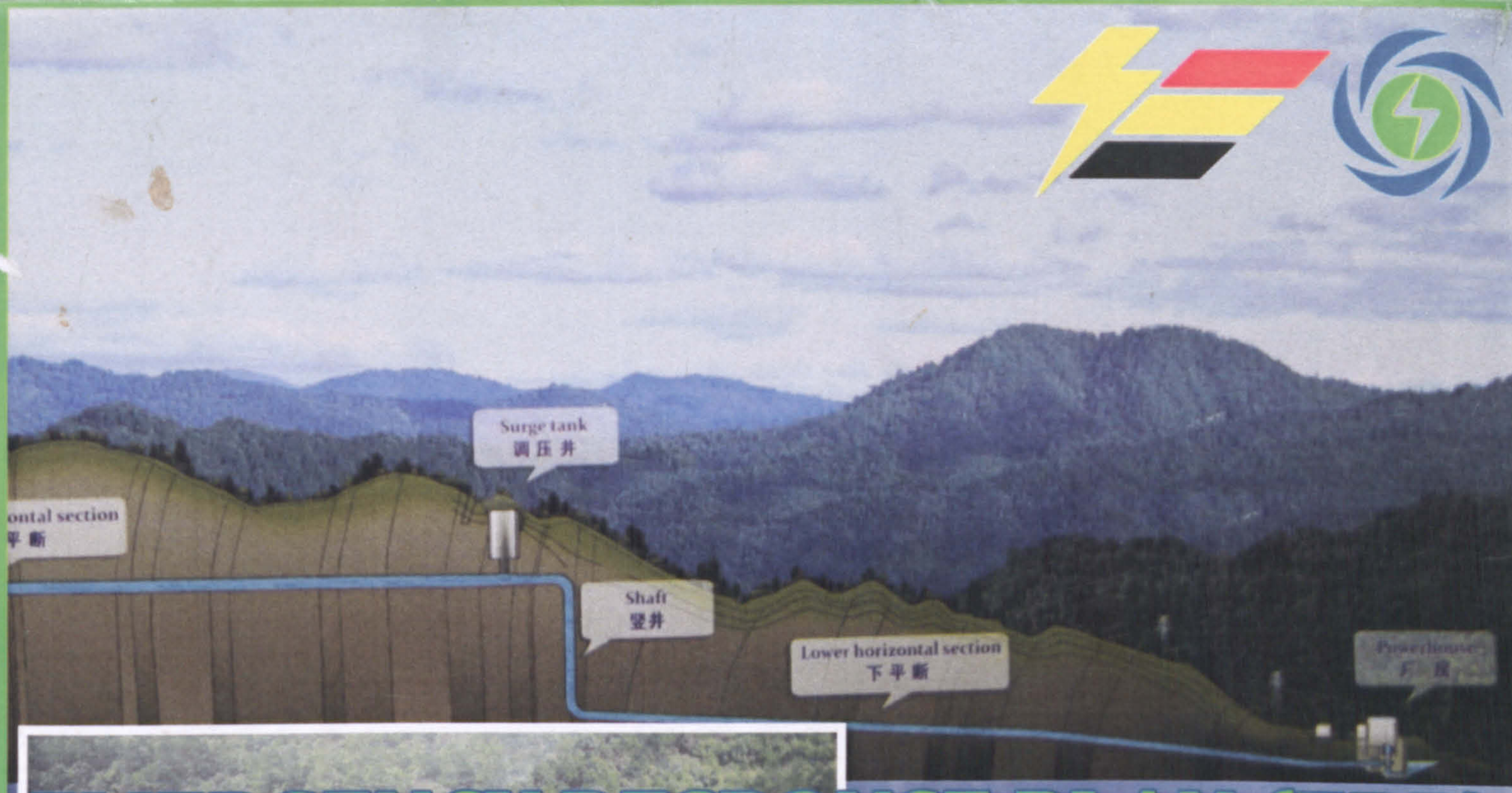

EMERGENCY RESPONSE PLAN (ERP) FOR MURUM DAM

FINAL REPORT
Volume I

Uni
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Vol.1
RPT

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MURUM HYDROELECTRIC PROJECT
EMERGENCY RESPONSE PLAN (ERP)
DRAFT FINAL REPORT
VOLUME I
MAIN REPORT

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Appendix 1: JAWATANKUASA PENGURUSAN DAN BANTUAN BENCANA DAERAH BELAGA, BAHAGIAN KAPIT

Appendix 2: PENYATA KELENGKAPAN PENGANGKUTAN / LOGISTIK

SECTION 1: INTRODUCTION

1.1 Background

An Emergency Response Plan (ERP) is a formal and comprehensive plan that identifies potential emergency conditions, which could occur at a dam, and prescribes procedures to minimise loss of life and the potential for property damage. Ideally, the design, construction, operation, maintenance, and inspection of dams are all steps intended to minimise the risk of dam failures. Despite the adequacy of these programs, unique situations sometimes develop that may result in dam failure. Thus, it is prudent for dam managers to develop and maintain an ERP, so that emergency measures can be initiated that could prevent or minimise the consequences to life and property.

The primary function of an ERP is to provide a means of notifying downstream residents of failure or impending failure of a dam, so that the area can be evacuated in a timely manner. To accomplish this, the ERP must provide procedures to evaluate those conditions at the dam, which could lead to failure, and clearly identify the circumstances under which the ERP is to be implemented. A secondary function of the plan is to identify strategies that can be taken following discovery of an emergency situation to prevent failure, or alternatively to delay failure until after downstream residents have been alerted.

The Centre for Technology Transfer and Consultancy (CTTC), Universiti Malaysia Sarawak (UNIMAS) collaborating with the UNIMAS Holdings Sdn Bhd., (a wholly own company of UNIMAS), have been appointed as the consultant for the preparation of an ERP for Murum Dam.

1.2 General Description of Murum Dam and the Reservoir

Murum Dam is a 141 m Roller Compacted Concrete (RCC) Dam with a stepped spillway incorporated in the dam body, an underground headwater conveyance system of tunnels, surge tanks and vertical shafts and a surface powerhouse with four turbine generator units located at the rim of the Bakun Reservoir. The reservoir created by the Murum Dam covers a surface area of 245 km^2 and can store more than 12 billion m^3 runoff water from the catchment area of 2,750 km^2. The salient features of the Murum HEP are shown in Table 1.2.1

Table 1.2.1: Salient features of the Murum HEP Dam

Item	Unit	Particulars
Hydrology		
Catchment Area	km^2	2,750
Mean River Discharge	m^3/s	242
Routed PMF flood discharge	m^3/s	16,000
Reservoir		
Full Supply Level (FSL)	masl	540
Minimum Operating Level (MOL)	masl	515
Maximum Flood Level (PMF)	masl	547
Reservoir Volume at 540 masl	Mm^3	12,043
Reservoir Area	km^2	245
Filling Time	Year	1.75
Active Storage Volume (540 – 515 masl)	Mm^3	5,475
Power Generation		
Installed Capacity	MW	944 (4X236 MW)
Nominal Plant Discharge	m^3/s	344
Net Head (Rated)	m	300
Dam		
Dam Type	-	Roller Compacted Concrete (RCC) Dam
Dam Height	m	141
Crest Elevation	masl	546
(with top of parapet wall)	masl	547.5
Average Riverbed Elevation	masl	400
Crest Length	m	473
Crest Width	m	7
Dam slopes:		
• Upstream (V:H)	-	1.00: 0.20 (El 470 below)
	-	1.00:0.00 (Above El 470)
• Downstream (V:H)	-	1.00:0.75/0.80
Spillway		
Type	-	Opening arranged in the dam crest
Weir Type	-	Ungated Overflow Crest
Energy dissipater	-	Steps + Flip Bucket
Crest Length	m	54
Ogee Crest Elevation	m^3/s	540
PMF Discharge	m^3/s	2,100
Waterway		
Headrace Tunnel	-	2
Type	-	(Concrete + steel) lined tunnel
Tunnel Diameter	m	8.0 ~ 3.4
Design Discharge	m^3/s	172 each
Invert at Intake	masl	496
Length	m	≈(1345+1465) ≈ 2810
Powerhouse		
Dimension	m	24X37X70 (HXWXL)

Number of Units	-	4
Turbine Axis Elevation	masl	218
Rated Discharge	m^3/s	86
Tailwater Level (Considering Bakun HEP):		
• Mean	masl	224.7
• PMF in Bakun Reservoir	masl	237
• Maximum Operation Level	masl	228
• Minimum Tailwater Level	masl	224
Ecological Powerhouse		
Dimension	m	15X16X35 (HXWXL)
Number of units	-	2
Installed Capacity	MW	7.4 (2X3.7 MW)
Discharge flow rate per unit	m^3/s	3.87
Minimum tail-bay water level	masl	414.5
Maximum tail-bay water level	masl	415.0
Design tail-bay water level	masl	414.7

1.3 Dam Structure

The chosen dam type is Roller Compacted Concrete (RCC) dam which was considered by the Project Proponent as the most economical and technically feasible solution after having taken into account the prevailing foundation conditions, availability of construction materials, climatic conditions, current dam design and construction technology, and construction time (Murum Dam Design Update Report, SEB 2007).

The axis of the dam runs W-NW / E-SE in the direction of the sandstone ridge which forms a natural barrier through which Sg. Murum has eroded a passage. The dam axis is therefore, approximately, at the central portion of the ridge, which together with other ridges is a typical physiography along Sg. Murum. These ridges are made up of relatively hard, steeply dipping sandstone/greywacke beds that cause rapids in the riverbed.

The dam was constructed upon a sequence of steeply dipping sandstone/ greywacke, siltstone, mudstone and shale beds. Similarly, sandstone/greywacke beds are predominant in the middle portion of both abutments whereas siltstone, mudstone and beds prevail in the upper and lower portions, along the alignment of the foundation for the plinth.

A comprehensive review of the seismicity of North Borneo has demonstrated that the region of eastern Sarawak is a fairly stable block which has experienced a relatively mild tectonic regime. Although there are indications that some offshore faults may extend into the mainland of Sarawak, their

seismic activity is not firmly established. Regions of moderate seismicity occur in eastern Sabah at a distance of at least 400 km from the Murum site. No earthquake events have been reported or recorded within about 150 km from the site. The seismic hazard at Murum can, therefore, be judged as low.

For design purposes, a random earthquake of Magnitude 5.5 at a focal distance of 10 km has been assumed as the maximum credible event (MCE). This results in a peak ground acceleration (PGA) at the Design Basis Earthquake level of 0.07 g.

The general layout of the dam, together with its appurtenant structures, such as spillway and diversion tunnels, is illustrated in Figure 1.3.1. The dam structures have a maximum height above the riverbed level of 141 m and a total RCC volume of 1.604 million cubic metres. The adopted design of dam has a slope of 1.00:0.20 (V:H) El 470 below and 1.00:0.00 (V:H) above El470 on the upstream side and 1.00:0.75 (V:H) on the downstream side. The dam body has a crest elevation of 546.00 m asl whereas the designated elevation of the parapet wall is 547.50 m asl, hence providing ample freeboard. Figure 1.3.2a and 1.3.2b illustrates the longitudinal and cross sections of the dam respectively. Figure 1.3.2c shows the typical cross section of the cofferdams and the diversion tunnels.

1.4 Downstream Flood Path

The river cross-section downstream of Murum Dam was surveyed on 20 – 23 February 2012. The Murum river section surveyed is shown in Fig. 1.1.

The river section surveyed was limited by the accessibility. Only the river stretch from the Murum Powerhouse and Bakun Dam was accessible by boat and a total of 43 cross-sections were measured. The river stretch between Murum Dam and the Murum Powerhouse was inaccessible to boat and consequently it was not measured. However, this stretch of the river is relatively short and quite linear. This section will be estimated based on the topographic map.

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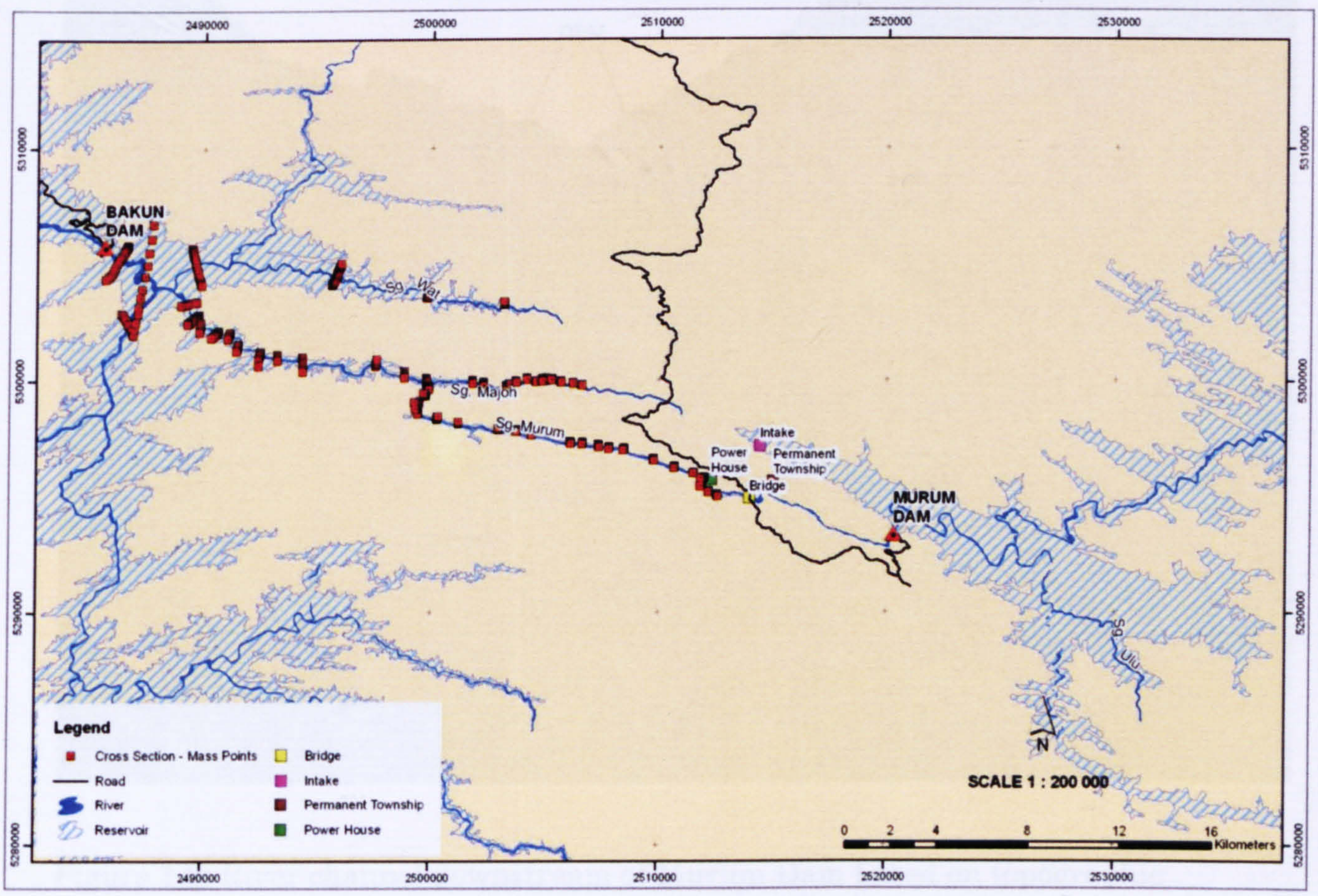

Figure 1.1: Survey of river cross-section between the Murum Power House and Bakun Dam.

Through the GIS simulation of the topographic map the river channel can be represented graphically, as shown in Fig. 1.2. The detail GIS simulated maps are shown in Volume II of the Murum Dam Emergency Response Plan (ERP).

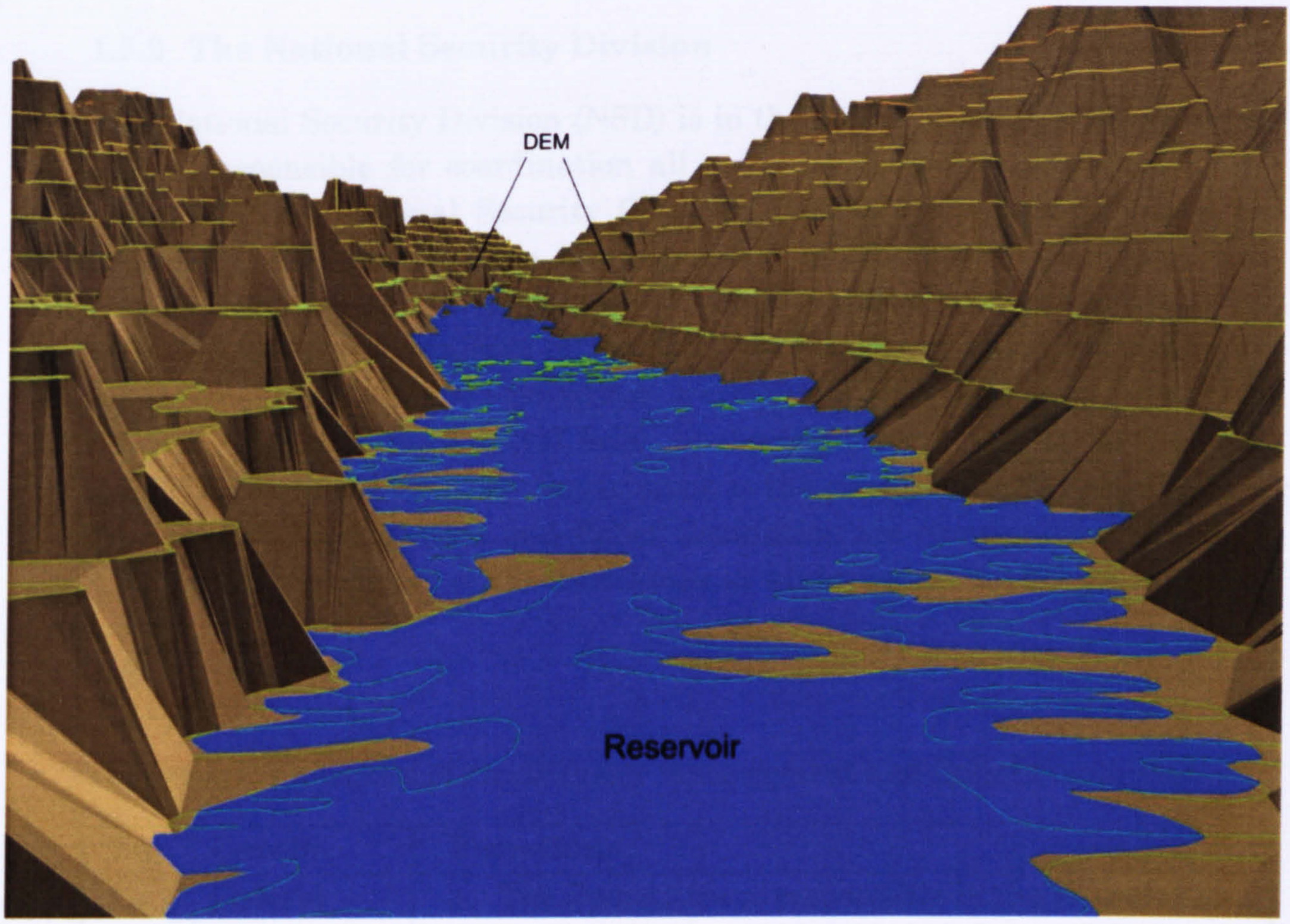

Figure 1.2: River channel downstream of Murum Dam based on topographic data

1.5 Organisations Responsible for Implementing the ERP

1.5.1 Introduction

This section describes the purpose of the institutional framework that should be in place for this Emergency Respond Plan (ERP). This section will describe and identify the relevant institutions that are responsible for the implementation of the ERP. It is also important to describe the various legislations (if any) that are under the jurisdiction of the said institutions. This section also described and analyse the content of the National Security Council Directive No. 20, a directive for the guideline on the management of disasters, responsibilities and functions of the relevant agencies.

1.5.2 The National Security Division

The National Security Division (NSD) is in the Prime Minister's Department and is responsible for coordination all activities related to any disaster in Malaysia. The National Security Council's Directive No. 20 was issued to provide guidelines on the management of disasters, including the responsibilities and functions of the various agencies and institutions. To carry out the responsibilities of the National Security Council, the Disaster Management and Relief Committee were established and have three (3) different levels; a) the Federal level, b) the State level, and c) the District level. The National Security Department is the secretariat. The functions of the Disaster Management and Relief Committee are as stipulated in Table 1.5.1 and the members of the committee at all levels are as shown in Table 1.5.2.

Table 1.5.1: Functions of the Disaster Management and Relief Committee

No	Levels	Functions
1.	Federal Level	a. The Committee is responsible in the formulation of national policies and strategies regarding alertness and the preparation of various agencies involved in the handling of disasters; b. To ensure sound coordination among agencies involved in the handling of disaster and determine the roles of the principal emergency services and other supporting services; c. To activate Disaster Operation Control Centre at District, State or Federal level; d. To coordinate and mobilise whatever resources and logistics available from government agencies and if necessary, the private sector; and e. To coordinate assistance and rehabilitation to disaster victims.
2.	State / District level	The Disaster Management and Relief Committee at these levels are required to implement and carry out such policies and strategies.

Table 1.5.2: Committee members of the Disaster Management and Relief Committee

No.	Level	Members
1.	Federal	• Minister of Information (Chairman) • Minister of National Unity and Community Development • Minister of Finance • Chief Secretary to the Government • Chief of Armed Forces • Inspector General of Police • Director General of Health • Director General of National Security Division • Director General of Fire and Rescue Department • Director General of Atomic and Energy Licensing Board • Director General of Road and Transport Department • Director General of Public Works and Utilities Department • Director General of Meteorological Department • Director General of Drainage and Irrigation Department • Representatives from Ministry of Finance and Attorney General Office • Director General of Dept of Occupational Safety and Health
2.	State	• State Secretary (Chairman) • State Chief Police Officer • Commander of Armed Forces • State Director of Fire and Rescue Department • State Director of Health • Other Directors of various government agencies/departments
3.	District	• District Officer (Chairman) • Officer in Charge of Police District (OCPD) • District Fire Officer • Medical and Health Officer • Representatives of various relevant departments/agencies

Also under the ambit of the National Security Division are the "**On-Scene Control Post (OSCP)**" and the "**Special Malaysia Disaster Assistance and Rescue Team (SMART)**".

The On-Scene Control Post will be established immediate upon the occurrence of a disaster. The main functions of its commander are:

- To make an early assessment at the scene of potential or actual disaster and immediately activate the OSCP;
- To identify the equipment and logistic requirement;
- To coordinate the functions of the various agencies/departments involved in the search and rescue operation;
- To report and advice the Disaster Management and Relief Committee at their respective levels.

The Special Malaysia Disaster Assistance and Rescue Team (SMART) established in 1995 under Directive No. 19 is directly responsible to the Director of Crisis and Disaster Management Unit. SMART has officers and personnel from the Fire and Rescue Department, Royal Malaysia Police and the Armed Forces. They are equipped with specialised skills and equipment to respond to any disaster.

1.5.3 Agencies and their Responsibilities

For any emergency, it is important to know the roles and responsibilities of every organisation and their respective officers that are involve in any calamity, directly or indirectly. Each agencies involved would know their respective roles and responsibilities in the event of the occurrence of a disaster. This is to avoid and minimise incorrect interpretation and miscommunication.

a. The Police Department
b. Medical and Health Department
c. Malaysian Armed Forces
d. Fire and Rescue Department (Bomba)
e. Resident and District Office
f. Social Welfare Department
g. Public Works Department

h. RELA (*Ikatan Relawan Rakyat Malaysia*)
i. TELECOM Malaysia
j. Red Crescent/Red Cross
k. St. John Ambulance Malaysia
l. Community Leaders
m. Community leaders

The list of organisations shall be updated whenever there is any additional organisation being identified or need to be included in the ERP stakeholders. The Directive No. 20 has identified several agencies/departments that are relevant or are involved directly or indirectly in the event of any disaster.

1.5.3.1 Police Department

This department is tasked with the maintenance of public security and order. It is responsible for traffic control and search & rescue (SAR) operations. In any disaster, this department cooperates with other agencies. They have offices in all Divisions, Districts and Sub-districts of Sarawak. For this Emergency Respond Plan purposes, the Table 3 below indicates their address and contact numbers in case of any disaster caused by the Murum Dam.

The roles and responsibilities of the Police Depart as stipulated by the Directive No. 20 are:

- To inform all relevant agencies/departments of any occurrence of a disaster
- To coordinate disaster plan with all relevant agencies
- To establish an On Scene Control Post
- To cordon the disaster area
- To conduct search and rescue on life and property
- Control traffic movement within the disaster area

- To investigate the cause of the disaster
- To protect unclaimed property and to indentify its rightful owner
- To protect life and property
- To collect and protect all information with regard to the disaster
- To provide air transport through its Air Unit

Table 1.5.3: Police Headquarters of Kapit, Bintulu, Miri and Belaga

No	Division/District /Sub-district	Location	Contact No.
1.	Kapit	Police Headquarter of Kapit District	Tel: 084 796222
2.	Bintulu	Police Headquarter of Bintulu District	Tel: 086 332044
3.	Miri	Police Headquarter of Miri District	Tel: 085 432222
4.	Belaga	Police Headquarter of Belaga District	Tel: 086 461318

1.5.3.2 Medical and Health Department

The Medical and Health Department is an important department as it is mainly responsible for the wellbeing of the victims. The roles and responsibilities are:

- To provide emergency medical services to the disaster victims and the search and rescue team
- To provide forensic services, inclusive of identifications, placement of corpse, and documentation of evidence
- To provide medicine

- To provide for health services and to control the spread of contagious and infectious diseases
- To provide physiological services, such as post trauma disorder, psychotherapy, counselling and debriefing.

Table 1.5.3.4: Contacts for general hospitals at Bintulu, Kapit and Miri.

No	Division / District / Sub-district	Location	Contact No.
1.	Bintulu	Bintulu General Hospital Jalan Nyabau 97000 Bintulu	Tel: 086 255899 Fax: 086 255866
2.	Kapit	Kapit General Hospital	Tel: 084 796333 Fax:
3.	Miri	Miri General Hospital	Tel: 085 420033

1.5.3.3 The Malaysian Armed Forces

The roles and responsibilities of the Malaysian Armed Forces when any disaster occurred are:

- To provide manpower in any disaster
- To assist and provide land, air and sea transport
- To assist and provide for heavy machineries during any disaster in all level
- To assist and provide for experts in explosive, engineering, communication and medicine, if needed
- Where necessary, assist to do construction works to ease the rescue works
- To provide for divers
- To conduct search and rescue works
- To provide for an air ambulance for the evacuation of victims
- To provide a liaison officers at all levels

Table 1.5.3.5: Contacts for Malaysian Armed Forces

No	Division/ District/ Sub-district	Location	Contact No.
1.	Miri	Kem Sri Miri	Tel:085-415300
2.	Sibu	Kem Sri Rejang	Tel: 084-333933
3.	Kuching	Panglima Wilayah II (Sabah dan Sarawak)	Tel: 082-585500 Fax: 082-585598

1.5.3.4 Fire and Rescue Department (Bomba)

The roles and responsibilities of the Fire and Rescue Department as in the Directive No. 20 are as follows:

- To search and rescue victims
- To prevent the spread of the disaster such as fire, chemical leak and any other dangerous situation
- To collect information and to assess the danger and to advice the Police on any evacuation plan
- To corporate with the Police on the inner cordon area and to effect control of the disaster area
- To ensure the safety of all search and rescue personnel
- To assess the surrounding environment and to minimise the effect of the disaster
- To corporate with the Medical Officer and ambulance to provide assistance to victims who required the services and to evacuate, if necessary.
- To assist the Police to search for dead victims
- To investigate if necessary and thereafter to provide the disaster report complete with evidence

Table 1.5.3.5: The Fire and Rescue Department has offices in Kapit and Bintulu.

No	Division/ District / Sub-district	Location	Contact No.
1.	Kapit	Balai Bomba Jalan Selirik 96800 Kapit	Tel: 084 796444 Fax: 084 798569
2.	Bintulu	Balai Bomba Jalan Tun Ahmad Zaidi 97007 Bintulu	Tel: 086 763444 Fax: 086 762497
3.	Miri	Balai Bomba P.O.Box 2170, 98008 Miri	Tel: 085 420991 Fax: 085 417059

1.5.3.6 Resident and District Office

The Resident and District Office act as the government liaison office with the people. This office can act as the operation centre for any occurrence of a disaster. The District Officer is also the Chairman of the Disaster Management and Relief Committee at District Level. The Resident and District office can be found in all divisions, districts and sub-districts. For this report, the below table indicate the Resident and District Office that could be contacted in the event that a disaster occurred due the Murum Dam.

Table 1.5.3.6: Resident Offices at Bintulu and Kapit Divisions.

No	Division/ District / Sub-district	Location	Contact No.
1.	Bintulu	Bintulu Resident Office Wisma Resident, Tun Razak Road, 97000 Bintulu	Tel: 086 331896 Fax: 086 336620
		Bintulu District Office 97000 Bintulu	Tel: 086 331896 Fax: 086 338441
2.	Kapit	Kapit Resident Office Kompleks Kerajaan Kapit Seleteh Road 96800 Kapit	Tel: 084 796963 Fax: 084 796932
		Kapit District Office 96800 Kapit	Tel: 084 796322 Fax: 084 797625
		Belaga District Office 96900 Belaga	Tel: 086 461326 Fax: 086 461435