

**Applied Geoscience and  
Technology Division (SOPAC)**  
Private Mail Bag Suva  
Mead Road Nabua, Fiji Islands  
Telephone: (679) 3381377  
Fax: (679) 3370040/3384461  
www.sopac.org  
Email: director@sopac.org  
SPC Suva Regional Office



SPC Headquarters  
BP D5  
98848 Noumea Cedex  
New Caledonia  
Telephone: +687 26 20 00  
Fax: +687 26 38 18

## **MARINE SURVEY AND MAPPING ACTIVITIES, October 2011 to October 2013**

### **Report to the South West Pacific Hydrographic Commission (SWPHC)**

**12<sup>th</sup> IHO SWPHC Conference, Port Villa, Vanuatu 11 - 15 November 2013**

*Salesh Kumar and Jens Krüger  
Ocean & Islands Programme, SPC-SOPAC  
November 2013*

## 1 Introduction

The Secretariat of the Pacific Community (SPC) is an international organisation, owned and governed by its members, that exists to help Pacific Island people achieve sustainable development. The goal of the Applied Geoscience and Technology (SOPAC) Division of SPC is to apply geoscience and technology, including marine surveying, to realise new opportunities for improving the livelihoods of Pacific communities. Such surveys are carried out through the Ocean & Islands Programme (OIP). To ensure holistic solutions are developed, SPC integrates complementary tools such as resource economics and socio-economic assessment into its programming where appropriate. SPC is also a regional leader in the use of remotely-sensed products, numerical modeling techniques and GIS applications and also is active in the preservation and management of geospatial and geoscience data and information, including bathymetric data.

This report is a summary of SPC's marine survey and related activities for the period from October 2011 to October 2013, provided to the Chair of the South West Pacific Hydrographic Commission (SWPHC) in preparation to the 12<sup>th</sup> Conference of the IHO SWPHC to be held in Port Villa, Vanuatu, from the 11th to the 15th of November 2013.

## 2 Marine Survey Activities, 2011-13

The table below summarises SPC's marine survey activities during 2011-13.

Date	Location	Activity	Status & Comments
October 2011	Naduri, Vanua Levu, Fiji	New wharf site survey- multibeam and single channel seismic includes survey of north passage past Kioa Island (cf. Admiralty Chart 749)	Completed, Technical report PR 0036
October 2011	Malau port Vanua Levu, Fiji	Investigate possible expansion of FFA jetty. Work included multibeam and single channel seismic	Survey completed, Draft report
October 2011	Valaga bay Vanua Levu, Fiji	New wharf site investigation. Multibeam and single channel seismic for geotechnical survey	Completed, Technical report PR 94
May 2012	Buresala Jetty, Ovalau, Fiji	Post dredging survey of wharf (cf. Admiralty chart 488)	Completed Technical report PR 100
October 2012	Tagaqe, coral coast, Vitilevu, Fiji	Wave energy site investigation. Multibeam, seismic and drilling. Investigation for geotechnical feasibility works	Completed, Technical report PR 148
October 2012	Sigatoka River offshore, Vitilevu, Fiji	Mining resource survey. Multibeam and single channel seismic	Survey completed, data to be processed.

March 2013	Tarawa Atoll, Kiribati.	UXO SURVEY. Multibeam and magnetic survey. Resource site for dredging aggregates and locating possible UXO and ERW's	Survey completed, draft technical report PR 173. 8 wrecks located in survey and an unknown one found approximately 40 m from new wharf
June 2013	Niue	New wharf expansion investigation. Multibeam, geotechnical drilling and modelling of proposed structure	Completed preliminary report of survey data. Technical report PR157
October 2013	Keita Bouganville, Papua new Guinea	Cable route survey from mission point to Pokpok island.	Survey completed, reporting in progress.

### 3 Survey Equipment and Software

The table below summarises the equipment and software currently in use at SPC for the collection of bathymetric data. In addition to the below, SPC also has equipment for the collection of geophysical, oceanographic and water quality data (e.g. magnetometer, single channel seismic boomer, various current meters and wave gauges, and water quality probes). We do not currently have a sidescan sonar, precision motion sensor, or vented tide gauge, and are looking at purchasing these in 2014.

Survey Equipment Category	Details
Single beam echosounder	<ul style="list-style-type: none"> <li>• Echotrac CVM with 200kHz transducer</li> </ul>
Multibeam echosounder	<ul style="list-style-type: none"> <li>• Reson SeaBat 8160, 50kHz</li> <li>• R2Sonic 2024, 200kHz to 400kHz</li> </ul>
Motion sensors	<ul style="list-style-type: none"> <li>• TSS DMS2-05 (downgraded to DMS-25)</li> <li>• VRU motion sensor</li> </ul>
Heading	<ul style="list-style-type: none"> <li>• Surveyor Meridian gyro</li> <li>• SCAN 2000 gyro</li> </ul>
Conductivity, temperature, depth sensors	<ul style="list-style-type: none"> <li>• Seabird SBE 19-03, 600m</li> <li>• Seabird SBE plus, 3500m</li> <li>• Seabird SBE 19-01, 1024m</li> </ul>
Tide gauge	<ul style="list-style-type: none"> <li>• RBR TWR-2050 submersible pressure sensor</li> <li>• InterOcean WTF 904 submersible sensor</li> </ul>
Positioning	<ul style="list-style-type: none"> <li>• Trimble RTK R10</li> <li>• Thales Aquarius LRK GPS</li> <li>• Trimble DSM12 GPs</li> <li>• Trimble 5800</li> <li>• Trimble SPS 852 with Fugro G2 license</li> <li>• MarineSTAR 9200 G2-H for horizontal positioning and heading with Fugro G2 license</li> </ul>
Software	<ul style="list-style-type: none"> <li>• Hypack</li> <li>• Surfer</li> <li>• Fledermaus</li> <li>• AutoCAD</li> </ul>

Survey Equipment Category	Details
	<ul style="list-style-type: none"> <li>• Trimble Business Centre</li> </ul>

The maintenance and operation of the above equipment is supported through the SPC-SOPAC Division Technical Workshop. The Technical Workshop also has a direct role in the procurement, servicing, modification, repair, calibration and cataloguing of oceanographic, geodetic, climate and geological equipment and instruments held by the SOPAC Division. It deploys, mobilises and demobilises millions of dollars' worth of equipment safely and successfully every year, including marine surveys. Due to the excellent support from the NZ Government's Regional Ocean Sciences Program (NZ-ROSP) in 2012 – 2013 the workshop has been able to fully support SOPAC Divisional needs and has maintained and where necessary upgraded vital equipment.

#### 4 Hydrographic Training

A two week-long IHO/IMO Regional Training Courses on Hydrography and Nautical Charting was held in Fiji from 24 September to 05 October 2012. The course was conducted by David Parker and Sam Harper of UKHO. The training was attended by six staff from SPC and participants from Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Burma, Niue, Palau, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. The training received support through the facilities of the Fiji Hydrographic Survey office on-shore and the ship, FNS Lautoka, for surveying activities at sea.

The Australian Hydrographic Service successfully partnered with SPC-SOPAC in a proposal entitled "Pacific Regional Hydrographic Capability Improvement Programme" to AusAID under the Pacific Public Sector Linkages Program (PSLP) 2011-12. Satesh Kumar, staff member of SPC-SOPAC was able to attend the CAT-B training at Australian Hydrographic School at HMAS Penguin in Sydney from April 22<sup>nd</sup> to September 28<sup>th</sup> 2013. He successfully completed the theoretical and practical requirements prescribed by the FIG/IHO/ICA International Advisory Board on Standards of competence for Hydrographic Surveyors Category B with specialisation in Nautical Charting and Military Hydrography. As part of the project, Satesh is also scheduled to undergo a further three weeks practical training with the Royal Australian Navy in 2014.

#### 5 Associated Activities

##### 5.1 Regional Maritime Boundaries

The Regional Maritime Boundaries (RMB) sector has been implemented by SPC-SOPAC since 2001 and serves to assist PICs with the technical development of baselines (including archipelagic baselines where applicable) and the computation of subsequent maritime zone limits (territorial seas – 12 nautical miles [NM]; contiguous zones – 24 NM and exclusive economic zones – 200 NM). The RMB also assists PICs to calculate the technical solutions to overlapping or shared maritime zones and assists those PICs with extended continental shelf (ECS) potential to delineate these areas and submit claims to the UN Commission on the Limits of the Continental Shelf (UNCLCS). The RMB Sector undertakes all work in accordance with the provisions of the UN Convention on the Law of the Sea (UNCLOS) and ultimately, the RMB aims to assist PICs to develop, promulgate and declare their respective maritime zones, limits and boundary information with the UN Division for Ocean Affairs and the Law of the Sea (UNDOALOS).

Successful delivery of the PIC maritime boundary programme has been possible through the broad, collaborative network of partners. These partners (Geoscience Australia, Australian Attorney General's Office, UNEP GRID Arendal, Commonwealth Secretariat and the Forum Fisheries Agency) join the SPC-SOPAC to run and resource the Regional Maritime Boundaries

Workshop series. Until recently, these had occurred approximately every eight months and have been the major driving force in recent successes, for example: seven bilateral shared boundary agreements and one tri-point agreement settled in 2012 and three bilateral boundary areas settled between the USA and Kiribati in 2013. This model for progress has proven so successful that other agencies are attempting to emulate the approach in other locations such as the Caribbean.

## 5.2 South Pacific Sea Level and Climate Monitoring Project

The AusAID-funded Pacific Sea Level Monitoring array is implemented and maintained due to increasing regional concern over climate change associated sea-level rise and the poor understanding of sea-level variability in the region. The array was installed between 1991 and 2001 and since establishment, the array has captured a mostly uninterrupted stream of high quality, accurate data on sea level, temperature (water and air), barometric pressure and wind speed and direction. Associated earth movement monitoring stations have also been established at each gauge location to continually monitor and account for vertical ground movement and thus provide superbly accurate sea level data. The Pacific Sea Level Monitoring Project (PSLM) is a component of the broader Climate and Oceans Support Program in the Pacific (COSPPac Project) which is managed by the Bureau of Meteorology Australia (BoMA) and implemented in partnership with Geoscience Australia (GA) and the Ocean and Islands Programme (OIP). The OIP's role is in two main areas: (1) technical support to continue the repair, maintenance and calibration of the sea level monitoring array, and (2) to support the communications and outreach components of COSPPac via a Pacific Islands based regional COSPPac officer.

At the time of writing there is a PSLM station in the Cook Islands (Rarotonga), Federated States of Micronesia (Pohnpei), Fiji (Lautoka), Kiribati (Tarawa), Marshall Islands (Majuro), Nauru, Papua New Guinea (Manus Island), Samoa (Apia), Solomon Islands (Honiara), Tonga (Nukualofa), Tuvalu (Funafuti) and Vanuatu (Port Villa). The former University of Hawaii station in Suva, Fiji is also calibrated and maintained by the PSLM team. Also in response to requests from Niue, the PSLM Project will install a sea level gauge and associated GNSS station at Alofi wharf over the next 12 months. The PSLM has also purchase two portable (or temporary) gauges for short-term deployment in the region. The first deployment in Vava'u, Tonga has already been completed, and a second is planned for Auki, Malaita Province, Solomon Islands to improve our understanding of mean sea level and tidal predictions in these locations.

A major component of work within the PSLM Project over the last 3 years has been the implementation of the *Operational Network Upgrade Project (ONUP)* which has upgraded the sensor and communications technology on both the sea level monitoring and GPS stations. These improvements, which are complete in all countries, extend the life of the array and improve monitoring of phenomena such as tsunamis. Likewise, the GPS facilities in each location have been upgraded to the Global Navigation Satellite System (GNSS); meaning they can now utilise a far larger array of satellites to fix exact position and ensure any ground movement is detected. Improved communications systems mean that real time signals are now available and a facility to provide access to the real time data collected by the array is also being developed by the PSLM Project in Australia.

## 5.3 Data and Information Management

The Geonetwork facility (<http://geonetwork.sopac.org/geonetwork/srv/en/main.home>) has hugely improved the SPC-SOPAC's data and product visibility, as well as our ability to collate, protect and provide access to historical data and analysis products. The uploading of historical data holdings to Geonetwork continues and the volume of requests for such data grows yearly.

Since 2008, statistics regarding use have been gathered and show Geonetwork is truly a demand led activity. The Geonetwork effort is largely carried by one full time position and is also greatly supported by the Divisional IT Development Team and our technical partners.

In its first full year of operation (2009) Geonetwork recorded a modest 31 downloads, during the 2013 reporting period Geonetwork recorded 223,327 total downloads, an extraordinary achievement! The Geonetwork is largely financed by the NZ Government's Regional Ocean Sciences Program (NZ-ROSP) given the substantial investment of NZ ROSP towards the collection of high quality oceans data by the OIP.

In 2011, SPC-SOPAC gained approval from SPC's Committee of Representatives of Governments and Administrations (CRGA) to enhance the Geonetwork internet interface to allow it to be more user-friendly, particularly for specialist geospatial data such as publically available maritime jurisdictional information and data. Recognising that a more user friendly web interface would likely create demand by our clients across a range of spatial data needs, the OIP has collaborated with the UNEP GRID Sydney Office, Geoscience Australia and the SOPAC Division ITC Development Team to implement an AusAID funded project to develop a new online map interface and discovery platform. This portal will continue to draw on data stored on Geonetwork, but will display this information in a more intuitive map environment allowing the user to also download the data layers of interest. This will be particularly suited for the discovery of hydrographic data.

In line with the SOPAC Division's evolving policy towards open data access, the new interface will provide a new level of operability and access to the SPC's holdings. Following the first SOPAC Divisional meeting (Oct 2011) a recommendation was passed by CRGA to: *"acknowledge the (SOPAC) division is committed to making its data and products as open and freely available as possible, in line with international best practice for dissemination of public domain data"* (see: SPC/CRGA 41 (11)/Paper 4.1/Supplementary Paper. Technical Support Services – Data Management – recommendation 46). Likewise, the second SOPAC Divisional meeting (Nov 2012) also reaffirmed: *"the increasing demand from PICTs for access to scientific data and information, including the division products; and acknowledged the Division is committed to making its data and products as open and freely available as possible, in line with international best practice for dissemination of public domain data"* (see: SPC/SOPAC-2 (2012); SOPAC-2/7 Technical Support Services – Data Management – recommendation 59). The new Oceans Data Portal will be used as an opportunity to implement these recommendations and provide improved access to the OIP and other regional oceans data held by the Programme, including bathymetric data holdings.

#### **5.4 Pilot Training**

Instructors from nine PICTs participated in a week-long simulator training course for instructors in Suva from 26-30 August 2013. A computerised simulator was used that included SPC's bathymetric data holdings for Suva Harbour, producing the first simulation of a Pacific Island port.

The training was organised by SPC with funding from the International Maritime Organization (IMO) Technical Co-operation Fund and Singapore through the Singapore-IMO Memorandum of Understanding (MOU) on a Third Country Training Programme (TCTP).

## **6 Agreements**

The United Kingdom Hydrographic Office (UKHO) and SPC-SOPAC signed a Cooperation Arrangement in April 2013 whereby data collected by or held by SPC on behalf of its member

countries can be forwarded to the UKHO and be used to modernise *Admiralty* charts in the Pacific.