7.1 RISK ASSESSMENT

The objectives of carrying out Risk Assessment Study for any project is to study the risk involving hazardous chemicals and their consequences. Present project does not create any hazardous chemicals which will create risk to the human as well as environmental health. All efforts will be made to preserve trees including evaluation of minor design adjustments/ alternatives to save trees. Specific attention will be given for protecting giant trees, and locally important trees (religiously important etc.).

Tree cutting is to proceed only after all the legal requirements including attaining of In-principle and Formal Tree felling and forest land diversion permission from Forest Dept. under Forest Conservation Act, 1980. A clearance from the Forest Dept. and subsequently a written order is issued to the Contractor.

All environmental impact associated with the project which will be either avoid or minimized during planning stage if it is not possible then it will be compensated suitably, so that project will become eco-friendly.

7.2 DISASTER MANAGEMENT PLAN

India is prone to a large number of natural as well as man-made disasters. Disasters disrupt progress and destroy the hard-earned fruits of painstaking developmental efforts in quest for progress. Considering the consequences of past disasters priority has been given to preventive, mitigation and preparedness measures. Preparation of Disaster Management Plan (DMP) is a part of it.

Disasters can be due to human error or to rough weather conditions, they can cause serious injuries, loss of lives, and extensive damages to property and equipment. Most of the time disasters arise with no warning and sometimes they may not be controlled. The first few minutes determines the effectiveness of the emergency plan. Dealing with an emergency situation may require external aid. The quickest and well prepared the response is, the less likely there will be serious damages. Emergency planning enables to reduce the thinking time and thus permit to decrease the potentiality of damages. Emergency plans and equipment may never be used but they are essential. The key objectives of the disaster management plan are:

- Provide the framework for an integrated multi-agency crisis response to a significant disaster incident within the MMC
- Clarify specific roles and responsibilities
- Safest possible environment during the resolution of the incident
- Reduce the adverse impacts of an emergency incident on personal, business and the general community
- Provide a management framework for the sub plans and associated specific response plan
- Provide continued education review and testing.

7.2.1 Types of Disaster Causing Interruption to Metro Train Services

Human/Equipment failure:

The following disasters/ accidents may be caused by human/equipment failure, which may affect normal movement of train and road transport services with loss of life or property or both.

- Collision and Road Accident
- Derailment
- Fire in vehicle and Train/ at Station/ with in ROW

Natural Calamities:

- Landslide
- Earth quake
- Flood

Sabotage:

- Terrorist Attack
- Setting fire to train/railway installations and railway property
- Bomb blasts
- Placing of obstructions on track to cause disruption to traffic
- Tampering with railway fittings to cause accidents
- Release of Chemical or Biological Gas in trains, stations, tunnel

7.2.2 Classification of mergencies

In an emergency situation defining the level of risk is the initial step. Classifying emergencies enable to understand quickly what is likely to happen and to what extent the emergency plans will be driven. The nature of the emergency refers as if it is a man-made disaster or a natural one and the level of an emergency refers to the intensity of potential damages.

7.2.3 Potential Mergencies

The potential emergencies likely to occur in a project area include:

Nature 1: Natural Disasters and Calamities	Nature 2: Man-Made Disasters
Flood Cyclone Coastal hazards: erosion/storm surge/tidal waves/swell waves Earthquakes Tsunami	Fire and Explosion Major release of flammable/toxic chemical or gases Person falling in harbor water Collapse of lifting appliances War and terrorism Industrial unrest Oil Spill,

7.2.4 Categorization of Emergency

Any emergency situation has to be first categorized as an onsite emergency or an offsite emergency, the difference being that the effects of the onsite emergency are confined within the premises while those of an offsite emergency spill over beyond the port premises or even beyond the project site premises. Thus, the onsite and offsite emergency plans are detailed below:

7.2.4.1 Onsite & Offsite Emergency Plans

These plans would have the following components:

Components of an Onsite Emergency Plan	Components of an offsite emergency plan
Formulation of Disaster Management Plan and Emergency Services Organization Structure Roles and Responsibilities of Emergency Teams Communication Emergency Control Centre • Alarm Systems & Assembly Points • Mutual Aid Scheme • Onsite Emergency Plan and Rehearsals • Spillage & Contingency Plan • Formulation of Disaster Management Plan for Cyclones	Identification of location of hazardous or dangerous substances, personnel and emergency control rooms Technical information such as chemical and physical properties, dangers, etc. Background information, past accidents, control techniques and effects of hazardous materials of relevance Identification of facilities and transport routes for toxic materials • Contact for further advice such as meteorological information, transport, temporary food and accommodation, first aid and hospital services, water, etc. • Establishing communication links including firefighting materials, damage control and repair items • Detailing emergency response procedures • Notification to public at large • Evacuation arrangements • Press / media handling • Addressing longer term environmental cleanup t for further advice such as meteorological information,

7.2.4.2 Onsite Emergency Plan (Formulation of DMP and Emergency Services)

The assessment of the risks and hazards leads either to improvements being made at the installation in the form, for example, of additional safeguards or better procedures, or the decision being taken that the risk is sufficiently small to be accepted. The DMP must be related to the final assessment and it is the responsibility of the MMC management to formulate it. The plan will include the following elements.

Assessment of the magnitude and nature of the events foreseen and the probability of their occurrence

- Formulation of the plan and liaison with outside authorities, including the emergency services
- Procedures for raising the alarm and communication both within and outside the port
- Appointment of key personnel and their duties and responsibilities (organizational structure)
- Emergency Control Centre
- Action on site and Action off site

7.2.5 Scenarios

Coastal flooding: Coastal flooding occurs when high tides, combine with low barometric pressure and high winds. During the south west monsoon heavy rainfall and flood are more likely to occur.

Cyclonic storms: Storms vary in size and intensity, in severe situation port operations should be interrupted. High winds are particularly hazardous.

Earthquake: Project area falls under earthquake zone III which corresponds to a magnitude of 6.5 or more on the Richter scale. That means that the risk of earthquake and its consequences are non- negligible. Buildings and facilities construction must be designed to minimize the consequences of an earthquake.

Tsunami: The phenomenon Tsunami is a series of travelling ocean waves of extremely long length generated primarily by Submarine earthquakes. Tsunami has already occurred in the southern coast (Tamilnadu and Kerala) and thus may likely to occur again. Nevertheless, Tsunamis are unexpected and unpredictable but are a rare natural phenomenon. Mumbai lies on the western coast of India by the bank of Arabian Sea. Mumbai is made from the group of seven islands and is thus referred to as the Island city. MMC may also get impacted by the Tsunami.

Fire and explosion: A fire incident is described as the destruction or partial destruction by fire of a building or its contents. In metro there are a lot of sources of fire ignition because of the presence of wooden facilities and inflammable substances. A fire spread can be very fast, to confine the fire to manageable limits the reaction must be very quick. Fire can also accrue due to road accident and sparking in running vehicle may also cause serious causalities.

Collapse of lifting appliances, buildings, sheds: Road and Metro construction include the intervention of a lot of lifting and heavy appliances, which can collapse under man-made error or rough weather condition. The managers are trained to respond to this problem. They should monitor all safety measures necessary and coordinate response with other authorities if necessary.

Transportation Accidents: Transportation mishaps could endanger human lives, lead to chemical spills, fires, explosions and other problems. These emergencies may call for special operations such as evacuation and rescue. Usually transportation incidents affect only relatively small areas and involve only a small number of people.

Terrorist attack and Bomb threat: Due to political climate, emotional and psychological stresses that exist, terrorist acts could happen anywhere at any time. Bomb threats are the majority of the time false threat, however the threat itself is a crime and appropriate action should be taken to provide safety of employee.

7.2.6 Response Organization

7.2.6.1 General Action Plan

The primary role of the emergency response organization should be to determine the degree to which the emergency action plan should be activated, to coordinate the response and to assess the consequences. We can define three or four phases that composed an emergency action plan regarding the fact that there had been or not a warning.

- **First phase:** Planning and preparedness: This phase generally consist of constituting an emergency response team and making all the liaisons with all the parties susceptible to intervene. The number of person constituting the emergency response team will be based

on the need to ensure safety to all port workers, property and equipment.

- **Second (optional) phase:** Action before effective period: It consists of ensuring that all the protective measures are well implemented. It is only possible when the danger has been identified by advance. Generally, the evacuation of the personnel which is not implicated in the emergency action plan takes place during this phase whenever possible.
- **Third phase:** Action during effective period: It consists of stopping all the activities at stakes and ensuring the safety of the employees, taking the action to minimize damages.
- **Action after effective period**: When the normalcy and safety of the area is ensured, it consists of making impacts assessment, undertake repairing measures and restart port activities**.**

7.2.6.2 Assembly Point

A list of all the emergency assembly points should be made, notified on a plan and distributed to employees. All personnel that are not involved in handling the emergency response should assemble at the appropriate assembly point.

7.2.6.3 Emergency Control Centre

The emergency control center should be established separately for Metro and Road should be equipped with the following:

- An adequate number of external telephones. If possible, one should accept outgoing calls only, in order to bypass jammed switchboards during an emergency.
- An adequate number of internal telephones, Radio equipment/pager system.
- A layout plan of the facility.
- Location of possible spillage/fire points.
- Sources of safety equipment and other fire-fighting system elements.
- Escape Routes.
- A nominal roll of employees at the facility.
- A list of KEY PERSONNEL with addresses, telephone numbers, etc.
- An adequate number of personnel protective/safety equipment available on site / backup in warehouse or with other member groups of mutual aid programme.

7.2.6.4 Alarm Systems

The emergency (due to fires or spillages) should be initiated by the first person noticing it by activating the fire alarm from the nearest call-point or by contacting the fire control room immediately on the internal telephone in case of any emergency.

7.2.6.5 Communication

Communication is a very important issue, a good communication that liaise all the services will enable a more effective response.

Some means of communication	
Inside include	**With government authorities include**
Telephone Mobile Port announcement system Wireless radio Email Emergency vehicles	Telephone Fax E-mail Emergency vehicles

7.2.6.6 7.3.6.6 Training

Emergency response drills should be conducted once in a month, all types of siren codes should be exercised, and a clear notice should be distributed to all the employees.

7.2.6.7 Reporting and investigation

Reporting: Any minor or major incident should be reported and a complete analysis of the incident should be done to understand causes, consequences and the level of failure. Special procedure and forms should be provided for this purpose (Incident report form, Work injury report etc.). A report should also be provided to government authorities.

Investigation: Each incident should be investigated to identify the causes, take appropriate preventive measures and comply with requirements. Special procedures and forms should also be provided for investigation.

Individual Plans: Following are proposed general mitigation measures for emergency action plan related to the disasters described above.

Nature 1 Disasters:

	Action By	**Action**
Cyclonic	**MMRDA**	Immediately inform control room Consult stations/operator and activate Emergency Action Plan
Flood	**Individual**	Do not panic Avoid standing near to sea side Assembly at emergency assembly point
Earthquake	**Individual**	Do not panic Avoid standing near windows, external walls Stand near columns or duck under sturdy furniture Assembly at emergency assembly point
	MMRDA	Take head count Activate Emergency Action Plan Stop metro rail movement if required Arrange medical assistance
Tsunami	**Individual**	Do not panic Avoid standing near to sea side Stand near columns or duck under sturdy furniture Assembly at emergency assembly point
	PIU	Activate Emergency Action Plan Stop movement of metro rail and movement of traffic Arrange medical assistance
2. Manmade Disaster		
Electric short circuit	**PIU**	Although the chances of an electric shock accident occurring is not high, once the accident occurs there is a high chance that the disaster will result in casualties and property damage. Sufficient preparation must be done because electric shock

		accidents happen in the blink of an eye – once the accident is detected it is usually too late General Prevention Measures: • Do not expose the live part of any electrical appliance or wire. • Be sure to ground electrical appliances. • Reduce the severity of electric shock accidents by installing circuit breakers. • Limit the authorized personnel responsible for handling switches on electrical appliances. • Do not touch electrical appliances with wet hands. • Be sure to use standard regulation fuses for switches and not to use copper/steel wire. • Do not use faulty or malfunctioning electrical products. • Do not use wiring with a link in the middle connecting two separate wires • Conduct periodical (monthly safety inspection days, every semester) safety inspections on the necessary items in order to prevent electrical fires
Electricity		• Prolonged electricity failure • The affected victims may be panicked • Halt of all activities specially jamming communication-networking systems in the affected site • The members of (Quick Response Team) QRTs will establish temporary electricity supplies for transit camps, feeding centers, relief camps, District Control Room and on access roads to the same. • The members of QRTs will establish temporary electricity supplies for relief material go downs. • Compile an itemized assessment of damage, from reports made by various electrical receiving centers and sub-centers. • Report about all the activities to the head office
Communication	**Mahanagar Telephone Nigam Limited (MTNL)**	• There would be a congestion in the network because of increased calls to control rooms due to panic created in the community, • The initial reports on damage may not give a clear picture of the extent of damageto communication network, • The affected site may cut off from the state control rooms and the officials on site and find difficulty in communicating to the District/State EOC.
Water Supply	**PIU**	• Existing water storage bodies will be damaged and unusable. • There would be an urgent need of water to assist victims in rescue operation. • Break down of sanitation system • Contamination of water due to outflow from sewers or due to breakage of water pipelines. • Identify unacceptable water sources and take necessary precautions to ensure that no water is accessed from such sources, either by sealing such arrangements or by posting the department guards. • Arrange for alternate water supply and storage in all transit camps, feeding centers, relief camps, cattle camps, and also the affected areas, till normal water supply is restored. • Ensure that potable water supply is restored as per the standards and procedures laid down in “Standards for Potable Water
Debris and Road Clearance	**PIU**	• Access to disaster-affected area would depend upon the re-establishment of ground and water routes • Undertake construction of temporary roads to serve as access to temporary transit and relief camps, and medical facilities for disaster victims. • Repairing of all paved and unpaved road surfaces including edge metalling, pothole patching and any failure of surface, foundations in the affected areas by maintenance engineer's staff and keep monitoring their conditions
Transport	**PIU**	Transport should ensure smooth transportation links at state and district level. Within the disaster context, quick and safe movement of material and humans are a priority. It should coordinate the use of transportation resources to support the needs of

		emergency support forces requiring transport capacity to perform their emergency response, recovery and assistance missions
Relief (Food & shelter)	**PIU**	In the event of a disaster there would be a need of disbursing relief materials due to massive destruction of life and property taken place. The ESF on Relief should ensure coordination of activities involving with the emergency provisions of temporary shelters, emergency mass feeding and bulk distribution of relief supplies to the disaster victims as also the disaster managers and relief workers. • Initiate, direct and market procurement of food available from different inventories and ensuring food supplies to the affected population • Preparing take-home food packets for the families • Ensuring distribution of relief material to the all the people including vulnerable groups of the target area such as women with infants, pregnant women, children, aged people and handicapped.
Addressing Health related issues	**PIU**	• Ensure sufficient stock of emergency medicines, antidotes, etc in all hospitals at district and taluka level. • Keep all hospitals on ready position with manpower and medicines to address any emergency situation. • Ensure that the required medical assistance/aid and medicines/antidotes are provided to the affected people at site as well as at evacuation/relief centers in the affected area and necessary records are maintained. • Contact with State authority for any additional help like doctors, medicines, equipment etc. • Mobilize doctors/paramedics If required, from one district/taluka to other

7.2.7 District Disaster Management Authority

The District Disaster Management Authority shall act as the district planning, coordinating and implementing body for disaster management and take all measures for the purpose of disaster management in the district in accordance with the guidelines laid down by National and State Authorities.