

2.0
Emergency Planning and Preparedness

2.0 EMERGENCY PLANNING AND PREPAREDNESS

2.1 Experience and Background

Montserrat Administration's Emergency Planning and Preparedness has been severely tested in recent time. They faced the devastation of Hurricane Hugo in 1989 which had significant adverse impact islandwide. This was followed by the commencement of Soufriere Hills Volcano activities in 1995, followed the same year by a visit from Hurricane Luis.

The limited resources of a small island and their isolation as an island state does not always make it easy for ready external response to assist, in particular, immediately after the adverse effects of a disaster.

An island state must therefore be very dependent on its own resources in the period immediately after a disaster, at a time when there could be significant adverse psychological impact on its human resources.

While after the event of a hurricane, facing the adversity could be traumatic, at least it could be faced with a higher degree of certainty with respect to discontinuity, especially in the present day when monitoring of weather systems and the dissemination of information on them is reasonably widespread and accurate, via the portable battery operated transistor radio.

Dealing with a volcano is somewhat different. It is the high degree of uncertainty in the activities of the Soufriere Hills Volcano that places a higher level of long term stress on the emergency planning and preparedness organisations and the population in general. Maintaining a cohesive and cooperative organisation is one concern, but maintaining the morale of the nation is a far greater concern, especially when external comment does not always assist in encouraging cohesion.

The Contractor's first hand experience some months after the event of Hurricane Hugo indicated a Water Authority organisation with leader and workers who had utilised the available resources to put together a functioning system despite the many limitations, starting the day early and working long hours.

A subsequent visit by the Contractor after Hurricane Luis in 1995 found an Administration, in spite of the twin disasters of hurricane and volcano, who were able to clearly state that they were in a position to handle the adverse effects of the recent hurricane, although under high

stress from a long period dealing with the problems encountered with the uncertainties of the volcanic activity, on which they needed some assistance

The more recent visits in connection with this project identified organisations having to operate in make-shift accommodations, making significant efforts to bring order after a major dislocation, including removal from the capital where the centre of Government and Business resided.

Despite the foregoing, however, time has taken its toll and there has been a departure of a significant number of residents. As a result it may be said that there should be less stress on the administration dealing with fewer in number. However there are certain basic needs to be met if Montserrat is to maintain itself as a viable entity, and reduction in human resources, in particular trained and active personnel, can increase stress on those remaining, particularly when the available expertise is limited and often required to take on added duties outside critical need for the traditional service. The added stress in ensuring this maintenance, along with the uncertainty of the volcanic activities is certainly a significant stress on emergency planning and preparedness. The aggravation has been even greater due to the most recent events reducing access to the island, because the recent explosive volcano events caused the only airport to be closed.

2.2 Planning and Preparedness Organisation

While this project deals primarily with the vulnerability of the water supply systems, it is considered essential to have some background into the overall planning and preparedness organisations, primarily that of the Emergency Operations Centre. It should however be noted at this stage that while it may be the goal of the Government of Montserrat to take all possible steps to ensure the safety of human life, it is certainly not possible for the Government to take actions which will guarantee the protection of public and private property due to the physical exposures that exist, especially with the high level of uncertainty with respect to the range of activity of the volcano

The Emergency Operations Centre is charged with the responsibility for coordinating all the necessary responses to the volcanic alert, as was the case with the recent hurricane events and as would be the case in the event of significant seismic activity beyond that being experienced with the volcano

The Emergency Operations Centre operates on Standing Operating Procedures. There are several other agencies which have critical functions to perform. They include, the Ministry of Health, the Royal Montserrat Police Force, the Montserrat Defence Force, the Montserrat Water Authority, Cable and Wireless, Montserrat Electricity Services, Montserrat Port Authority and the Ministry of Communications and Works. Many other departments and agencies have important roles to perform after any relocation exercise.

The Emergency Operations Centre is operated by a senior officer in charge, who functions under the instructions of the Governor and/or the Chief Minister. At the time of the first visit of the Contractor to Montserrat, consideration was being given to refinements in the structure and management operation, but no publication is available with respect to any changes that have occurred. As a result, the November 1995 guide is the basis for the Contractor's review.

External to Montserrat is the regional Caribbean Disaster Emergency Response Agency, (CDERA). They are charged with coordinating external assistance. With Montserrat as a colony of Britain however, the British Government has been the prime provider of substantial material and technical assistance while continuing to pledge support.

The several agencies which are coordinated by the Emergency Operations Centre all have their own specific contingency management plans. Those of the Montserrat Water Authority are addressed later.

While as a result of a hurricane, the dislocation is generally temporary until reinstatement of damaged property is carried out, in the case of volcanoes the uncertainty over the period of their activity and hence period of displacement, the period and extent of shelter management is a great uncertainty. The relocation also places significant stress on services especially when relocation is to an area where the emphasis on the services was at a minimum prior to the emergency, as is in the case of Montserrat, where the Safe Zone in the north is the least serviced by the utilities, and flow patterns virtually have to be reversed from the traditional to satisfy the new demands.

As has been the case with the hurricanes in recent time, the Montserrat community has been able to demonstrate commendable adaptability, but there is a limit to which any community can face the type of stress to which they have been exposed, especially when events appear to be escalating and no long term plans for stability can be put into place due to the high level of uncertainty and exposure to danger.

Despite the foregoing, the Emergency Operations Centre, with scientists at the Montserrat Volcano Observatory, after having established various stages of alert, have been able to maintain a warning procedure which triggers warning systems and management response. Unfortunately some have not taken heed of the warnings, resulting in recent deaths due to pyroclastic flows

The scientists at the Montserrat Volcano Observatory maintain a constant watch and, based on the signs of volcanic activity, inform the relevant Authorities. The Governor, in consultation with the Chief Minister, determines the stage of alert that will be declared. The priority actions follow based on the established systems

Whenever the Government of Montserrat (on the advice of the scientists) decides that a relocation response is required, the following actions will be taken

- 1 The Emergency Operations Centre (E.O.C.) will be informed of that decision by the Governor and/or the Chief Minister. The E.O.C. management team will be immediately mobilised.
2. The E.O.C. will immediately inform the District Chairman in the affected areas and the Ministry of Education if schools are in session.
- 3 A system of sirens controlled by the Police will be sounded continuously in the affected areas. The sirens' alarm will last several minutes.
- 4 A broadcast which explains the respective phase of alert will be made on Radio Montserrat by His Excellency, the Governor. The broadcast will be repeated several times
- 5 The District Chairman will pass word through the affected areas by word of mouth and telephones
- 6 The logistics of the relocation will be implemented by the E.O.C.
- 7 Managers will ensure the procedures under Sectoral Plans such as those of the Ministry of Education, Ministry of Health and Utility Services and Security forces will be activated depending on the particular circumstances.

The E.O.C officials who are part of the management team should report to the E.O.C Headquarters as soon as practical after the alert has been declared. E.O.C volunteers who have specific responsibilities in an evacuation would also report to the E.O.C.

If an evacuation order is made during normal working hours, Permanent Secretaries and Heads of Departments should take action to ensure that all staff are informed and that action is being taken according to the relevant contingency plans and procedures.

If an evacuation order is made outside normal working hours, Permanent Secretaries and Heads of Department should take all reasonable steps to secure offices and protect vital records.

The phases of evacuation are clearly identified in relation to the risk map with those in the higher risk area obviously given priority. The phases are however subject to modification on the basis of recommendations from the Montserrat Volcano Observatory scientists.

The scientists have prepared a generalised framework for the stages of alert for volcanic eruptions, which are signified by colour identifications from yellow to orange to red with increasing level of risk.

Based on the phases of evacuation, there is a relocation strategy and evacuation procedures. The relocation strategy has objectives by priority. All available resources are drawn on with emphasis placed on the alert system to allow people who have the available resources to do for themselves while Government resources can be focused on those in need.

Each area has an identified evacuation route and the procedures to be followed to get to the Safe Zone. To assist in the procedures there are identified site pick-up locations for those in need of transport.

There are allocated shelters earmarked initially for residents from particular areas to be grouped, which helps in overall planning, permitting a rapid check for persons who may have been separated from family groupings.

Due to the large numbers however, there is a need for a tent city, which has been supplemented by buildings, but there continues to be a growing demand.

Arrangements have been made for:-

- feeding in the shelters along with health and sanitation.

- welfare arrangements.
- psychological and social issues and
- general shelter management.

The major functional responsibilities of the E.O.C. in these conditions are.-

- Communication.
- Information dissemination.
- Damage assessment.
- Response mechanisms.
- Operations and logistics.
- Relief coordination.
- Accounting and record keeping

In the majority of the listed activities the E.O.C. would be delegating certain responsibilities To assist in the carrying out of the responsibilities, there is a list of suggestions for managers in the civil service for organisation of work before relocation and during relocation Management staff are included in meetings due to their involvement in contingency plans and advice on general crisis management guidelines. The emphasis is placed on leadership, with effective and efficient use of resources to achieve agreed objectives by management.

The emphasis in the foregoing is obviously recognised in that the public sector is taking the lead in many of the emergency response actions in evacuations and relocations required It is critical however that the community at large, including service clubs, voluntary organisations, churches and church councils provide assistance. The E O C has taken steps to encourage activities by such organisations by appointing liaison persons to facilitate work with the major non Governmental organisations or interest groups

2.3 The Need to Reduce Vulnerability

With the possibility of long term relocation in the volcano alert, the longer term demands on utilities make it essential for upgrading of such utilities into the new areas of demand Water is

a basic need and a priority in this respect. The uncertainty of volcanic activities and the long term uncertainty with respect to water quality as against that of a hurricane event, creates greater concern over the range of emergency planning and preparedness.

In addition, the experience of hurricanes has permitted the Water Authority to establish a disaster preparedness plan in clearer stages than it has for volcanic events of unknown periods. Warnings for hurricanes permit time, sometimes in terms of days, for planning, as against the volcano condition activities, even with the monitoring procedures in place, and in particular with the uncertainties over the event's power and aerial extent, although historical records have probably permitted improvement in predictions with time.

The volcanic alert plans by the Water Authority were developed in two phases. While the second phase of the plan addresses certain specifics and probably considers the short term impacts, it is the longer term demand that requires more attention and planning. The Montserrat Water Authority's Disaster Preparedness Plan for hurricanes and Draft Volcanic Alert Plan are included at Appendix B to this report.

While there is no specific plan for seismic activity beyond that which is incorporated with the current activity of the volcano, the geology of Montserrat is not defined in such detail as to assess the extent of risk without the advice of experts in the sector. Being virtually a mountain coming out of the water, over a large area of the island one is at risk due to possible large displacements at levels above one's location. Certainly the recent alluvial deposits resulting from the volcanic activity would lead to higher levels of instability than previously existed, and which will continue to exist for some period of time, with a higher degree of risk at times of high rainfall activity. It is this high level of uncertainty that makes it extremely difficult for any emergency planning and preparedness. It is therefore essential in the current circumstances to look at a revised plan of settlement for the people of Montserrat if the decision is to stay.

In this respect the "Development Strategy for North Montserrat" prepared by the Physical Planning Unit of the Ministry of Agriculture, Trade and Environment in September 1996 should form a base on which revision should take place in the light of the added information from recent events, subject to the policy decisions of the principal decision makers with respect to the commitment of maintenance of the island of Montserrat as a habitable area for its citizens.

In summary it is certainly a firmness of decision making that is essential if emergency planning and preparedness is to have any meaning for the future. Certainly if there is continued outward

migration there will be a lesser demand on services. However, maintenance of services also requires people, and significant losses of human resources, in particular the active ones, will not permit maintenance of a meaningful Emergency Operations Centre. For emergency planning and preparedness to therefore be effective, it must be integrated with some longer term planning, based on specific assumptions, the first of which shall be whether or not Montserrat remains a place of residence for its citizens. The basis of the decision must come from the scientists at the Montserrat Volcano Observatory, with whatever other expert support that is necessary, to give the best available advice on the likelihood of a major eruption and, in the event of a major eruption, the safety of the northern portion of Montserrat with respect to the maintenance of life.

It must be clearly understood that the judgement must be based on the available information and the fear of criticism and blame should not be factors of influence on the decision. Because of the likely uncertainty that will hang over any decision, a sound emergency off-island evacuation plan must be put in place and all shall be well aware of the plan.

Currently no decision has been announced on the long term future of Montserrat. This level of uncertainty needs to be removed conditionally, in the light of a firm plan of emergency evacuation, if the intent is to try and maintain a viable Montserrat. Alternatively a positive decision on relocation off island should be made.

Assuming an acceptable level of risk in residing north of the Belham Valley, the "Development Strategy for North Montserrat" should be developed and implemented as a priority based on "a strategic choice approach" in the decision making process. Such a strategy would allow for an incremental approach in a coordinated and integrated manner, allowing for judgements to be made with lower levels of uncertainty than in large increments. This does not mean that there cannot be significant implementation in a short period, with monitoring allowing for adjustment of immediately following stages, developing greater degrees of certainty with time

While traditional tools influencing the decision making process will be useful (e.g. the economic analysis of alternatives) many must be set aside in the formal sense and decision making must proceed on sound judgements based on as wide a base of information from persons and organisations pertinent to the decision. While quantitative information often provides a base for greater certainty in decision making, collection and assembly is often time consuming, hence sound qualitative information from the broadest readily available base should be a major basis for decision making when quantitative information is not readily available

Errors will be made, but with an incremental approach, corrections can be made and repetition prevented in the next increment.

2.4 The Approach to Reducing Vulnerability

Assuming that a decision would be to maintain Montserrat as a viable entity with a planned emergency evacuation method established in the event of a catastrophic eruption, there should be a review of the current level of principal decision making and implementation

In principle, the emphasis should be shifted from emergency planning and preparedness to rehabilitation within a Safe Zone, with the knowledge of the evacuation plan well established and disseminated to all

We all live with a certain degree of risk in our everyday life, some with the knowledge of possible catastrophes, such as those in California where habitated areas are prone to earthquakes. In the Caribbean, except for the impacts of hurricanes, which in recent time come with a relatively high degree of prior warning, the people are accustomed to living with a low level of stress over the fear of catastrophes. In other words, we generally live with a low level of uncertainty in our daily lives with respect to disasters.

In order to relieve the levels of uncertainty in Montserrat today, it is therefore essential that some basic decisions be taken with respect to the future. Assuming a decision to maintain Montserrat as a viable entity, it is suggested that the emphasis be now placed on planning and development as part of the mitigation measures, otherwise the vulnerability of the island as a home for Montserratians is threatened

In view of the existing conditions and constraints in Montserrat, it is proposed that the key persons currently in place, with their wealth of information and knowledge about the conditions, continue to form the nucleus of a planning and development organisation. Such a body would lead what must be a very significant task in the rebuilding process. A Task Force drawing on the expertise and resources in the public and private sectors is therefore recommended to provide an appropriate institutional framework to implement the planning and development process. The strategic choice concept suggested in the foregoing should be elaborated and be used to define the objectives and scope of the Task Force.

The Task Force could operate as an entity independent of the principal decision makers after the receipt of policy directives.

The Task Force would then develop detailed recommendations for presentation to the principal decision makers, broadening the information and knowledge base, and reducing uncertainty in the decision making process. The emphasis in the early stages must however be on outputs for

implementation. in increments following quickly one after the other, if it is to gain the confidence of the people and improve their psychological status

Figure 15 following indicates the possible structure of the proposed Task Force.

The principal decision makers would include His Excellency the Governor, the Chief Minister and other Ministers, with one of the principal decision makers designated as the chief liaison with the Task Force. In principle, the person responsible for the planning process should be considered as the liaison person.

The Task Force would be drawn from the membership of the public, private and community sectors. The Task Force chairperson is selected from among its members, preferably from the private sector for reasons addressed later.

Private and community sector personnel should be people drawn from the professions, commerce, industry, trade, tourism and the environment and include representatives of organisations such as the trust and historical associations, private sector transport operations, small business associations, residents associations, banking and advisory consultants.

Public sector representation should include personnel from Finance, Development and Planning, Communications, Works, Tourism, Commerce, Water Authority, Ports Authority and other relevant public utilities, authorities and corporations.

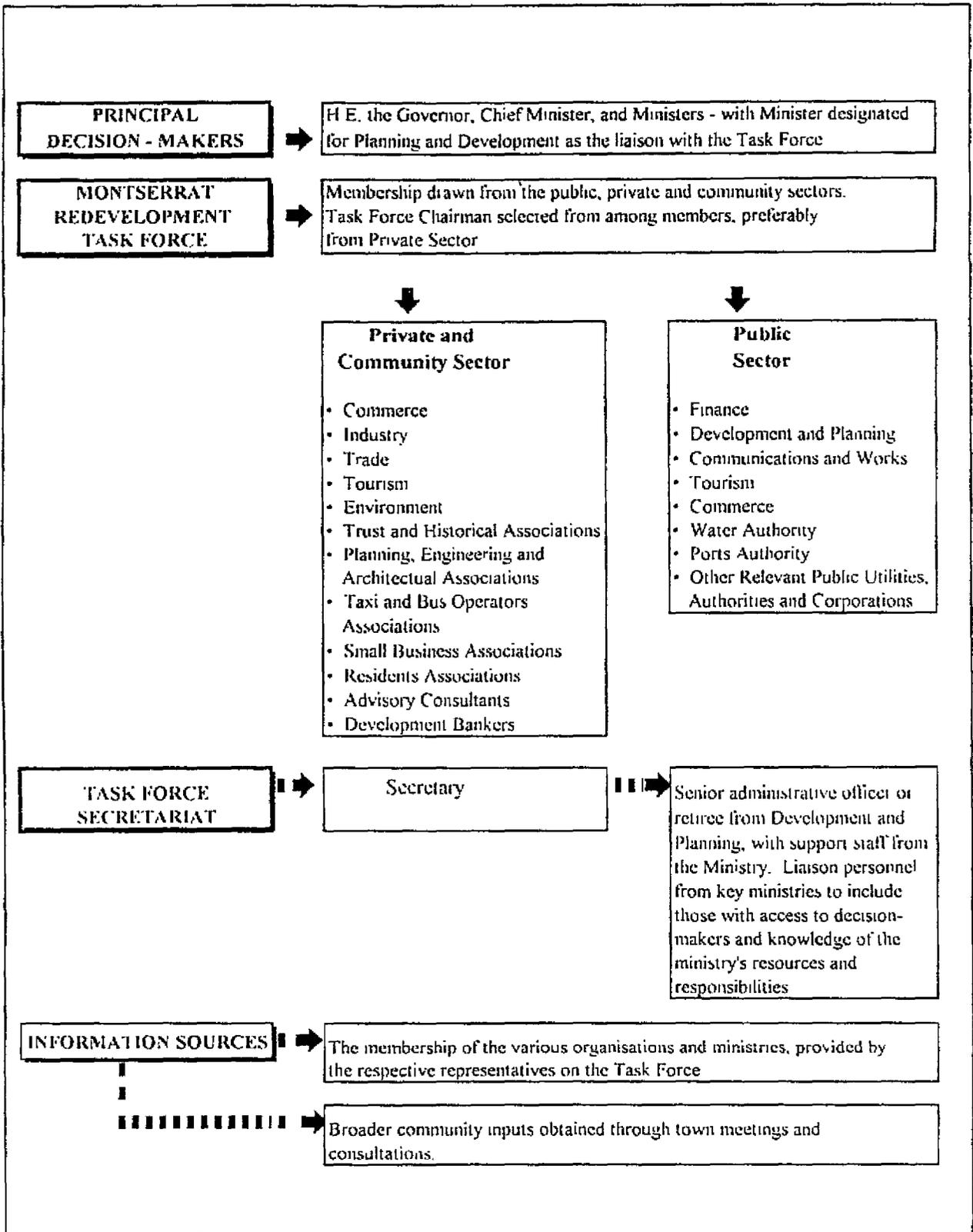
While the aforementioned may appear to be a significant organisation, with a fear that it may prove to be unwieldy in a small community like Montserrat, it is likely that individuals may represent a range of sectors, hence an individual for each sector may not be necessary. The principle here is that the representation provides knowledge of organisations' needs and has recourse to the organisations for their knowledge and information base, which is very pertinent in the development process for ready decision making.

The Task Force will require a secretariat which should be headed by a senior administrative officer of Government or maybe a senior retired officer, such as someone from the Ministry of Finance, Development or Planning, with supporting staff from the Ministry. Liaison personnel from key ministries should be identified to include those with access to decision makers and knowledge of the respective Ministry's resources and responsibilities.

As indicated earlier, the matter of information sources is essential. In addition to sources from the private sector organisations and the ministries and departments of Government, the broader community inputs should be obtained by consultation through events such as town meetings. Besides participating in the development process, such opportunity for the community in the current circumstances could provide a good psychological boost.

MONTSERRAT'S REDEVELOPMENT TASK FORCE-PROPOSED STRUCTURE

Figure 15



In Montserrat, the need for immediate improvement of the institutional framework for planning and managing development is essential. A formal approach to institutional reform, such as a body requiring legislative approval, would entail time and resources that are neither feasible or appropriate in the present times.

Therefore it is proposed that the Task Force be established as an ad hoc advisory committee to Government. To fulfill its mission, the Task Force should report to the relevant authority and be directly linked to the principal administrative and decision making personnel of the relevant Government organisations. This approach of an advisory committee will facilitate the rapid mobilisation of personnel and other resources necessary to enable the Task Force, in the short term, to contribute to the effective implementation and coordination of the development initiatives. It will also permit a much sounder information base, which external resources can use to support current conditions, with judgements on implementation with a higher level of security.

With representation of the public and private sectors, the best available expertise from the sectors and the community will promote ongoing collaboration and partnership among all interveners in the development process.

At the time of the creation of the Task Force the principal decision makers will have to name a Chairman. This person should have extensive knowledge of, and experience with, both the public and private sector resources and decision-making processes for development. He or she should also have the full support of all members of the Task Force and the Government. While external aid support will be essential in the immediate future, any long term redevelopment must have the private sector as the primary generating force of development. Private sector stakeholders are also likely to have a higher degree of flexibility in the necessary communication linkages. Therefore it is recommended that consideration be given to naming the Chairman for the Task Force from the private sector.

The Task Force should remain flexible in its structure and operation, with the capacity to draw on other personnel in a sub-committee type of format as demand arises, with respect to volume support or expertise support.

The Task Force should sponsor an incremental, strategic choice approach to development, within an overall framework of national development policies for Montserrat.

Because of the extent of change resulting from the recent volcanic activities it may be considered necessary to review the institutional requirements for Montserrat. The Task Force could constitute an interim step towards long term institutional reform in Montserrat.

3.0 EXISTING WATER SYSTEMS AND THEIR VULNERABILITY

3.1 Geology and Hydrogeology

A number of investigations, studies and reports, some of which are stated in the references in Appendix A, have been carried out recently. Information has been drawn from these sources, interviews with personnel in Montserrat and inspections carried out by the Contractor.

In order to obtain an appreciation of the vulnerability of water supply in Montserrat and propose mitigation measures, it is necessary to provide some background to the geology of the island.

Montserrat is a recent volcanic island comprising six mountain ranges separated by hollows or areas of relatively low ground. These centres are Bugby Hole, Silver Hill, Centre Hills, Garibaldi Hill, Soufriere Hills and St. George's Hill. The rocks, which range in age from 4.5 million years to less than 400 years, are predominantly coarse pyroclastic, agglomerates, lavas and lava flows. The mountainous areas are characterised by radial drainage, with the main stream channels (ghauts) being broadest and less deep in size than the older rocks (Harris - Bugby Hole and Silver Hill). Weathering and erosion have degraded the characteristic cone shape of these two volcanic centres but the more recent Centre Hills and youngest Soufriere Hills form striking symmetrical cones overlying the older formations.

Intensive faulting has been observed in the dome lavas of the Centre Hills and the Soufriere Hills areas. Predominant directions of the faults and joints are northeast - southwest and east-west, as indicated in Figure 10.

Also shown on Figure 10 are the springs, of which almost all the important and permanent ones are tapped by the Montserrat Water Authority. The majority of them are located in the Centre Hills. Inspection of aerial photography indicates that most springs are located on or near the contact between a volcanic core forming steep slopes and the softer agglomerate and pyroclastic deposits forming gentle slopes. Subsequent field checks have confirmed this observation. The clear indication is that faulted and jointed volcanic cores form the aquifers while the clayey and unsorted softer materials create impermeable barriers to water flow towards the sea. However, it is only at Killiecrankie Springs that it is clearly established that water is actually coming out of the fractured lava. In most other cases the water seeps profusely out of the pyroclastics close to their contact with the volcanic core.