

Pagan Island, CNMI

Volcanic Eruption Emergency Action Plan

for

Biological Survey Workers

I. Introduction

The "Marianas Expedition Wildlife Surveys 2010" (MEWS) is a U.S. Fish and Wildlife Service (USFWS) project funded by the Department of Defense – U.S. Marine Corps to gather information on fish and wildlife resources in the Mariana Islands, especially those species that are designated federally threatened or endangered. Micronesian megapode, Mariana fruit bat, and opportunistic seabird colony surveys will be conducted on nine islands (Anatahan, Sarigan, Guguan, Alamagan, Pagan, Agrihan, Asuncion, Maug and Uracas). Surveys on Pagan Island in addition to megapode, fruit bat and seabird colonies include reptiles, tree snails, insects, vegetation, and the near shore habitat including corals and marine fish.

To facilitate these survey projects, temporary encampments will be established on five of the islands for logistical support. The primary base camp will be on Pagan Island (Figure 1) since it is centrally located and has an airplane landing strip. The base camp will be established on Pagan in May and maintained until early August. Fieldwork and data collection on Pagan will be conducted between May and July 2010 with peak activity in June and early July. Pagan has a small village area with 1 to 2 semi-permanent residents and minimal infrastructure. The camp on Pagan will consist of personal tents, a large, walled Army tent for cooking, portable 500-gallon fiberglass cisterns for water storage, ridge-hulled inflatable boats (RHIB), and small, portable toilets. The camp on Pagan will be staffed with a camp manager, a staff member from the CNMI Emergency Management Office (EMO), a single DOI MOCC trained boat operator for each ridge-hulled inflatable boat (RHIB) and technicians familiar with Pagan to assist biologists. The camp will be supplied with fuel, solar/generator power, water, communications equipment, food and miscellaneous equipment. The temporary camp on Pagan is anticipated to support up to 30 personnel for short periods of time. Camp capacity is limited by available resources to evacuate all personnel in the event of an emergency. The CNMI EMO staff member will be dedicated to monitoring volcanic activity and providing regular updates on volcano status to CNMI EMO and the USGS.

Pagan Island (Figure 1) consists of two stratovolcanoes connected by a narrow isthmus. Both the North and South Pagan stratovolcanoes were built by calderas, 7 and 4 km in diameter, respectively and represent the largest and one of the most active CNMI volcanoes. The 570-m-high Mount Pagan at the NE end of the island rises above the flat floor of the northern caldera, which probably formed during the early Holocene. South Pagan is a 548-m-high stratovolcano with an elongated summit containing four distinct craters. Almost all of the historical eruptions of Pagan, which date back to the 17th century, have originated from North Pagan volcano. The largest eruption of Pagan in recent history time took place in 1981 and prompted the evacuation of the sparsely populated island. See the web site Global Volcanism Program

(www.volcano.si.edu/world/volcano.cfm?vnum=0804-17=&volpage=erupt) for an eruption history.

II. Summary of Current Volcano Risk

The following is a volcano risk assessment produced on 5 June 2010 by the USGS for the USFWS to support reimplementation of biological surveys of Pagan and Sarigan Islands following an evacuation of all survey personnel on May 30, 2010.

“The purpose of this memorandum is to briefly outline the potential hazards to life and property on Pagan and Sarigan Islands associated with possible eruptive activity in the context of the planned resumption of USFWS studies on the northern islands of the CNMI. Presently both Pagan and Sarigan Volcanoes have an assigned Aviation Color Code and Volcano Alert level of YELLOW/ADVISORY. Pagan Volcano continues to exhibit signs of unrest that are above background levels. [background levels would be defined as little or no seismicity or other outward signs of unrest]. The submarine vent south of Sarigan Island has shown no significant signs of continued activity following the eruption on Sunday, May 30, 2010. At this time, USGS has no expectation that the current level of unrest will interfere with resumption of USFWS studies on the northern islands of the CNMI.

However, the level of volcano monitoring at both volcanoes is minimal, and conditions may change over the coming weeks to months, possibly with little or no advance warning. Therefore, it is important to maintain vigilant awareness of the outward signs of unrest while people are on Pagan and Sarigan Islands. We [USGS] support the proposal suggested by the EMO to have a staff member on Pagan who monitors seismic activity on the PS2 seismometer and is in daily communication with the EMO and USGS. We [USGS] also endorse the idea to have seaworthy boats nearby and available to evacuate people from Pagan Island should volcanic activity escalate.

The dominant volcanic hazard on Pagan Island is likely to be ash fallout. It is possible, but by no means certain, for ash to accumulate on areas where people are camping and working in amounts that could be harmful. During periods of intermittent or sustained ash emission, no areas on North Pagan Island are safe from the effects of ash fall and it is possible for ash to blanket all sectors of the northern part of Pagan Island. During times of ash fallout, it may be impossible for aircraft or boats to approach the island. Given the recent level of unrest at Pagan Volcano, we [USGS] do not anticipate significant ash emissions to occur, although minor low-level ash bursts, similar to those in late May, could occur at any time.

It is also possible that magma-water interactions in the crater could lead to violent explosive activity producing ballistic ejection of rock debris that could extend several kilometers or more beyond the vent. It is currently not possible to forecast or predict such events, although this process would be more likely if magma begins to move toward the surface after a period of heavy rainfall when the upper part of the volcanic edifice is wet or possibly water saturated. No place on North Pagan Island is safe from ballistic fallout. We have observed no strong thermal features in satellite images of Pagan and this indicates that an amount of magma that could lead to hazardous activity has possibly not reached the summit, and may or may not during this current period of unrest. Although we do not expect ballistic fallout to be a significant hazard, sudden onset phreatic or phreatomagmatic events (explosions involving hot rock or magma and

water) can occur and people on the island should be aware that explosive ejection of rock debris is possible.

Other hazards that might develop during the current low-level of unrest could involve emission of volcanic gasses, primarily sulfur dioxide (SO₂). During times of northerly winds, the vapor plume emanating from the volcano could produce hazy air conditions and sulfur smell in the south portion of the island. If the concentrations are high enough, SO₂ can cause eye and respiratory irritation or in rare cases, allergic reactions if persons are sensitive to sulfur. Given the typical meteorological conditions in the area, we do not expect that volcanic emissions from Pagan will be more than an occasional nuisance to people on the island.

At Sarigan Island, USFWS personnel also must remain vigilant and aware of possible hazards associated with a resumption of submarine activity south of Sarigan Island. At this time, we do not anticipate further activity. Because little is known about the source or nature of the recent eruption, it is possible, but not certain, that activity may resume. While people are on Sarigan Island, USGS can remotely monitor seismic activity using data from a seismic station on Sarigan Island and from one on Anatahan Volcano. Should the level of seismic activity begin to increase, we would need to be able to contact people on Sarigan and advise them accordingly. Evacuation may be necessary should activity resume.

Another submarine eruption likely will be similar to the previous event, and people on Sarigan can expect ash fall, small water waves, and possibly volcanic gas emissions. Given the violent nature of the eruption last week, we would advise mariners to avoid the immediate area around the vent.

To summarize, it does not appear that the level of unrest currently exhibited by Pagan Volcano and the submarine vent south of Sarigan Island should interfere with resumption of USFWS fieldwork in the northern islands of the CNMI. We cannot stress enough the importance of having reliable and regular communication with people in these areas, as well as having the means to evacuate people within a reasonable amount of time after an increase in the level of volcanic unrest is detected and confirmed.”

USGS staff (F. Trusdell) have provided figures for reference illustrating potential patterns of low volume ashfall (Figure 2) and generalized sites that could be impacted by ballistic ejecta and pyroclastic surges from Mt. Pagan (Figure 3).

If the status of Mt. Pagan changes implementation of biological surveys will be re-assessed by the Service in collaboration with the CNMI EMO and the USGS.

III. Basic Safety

All persons participating in the 2010 Northern Island Surveys will first report to the project Logistical Officer on Saipan and provide name, organization, sub-project, and home emergency contact number. The Project Office located at the airport on Saipan will be the rally point in the event of an emergency. All survey personnel will report to the Logistics Officer upon rallying at the Project Office for further instructions. Secondary meeting rally point will be the Division of Fish and Wildlife Office and the tertiary rally point will be the

Northern Islands Mayors Office.

Primary emergency rally point and contacts

- Logistical Officer: Curt Kessler, 808-391-9672
- Project Office location: USFWS warehouse/office at Saipan Airport, International Terminal Loop at the corner with Commercial Terminal Place

Secondary emergency rally point and contacts

- Wildlife Supervisor: Howard Ferguson, 670-664-6010; or Ben Camacho, 808-779-4255
- DFW Office : 670-664-6000

Tertiary emergency rally point and contacts

- NIMO Representative: Jerome Aldan, 670-788-4336
- NIMO Office location: Northern Islands Mayor's Office, Capitol Hill, Saipan

Efforts on Pagan will be coordinated through a contracted Camp Manager. His contact information follows below:

- Camp Manager: Tom McCay, dial 480-768-2500 to reach the Iridium Satellite Network Switchboard, and then dial 8816-3166-2199.

While on Saipan, prior to arrival on Pagan survey participants will be briefed on evacuation and emergency planning by the Logistics Officer or his designee.

Upon arrival on Pagan Island, personnel will check in with the Camp Manager and provide name, organization, sub-project, and home emergency contact number. The Camp Manager will maintain a current camp roster with emergency contact information for each camp resident. Subsequently, personnel will be given a series of briefings related to work on Pagan. One briefing will focus on emergency actions and procedures on island of Pagan. In addition to the emergency briefing, all survey participants working on Pagan will be required to read this plan and acknowledge that they understand the emergency action procedures.

The main camp on Pagan will be equipped with a single side band radio and a satellite phone for communications to both the Saipan Project Office and to CNMI Emergency Management Office (EMO). A representative of EMO will be stationed on Pagan for the duration of this project. The EMO representative will contact the EMO office twice daily on the status Pagan volcano and USGS CNMI Duty Scientist once daily to relay updates on volcanic activity and local weather patterns. The EMO representative's primary role and responsibility is to provide safety communication between Pagan and Saipan and secondarily volcano activity updates to the Camp Manager. The decision to evacuate personnel from Pagan lies with either USFWS or the Saipan CNMI EMO office. USGS Volcanologist in put will be critical to this decision-making.

Upon workers/surveyors departing the main camp for work on Pagan, the Camp Manager will record in a log book to be kept at the main camp, each worker's:

- Area of the island where work will be conducted
- Duration of stay away from camp
- Who is in the group
- Who is the leader of the group

In addition to information recorded in the log, the Camp Manager will discuss with each group departing the field camp exit strategies and the location of the nearest evacuation vessel, vehicle or aircraft. The daily activities and locations where biologists and technicians will be working on Pagan will be relayed to the Logistics Officer at the Project Office in Saipan.

All groups of biologists and technicians conducting field work on Pagan will be supplied with a hand-held marine band radio. Radio communications will be monitored by staff at the main camp at all times. This will ensure that the specific location of biologists and technicians is at known at all times. Biologists and technicians must report any deviation in survey plans and monitor volcanic activity. Changes in volcanic activity should be immediately reported to the Base Camp. A GPS will be supplied to all groups working in remote locations (e.g. sites away from the main camp area) to ensure their location can be relayed to the main camp. An air horn will be supplied to each field team as a back-up signaling device.

The primary channel for daily field use of hand-held marine band radios will be VHF Channel 7. These radios will also be able to communicate with Americopter helicopters and any other rescue craft that is equipped with a marine band radio. All emergency communications will be conducted on VHF Channel 16.

Personnel will also be provided with a face mask that will give basic protection against particulate matter and high sulfuric content;

- Mask #M made 7502/37082 Half Face piece, Silicon (sizes s, m, lg)
- Cartridge: 3M 60926
- Equipped with a particle filter--HEPA that covers the cartridge. (filters out small particle that are respirable).

GAR (Green Amber Red) Assessments will be conducted by the Logistics Officer or his signee while operations are on-going on Pagan to provide managers and crews with collective risk assessments levels that can significantly aid in their planning and decision making.

IV. Escape Routes and Safety Zones

The safety and security of project personnel is of highest importance followed by the safe disposition of all equipment and property. Biologists conducting field work will be accompanied by staff familiar with escape routes and safety zones on the Island of Pagan. Pagan rally points are shown on Figure 1. Evacuation / escape routes to rally points are shown in Figure 4. In an emergency situation, all transportation resources will be utilized to move all personnel to the nearest island (Alamagan – 30 miles south or Agrihan – 40 miles

north) until further transportation can be arranged to Saipan where facilities exist for reception and accommodation. Reasonable accommodation will be arranged by the USFWS if required. If the situation permits, critical property and equipment will be removed from hazard areas as long as there is no undue risk to personnel.

V. Phased response:

If EMO alerts the base camp regarding an increase in volcanic activity and recommends evacuating the island, personnel in the field will be alerted of the situation (all means available including radio and voice contact) and instructed to go to the closest safe camp. Project personnel in the field shall immediately make way to these camp sites and prepare to be evacuated either by aircraft or boat. The primary rally point, if safe, will be the Main Base on Pagan Island where the loading of aircraft and/or vessels will occur. All personnel shall be accounted for by the Camp Manager and evacuated from the island in the safest, most rapid and efficient manner. Evacuation will be by airplane (if the situation allows landing on the airstrip), helicopter, and/or boat at the direction of the Camp Manager.

VI. Immediate emergent response:

In the event of immediate danger due to imminent volcanic activity, all personnel shall immediately exit the ash plume and head for rendezvous points along the shore for pick-up by boat. This is expected to be to the windward side of the island with wind blowing ash away from the direction of travel. Major rendezvous points are the sites of camps as shown in Figure 1. Upon reaching the safest shore for pickup, personnel shall report their position by any means available including radio communication to any unit for pick-up by any means available. In the event of lost communications, external search and rescue assets will be directed to patrol the windward shoreline where project personnel have been directed to go in an emergency until all personnel are accounted for and evacuated.

Rigid Hull Inflatable Boats (RHIB's) stationed on Pagan for project work will be utilized as floating sanctuaries to remove personnel from immediate danger. RHIB's will meet at a rally point on the southern end of the island, upwind of the volcano along the 18° 03' 00" N latitude line. Movement of RHIBs along the west or east side of the island will be dictated by wind conditions at the time of evacuation. Ultimately, RHIBs should meet on the lee side of the island. It should be made clear that the southern end of the island of Pagan has unique features that afford many safe havens from prevailing weather. All RHIBs will be equipped with a minimum of one marine radio, GPS unit, satellite phone and personal flotation devices for each occupant. In addition, RHIBs will carry a minimal supply of drinking water and MRE's (Meals Ready to Eat). At least one boat will remain stationary at the rallying point to act as "life raft" allowing the other boats to search for any missing personnel if required. The search for missing personnel will only happen once all boats have been accounted for at the rallying point, communication among all vessels is satisfactory, and contact has been established with the CNMI EMO office and a search plan formulated. Constant radio communications will be maintained at all times.

V. Evacuation/Search and Rescue Assets

All the vessels listed below are available, or will be available, for use on Pagan. All commercial vessels and aircraft have contracts in place for payment of services rendered. The USFWS has provided Department of Interior Motorboat Operator Training (MOCC) to 10 CNMI agency staff supporting this project. All RHIB operations will be conducted meeting USFWS regulations. A MOCC operator will accompany each RHIB stationed on Pagan.

TYPE	Personnel	Limitations	Time	Other	
Boat - RHIB Apex A-17 (17') 90 HP	8 (legal limit)		On Island	Marine band radio EPIRB	On Pagan Island
Boat - RHIB Ballistic (20') 90HP	10 (legal limit)		On Island	Marine band radio EPIRB	On Pagan Island
Boat – RHIB Apex A-15 (15') 25 HP	6 (legal Limit)		On Island	Marine band radio EPIRB	On Pagan Island
Boat – RHIB Apex A-15 (15') 25 HP	6 (Legal limit)		On Island	Marine band radio EPIRB	On Pagan Island
Boat – RHIB Apex A-12 (12') 9.9hp deep thrust	6 (Legal limit)			Marine band radio EPIRB	Temporarily assigned to a different island. Will be moved to Pagan when available
Boat – RHIB Apex A-12 (12') 9.9hp deep thrust	6 (Legal limit)			Marine band radio EPIRB	Temporarily assigned to a different island. Will be moved to Pagan when available
Ship (MV Micronesian) Saipan Micronesian Marine	30 (legal limit)		12 hrs to Pagan	Marine band radio Single side band radio (SSB) Life rafts	Stationed on Saipan. On call contract in place.
Jet Ranger Helicopter	3-4	Requires prepositioned	2.5 hrs to Pagan	Life raft	On Saipan On call

Americopters		fuel (fuel is on all islands)			Contract in place.
BE 105 Bolkow Helicopter Americopters	5-6	Requires prepositioned fuel (fuel is on all islands)	2 hrs to Pagan	Life raft	On Saipan On call Contract in place.
Skymaster Airplane Americopters	5	Does not require prepositioned fuel Can only land on Pagan and Saipan	1.5 hrs to Pagan	Life raft	On Saipan On call Contract in place.

Other search and rescue options are:

- US Coast Guard: Coast Guard District Fourteen Command Center, Honolulu; 808-535-3333, Fax 808-535-3338 jrcchonolulu@uscg.mil
- USCG Sector Guam; 671-546-8724
- US Navy: Staff Quarter Deck; 671-339-7133

VII. Accommodation

Once the evacuees have reached Saipan, they rally at the Project Office for accounting, are assigned quarters if necessary, and await further instructions. Reasonable quarters will be arranged by the USFWS.

VII. First Aid and Medical Evacuation

First aid and hospital treatment could be required for three major types of injury:

- Respiratory problems due to exposure to volcanic ash and gases (fine silicate dust, H₂S, SO₂ and others);
- Broken bones, lacerations, abrasions, and bruises resulting from falls;
- Dermal and pulmonary burns (first to third degree) resulting from exposure to steam and hot dust clouds, especially those spreading from the fringes of pyroclastic flows. In the event of the latter, personnel casualties may be severely burnt, and in critical condition.

In addition to the above, there may also be victims of toxic gases such as carbon monoxide (CO) or of suffocation in pools of carbon dioxide (CO₂) or other gases which may have

accumulated in valley bottoms or other low-lying places. This is not expected to be a hazard associated with reimplementing of the surveys however could be a hazard following eruptive activity.

First aid will be administered as needed with first aid kits located in the main camp and on the two larger boats. Injured personnel will be stabilized by first responders and communications with appropriate medical professionals will be established as soon as practical through radio or satellite phones to relay patient data and receive first aid instructions until transport to a medical facility or the arrival of medical personnel on-scene.

Medical evacuation patients will be taken directly to the Commonwealth Health Center (CHC) on Saipan. Further medical treatment at different facilities will be coordinated as needed by appropriate medical professionals.

- Commonwealth Health Center: 670-234-8950
- Alternately on Guam: Guam Memorial Hospital: 671-647-2555

VIII. Alert procedures within government

The CNMI Emergency Management Office (aka EMO or Civil Defense) is the agency responsible for volcanic activity monitoring and issuance of associated warnings. EMO has an emergency response plan for alerts in accordance with its directives. In general, it is possible to define several stages of alert, each corresponding to a different level of hazard as assessed by the scientific team monitoring the volcanic activity. The responsibility for declaring the various stages of alert will lie with a designated CNMI-EMO official, who will act on the advice of the USGS scientific team monitoring the volcano. However, because the level of monitoring by volcanologists is minimal, and conditions may change with little or no advance warning, it is important for the field crew(s) to take personal responsibility and be vigilant and aware of the outward signs of volcanic unrest while on Pagan Island and alert EMO and the USGS to changes.

- CNMI Emergency Management Office: Juan Camacho; 670-322-8001
- USGS - 24/7 - Volcano Scientist Duty phones: (808) 967-8815, (907) 786-7497, (907) 632-2276

The CNMI Emergency Management Office will have a staff member on Pagan, discussed above, to support these surveys.

IX. Communications List

Radio Frequencies:

Single side band radio – 5205Mhz

Marine band radio – channel 16 emergency

Contact numbers

US Fish and Wildlife Service

- Field Supervisor - Loyal Mehrhoff; 808-792-9430
- Assistant Field Supervisor – Earl Campbell; Office 808-792-9414, or Cell 808-226-6076
- Logistics Officer – Curt Kessler; Cell 808-391-9672, Office 808-792-9465
- Assistant Logistics Officer – Craig Clark – USDA APHIS-Wildlife Services; Cell 671-888-5735, Office 671-635-4400

CNMI Division of Fish and Wildlife

- Secretary Dept Lands and Natural Resources; 670-322-9830
- Supervisor Div. Fish & Wildlife – Howard Ferguson; 670-322-6010

CNMI Emergency Management Office

- Reception – 670-322-8001/2/3/4
- Operations – 670-322-9274/9528
- Seismic monitoring – Juan Camacho - office 670-322-9528/29, cell 670-287-8072

USGS Volcano Monitoring Scientists

- Alaska Volcano Observatory – Duty Phone; (907) 786-7497, (907) 632-2276
- Hawaiian Volcano Observatory – Duty phone; (808) 967-8815

Americopter

- Rufus Crowe – owner – 671-888-5060
- Office – 670-288-1304

Saipan Crew Boats

- Jason Shankweiler – Ship captain – 670-787-2420
- John Manabusan – Ship coordinator – 671-688-5038

US Coast Guard

- USCG MSD Saipan – 670-236-2969/37
- USCG Sector Guam – 671-546-8724
- National response center (24hr) – 800-424-8802

US Navy

- Base Operator – 671-355-1110
- ComNavMarianas – 671-339-3200
- Staff Quarter Deck – 671-339-7133

Commonwealth Health Center (CHC)

- CHC Emergency only – 670-234-8950/51

CNMI Police

- Susupe Station 670-234-6016/6006

US Coast Guard

- USCG MSD Saipan – 670-236-2969/37
- USCG Sector Guam – 671-546-8724
- National response center (24hr) – 800-424-8802

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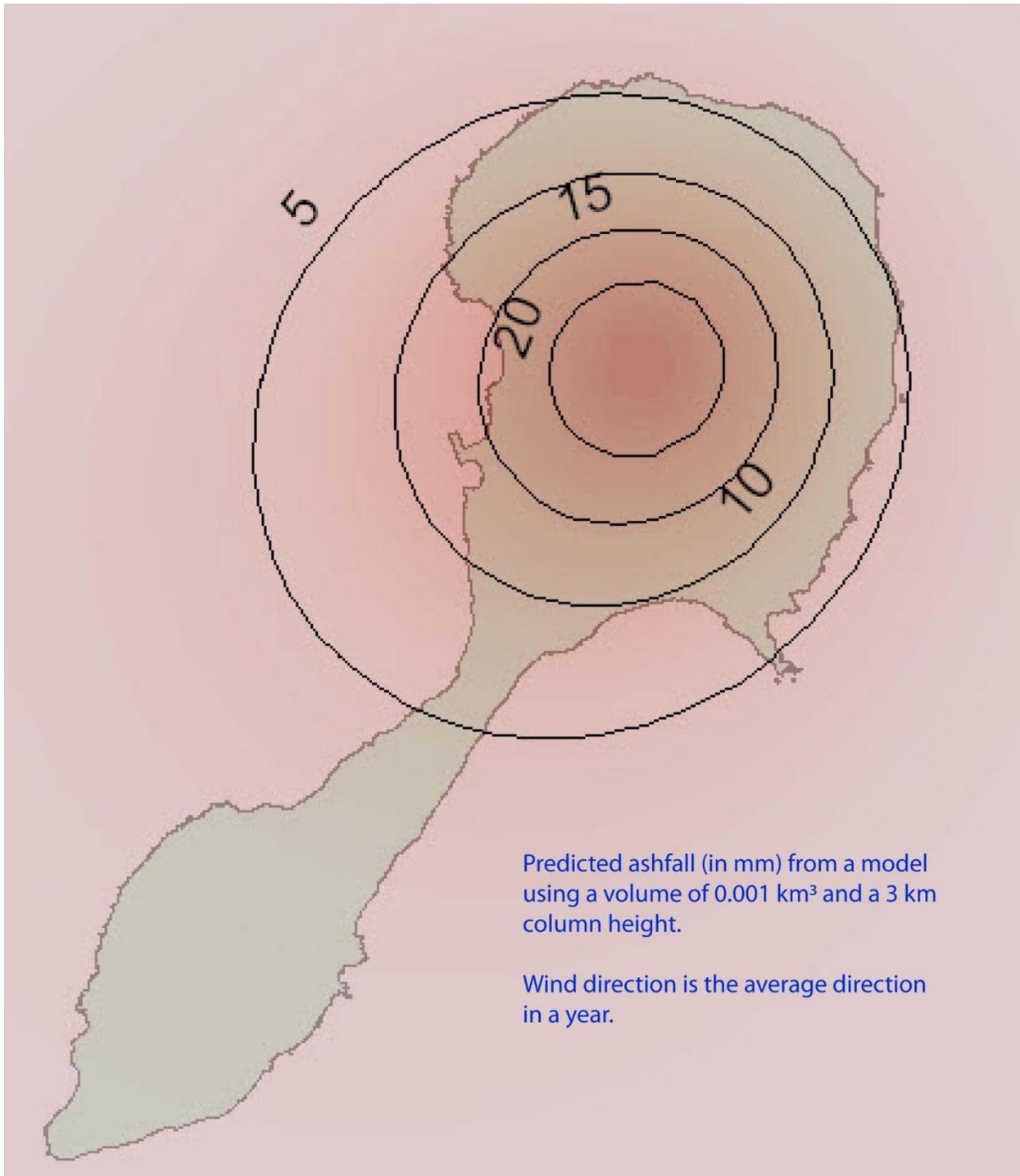


Figure 2. Predicted ashfall (in mm) from a model using a volume of 0.001 km³ and a 3 km column height. Wind direction is impossible to predict (F. Trusdell, USGS, 2010).

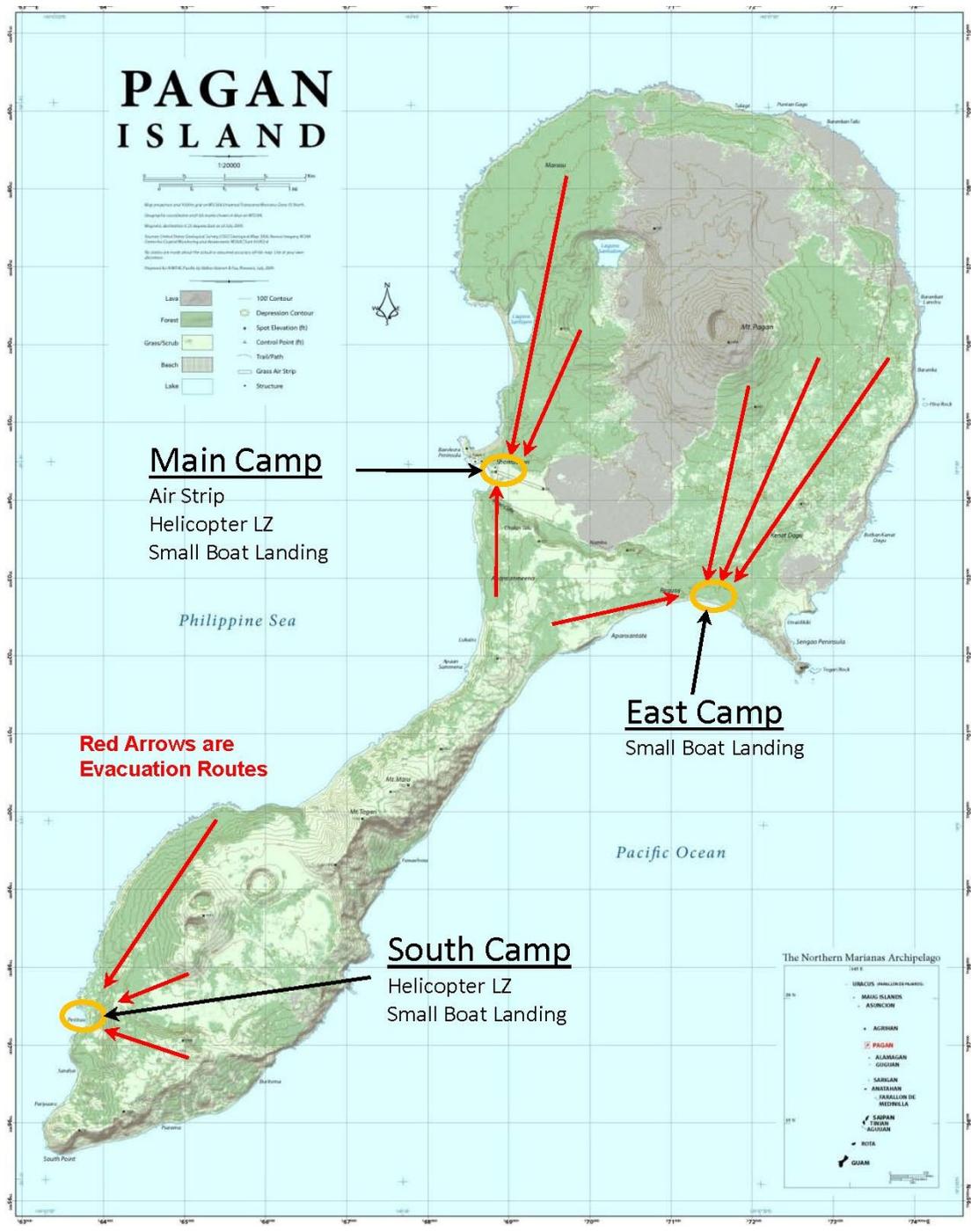


Figure 4. Map of Pagan Island. Evacuation routes to camps are designated.