SECOND REPORT ON POST-EARTHQUAKE INVESTIGATION, WEWAK

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OBJECTIVES

The visit was undertaken with the following objectives:

1. confirm the uplift of the Wewak islands; and
2. examine earthquake and tsunami damage at localities that were notseen on first visit.After discussion on 18 September in Wewak, three other objectives wereadded:
3. check any evidence for volcanic activity in Victoria Bay orelsewhere;
4. check reports of a possible major fault or impending major slopefailure on the north side of Kairiru Island; and
5. discuss with the public the aftershocks that had occurred since theM7.6 earthquake of 9.9.02.

SUMMARY OF RESULTS

1. UPLIFT

Most of the islands have been elevated by 30–40 cm (vetical distance).The uplift shows on the shorelines of Tarawai, Walis, Kairiru and thepart of Mushu that was visited (northwest Mushu). The uplift isexpressed in the emergence of reefs and wave-cut platforms, in thedevelopment of a new high-water mark on beaches, in the drying out ofnear-shore sea-grass banks that are now exposed at medium and low tide,and the drying out of swamps, and the (reported) lowering of the watertable in open wells.

2. IMPLICATION OF THE UPLIFT FOR FOOD CROPS

The drying out of swamps on the islands, if long lasting, can haveserious implications for food supply, because of the reduced growth ofsago palm, and the lack of the plentiful supply fresh water needed toprocess sago. Garden crops such as sweet potato, yams and greens, alsocould be affected if the soil becomes drier as a result of the lowerwater table. This effect can be exacerbated by the predicted lowerrainfall in the next year or so, due to the current El Nino conditions.

3. DAMAGE CAUSED BY THE TSUNAMI

Most of the damage on the morning of 9.9.02 was caused by the earthquakeand not by the moderate tsunami that followed. Damage caused by thetsunami is known at three locations. No person is known to have beeninjured by the tsunami. One location is Buruwan in Victoria Bay, KairiruIsland, where a tsunami wave approached the shoreline obliquely from thesouthwest, as it swirled anti-clockwise along the shore of the bay.Run-up height exceeded 3 m, and inundation reached 50 m inland. The wavecarried large logs into the front of the village, where one housecollapsed and another was damaged. Villagers were alerted to theapproach of the wave by a lone fisherman, who had gone to the beach.None was hurt. Two other fishermen observed the wave from their canoesome hundreds of metres out to sea.

Another locality is Boiken, on the mainland, where a house was sweptinland by a wave with run-up height of 3–4 m (information from BishopAnthony Burgess). On the north coast of Mushu Island, opposite StXavier's School, a house was swept towards the sea by the returningwaters, after a tsunami wave had swept inland; and there are reportsthat houses were swept into the sea by a tsunami wave on the south coastof Mushu island. None of these localities was visited by the writer.

4. MATERIALS FOR RE-BUILDING HOUSES

Some hundreds of houses were destroyed by the earthquake and are to bere-built. The communities are self-reliant and are already cleaning upand re-building. Some but not all of the building materials from theformer houses can be salvaged and re-used. Depending on how muchmaterial can be recycled, there will be a need for new materials,including morata roofing, nails, Kanda vine rope, and timber. For somecommunities, notably on the smaller islands such as Tarawai, where thereare limited areas of forest and swamp, bush materials such as timber andmorata are not readily available. Assistance from outside sources my beneeded if houses are to be re-built before the onset of the NorthwestMonsoon in December-January.

5. RUMOURS OF IMPENDING VOLCANIC ERUPTION

On 18 September, rumours of an impending volcanic eruption werecirculating in Wewak and the Wewak area, and were causing concern andfear amongst the general public. Various reports were that thehotsprings in Victoria bay had shut down and so were building up to anexplosion, or that Kairiru mountain itself might erupt. The publishedgeological map shows that Kairiru, although composed mostly of volcanicrock, is not an active or dormant volcano but is, rather, a pile of30–million–year old volcanic rock and sediment – rocks that have beenfolded and faulted and eroded, and show no indication of furthervolcanic activity.

With the object of confirming that the previous mapping was correct,observations of coastal rock outcrops were made in and near Victoria Bayand along the north coast. The outcrops are of rocks from the core of avolcanic complex that had been deeply eroded. There were no volcanicrocks of modern origin, and no indication of recent volcanic activity,and no indication that volcanic activity was likely to develop. Contraryto rumour, the main hot spring in Victoria Bay, at Wai, was seen to beflowing vigorously. Nearby several new small hot springs had developed.Hot springs develop where water that has been heated deep in the earthcan reach the surface, travelling along fractures in the rock. The hotsprings on Kairiru have been known for many years, and are not an indication of impending volcanic activity.

Conclusion: The rocks in Victoria Bay clearly are not part of a modernactive volcano and there is absolutely no evidence that a volcano isgoing to develop in Victoria Bay or at any other point in the Wewakislands.

6. SLOPE FAILURES ON THE NORTH COAST OF KAIRIRU

Villagers on the north coast of Kairiru Island had noted cracks in theground upslope from Bou Primary School, Korgur (Kragur) and Shagur, andpossibly extending further west to Rumlal and Surai. There was concernthat the cracks might be interconnected and might be the surfaceexpression of a deep–seated fault or zone of weakness in the earth;scrust that could fail catastrophically. There was speculation thatentire hillsides and villages might be at risk.

An inspection by helicopter revealed that there are a great many freshlandslides on the northern slopes of Kairiru Island, especially in theeast, where weaker sedimentary rocks are exposed. An inspection on theground of the steep slopes behind Korgur (Kragur) confirmed that thereare many cracks in the ground, some showing downslope displacement of20–30 cm. It was clear that in each case the cracks were caused byincipient small–scale slope failure, and were the combined result ofover–steepening of the ridge slopes by erosion, and of shaking by theearthquake. Each of the cracks clearly is local, and extends torelatively shallow depth. In time, some of the cracks may develop intolandslides. The landslides are likely to be on a relatively small scale,such as the village people are accustomed to. There is no evidence of adeep–seated zone of weakness, and no evidence that there will be anymassive large–scale failure of the northern slopes.

7. POSSIBLE DANGER FROM LANDSLIDES ON KAIRIRU

Many new landslides developed, or old landslides were re–activated, atthe time of the earthquake of 9.9.02. Some of these landslides mayrepresent a threat to the safety of people and gardens below. The mostextensive landslides are on the eastern slopes of Kairiru, and towardsthe eastern end of the northern slopes, above Baru, where the slopes aremade up of weaker rocks. These areas should be examined by anengineering geologist to determine whether any threat to safety exists.Another locality that needs to be examined is the high vertical faceexposed by a landslide southwest of Rumlal, at the western end of thenorth slopes of the island. This may be unstable and may pose a threatto homes and gardens.

8. AFTERSHOCKS

In the period of this visit, 18–20 September, one or more aftershocksoccurred each day. The continuing tremors were adding to the tension andfear in the community. The people were advised that aftershocks are tobe expected after any major earthquake, and may be expected to continuefor some months. They also were advised that aftershocks are normallyweaker than the original earthquake, but can be strong enough to triggera tsunami, so they should continue to observe tsunami safety proceduresat the time of any strongly felt earthquake.

9. FURTHER INVESTIGATIONS

A team of three tsunami scientists from the United States will be inWewak 25–30 September to continue the mapping and recording of thetraces of the tsunami. The team comprises Dr Jose Borrero and Mr BurakUslu of the University of Southern California, and Dr John Freckman ofthe ports authority of the State of California. They will be accompaniedby a senior geology student from University of PNG, Mr James Bu, andwill be assisted in Wewak by Mr Pius Mukanje of the Wewak ProvincialDisaster Committee. The team will report their findings to theProvincial and National authorities. They also will

present a computerto the University of PNG with the software needed for computer modelingof tsunamis, and will conduct a training session, so that this type ofresearch can be conducted in PNG.

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