



SOUTH PACIFIC APPLIED GEOSCIENCE COMMISSION

SPSLCMP III Field Survey Visit – Cook Islands & Samoa 6th August to 5th September 2004

SOPAC Trip Report 366

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INTRODUCTION:

The South Pacific Sea Level and Climate Monitoring Project (SPSLCMP) Phase III aims to help the Pacific Island countries understand the implications and scale of sea-level and climate changes. The duties of the “Assistant Surveyor” in this project concentrates on the objectives stated below. But overall this project is established to:–

- a. Set up high-resolution monitoring stations in the South Pacific region to compute relative motions of land and sea at each station based in each of the twelve countries.
- b. Carry out a geodetic survey programme (Precise Differential Levelling Survey) to measure movements of the crust at the other strategic sites in each country with respect to the reference station.
- c. Help identify changes to sea levels with reference to a similar network of stations in Australia and elsewhere in the world, whether these changes are due to thermal expansion of the ocean, contributions from the land ice or changing properties of water from different ocean zones.
- d. Provide a measure of regional vertical controls and exchange information and data with national, regional and international climate change centres in relation to the ongoing international geodetic programmes, which incorporate satellite altimetry and radio astronomy.

OBJECTIVES:

1. To provide assistance in the collection and reduction of precise levelling survey data between the Sea Level recorders, benchmark arrays and CGPS receiver in the field as part of the SPSLCMP Phase III, funded by AusAID.
2. To monitor and identify changes to sea levels in the South Pacific that is due to thermal expansion of the ocean, glaciations from the land ice or changing properties in the continental plates between zones.
3. To accomplish the above tasks by providing survey assistance to Mr Steven Turner, Geodetic Surveyor of National Tidal Centre Australia [NTCA], to carry out Precise Differential Levelling Survey.

The previous Precise Differential Levelling survey was carried out in November 2002.

LIST OF PEOPLE INVOLVED/CONSULTED:

Field Team Members

Steven Turner (National Tidal Centre – Bureau of Meteorology, Adelaide)
 Andrick Lal (South Pacific Applied Geoscience Commission)
 Robert Smith (South Pacific Applied Geoscience Commission)
 Simon Young (South Pacific Applied Geoscience Commission)

Cook Island

Mr Ata Herman, Secretary – Ministry of Works
 Mr Keu Mataroa, Policy Advisor – Ministry of Works
 Mr Ben Parakoti, Director – Department of Water Works
 Mr Timote Tangiruaiane, GIS Manager – Department of Survey
 Mr Arona Ngari, Manager – Cook Islands Meteorological Service
 Mr Ian Bertram, Secretary – Department of Marine Resources

Samoa

Mr Ausetalia Titimaea, Superintendent – Samoa Observatory Department
 Mr Shaun Williams, Geophysics Section Head – Samoa Observatory Department
 Mr Happy Valley Patu, Geophysics Observer – Samoa Observatory Department
 Mr Ueligitone Seiuli, Principal Surveyor – Ministry of Natural Resources and Environment

EXECUTIVE SUMMARY

The Precise Differential Levelling Survey Programme was completed on schedule for the Cook Islands and Samoa. The geodetic survey programme carried out along the coastal array of the Rarotonga and the Apia Harbour was successful with the weather holding for the entire field work. The old survey marks were found along the coastal survey array. The three-kilometre survey in Rarotonga and twelve-kilometre survey in Apia achieved good accuracy and closure as per standards to the Precise Geodetic Levelling.

But as per work programme I arrived on the 6th August 2004 in Cook Islands three days prior to the Sea Level Geodetic Survey Program on the 10th August 2004 to carry out the Beach Profile Survey around the island of Rarotonga. Unfortunately the local government offices were closed during the weekend therefore organising and carrying out the field survey was a difficult task as there was no survey information for the island available; contacting the local counterpart was futile. Therefore both the days were spent helping Mr Robert Smith and Mr Simon Young of SOPAC and Mr Ian Bertram of Ministry of Marine Resources in preparation for the bathymetric survey around the Rarotonga atoll by installing all the instrumentation on the boat.

On the 9th August 2004, a new ground control point was established and surveyed using the Static GPS technique to set up a real time kinematic GPS base station on the roof of the Ministry of the Environment Workshop building. The real-time kinematic GPS base station was set up for a week to communicate with the Rover on the boat to relaying real time coordinates for the bathymetry survey.

Apart from the limitations faced in the Cook Islands with the coastal-management project, the Sea Level Precise Differential Levelling Survey Programme was carried out successfully in Cook Islands and Samoa.

I would like to acknowledge the Meteorological Office and the Ministry of Works of the Cook Islands and also the Survey Department and the Observatory Department of Samoa for their tireless effort and support during the field survey visit.

GENERAL:

Itinerary		Activity Name – South Pacific Sea Level & Climate Monitoring Project Phase III (O.I.P 2.3.2)	ACTION
Date	Time		
06/08/04	2200	<ul style="list-style-type: none"> Arrived in Rarotonga, Cook Is via Auckland and checked in at the Central Motel. 	OIP/AL
07/08/04	1000	<ul style="list-style-type: none"> Visited the Marine Department office and then left for the Marine Workshop where all the marine and land survey gear was stored. Organised the survey gear and contacted the local survey counterpart, Mr Vaipo Mataora, but was futile. There was no survey info available to carry out the coastal/land survey. Assisted Robert and Simon in organising for the marine survey. 	OIP/AL OIP/RS OIP/SY IB/DMS
08/08/04	0900	<ul style="list-style-type: none"> Assisted Robert and Simon in organising for the marine survey Carried out the Reconnaissance survey for the DGPS station to be set-up for the Bathymetry Survey. Found a suitable site for the DGPS station along the coast on top of the Marine Resources Workshop. 	OIP/AL OIP/RS OIP/SY IB/DMS
09/08/04	0900	<ul style="list-style-type: none"> Visited the Survey Office for survey information Carried out the GPS Survey for the DGPS Survey Station on top of the Marine Resources Department, the DGPS station was established for the marine survey. 	OIP/AL OIP/RS OIP/SY IB/DMS
10/08/04	1100	<ul style="list-style-type: none"> Reconnaissance Survey:– <ul style="list-style-type: none"> Locating old survey marks (temporary and deep benchmarks). At the same time putting/replacing some of the temporary benchmarks that were knocked down since the previous survey, along the survey array from the Mobil Depot to the Airport compound. Precise Differential Levelling Survey in the airport area compound where the CGPS station is based and reduction of the survey data at the end of the day. 	OIP/AL NTCA/ST
11/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey from the Mobil depot towards the airport all day and reduction of the survey data at the end of the day. 	OIP/AL NTCA/ST
12/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey along the Mobil depot to the Tide Gauge and from the Car Sales Survey mark to the Cemetery deep benchmark and reduction of the survey data at the end of the day. 	OIP/AL NTCA/ST
13/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey from the Cemetery to the airport compound and reduction of the survey data at the end of the day. 	OIP/AL NTCA/ST
14/08/04	1000	<ul style="list-style-type: none"> Carried out Re-Precise Differential Levelling Survey from the Car Sales to Cemetery and completed all the survey in Rarotonga and did reduction of all the survey data at the end of the day. All the bays closed properly 	OIP/AL NTCA/ST

15/08/04	0600	<ul style="list-style-type: none"> Left Cook Islands for Apia, Samoa via Auckland 	OIP/AL NTCA/ST
16/08/04	0300 1000	<ul style="list-style-type: none"> Arrived in Apia, Samoa and checked in at Apia Central Motel. Visited the Samoa Observatory Office; Survey Office and Ports Authority Harbour Master for courtesy call and for permission to enter the wharf area. Reconnaissance Survey: <ul style="list-style-type: none"> Locating old survey marks (temporary and deep benchmarks). At the same time putting/replacing some of the temporary benchmarks that was knocked down from the previous survey, along the survey array from the wharf to the Faga'alli Airport. 	OIP/AL NTCA/ST
17/08/04	0800	<ul style="list-style-type: none"> Brief meeting with the Samoa Observatory Office on the sea level project and its outcome. Precise Differential Levelling Survey from the wharf to the Apia Park Road and reduction of the survey data at the end of the day. All the bays closed properly. 	OIP/AL NTCA/ST AT/SOD SW/SOD HVP/SOD
18/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey along the Apia Park Road and reduction of the survey data at the end of the day; approximately 1.1km surveyed. 	OIP/AL NTCA/ST HVP/SOD
19/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey along the Apia Park Road and reduction of the survey data at the end of the day; approx. 700 m of level run done. One bay was re-levelled. 	OIP/AL NTCA/ST HVP/SOD
20/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey from the Apia Park Road into the Matafagatale Road and reduction of the survey data at the end of the day. One bay was re-levelled. 	OIP/AL NTCA/ST HVP/SOD
21/08/04	0800	<ul style="list-style-type: none"> Two Bays of Precise Differential Levelling Survey and one bay re-levelled and due to heavy rain, the survey was halted but in due course carried out the reconnaissance survey for the rest of the 12km survey:– <ul style="list-style-type: none"> Locating old survey marks (temporary and deep benchmarks). At the same time putting/replacing some of the temporary benchmarks that were knocked down from the previous survey, along the survey array from the wharf to the Faga'alli Airport. 	OIP/AL NTCA/ST
22/08/04		<ul style="list-style-type: none"> Rest Day 	OIP/AL
23/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey along the Matafagatale Road (road to Faga'alli Airport) and data reduction of the survey data at the end of the day. 	OIP/AL NTCA/ST HVP/SOD
24/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey along the Ford and Faga'alli Airport roads and data reduction of the survey data at the end of the day. 	OIP/AL NTCA/ST HVP/SOD

25/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey along the Ford and Faga'alli Airport roads and data reduction of the survey data at the end of the day. 	OIP/AL NTCA/ST HVP/ SOD
26/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey around the CGPS in the Faga'alli Airport compound and data reduction of the survey data at the end of the day. 	OIP/AL NTCA/ST HVP/SOD
27/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey from junction of the Ford Road and Matafagatale Road long Vaivase Road and reduction of the survey data at the end of the day. 	OIP/AL NTCA/ST HVP/SOD
28/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey from the Vaivase Road into the Lelata Road and to the Nursing School deep benchmark and reduction of the survey data at the end of the day. 	OIP/AL NTCA/ST
29/08/04	0800	<ul style="list-style-type: none"> Rest Day 	OIP/AL
30/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey from the Apia Park Road along the harbour into Ifiri Street and reduction of the survey data at the end of the day. 	OIP/AL NTCA/ST HVP/SOD
31/08/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey along the Ifiri Street and reduction of the survey data at the end of the day. One bay was re-levelled. 	OIP/AL NTCA/ST
01/09/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey along the Ifiri Street (road to the hospital) and reduction of the survey data at the end of the day. One bay was re-levelled. 	OIP/AL NTCA/ST
02/09/04	0800	<ul style="list-style-type: none"> Precise Differential Levelling Survey along the Ifiri Street to the hospital deep benchmark and reduction of all the survey data at the end of the day. All the field survey was completed and the survey closed with accuracy. 	OIP/AL NTCA/ST
03/09/04	0800	<ul style="list-style-type: none"> Visited the Samoa Observatory and the Survey Office to thank them for their support during the field survey. Packing of survey equipment and freighting them via TNT. 	OIP/AL NTCA/ST
04/09/04	0535	<ul style="list-style-type: none"> Departed for Nadi, Fiji Islands from Apia, Samoa. 	OIP/AL

ADDITIONAL NOTES AND COMMENTS	ACTION
Mr Steven Turner of National Tidal Centre Australia – Bureau of Meteorology will compile the survey report with survey computations, adjustments and results.	NTCA/ ST

REFERENCE DOCUMENTS:

SOPAC Work Plan:– Ocean & Islands Task Activity 2.2.1
 South Pacific Sea Level & Climate Monitoring Project Phase III – Annual Plan 2003 – 2004 (Co

ANNEX:

Location of Survey Marks along the Survey Array in Apia Samoa.

ANNEX

Location of Survey Marks along the Survey Array in Apia Samoa.



Source for Base Map: Western Samoa Topographical Map – Sheet 19, 1:20 000, 2nd Edition. Lands & Survey Ref 17/346/W.S./19, July 1976