7) Mauritius, as a State Party to the SOLAS Convention must recognise and act upon its treaty obligations to ensure that appropriate paper charts and ENC's are available in accordance with Regulations 9 and 4 of Chapter V of that Convention. In this regard, Mauritius does not appear currently to be meeting its obligations. This is because there is no infrastructure or capability in place to provide information to the Primary Charting Authority (UKHO) so that the relevant charts can be kept up to date and fit for purpose.
- (8) The absence of up to date charts and a very limited MSI capability to satisfy the requirements of the SOLAS Convention, threaten the likelihood of Mauritius passing the hydrography section of the IMO Member State audit scheme which is likely to become mandatory around 2015.

7. Recommended Actions

In order to provide an appropriate level of hydrographic surveying and nautical charting services in Mauritius, it is recommended that the relevant authorities consider the following actions:

- (1) **The Government of Mauritius** should:
 - a. formally designate a **National Hydrographic Authority** to be responsible for coordination and ensuring the provision of appropriate nautical charting services for Mauritius in accordance with the requirements of the International Convention on the Safety of Life at Sea (SOLAS), and in accordance with the principles established by the IHO;
 - b. allocate regular funding and travel support for the **National Hydrographic Authority** to fulfil the duties of the Office and to represent Mauritius in appropriate forums, and in particular, to attend relevant meetings of the SAIHC, NOIHC and IHO;
 - c. ensure that a **Maritime Safety Information (MSI) Coordinator** position is established as soon as possible to fulfil Mauritius' treaty obligations under SOLAS V/4 - *navigational warnings*;
 - d. ensure the development and execution of a **National Maritime Safety Information Plan** – by ensuring that field checks are carried out on the current charts and publications and the results are forwarded promptly to the current PCA (UKHO) and eventually to the Indian Naval Hydrographic Department;
 - e. Negotiate with the Indian Government for the release of Indian Naval Hydrographic Department (INHD) data from the Indian Navy surveys of Mauritius past and in the future;
 - f. to provide INHD data to the Primary Charting Authority (UKHO) for use in the compilation or revision of the existing INT charts of Mauritius;
 - g. actively promote cooperation with the hydrographic offices of India and the United Kingdom to assist with a successful handover of PCA responsibilities
- (2) **The National Hydrographic Authority** should:
 - g. liaise with the Regional Team 3 at the UKHO to ensure that new navigationally significant information is forwarded and included in existing charts of Mauritius;
 - h. apply, through the SAIHC, for training for the MSI Coordinator under the IHO Capacity Building Program;
 - i. apply, through the SAIHC, for the short term assistance of an established hydrographic office to develop a National Hydrographic Structure for Mauritius;
 - j. organise an urgent national programme of review of all the published charts of Mauritius and inform the PCA (UKHO) of all detail that is incorrectly shown on these charts. Such a national programme should encourage all mariners and other interested parties to report discrepancies on existing charts together with as much information as possible on what should actually appear in the charts;
 - k. conclude an MoU or a Cooperative Arrangement with the Primary Charting Authority (UKHO);
 - l. establish and chair a **National Hydrographic Committee** or forum that coordinates national hydrographic requirements including input to a **National Charting Plan**, a **National Hydrographic Survey Plan** and a **National Maritime Safety Information Plan**. This group should include representatives from all stakeholder sectors, including but not be limited to: shipping, environmental protection, survey and mapping, national infrastructure development, coastal zone management, marine exploration, resource exploitation – minerals, fishing, maritime boundary delimitation, maritime transport, maritime defence and security, disaster management and tourism.
- (3) **The Government of Mauritius** should
 - e. actively support existing hydrographic surveyors in the enhancement of national hydrographic surveying; provide funding to re-equip the Ministry of Housing and Lands Hydrographic Unit with modern, portable survey equipment, including sidescan sonar, to conduct surveys in up to 100m depth;

- f. provide on-going funding for the regular maintenance and routine replacement of equipment and for the training and requalification of operators;
- g. establish and fund a national marine cartographic capability such that Mauritius can provide specialist chart products for national use and to be sufficiently informed to participate in decisions regarding chart coverage and availability;
- h. engage overseas hydrographic advice to guide and assist the **National Hydrographic Authority** and stakeholders to enhance in-country hydrographic data gathering capability and to foster close liaison and possible support from recognized national hydrographic authorities in other countries.

Annex A – List of Contacts

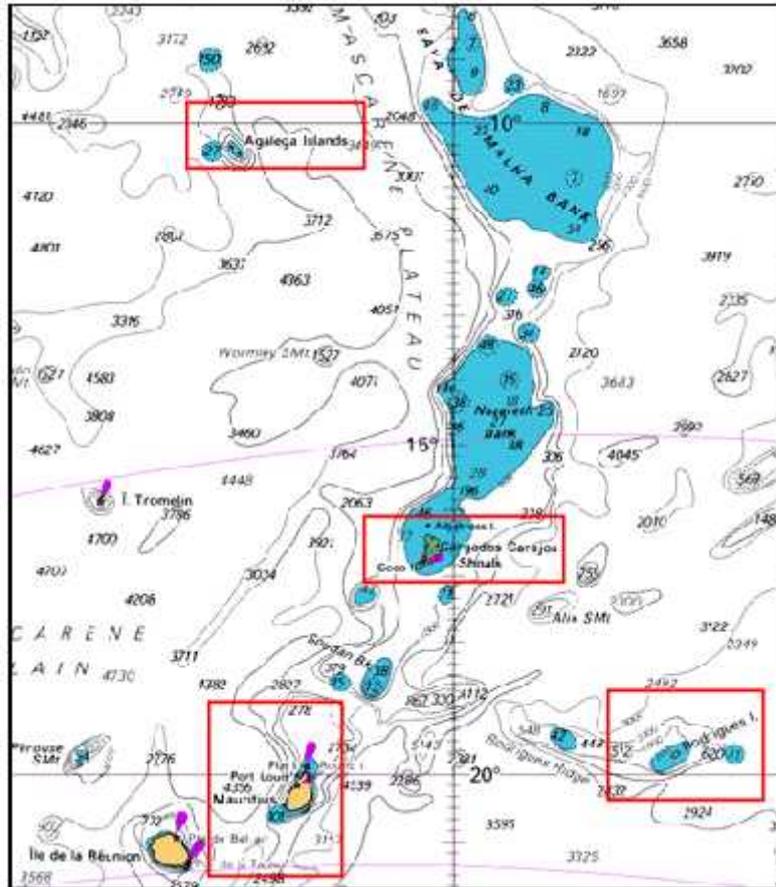
Name	Organization	Contact No <i>Direct</i> <i>Mobile</i>	Email Address
Dr. the Hon. Abu Twalib KASENALLY Minister	Ministry of Housing and Lands	+230 403 4086	akasenally@mail.gov.mu
Mr OOZEER Senior Chief Executive			
Mrs M MUDALLAR Permanent Secretary			
Mrs S K DOORGAKANT Principal Assistant Secretary			
Mr F P RAMCHURN A/Chief Surveyor			
Mr S TECKMAN Principal Surveyor			
Mr N LUCHOO Principal Surveyor			
Miss K APPADOO Assistant Secretary			
Mr R K BUNJUN Acting Principal Assistant Secretary	Ministry of Public Infrastructure, National Development Unit, Land Transport and Shipping (Land Transport and Shipping Division)	+230 201 3321	rbunjun@mail.gov.mu
Capt Pravinchand SEEBALUCK Director of Shipping		+230 201 2115	pseebaluck@mail.gov.mu
Capt Asiva COOPEN Principal Nautical Surveyor		+230 240 7016	acoopen@mail.gov.mu
Capt J HUBERT NOEL Nautical Surveyor		+230 240 4130	hnoel@mail.gov.mu
Mr Vaganaden MAUNIKUM Senior Maritime Officer		+230 201 3346	vmaunikum@mail.gov.mu
Mr A DONAT		+230 216 4052	

Name	Organization	Contact No		Email Address
		Direct	Mobile	
Mrs Shyama RATHACHAREN Principal Fisheries Officer	Ministry of Fisheries and Rodrigues	+230 234 2780	+230 258 9258	srathacharen@gmail.com
Mr DUSCOA Technical Officer		+230 234 6858		
Mr Rajiv BEEDASSY Divisional Environment Officer – ICZM Division	Ministry of Environment and Sustainable Development	+230 213 1137	+230 918 9246	rbeedassy@mail.gov.mu
Mrs N SOOGUN				
Mr JHEENGHUT		+230 203 6200		
Mr J I MOSAHEB Research Scientist	Mauritius Oceanographic Institute	+230 427 4434		jmosaheb@moi.intnet.mu
Mr Arshad RAWAT Research Scientist		+230 427 4434		arawat@moi.intnet.mu
Mr Dass BISSESSUR				dbissessur@moi.intnet.mu
Capt L B BARBEAU Port Master	Mauritius Ports Authority	+230 216 3504	+230 942 1836	l.barbeau@mauport.com
Capt T SAUGUR Assistant Port Master	Mauritius Ports Authority	+230 216 2919	+230 252 3945	t.saugur@mauport.com
Mr Diwakar GANGAPERSAD Research Coordinator	Mauritius Research Council	+230 465 1235		diwakar@mrc.intnet.mu
Inspector D BHOLAH Sergeant K MOHESH	National Coast Guard			opsncohg@orange.mu
Mr DWARKA Tourism Planner	Ministry of Tourism	+230 722 4554		
Capt Abri KAMPFER SAN	South African Navy Hydrographic Office	+27 21 787 2412	+27 (0)825 545 218	hydrosan@africa.com
Mr Bob WILSON	United Kingdom Hydrographic Office	+44 (0)1823 723415	+44 (0) 777 181 0114	Robert.wilson@ukho.gov.uk

Annex B – Mauritius’ Dependency on Hydrography and Charting

1. Introduction

Mauritius is a republic within The Commonwealth and includes the dependencies of Rodriguez Island, Agalega Islands and Cargados Carajos Shoals. In 2012, the population of Mauritius, Rodriguez Island and Cargados Carajos Shoals was estimated at 1,314,000. The capital, Port Louis, had a population of 148,877 in 2007.¹



Islands forming the Republic of Mauritius

The islands of the Republic of Mauritius rely almost totally for their existence on the import of goods by sea. The islanders have throughout their history relied on the sea for sustenance; life in the modern world has made this reliance even more essential.

2. Ports and Harbours

The sole port of entry for Mauritius is Port Louis; it is also the only commercial port within the country. International shipping, operating between East Asia and southern African ports and beyond, routinely calls at Port Louis. Sugar product export, although much reduced in recent years, is still a significant export. Having no natural oil reserves of its own Mauritius imports all of its petroleum requirements, in excess of 1.2 million tonnes per annum, through Port Louis: tankers of between 35,000 and 45,000 grt discharge at Port Louis. The total import/export tonnage through Port Louis in 2011 was 6,447,220 tonnes. The container terminal handles ships with a draft of up to 14m and during 2011 some 350,624 TEUS were handled of which almost one third were for transhipment. There are plans in hand to increase both berthing and depth to accommodate ships of up to 16m with a further improvement to 18m should the financial case be made. A large number of primarily Asian fishing vessels operate under licence in Mauritian waters and use the port. Total vessel traffic in 2011 amounted to 2,654 vessels. There are two commercial dry docks in the port with minor ship repair and construction facilities.

¹ NP39.p.11

3. Inter-Island Communication Routes

Inter island shipping is catered for by two cargo passenger vessels of the Mauritius Shipping Corporation (*Mauritius Pride* and *Mauritius Trochetia*) operating from Port Louis serving Rodrigues and providing a link with the French island of La Réunion.



*MS Mauritius Trochetia*²

4. Cruise Ship Operations

Few cruise ships call at Mauritius, the current call rate averages 15 to 20 calls per annum. A cruise terminal is situated in Port Louis. There are no small cruise ships operating in Mauritian waters.

5. Shipping Routes including Navigable Channels

Inspection of AIS tracks at the NCG HQ show that shipping passes clear to the south and east of Mauritius to avoid pirates operating in the northern Indian Ocean. Navigable channels are restricted to the many passes through the reefs around Mauritius and are in general poorly surveyed and charted despite the clear need for surveys and charts to support NCG operations, tourism, etc.

6. Offshore Banks and Vigias

The island of Mauritius

MFR staff informed the IHO Team that neither Flinders Bank (24° 35'S 57° 09'E) nor the 517m sounding west of Rodrigues (19° 38'S 62° 36'E) could be found during their fishery research operations.

7. Offshore Oil and Gas

Although on 13th July 2006 the Mauritian Government, signed a Memorandum of Understanding with the Oil and Natural Gas Commission Videsh Limited of India for cooperation in the field of hydrocarbon exploration there is currently no oil or gas exploration or production taking place or planned for Mauritian waters.³

8. Maritime Claims

Mauritius claims a 12 mile territorial sea and an exclusive economic zone (EEZ) of 200 miles.⁴ The total EEZ area totals approximately 1,332,000 square kilometres⁵ an area over 653 times larger than its land area. Mauritius has a Continental Shelf area of approximately 48,800 square kilometres⁶.

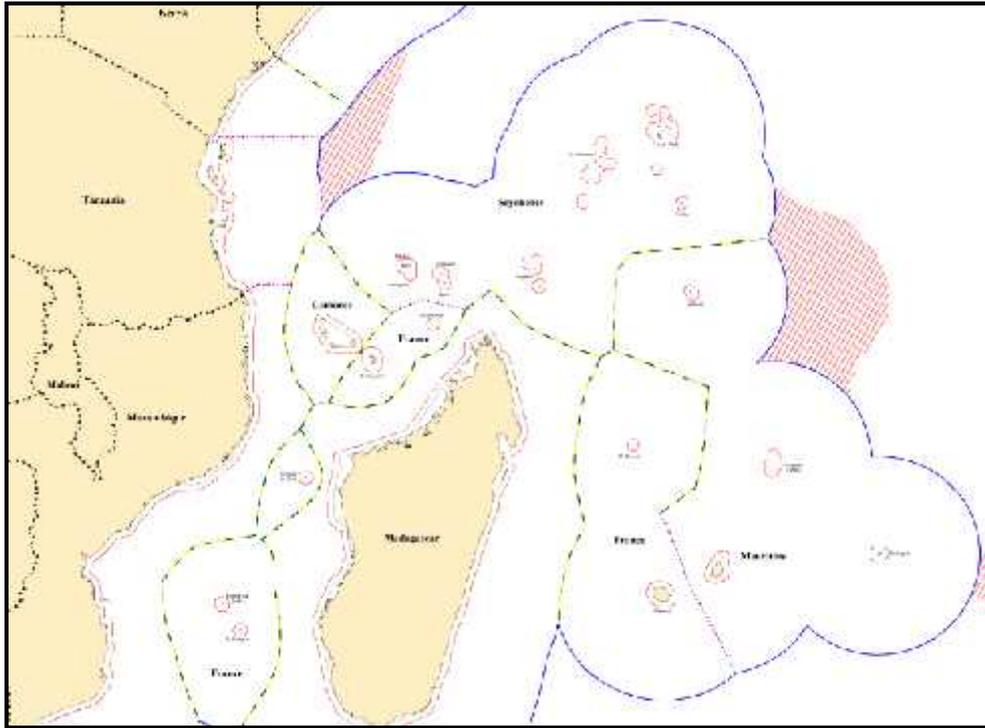
² <http://www.mauritiussshipping.intnet.mu/>

³ http://moi.gov.mu/research_projects.htm

⁴ NP39 p.9

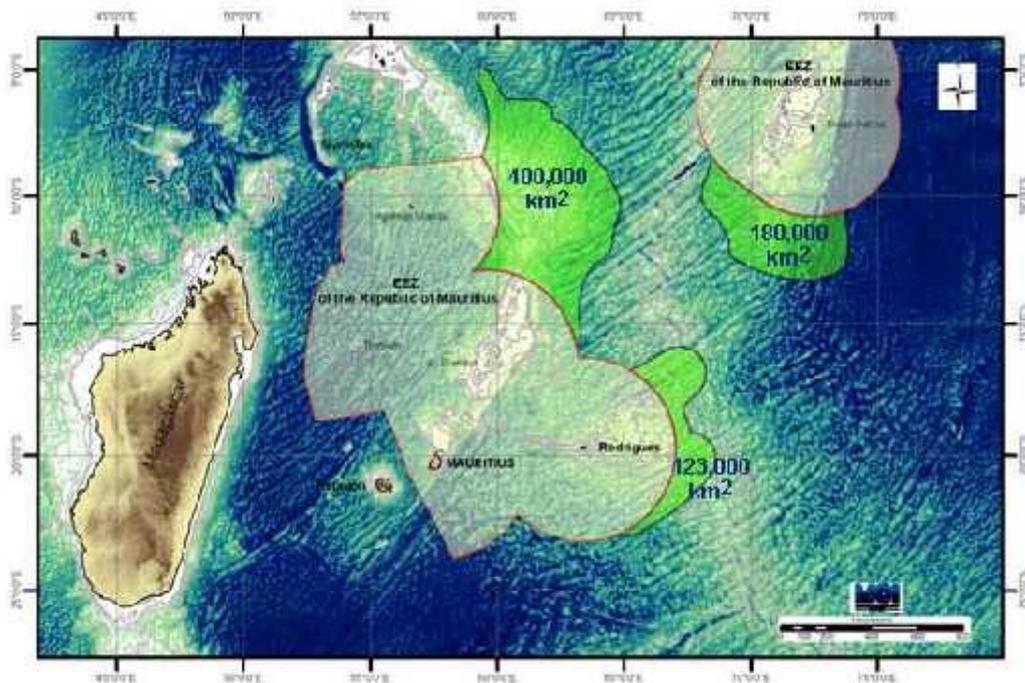
⁵ <http://www.seaaroundus.org/eez/690.aspx> [accessed 7 September 2012]

⁶ <http://www.seaaroundus.org/eez/690.aspx> [accessed 7 September 2012]



Mauritius' Maritime Boundaries

The Mauritius Oceanographic Institute (MOI) has the responsibility of providing technical assistance to the Government of Mauritius in formulating claims to the UN Commission on the Limits of the Continental Shelf for an extension of the marine jurisdiction of the Republic of Mauritius. The acquisition of bathymetry and geophysical data necessary to substantiate this submission were completed in June 2002. Mauritius made a joint submission with Seychelles over the Saya de Malha Bank and its adjoining areas at the beginning of December 2008. Two additional submissions were made to the UNCLCS in May 2009; claim regions are shown in the diagram below⁷



⁷ <http://moi.gov.mu/institute.htm> [accessed 17 September 2012]

9. Defence including Coastguard

The Mauritius' Coastguard operates a mix of inshore and near shore patrol craft. There is a need for surveys in the many passes through the reef areas for the better operation of all NCG Vessels. The NCG operates the MRCC at the NCG HQ from where it also monitors all foreign fishing vessels operating in Mauritius waters passing information to NCG vessels and aircraft as appropriate to maintain order in the licensed fishing sector. NCG vessels monitor coastal zone alterations for possible MSI promulgation.

10. Environment

The IHO team visited the ICZM Unit of the Ministry of Environment and Sustainable Development (MESD); the unit's particular area of interest is coastal erosion. The ministry undertakes beach recharge work and uses gabions to arrest beach erosion, however such work needs to be repeated every five to six years. Japanese International Cooperation Agency (JICA) is assisting in the development of wave energy dissipation methods but is hampered by a lack of hydrographic data for modelling. MESD use the recently Indian Navy charts but find the data inadequate for their purpose requiring the full detailed original data set for modelling; MESD is unable to acquire this data. Inshore bathymetric data is urgently required to support MESD's work; JICA staff are preparing specifications for a hydrographic data gathering programme.

To determine the rate of erosion the ICZM Unit would ideally like to undertake a programme of beach profiling but lack the equipment or expertise. It is considered that such assistance could be provided by both MHL and the Mauritius Oceanographic Institute. UKHO undertook to review its archive holdings for data relevant to coastal erosion and pass this data to the MESD.

11. Fishing

Fishing is either domestic or under licence to Asian vessels with those vessels operating in the oceanic waters of Mauritius' EEZ. Closer in shore around the coast of Mauritius itself the Ministry of Fisheries and Rodrigues (MFR) have established approximately 26 fish aggregation devices (FADs) to relieve the pressure on fishing in the lagoons around the island. The lifespan of a FAD is estimated at 500 days. MFR plan to deploy a second outer ring of FADs during 2013. The devices are shown in the figure below and are a hazard to shipping.

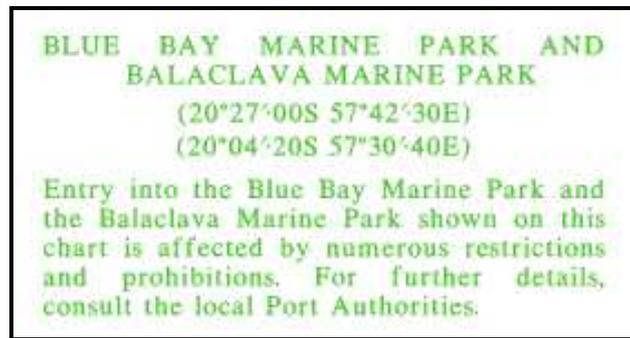


Positions of these devices cannot be guaranteed and thus notes on BA711 and 713 but not on BA 3048 Grand Port (below) warns the mariner to be vigilant. It should be noted that this information was taken from the internet as a direct request by UKHO to the Fisheries department drew no response.

FISH AGGREGATING DEVICES

Fish aggregating devices are present around Mauritius. They are fitted with a string of orange, red or yellow coloured floats and a radar reflector. Their positions may change frequently. Mariners should keep a distance of 1 mile off these devices.

MFR has established six fishing reserves and three marine protection areas but not all are charted. The Blue Bay and Balaclava Marine Parks are indicated to the mariner by a note on BA711 shown below.



MFR intend to establish fish farms in Grand Port; MFR was advised that these will need to be charted when established.

12. Tourism and Coastal Recreational Amenities

The Ministry of Tourism is the licensing authority for all pleasure craft, private and commercial, totalling in excess of 3,500 craft for use up to 8 miles offshore. The ministry has an interest in the inshore waters where it defines zones for various users such as swimmers, divers, fishing, etc. A programme of buoying the passes with port and starboard hand buoys is in progress but is hampered by a lack of adequate hydrographic data. The ministry is aware of the Indian Navy surveys but found the charted data inadequate for this task and requires more detailed surveys of the passes and inshore areas along with ready access to the full processed data sets. To support the safe operation of licensed craft the ministry wishes to develop a series of leisure charts but here again it is prevented from doing so by a lack of data. The IHO team discussed issues with leisure charts and undertook to provide examples to the ministry to consider. It was noted that a new marina is planned to be established in the Black River.

13. Education and Science

There do not appear to be any educational or scientific programmes sponsored by Mauritius government requiring or including the gathering of hydrographic data.

14. Planned Maritime Developments in Mauritius Waters

Only one identified maritime development is planned for Mauritius, the extension to the container terminal and deepening of the berth to allow larger container ships to operate in Port Louis. No major coastal zone construction works are planned other than the new marina at Black River.

Annex C – Existing Hydrographic Data for Mauritius

1. General

Hydrographic data for Mauritius falls into two categories: old British Admiralty data and modern Mauritius Ports Authority or Indian Navy data. There has not been any meaningful national data collection programme.

2. National Data

There is very little national hydrographic data and that which exists arises primarily from large scale surveys of the passes in the reefs; none of these surveys have been conducted to a recognized hydrographic standard. MOI have been conducting bathymetric surveys of the shallow lagoons of Mauritius and Rodrigues with the primary objective to have a detailed bathymetric and bottom sediment profile of the lagoons of the islands of the Republic of Mauritius. This work will eventually be extended to cover Agalega and St Brandon. The maps (hard copy and electronic format) will be generated from the surveys generated.⁸

Such national survey data as does exist has not been catalogued or made generally available to the Mauritian government agencies or to the PCA.

3. India

In August 2005, Mauritius and India signed a Memorandum of Understanding (MoU) in the field of hydrography. The MoU provides for the mutual development and cooperation in hydrography for hydrographic surveys within Mauritius' EEZ, hydrographic surveys of ports, harbours and Mauritius' coastal waters and outlying islands, exchange of hydrographic data and the provision of hydrographic expertise for the setting up of a national hydrographic infrastructure and Hydrographic Office in Mauritius.

The Indian Navy Hydrographic Department (INHD) has, since signing the MoU, conducted extensive surveys in Mauritius. Mauritian surveyors have been embarked in Indian Navy survey ships during these operations. The Indian Naval Hydrographic Department has produced nautical charts from these surveys but has not passed processed survey data to the Mauritian authorities for either national use or for use by the PCA. Known surveys conducted by INHD are as follows:

Period	IN Ship	Survey
12 Jan - 25 Feb 06	Sarvekshak	<ul style="list-style-type: none">• Agalega and surrounding waters• Port Louis• Approaches to Port Louis• Proposed fishing port at Bain des Dames• Deep sea water sampling
10 Mar - 09 Apr 07	Sarvekshak	<ul style="list-style-type: none">• Port Mathurin• Approaches to Port Mathurin• Bathymetric survey for LBOI at Trou d'Eau Douce and Riviere Noire
29 Feb - 09 Apr 08	Investigator	<ul style="list-style-type: none">• St Brandon Shoals• Profile for MOI - CLCS Survey
10 Mar - 16 Apr 09	Nirdeshak	<ul style="list-style-type: none">• St Brandon Shoals• Survey of Passes: Grand Bay, Tamarin Bay, Grande Riviere Noire Bay• Lagoon at Riviere des Galets
26 Mar - 26 Apr 10	Nirdeshak	<ul style="list-style-type: none">• St Brandon Shoals• Flic en Flac• Grand Port - Southern Entrance
23 Feb - 23 Mar 11	Sarvekshak	<ul style="list-style-type: none">• Survey in the East of Rodrigues• Survey of Eastern flank of Mauritius• Survey of Navigational Channel to SSR Terminal and Quays A to D up to the Fishing Port• Rodrigues Island• Survey of Passes - Cap Malheureux- Albion
24 Apr -15 May 12	Darshak	<ul style="list-style-type: none">• Survey of off lagoon from Bel Ombre to Le Chaland• Survey off Albion coast

⁸ http://moi.gov.mu/research_projects.htm [accessed 18 September 2012]

4. United States of America

No US data was been identified during the technical visit although such data may exist.

5. United Kingdom Hydrographic Office

All survey data held by UKHO has been incorporated into the current published charts. This data is assessed further in this report.

6. Summary of Current State of Surveys

The current state of surveys as summarized in IHO Publication C-55 'Status of Hydrographic Surveying and Nautical Charting Worldwide' Third Edition (2004) updated 27 September 2011 is shown in the table below. Mauritius' EEZ is approximately 1,332,000 square kilometres of which that >200m depth is approximately 33 times that of the area <200m which totals approximately 39,855 square kilometres. Given the imprecise delineation of the 200m contour and the incomplete knowledge of surveys undertaken in Mauritius' waters outside of the 200m contour the figures in and for C-55 are at best approximate. Given the research conducted by the IHO Team during its technical visit in September 2012 the figures have been revised and are shown in the right-hand column.⁹

Area Code	Definition	C-55 (%)	Revised Value (%)
A1	Area adequately surveyed (<200m)	10	
A2	Area adequately surveyed (>200m)	30	
B1	Area requiring resurvey at larger scale or to modern standards (<200m)	90	
B2	Area requiring resurvey at larger scale or to modern standards(>200m)	40	
C1	Area which has never been systematically surveyed (<200m)	0	
C2	Area which has never been systematically surveyed (>200m)	30	

IHO C-55 Mauritius - Status of Hydrographic Surveys [Updated 16 May 2007]

⁹ <http://www.searoundus.org/eez/690.aspx> [accessed 7 September 2012]

Annex D – Charting Analysis of Mauritius’ Waters

1. Mauritius Chart Coverage

The Republic of Mauritius does not have a chart production capability and relies historically on the UKHO to fulfil this function. During the past six years the Indian Naval Hydrographic Department has produced a series of five charts covering sections of the coast of Mauritius and outlying islands based solely on modern survey data. The résumé of chart coverage for Mauritius shown in IHO Publication C-55 - *Status of Nautical Charting* (updated 16 May 2007) is shown in the table below. The figures in brackets show revised values as supplied by the PCA (UKHO) for this report.

Chart Type	% Covered by INT Charts	% Covered by RNCs	% Covered by ENCs
Small Scale:			
Offshore Passage	100 (100)	100 (100)	0 (100)
Medium Scale:			
Landfall, Coastal Passage	100 (100)	100 (100)	0 (100)
Large Scale:			
Approaches and Ports	100 (100)	100 (100)	50 (40)

IHO C-55 Status of Chart Coverage

While C-55 shows that Mauritius is well covered by charts, it must be noted that the assessment applies only to charts produced by the PCA (UKHO) of which the quality of the data of some of those charts is often old, inadequate and of variable accuracy. The status as shown in C-55, although accurate, may be considered to be misleading.

2. British Admiralty Charts

For historical reasons the United Kingdom, through the United Kingdom Hydrographic Office (UKHO) remains the Primary Charting Authority (PCA) for Mauritius. It was stated by the MPI ship surveyors under the Director of Shipping, the pilots at Port Louis and NCG officers that most vessels visiting Mauritius use UKHO produced charts and publications. Two of the five charts produced by the PCA (UKHO) are referred to WGS 84, the others are on varying reference systems such that making the transfer of positions from chart to chart difficult and possibly inaccurate. The data from which the charts are compiled is noted as being in many cases old, imperfect and on undefined reference systems such that some charts carry the note:

CHART ACCURACY

Owing to the age and quality of the source information, some detail on this chart may not be positioned accurately. Particular caution is advised when navigating in the vicinity of dangers, even when using an electronic positioning system such as GPS.

BA711 carries the following note:

CHART 713: POSITIONS

To agree with larger scale chart 713 which is referred to Le Pouce Datum, positions read from chart 711 must be adjusted by 0 18 minutes NORTHWARD and 0 42 minutes WESTWARD.

The published charts and current state of maintenance is shown in the table below, a fuller discussion of the charts and the data upon which they are based can be found in Section 4 below.

BA Chart INT Chart	Title	Scale	Published Lasted Updated	Annual Sales 2010 (2011)
711 INT 7737	Mauritius	125,000	3 Ed 12 Jul 2012 NM - 2003/16	986 (1336)
713 INT 7738	Port Louis and Grand Rivière Noire Bay Port Louis Approaches to Port Louis Grand Rivière Noire Bay	12,500 50,000 20,000	5 Ed 14 Aug 2008 NM – 3838/12	862 (1107)
715	Rodriguez Island Rodriguez Island Mathurin Bay Port South East	No scale 24,212 48,424	NE 22 Apr 1999 NM – 2352/12	805 (715)
1881	Cargados Carajos Shoals Cargados Carajos Shoals Agalega Islands St James Anchorage	121,000 163,700 25,000	LC 31 Jan 1941 NM – 2008/5603	136 (108)
3048	Grand Port Grand Port Southern Approaches to Grand Port	30,000 12,500	3 Ed 6 Sep 2012 -	40 (109) (Applies to sales of the 2 Ed)

Summary of UKHO Charting

3. Indian Naval Hydrographic Department

Since the signing of the MoU in 2005 between the governments of Mauritius and India there has been an active surveying and subsequent chart production programme conducted by the Indian Navy and its Hydrographic Department. All of the Indian Navy charts are derived from exclusive modern Indian Navy data and are referred to WGS84. The current series of Indian Navy charts is discussed in the Review of Charting below.

4. Review of Current Charting

Nautical charting of the Republic of Mauritius is provided by two hydrographic offices: the United Kingdom Hydrographic Office as the PCA and INT chart producer and the Indian Naval Hydrographic Department under an Indo-Mauritian MoU. There are a number of noticeable differences in the two series: area overlap; preference for different areas; quality of compilation data with the INHD clearly better than UKHO charts as they benefit from INHD data unavailable to UKHO; differences in content, e.g. the Oil Jetty in Port Louis (20° 08'.6S 57° 29'.2E) shown on BA713 which was not depicted on the version of IN2086 sighted by the IHO technical team. Both series of charts are summarized below.

4.1 Primary Charting Authority - UKHO

The UKHO charting of Mauritius and its outlying islands is of variable quality often relying on old data. In one instance, BA 711 (INT 7737), Indian Navy data has been incorporated from published Indian Navy charts. UKHO is unable to compile charts from original INHD data as this has not been made available. The current state of charts and data from which they are compiled is given in the table below.

Summary of UKHO Charting

BA Chart	Title	Remarks
711 INT 7737	Mauritius	The charted waters surrounding Mauritius are mainly based on surveys between 1876 and 1897 at scales between 1:9,128 and 1:73,000. The approaches to Port Louis, the NW coasts and the southern approach to Grand Port are from Indian Navy charts between 2006 and 2010 at scales from 1:12,500 to 1:50,000. This chart is referred to WGS 84 and is part of the IHO INT series
713 INT 7738	Port Louis and Grand Rivière Noire Bay	This chart is referred to Le Pouce datum which is not compatible with WGS84. It is part of the IHO INT series
	Port Louis	This plan is based on commercial surveys of Port Louis between 2001 and 2006 at scales between 1:500 and 1:5,000. Bathymetric data in the outer approaches on the plan are derived from British government surveys between 1876 and 1897 at scales from 1:4,816 and 1:72,249
	Approaches to Port Louis	This plan is based on British government surveys between 1876 and 1897 at scales from 1:4,816 and 1:72,249 and miscellaneous lines of sounding in the outer areas
	Grand Rivière Noire Bay	This plan is based on British government surveys between 1876 and 1897 at scales from 1:4,816 and 1:72,249
715	Rodriguez Island	The chart is not referred to WGS 84 and carries the warning that positional differences 'MAY BE SIGNIFICANT TO NAVIGATION'.
	Rodriguez Island	This plan is derived from a British survey dated 1874 at an unknown scale
	Mathurin Bay	This plan is derived from a British survey dated 1874 at an unknown scale
	Port South East	This plan is derived from a British survey dated 1874 at an unknown scale
1881	Cargados Carajos Shoals	The chart is not referred to WGS 84 and carries the warning that positional differences 'MAY BE SIGNIFICANT TO NAVIGATION'.
	Cargados Carajos Shoals	This plan is derived from a British survey dated 1846 at a scale of 1:121,000
	Agalega Islands	This plan is from a sketch survey dated 1934 at a scale of 1:163,700
	St James Anchorage	This plan is from a sketch survey dated 1934 at a scale of 1:25,000
3048	Grand Port	This chart is referred to WGS 84
	Grand Port	The surveys from which this chart is compiled are a commercial survey dated 1972 at a scale of 1:5,000 and a British government survey dated 1897 at a scale of 1:9,128
	Southern Approaches to Grand Port	The surveys from which this chart is compiled are a commercial survey dated 1972 at a scale of 1:5,000 and a British government surveys dated between 1877 and 1897 at a scales from 1:9,128 to 1:73,000

4.2 Indian Naval Hydrographic Department Charts¹⁰

The charts published by the Indian Naval Hydrographic Department (INHD) are shown in the table below. Only two ENCs have been produced. Inspection of the NM website shows that no NMs have been issued for these charts since publication. All the charts listed are compiled exclusively from modern INHD source data.

INHD Chart	Title	Scale	Published	ENC Published
2084	Agalega Island	37,500	15 Mar 07	No
2086	Port Louis and Approaches		30 Apr 12	No
	Approaches to Port Louis	37,500		
	Port Louis	12,500		
2503	Approaches to Cargados Carajos Shoals	75,000	31 Mar 09	Yes
2504	Mathurin Harbour	12,500	31 Aug 08	Yes
2505	Approaches to Mathurin Harbour	25,000	15 Feb 09	No
2506	Grand Bay and Grand Riviere Noire Bay		15 Jul 10	No
	Grand Bay	25,000		
	Grand Riviere Noire Bay	25,000		
2507	Grand Port	12,500	14 Aug 12	No

¹⁰ <http://www.hydrobharat.nic.in/pdf/Catalogue%202011.pdf> [accessed 17 Sep 2012]

4.3 INHD/UKHO Charting Comparison

The table below summarizes the charting provided by the INHD and UKHO.

INHD Chart	UKHO Chart	Title	INHD Scale	INHD Data	INHD ENC	UKHO Scale	UKHO Data	UKHO ENC
	711 INT7737	Mauritius				125,000	1876-2010	Yes
2084	1881	Agalega Island	37,500	2006	No	163,700	1934	No
		Agalega Is - St James Anchorage				25,000	1934	No
2086	713 INT7738	Approaches to Port Louis	37,500		No	50,000	1876-1897	Yes
		Port Louis	12,500		No	12,500	1871-2006	Yes
2503		Approaches to Cargados Carajos Shoals	75,000	2008	Yes			
2504	715	Mathurin Harbour	12,500	2007	Yes	24,212	1874	No
		Rodrigues				NS	1874	No
		Port South East				48,424	1874	No
2505		Approaches to Mathurin Harbour	25,000	2007-09	No			
2506		Grand Bay and Grand Riviere Noire Bay	25,000	2007-09	No			
	3048	Grand Port				30,000	1877-1972	No
		Southern Entrance to Grand Port				12,500	1897-1972	No
2507	3048	Southern Entrance to Grand Port	12,500	2010	No	12,500	1897-2010	No

Annex E – IHO Yearbook Revision

MAURITIUS (REPUBLIC OF)

<p>MINISTRY OF PUBLIC INFRASTRUCTURE, NATIONAL DEVELOPMENT UNIT, LAND TRANSPORT AND SHIPPING Shipping Division New Government Centre PORT LOUIS</p> <p>Director of Shipping: Captain P. SEEBALUCK Responsible for the provision of SOLAS V obligations</p>	
<p>MINISTRY OF HOUSING AND LANDS Ebène Tower Ebène</p>	
<p>Department of which the Hydrographic Office is part – Ministère dont dépend le Service Hydrographique – Ministerio del que depende el Servicio Hidrográfico</p>	<p>Ministry of Housing and Lands</p>
<p>Principal functions of the H.O. - Attributions principales du S.H. - Principales funciones del S.H.</p>	<p>To conduct hydrographic surveys of harbours and lagoon waters.</p>
<p>National day – Fête nationale – Fiesta nacional</p>	<p>12 March</p>
<p>Date of establishment and Relevant National Legislation - Date de fondation et législation nationale concernée – Fecha de establecimiento y Leyes nacionales de referencia</p>	
<p>Name and rank of the Director or Head - Nom et grade du directeur – Apellidos y graduación del Director</p>	<p>Mr A. N. OOZEER Senior Chief Executive Ministry of Housing and Lands</p>
<p>Tonnage – Tonelaje</p>	<p>198,490 (2011)</p>
<p>Total Budget - Budget total – Presupuesto Total</p>	
<p>Staff employed - Effectifs – Plantilla - Hydrographers (Name and rank of managing staff) - Hydrographes (Nom et grade du personnel de direction - Hidrógrafos (Apellidos y graduación del personal directivo)</p>	
<p>Surveying vessels/ Aircraft - Bâtiments hydrographiques/aéronefs - Buques Hidrográficos/Aeronaves</p>	<p>None</p>