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INTRODUCTION

The visit to the Federated States of Micronesia was planned as part of a series to SOPAC member countries with the objective of providing support to the development of project plans in the water and sanitation sector.

The overall purpose of the entire mission was to provide technical assistance to the Federated States of Micronesia Office of Planning and Statistics (FSMOPS) by assisting them in different projects ranging from identifying surface - and groundwater resources to assessing risks of landslides in some areas of Pohnpei, Chuuk and Kosrae State. A specific objective was to assist Kosrae State in designing short-term drought mitigation measures as well as work on design enhancements for Kosrae surface water intakes.

The work in Kosrae is described in this report.

GENERAL DESCRIPTION OF THE MISSION

TRAVEL ITINERARY

20 November 1997: Suva – Nadi – Nauru - Pohnpei by plane
 1 December 1997: Pohnpei – Kosrae by plane
 6 December 1997: Kosrae – Pohnpei by plane
 8/9 December 1997: Pohnpei – Nauru - Apia - Nadi – Suva by plane

Monday, 1 December 1997

Arrived at 3:30 PM at Kosrae Airport and was picked up by Mr. Maung Maung, Technical Engineer of the FSMOPS. Mr. Maung has worked 5 years on Kosrae as United Nations Volunteer and developed the Kosrae master Plan 1995 - 2002 which was later used as a basis for the design of the ADB - Project for Kosrae. He further introduced systematic leak detection programs for most water supply systems on Kosrae. We discussed the proposed work program for Kosrae and Mr. Maung provided valuable advice. A meeting with Bruce Howell, Administrator for the Road Department was scheduled for Tuesday morning.

Met with E. Gordon Fox, Senior Project Engineer of the ADB, and discussed water sector status on Kosrae.

Tuesday, 2 December

Met Bruce Howell and discussed the work programme for the following four days. Mr. Howell is the head of the Road Department and looks after the water supply for the Tofol area and the Okat water supply system. In general all water supply systems, except the Okat System, depend on surface water intakes. Precipitation on Kosrae is usually high with average monthly rainfall not less than 250 mm. No surface water intake has a significant reservoir and catchment areas are very small leading to a high vulnerability for the water supply system when rainfall doesn't occur regularly. This reliance on regular rainfall is combined with an exorbitantly high water consumption (which is unmetered) of more than 1000 litres per capita per day which forces the supply systems even after short periods of

rain into water rationing. Current weather patterns indicate the impending longer lasting drought period. Consequently Mr. Howell has slightly revised the work program. It consisted of:

- assessing a landslide, which occurred a year ago at the Okat water supply,
- improvements for surface water intakes,
- development of small springs, and
- assessing the purchase of Emergency Water Treatment Plants as drought mitigation measure.

He emphasised the need for the rapid development of some springs to provide a basic water supply during the drought.

During the afternoon some water supply systems were visited and small improvements were sketched up and initiated. The road department had already identified several candidate springs for further development and the design was discussed with Bruce Howell and the responsible technician for water works, Solmon Solmon. In particular Yesresr spring, Inyaa spring and Siktaf spring were identified as valuable water source to mitigate possible drought impacts on the existing water supply schemes (see Appendix 1).

Visited the Okat System storage tank and designed small and low cost securing works as well for the tank and the water main. The main is fed by several wells which are all pressure controlled and provide water of a reasonable quality. A landslide hit the main supply pipe. There is no imminent risk that further landslides could put the tank or the water main at risk. However, improvements of the drainage system for the access road and securing of the backfill for the transmission line were discussed and sketched up.

The remains of a small hydropower plant, which was constructed in 1987, was visited as well as the Melem Dam intake structure. The construction consists of a nearly vertical intake at the Melem Dam, a relatively short penstock of 18" and 15" PVC pipe and a Cross flow turbine. The rated power output was 35 kW but never reached more than 20 kW according to Bruce Howell who was then involved in the construction. The site is abandoned but still looks operational. Bruce Howell tried to win the Kosraen Utility Cooperation (KUC) support (and their taking over of the plant) for the rehabilitation and the incorporation of the plant in the grid. A major factor in the reluctance of the Melem Mayor to cooperate was that the hydropower plant was seen as a competitor for the water resources at the Melem intake. (He could be right except that water resources at the dam are not inadequate but made inadequate through the unrealistic high water consumption).

Visited the Tofol water treatment plant, which was abandoned. In fact, it is normally operational only for 2 hours because it was not designed to cope with the high consumption actually permitted by the operator when water flow in the Tofol River allows.

Wednesday, 3 December 1997

Visited further spring sites and made plans to develop at least one as an example while I was on Kosrae. Material orders were submitted and workforce for the coming day organized. Purchased some material (bolts, U-beams etc.) for the improvement of the Tofol Dam site and advised welders of the departments workshop how to prepare the materials.

Later on the Pukusrik intake structure was evaluated. The intake consists of an open rectangular basin (like a swimming pool) with a wide opening at the upstream end and a spillway and pipe intake at the downstream end. At the time of the visit the basin was full of

crayfish, frogs and eels. I presume that the basin was constructed to provide some kind of settlement space, or as a mini-storage, before the water is reticulated.

The intake is in an incredible state. Not only is it poorly maintained but also the design itself is questionable. In order to retain suspended materials within the basin a flow structure would have been required to allow only the reticulated portion of water to enter the basin. Instead, all incoming water flows through the structure and makes the basin superfluous. The rehabilitation of the existing intake structure is not recommended. It needs to be replaced.

Thursday, 4 December

Development of the Siktaf spring site was started. Usually these kinds of springs are captured through a small open dam structure designed to impound water, which is abstracted by a simple pipe in the dam. This doesn't provide any protection against high surface run-off during frequent heavy rain events or against contamination by animals or other sources. The design used for the Siktaf spring (Appendix 2), consists of a body of coarse to fine gravel material which is drained by a slotted pipe. The entire construction is protected by a concrete layer, which seals the spring against contamination. After the concrete has hardened the whole structure was filled back with the original material and the spring was ready to be connected to a storage tank.

We spent the rest of the day organizing the welding of the U-beams for the Tofol Dam. Appropriate cutting and welding tools were not available so that the preparation of the material had to finally be made by United States Navy soldiers of the "Arctic Cats Kosrae" support unit. (The US Navy undertakes major construction and maintenance tasks on Kosrae provided that they are supplied with the relevant materials for this purpose.) It took the whole afternoon to finalize the materials.

Friday, 5 December 1997

Discussed further options of cooperation with the Kosrae Road Department. Many seem to depend on the future development of the ADB project and the related foundation of the Kosrae Utility Cooperation (KUC), which is a prerequisite for the ongoing (or beginning) of the project. The actual financial possibilities of the Department for the maintenance and operation of the water supply systems are incredibly small (US\$ 26,000, \$25,000 for personnel (5 men) and \$1,000 for materials.) Although there is a relatively large stock of material in the Tofol treatment plant (which shortly will become unusable due to the poor storage condition) resources seems inadequate for urgent necessary improvements of the existing systems.

The key is obviously the introduction of consumption related water fees enabling the utility to at least preserve the present status of the supply systems. So far no signs are visible that this can become reality in the near future and even the ADB considers the possibility of excluding Kosrae from the project.

Finished the installation of a submerged weir and a sediment trap in the Tofol Dam intake structure. Problems with providing power made working difficult.

Saturday, 6 December

Final discussion with Bruce Howell. Visited two sites again, discussed the different design options for the development of a bigger spring and the securing of the Okat water main.

CONCLUSIONS

Accomplishments:

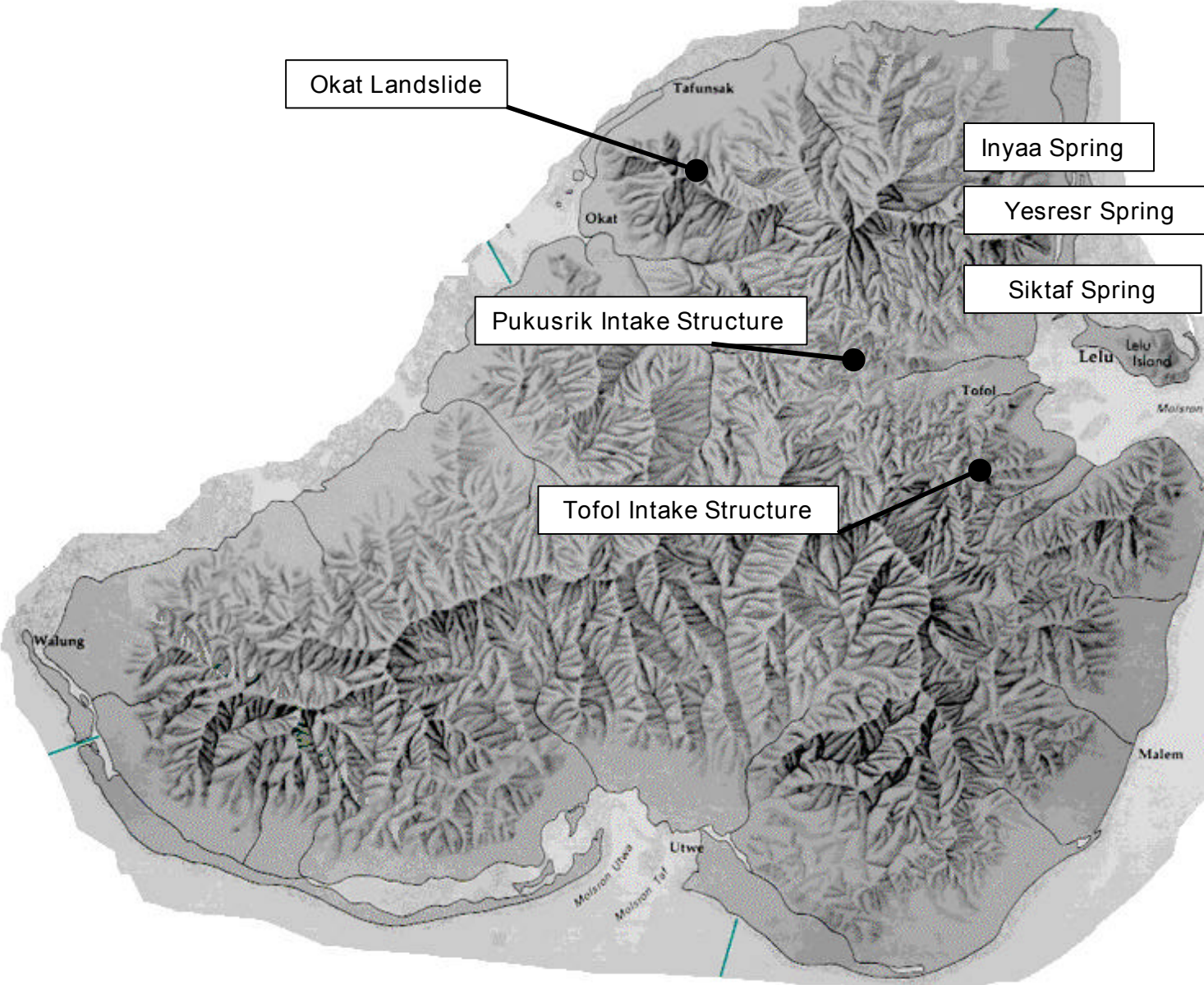
- Evaluation of Yesresr spring site for development.
- Evaluation and design of Inyaa spring site for development.
- Design and construction of intake structure for Siktaf spring site.
- Design and construction of additional weirs on Tofol River intake structure to improve retention of floating debris and sediments (the installation of a submerged weir and a sediment trap).
- Evaluation of the intake structure at Pukusrik.
- On-site training of relevant technicians and workers.

Appendices:

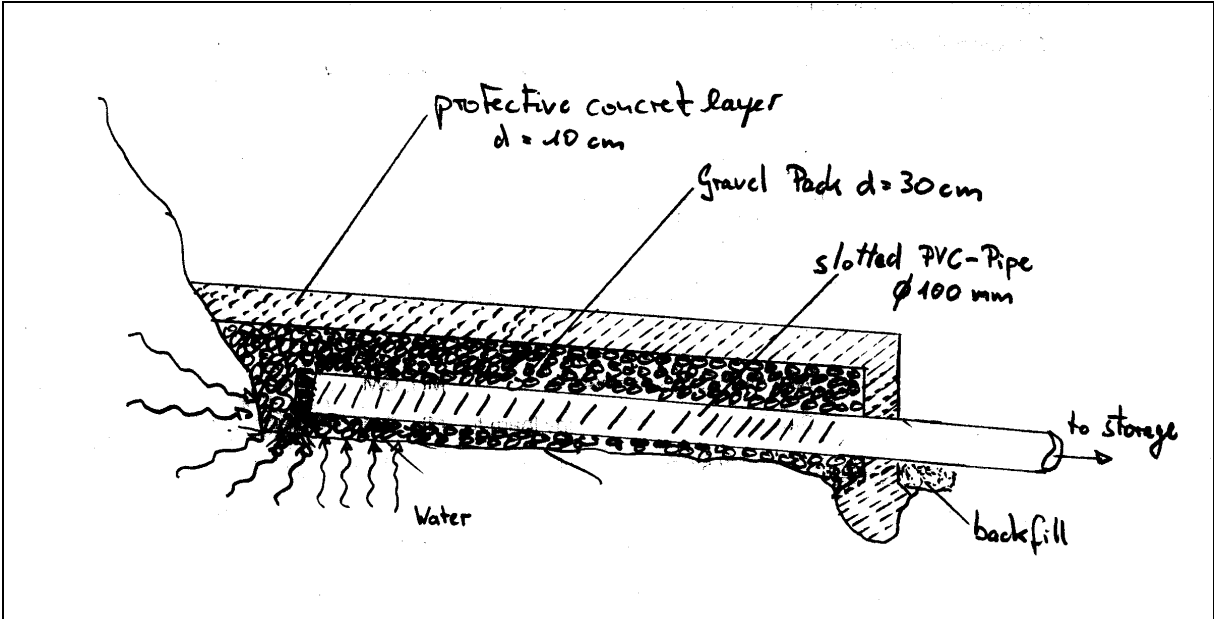
Appendix 1: General Map of Kosrae with Overview

Appendix 2: Designs for spring development

Appendix 1: General Map of Kosrae with Overview



Appendix 2: Design for spring development



Development of Siktaf spring, Kosrae, FSM (no scale)



... and its construction.