



# EL MOLINO AND SAN MATIAS HYDROELECTRIC PROJECTS

## ENVIRONMENTAL IMPACT STUDY VOLUME III OF V CHAPTER 9

DOCUMENT 2148-04-EV-ST-020-09

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**EL MOLINO AND SAN MATIAS  
HYDROELECTRIC PROJECTS**

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## 9 CONTINGENCY PLAN

### 9.1 GENERAL INFORMATION

This chapter outlines the general criteria of the Contingency Plan of El Molino hydroelectric project, which should be adjusted by the selected contractor and by the owner of the project in the operation stage.

Its development requires to take into account the technical specifications, the criteria for construction and operation of the project, and the threats and risks that it generates, in order to establish the procedures and measures to prevent, treat or control the effects that may result in the occurrence of a sinister due to constructional, operational, natural causes, or of the external source

For the formulation plan it was also included the analysis of the socio-economic conditions in the area, to measure the degree of affectation of resources during the construction and operation of the project.

Any accident, event, and unforeseen incidents that may arise during the construction will be responsibility of the contractor; for this reason, this contractor will implement its own valuation, assessment analysis and risk management.

It is necessary to take into account that as progress is made in the execution of the facilities, there may be analysis elements not initially considered. These new items or situations can determine the need on behalf of the contractor or the owner of the project to introduce changes, adjustments or upgrades.

The methodology for the design of this plan was based on the identification of the most significant threats, vulnerability analysis and the development of specific programs where prevention and attention actions are described.

#### 9.1.1 Objectives

##### 9.1.1.1 General

Generate an instrument of prevention, mitigation, monitoring and response to possible contingencies generated in construction and operation of the El Molino hydroelectric project.

##### 9.1.1.2 Specific

- Determine the potential risks that could be generated by natural actions or anthropic interventions with the purpose to define mechanisms of prevention and control and, in the event of contingency activate the mechanisms of the plan.
- Identify all the institutions, both private and state, present in the work influence area, that can offer their services of logistical support, to be linked to the Contingency Plan.
- Encourage the participation of the staff that will execute the project as well as the community and administrations, in prevention and attention activities of emergencies, as part of a permanent educational process, and of coordination with the competent authorities, to whom should be given the Contingency Plan.
- Define the response group with their respective organizational structure and operating procedures.

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### 9.1.2 Scope

The contingency plan is aimed at the implementation of the preventive and control measures for emergencies in the event of an incident in the direct area of influence, and must include character measures:

- Preventive. Where is defined the location and basic design of the projects to minimize or control the threats of the environment on the project, and on the environment.
- Structural. To incorporate protection facilities, to minimize the consequences of impact and risks assumed by the project.
- Remedial. To quickly control the consequences of an unchained threat, recovering in the shortest time possible the productive and functional capacity of the project.

### 9.1.3 Theoretical Framework

#### 9.1.3.1 Legal Framework

The Contingency Plan, in addition to the requirements of the legal framework of Decree 919 of 1989 on Disaster Prevention and Response, must comply with:

The standards to be met by the contractor with respect to the Contingency Plan are:

- Political Constitution of Colombia 1991, articles 8, 78, 79, 80, 83, 88, 90 and 95.
- Law 46 of 1989, which establishes the National System of Emergency Prevention and Response.
- Decree 919 of 1989, which defines the National Directorate for Disaster Prevention and Response.
- Decree 321 of 1999, which adopts the National Contingency Plan against oil spills, derivatives and harmful substances.
- Decree 93 of 1998, by which it is adopted the National Plan for Disaster Prevention and Response
- Presidential Directive 33 in 1989, which establishes the responsibilities of the agencies and entities of decentralized national order of the public sector, in the development and operation of the National System for Disaster Prevention and Response.
- Presidential Directive 05 of the December 28 1991, which establishes the responsibilities of state entities in the development of the national strategy against violence.
- Resolution 1016 of 1989, which defines the organization, operation, and contents of Occupational Health programs.
- Decree 1295 of 1994, which establishes the organization and administration of the system of professional risks.
- Decree 1281 of 1994, which regulates the activities of high risk.
- Decree 1609 of 2002, in which it regulates the handling and transportation of dangerous goods by road.

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### 9.1.3.2 Definitions

- **Contingency**

It is defined as an event that occurs suddenly or unexpected, that alters the normal patterns of human behavior or the functioning of ecosystems, which can trigger a situation of contingency or emergency, compelling the performance of response procedures in order to minimize the magnitude of their effects.

These phenomena may be caused by a natural phenomenon, or can be caused by human activity or as a result of a technical failure, and for its analysis, the concepts of threat, vulnerability and risk are used.

- **Threat.**

It is defined as the external risk factor of a subject or system, represented by a latent danger, associated with a physical phenomenon of natural origin, technological or anthropic, which may occur at a specific site and in a given time period, producing adverse effects on people, property or the environment. Mathematically this is expressed as the probability of occurrence of the phenomenon, with certain intensity and potentially harmful to people, property, infrastructure, or the environment, within a specific period of time and in a geographically limited area.

Because of its origin are classified into:

- Exogenous. When it comes from the outside of the project, which may be of natural or anthropogenic origin.
- Endogenous. When presented at the interior of the project and are caused by the development of processes or technologies used.

For their cause they can be classified into:

- Natural. Phenomena such as tectonic movements, mass movements, floods.
- Technical or operation. That corresponds to events related to equipment explosion, fire, chemical spillages, and structural flaws of the facilities.
- Anthropogenic. Related to human activity, and may be caused accidentally or intentionally by man or as a result of punctual or chronic improper pressure over natural elements.

- **Vulnerability.**

Defined as the degree of loss or damage an element or group of elements at risk, as a result of the probable occurrence of a disastrous event, expressed on a scale ranging from 0 (no damage) to 1 (total loss).

- **Risk.**

Destruction or loss expected, obtained from the convolution of the threat and vulnerability, which is expressed mathematically as the probability of exceeding a level of economic and social consequences in a certain site, in a certain period.

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## 9.2 RISK ANALYSIS

### 9.2.1 Methodological Process

For the risk assessment it was used the methodology proposed by Arboleda and Zuluaga<sup>1</sup>, which defines the risk as:

$$R = A \times V = P \times I, \text{ Where}$$

- R = qualitative value of the risk.
- P = occurrence threat probability = A.
- I = intensity or severity of potential consequences V.

The threat is qualified taking into account the criteria defined in Table 9- 1 that is based on the probability of occurrence of the event.

**Table 9-1 Criteria for assessing the threat**

Category	Description	Points
Frequent	When it can happen once each year during the life time of the project	5
Likely.	When it can happen once every five years	4
Occasional	When it can happen once every ten years	3
Remote	When it can happen once every 25 years	2
Unlikely	When it can happen once every 50 years	1

Source: EPM Magazine. The concept of environmental risk and its assessment. Julio Eduardo Zuluaga U. and Jorge Alonso Arboleda G. Medellín, volume 15, No 3 January - April 2005

To evaluate the vulnerability, it is considered the consequences that can be caused on the environment and people, as it can be seen in Table 9-2.

**Table 9-2 Criteria for assessing the vulnerability**

Category	Description	Points
Insignificant	Generates consequences of low intensity, punctual, fleeting, side-effect and recoverable immediately or reversible in the short term No disabling personal injuries occur	1
Mild	Generates consequences of medium intensity, timely, temporary, direct effect and recoverable or reversible in the medium term. Cause minor injury or temporary disability to the people	2
Serious	Generates consequences of high intensity, large, temporary, direct effect, reducible or reversible in the long term. Generate serious injury or permanent partial disability to the people	3

<sup>1</sup> Arboleda, Jorge y Zuluaga, Julio. The concept of environmental risk and its assessment. Magazine Public Enterprises of Medellín, volume 15, No. 3. January - April 2005.

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Category	Description	Points
Catastrophic	Generates consequences of very high strength, very extensive, permanent, direct effect, unrecoverable and irreversible. Generate death or permanent total disability to the people	4

Source: EPM Magazine. The concept of environmental risk and its assessment. Julio Eduardo Zuluaga U. and Jorge Alonso Arboleda G. Medellín, volume 15, No 3 January - April 2005

The risk, based on the equation defined above, and taking into account the assessment criteria for the threat and vulnerability, it can be calculated in accordance with the matrix presented in the Table 9-3.

**Table 9-3 Risk assessment matrix**

		Level of Risk					
Vulnerability	<b>Catastrophic</b>	4	4	8	12	16	20
	<b>Serious</b>	3	3	6	9	12	15
	<b>Mild</b>	2	2	4	6	8	10
	<b>Insignificant</b>	1	1	2	3	4	5
			1	2	3	4	5
			Unlikely	Remote	Occasional	Likely.	Frequent
			<b>Threat</b>				

	Acceptable Risk		Tolerable risk		Critical Risk
--	-----------------	--	----------------	--	---------------

Based on the previous matrix, the following ranges are defined:

- *Acceptable Risk* (1-4), which do not represent a significant threat to the environment and their consequences, are minor.
- *Tolerable risk* (5-9), are those which can cause more significant damage to the environment, thus requiring the design of attention plans.
- *Critical Risk* (10-20), which can cause serious damage on the environment and require priority attention plans and in the short term, with high availability of resources and with an intense monitoring

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**9.2.1.1 Identification of events**

Table 9-4 presents the events that can generate an emergency during the construction and operation of the project.

**Table 9-4 Events that can cause a contingency**

<b>Event</b>	<b>Origin</b>	<b>Scenario</b>
<b>Natural</b>		
Flood	Rises of stream in the San Matias River	Construction and operation of the collection area of the central Plant
Earthquake	Tectonic Movements	Construction and operation of the central
<b>Anthropogenic</b>		
Attacks	Attacks, terrorist threats, of labor strike and riots	Construction and operation
Conflicts with the community	Poor Employment policies and management of community relations	Construction and operation
<b>Technical/Operation</b>		
Failure of the weir	Cracking or collapse of the weir	Operation of the central plant
Failure of the conduction tunnel	Collapse of the tunnel by earthquake	Operation of the central plant
Fire	Short circuit. Ignite flammable material, fall of energized conductor	Camps and temporary facilities
	Sabotage, explosion	Commissioning of the plant.
Affectation of water bodies or soil	Conduction system and sewage treatment; poor maintenance.	Construction and operation of the central
Traffic Accident	Excess speed. Poor condition of the road, attentionless driving	Transport of staff, equipment or material
Fall of staff working at heights	Inexperienced staff. Non-use of safety elements	Mount structures, conductors and equipment
	Poor state of junction elements. Electrical Induction	Operation and maintenance of substation

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Fall of structures	Inadequate supervision of the mounting system. Sabotage. Earthquakes	Construction and operation
Irrigation of oil in the substation	Faults in transformers or in the management system of oils	Operation of substations

**9.2.1.2 Assessment of the event**

In Table 9-5 presents the events assessment, where it is noted that the most important events are the ones related to the community.

**Table 9-5 Evaluation of the risks**

Events	Threat	Vulnerability	Risk
<b>Natural</b>			
Flood	1	2	2
Earthquake	2	1	2
<b>Anthropogenic</b>			
Public order Affection	4	3	12
<b>Technical/Operation</b>			
Failure of the weir	1	2	2
Failure of the conduction tunnel	1	3	3
Fire	2	2	4
Affection of water bodies or soil	3	2	6
Accidents	4	2	8

**9.2.2 Analysis**

**9.2.2.1 Flood**

A study was conducted of maximum flow rates to the San Matias River, in sites of collection and discharge area, as well as for the main streams of the project direct influence area, in which facilities could be affected such as the access roads.

A sensitivity analysis was carried out with some methods, such as Clark, SCS, Snyder, Williamns and Hann, with the objective of not underestimate or underestimate the maximum flow rates. The methods presented similar results, with the exception of the method Hann and Williamns which presents very low values near the lower limit. For this reason it was decided to perform the same procedure without taking into account the flow rates obtained by the Williams and Hann method.

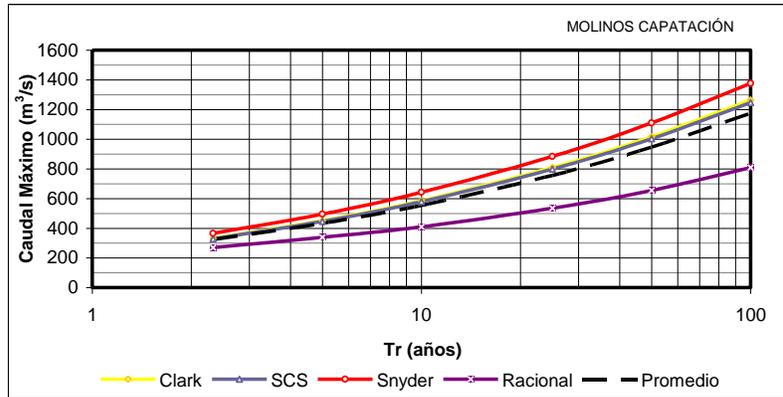
We selected the results of the SCS, given for flows of high return periods located immediately below the method of higher results found, see Table 9-6, Figure 9-1 and Figure 9-2.

**Table 9-6 Maximum flow rates in the interest sites with selected methodologies**

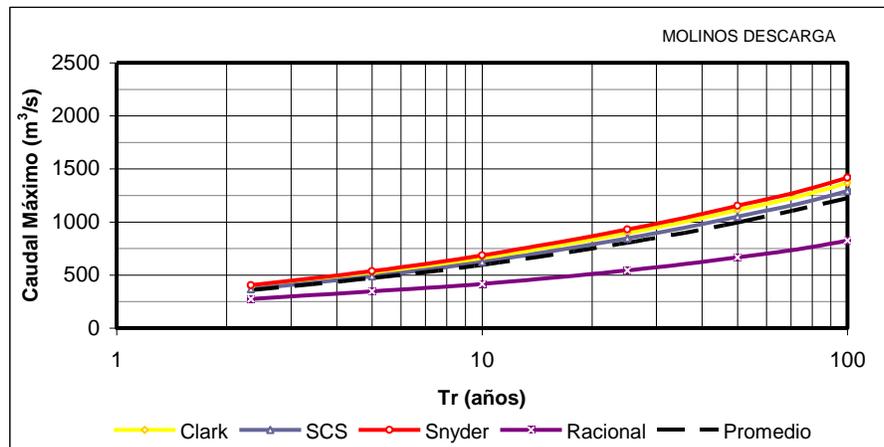
Basin	Tr	Clark	SCS	Snyder	Average	Selected
El Molino Collection	2.33	331	329	365	324	329
	5	451	447	495	433	447
	10	586	580	642	554	580

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Basin	Tr	Clark	SCS	Snyder	Average	Selected
	25	808	799	884	756	799
	50	1,016	1,003	1,109	946	1,003
	100	1,264	1,246	1,377	1174	1,246
El Molino Discharge	2.33	389	366	403	358	366
	5	514	488	537	471	488
	10	658	623	686	596	623
	25	893	845	929	803	845
	50	1,111	1,050	1,153	995	1,050
	100	1,369	1,291	1,418	1225	1,291



**Figure 9-1 Maximum selected flow rates - El Molino Collection**



**Figure 9-2 Maximum selected flow rates- El Molino Discharge**

With these values were calculated levels of the growing streams, which served to establish the base level of the facilities and their dimension.

### 9.2.2.2 Earthquake

The area of El Molino hydroelectric project is located in an area of moderate seismicity (see Figure 9-3); this factor along with the presence of slope deposits consisting of collations of flows of mud and debris in areas of high rainfall with a precipitation close to the 4,000 mm/year, makes it very susceptible to mass movements (Gomez, 1999).

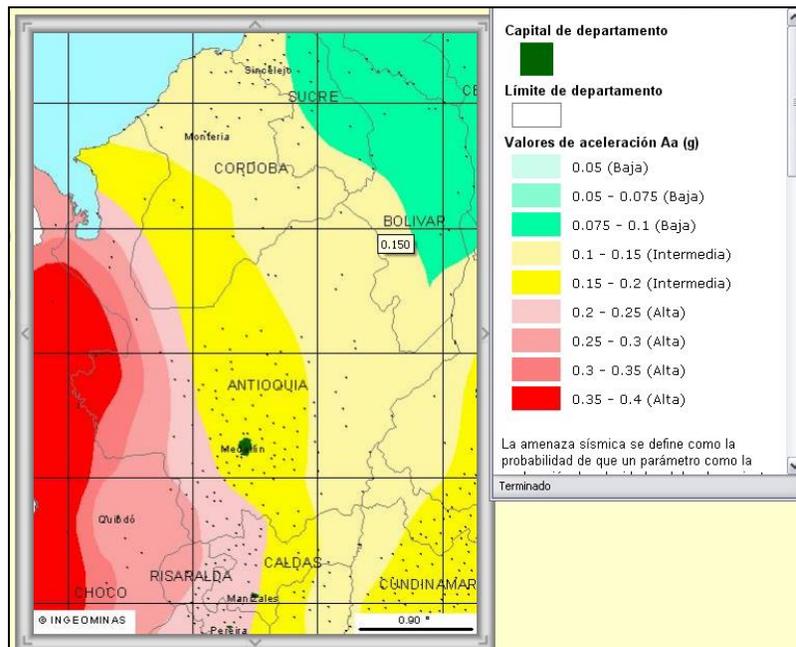
Given these features, for the structural design of the facilities were considered effective peak acceleration greater than 0.10g and less than or equal to 0.20g, in addition to working with batters that guaranty the stability of the facilities.

### 9.2.2.3 Affectation by public order

The influence area of the project, as mentioned in section 3.4.6, it is considered as one of the most historical presence of the so-called armed insurgent groups. Among the factors that determined the positioning of the guerrillas in the region, since the eighties, its enormous potential for strategic construction in the area of several hydroelectric projects, supplying more than 20% of the country energy demand.

The territorial advance of the insurgent groups, allowed the implementation of a strategy of wearing of the enemy, aimed to hit the infrastructure of vital importance, such as the energy transmission towers and hydroelectric power plants

The actions related to the armed conflict rose between the years 1994 and 2003, with a peak in 2000, with the taking and partial destruction of the urban area of the municipality of Granada.



**Figure 9-3 Map of seismic hazard and values of (Aa) Colombia (Ingeominas, 2004)**

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In terms of the paramilitaries, the so-called Metro Block, which had armed structures in the Northeast and West of Antioquia, as well as in Medellin, until mid-2003, the organization with more important presence in the east of the department, which was displaced by the Nutibara Block, which achieved by the end of 2003, the complete withdrawal of the Metro block toward the rural area of the municipality of San Roque and others in the Northeast region.

Given the political features of the area, there is the likelihood of terrorist events and alteration of the public order as:

- Assaults or robberies. Situation that can happen by not having the security needed for the project site and it can lead to the loss of machinery and equipment, damage to infrastructure, camps, and offices, among others.
- Sabotage. It can generate partial or total destruction of infrastructure, construction equipment, fuels centers, blocking or destruction of roads.
- Kidnapping: Plant staff participant of the project.
- Strikes. By the disagreement of the personnel that is carrying out the facilities during construction and operation of the project, and can cause the cease of activities, which in turn can generate delays in timetables, extra costs and partial or complete blockage of the project
- Civic standoff: As a reaction of the community of the influence area being dissatisfied toward the project or by changes in the social dynamics, it could occur from protests from members of the community, to road blocks and promotion of strikes, with the consequently delay in timetables and deteriorating of relations project - community.

#### **9.2.2.4 Failure of the weir**

The El Molino hydroelectric project is at the edge of water, due to not having a reservoir of large proportions; it will only have poundage with a storage capacity of 0.80 million cubic meters, approximately.

There might be a failure in the weir that makes up the poundage, which can originate as consequences an earthquake or a structural failure.

Because of the maximum volume of water that can be stored and by the operating conditions of the plant, it is expected that the level of the river keep it within the historical levels of San Matias River, without affecting existing infrastructure downstream of the collection area

#### **9.2.2.5 Failure of the conduction tunnel**

During construction makes reference to the possible destabilization and subsequent collapse of the walls or roof of the excavation during the removal of the subsurface material, for the construction of the conduction tunnel, with a consequent effect of sinking in surface and weakening of the massif.

In the operation stage, this phenomenon can occur by the occurrence of an earthquake.

#### **9.2.2.6 Fire**

Usually the fires are caused by ignition sources: electrical equipment, metal friction, the foreign material, open flames or sparks, smoking in places where are stored flammable

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substances (fuels), the improper disposal of waste oils, rags and garbage, no insulation of hot surfaces and overheated materials, no static electricity control, short circuits and lightning, no prevention of flammable liquids spills.

The vulnerability to which people are exposed (workers or community) thus depend on the combination of the fire magnitude, which is a function of the potential speed of propagation and its resistance to the control and the type, quantity, humidity and the characteristics of the materials susceptible to ignition.

#### **9.2.2.7 Affectation to water bodies or soil**

The pollution of water flows and soil of the direct influence area of the project can be presented by events such as:

- In the event of system failures of wastewater treatment from camps and temporary facilities, which can occur as a result of clogging and crushing of the lines that lead the wastewater, or deficiency in the removal of pollutant loads in the septic tank.
- Spills of fuels or lubricants, which may occur by accident of the tanker trucks that transport the fuel supply and the vehicles that pass through the access roads to the project, or by violent attempts to fuel storage tanks.
- Spills of polluting substances upstream of the collection area of the project (wastewater discharge, agrochemicals.).
- The soil contamination may occur by spills of deleterious substances (dangerous or toxic) as a result of poor handling and storage or by infiltration of contaminants through the soil.

#### **9.2.2.8 Accidents**

These can be presented because of:

- Poor working practices as a result of the negligence or disregard of the rules of hygiene and industrial safety, as well as the procedures envisaged for the execution of the different activities of construction and operation of the hydroelectric plant.
- Increase of transit vehicles and construction machinery, which may cause an increase in the risk of accidents in the influence area of the project and on the access roads to the labor fronts

### **9.3 EMERGENCY PLAN**

The Contingency Plan looking to manage or eliminate risk factors and prevent and mitigate the effect of potential events generated by the construction and operation of the El Molino hydroelectric project, through the adoption of measures that ensure the integrity of the workers, the community, the environment, the property, facilities and third-party.

#### **9.3.1 Structure**

##### **9.3.1.1 Committee for the emergency attention**

It must be implemented the Committee for emergency attention that must have a coordinator who will report to a hierarchical level high enough to ensure the effectiveness of their action.

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This committee will work in parallel with the occupational health and industrial safety program.

- It will be an organized group of workers, trained and equipped for:
- Identifying the risk conditions that could generate emergencies.
- Develop actions for the prevention.
- Prepare the way as how to proceed in the event of an emergency, which includes defining the evacuation routes, which will depend on how the contractor organizes their work fronts
- Designing measures to mitigate the impacts of the emergency.

It will ensure that all workers have enough information about the safe work procedure, the activities that generate greater risk, been familiar with the industrial safety program, occupational health and contingency plans, and get trained in the way to act in front of the events that may occur during the construction and operation of the project.

There will be regular meetings between the emergency committee and the joint committee on occupational health, in order to analyze the measures implemented and perform the appropriate corrective measures.

There must be permanent capacitation and training for all members of the Committee. At the same time, there will be a permanent relation and communication between the committee and the public and private entities that have direct or indirect participation in the inter-institutional coordination of the contingency plan in place.

The functions of this committee are:

- Before the emergency
  - Ensure compliance with the procedures of the contingency attention, ensuring the necessary administrative, technical, and logistical needs for its deployment, maintenance, and implementation.
  - Keep informed about the inventory of the technical and human resources, and the available material for the plan implementation.
  - Physically know all the sites of facilities and the temporary facilities and go around them to identify those most vulnerable areas.
  - Establish contacts with relief entities, for the provision of technical and human assistance for prevention and attention of contingencies.
  - Meet bimonthly to review the information, plan strategies and comply with the activities of risk mitigation.
- During the emergency
  - Learn in detail everything related to the emergency.
  - Support the coordinator in charge of the emergency.
  - Keep the senior staff informed responsible for the work on the phase of emergency attention.
- After the emergency

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- Evaluate the procedures developed in the phase of emergency attention, analyzing the weaknesses of the process and perform the corrective measures.
- Investigate the causes of the emergency and implement controls to avoid similar emergency.

It is recommended that the emergency committee is composed by the following persons:

- Coordinator of the emergency committee. It is recommended that the coordinator be the professional responsible for the program of industrial safety and occupational health of the contractor during the construction phase and the owner of the project in the operation stage. The person must have registration or license or comply with the requirements of the law, as set in Resolution 1016 of 1989.
- The director or manager of the contractor during construction; and in operation, responsible for managing the hydroelectric plant.
- The resident or responsible for each one of the labor fronts, in the construction phase, depending on how the constructor is organized.

#### **9.3.1.2 Coordinator of the emergency committee**

Among his/her functions are:

- Being informed about the inventory of the technical, human and resource material available.
- Find out about all the changes that the project may have, and analyze the possibilities that can cause an emergency, and in conjunction with the Emergency Committee, define the respective controls.
- Carry out and support all prevention activities that are running.
- Investigate, in company of the Emergency Committee, the causes of the event and define the new controls to avoid a similar contingency.
- Move to the emergency location and remain there.
- Coordinate the admission of evacuated staff to the facilities.
- Program research on the event causes and reporting on the same, which should include an assessment of the damage, and the impairment to human resources.
- Appoint a meeting with the Emergency Committee to present a report.

#### **9.3.1.3 Internal support groups**

The brigades are internal bodies of immediate response in case of an event. Acts as first instance under the orders of the Emergency Committee Coordinator.

People who make part of these brigades will receive ongoing training on the activities carried out during the occurrence of an event.

It will comprise three brigades (evacuation, fire, first aid), in which will participate a maximum of 10% of the associated people with the project.

- Evacuation Brigade

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The functions of the evacuation brigade shall be:

Before the emergency

- Analyze the work area to identify risk factors that can generate an emergency, and give suggestions on appropriate controls that can be deployed.
- Supervise that the evacuation routes are in good condition.
- Trained on their functions and on the most vulnerable areas.
- Keep an up-to-date listing of the staff in charge.

During the emergency

- Inform the emergency coordinator, the need to evacuate the area.
- Coordinate the evacuation by the established routes.
- Direct people to the meeting point.
- Evacuate persons found along the path and direct them toward the secure sites.
- Count the personnel under command and confront it with the number of workers who were working.
- Calm down people and demand their permanence in the meeting point until new instructions.
- State if you need presence of medical staff to attend injured.
- After the emergency
- Order the return to the work areas or otherwise of the evacuation of the work site.
- Contribute to the emergency cause's investigation.

- **Brigade of First Aid**

Before the emergency

- Trained on functions of first aid brigadier.
- Keep medicine kits and equipment to be required for an emergency.
- Learn in detail the possible events that may occur at work.
- Know the hospital centers that can provide help and their attention levels.

During the emergency

- Act immediately when the call of the emergency Coordinator.
- Bring the necessary equipment for emergency response.
- Meet the injured and refer them in priority order to the different health attention centers, according to the level of assistance.

After the emergency

- Make a register of the affected people during the emergency, and their diagnosis.

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- Make a written report on the handling and attention of the emergency and take into account aspects to be improved.

- Fire Brigade

Before the emergency

- Be prepared to prevent and control any risky situation.
- Recognize in detail the potential emergencies of work.
- Recognizing each of the elements of personal protection required to meet the different emergencies.
- Participate in all the carried out drills.
- Inspect and maintain in good condition the brigade available resources.
- During the emergency
- Respond immediately to the alarm call.
- Follow the emergency coordinator orders.
- Set in practice everything learned in the training to face an emergency efficiently.

After the emergency

- Collect the equipment used for the emergency.
- Assist in the restoration of damaged facilities.
- Participate in the emergency investigations.
- Create a report on the activities carried out to control the emergency and set out the measures and recommendations to be taken into account to avoid a similar emergency.

### 9.3.2 Communications System

The implementation of a communication system during the construction phase is critical to ensure the proper attention of an event and its restoration. It is recommended the use of mobile communication systems. The devices are located on the labor fronts, in charge of the responsible engineer of the activities that are being developed in there and the intervener supervision, and in places where permanent service is provided, as in camps, workshops, offices, community attention office.

The project must have portable radios in each one of the labor fronts, camps and other offices of the project.

At the same time, the members of the committees should have an up-to-date phone numbers of the staff members and the support entities.

### 9.3.3 Monitoring System and alarm

The installation of a monitoring system and alarms in each one of the labor fronts and other strategic sites, prevents the occurrence of a contingent event not triggering into a disaster of great magnitude.

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Monitoring systems and alarms should include:

- Evacuation Alarms on all work and labor fronts of potential danger.
- Gas Monitoring Equipment in underground excavations.
- Fire generation Alarms.

#### **9.3.4 Education and outreach program**

To comply with the preventive processes, the main tool of all contingency plans, education programs as of disclosure should be directed to two basic groups, staff assigned to the project and the people that inhabit the influence area.

The fundamental difference lies in the depth of how the processes are conducted, that is to say, it requires greater attention on those people who are exposed to an increased risk, for which the affectation will be larger than what is expect to be handled

- Disclosure. The outreach programs of the contingency plan should be addressed to the settled communities of the Veredas San Lorenzo, La Inmaculada, San Juan, El Choco, El Molino, Campo Alegre y Los Mangos, and the municipality of Cocorná; and on the Veredas Quebradona Abajo and Las Faldas of the municipality of Granada. This process will be conducted through lectures previously programmed with the assemblies of Communal Action and with teaching materials as thematic notebooks and brochures.
- It is recommended that during the first quarter of the project execution, giving a series of monthly lectures, taking advantage of the regular meetings of the various boards of Communal Action, and schedule others until the project is in operation.
- Education. Education programs will be aimed at people whose training ensures an improvement in the community quality of life and the good development of the project.

The personnel working in the project will attend talks about how one should act in the event of an emergency, behavior on the job sites and construction procedures. These meetings will be made quarterly.

Within the subjects to be dealt with in this education program are: Comprehensive Plan of Action, groups of internal support for emergency attention, first aid, fire extinguishers, evacuation from the work site, rescue people, Cleaning and maintenance of the work areas, personal protective equipment, handling materials (hazardous or not) and fuels, incident or accident report , management of the possible contingent.

#### **9.3.5 General Plan of Action**

With the following plan of action, which will be sufficiently informed and known by all employees, working in each one of the labor fronts, by means of programs of training and simulation, which will be set on go in the event of an emergency. The most important steps to follow in the attention of an emergency are:

- The first person to observe the emergency, must inform the coordinator of the Committee for the attention of Emergencies, who will evaluate it and decide the steps to follow.
- If necessary, call the members of the Committee of attention to attend the emergency, a leader shall be appointed for the attention and the alarm must be activated.

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- Notice shall be given to the support groups to be ready to respond to an emergency.
- It should be identified the safe areas closest to the site where the emergency occurs, to evacuate staff in the sector. Each site or work front will have a known evacuation route for employees which must be trained and complied with.

The evacuation process consists as a set of activities and procedures designed to preserve life and physical integrity of the people, by moving to places of less risk, as well as the rescue and transfer to the medical centers of injured persons and the rescue of company property. The evacuation process has three stages or phases:

- **Detection of the danger.** It is the time elapsed since the danger originates until someone recognizes it.
- **Alarm.** The audiovisual signal that alerts the danger existence.
- **Preparation for the exit.** Time elapsed since the communication of the decision to evacuate, until the first person begins to exit and the evacuation of the entire staff.
- The leader will review the conditions of the various construction fronts, as the case may be, and will confirm that nobody will remain at the emergency site.
- The leader will assess the need to seek external help, such as fire departments, hospitals, health centers, Red Cross, civil defense, to prepare what is necessary and to respond efficiently to the patients that arrive there. Also alert the available transport for these cases (ambulances and cars available in the work site).
- Once the emergency is controlled, the Committee will evaluate the condition of the affected area, and determine whether the activities can continue.
- The Committee will meet to determine the cause of the emergency, assess the losses and locative damage and take preventive measures.

In order to perform the above, all fronts will be working with a good communications infrastructure consisting of audible alarms, covering the surrounding area, loudspeakers, telephone and radio communication to communicate with the available transport.

Table 9-7 and Table 9-8 present the registration forms for the event evaluation and the functioning of the contingency plan

## **9.4 CONTINGENCY PLAN**

### **9.4.1 Objectives**

- Provide the necessary elements for timely decision making, allowing an immediate and efficient response before the occurrence of an event that affects the normal conditions of the influence area of the project.
- Define the group that is responsible for the disaster prevention and response, as well as the training requirements.
- Identify organizations that may participate in the attention of an event.

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**Table 9-7 Assessment Format of the contingency plan**

<b>HYDROELECTRIC PROJECT EL MOLINO</b> <b>Evaluation of the Contingency Plan</b>	
1.	Date of event occurrence : _____
2.	Event Type: _____
3.	Cause of the event: _____
4.	It consulted the contingency plan at the time of the event? <div style="text-align: right;">Yes: ___ No: ___</div>
5.	Was the procedure referred in the contingency plan effective? <div style="text-align: right;">Yes: ___ No: ___</div> If not, why not? _____
6.	Was there affectation of the facilities?                      Yes: ___ No: ___
7.	Could the event have been controlled?                      Yes: ___ No: ___ If not, why not? _____
8.	How was it controlled? _____ Own resources used: _____ External resources used: _____
9.	Was the control technique suggested by the plan effective? Yes: ___ No: ___ If not, why not? _____
10.	There was a need to evacuate people                      Yes: ___ No: ___
11.	How Many and for what cause?
12.	Was the evacuation timely and fast?                      Yes: ___ No: ___ If not, why not? _____
13.	Where were they attended?
14.	Where there enough equipment and staff used? Yes: ___ No: ___
15.	Was support needed from other institutions??                      Yes: ___ No: ___ Whom and why? _____
16.	Recommendations for improving the contingency plan: _____ _____ _____

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**Table 9-8 Format for reporting an event**

HYDROELECTRIC PROJECT EL MOLINO Notification of an event	
REPORT No _____ REPORT DATE _____ TIME _____	
<b>1. INFORMATION SUPPLIED BY</b>	
Name: _____ Phone: _____	
Location and Ranking _____	
<b>2. INFORMATION ABOUT THE EVENT</b>	
Location of the event (as exact as possible): _____	
Event Type (natural, technical, social): _____	
Magnitude of the event (approximate area): _____	
When was the first time that the event was identified? Date: _____ Time: _____	
Identified Affectations? _____	
_____	
_____	

Develop an information system that becomes a guide to procedures to achieve effective communication with the staff that makes up the brigade and entities of external support.

Structuring programs that allow a timely and appropriate response to the occurrence of any of the identified events.

Minimize the environmental impact before an event.

Reduce arising costs and claims out of the occurrence of an emergency or event.

Safeguard the integrity of the project facilities.

#### **9.4.2 Contingency Plan for the attention of fuel spills**

This contingency plan has its trigger mechanism at the time a spillage occurs.

When you have information about a spill, the Emergency Attention Committee will evaluate the situation and determine the potential damage that can cause on the water resources. The following actions must be taken, not necessarily one after another, and if they are applicable:

- The first person to observe the spill must raise the alarm.

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- As long as the spill continues, eliminate ignition sources in the area. As well:
  - Do not allow smoking in the area.
  - Do not allow the use of electrical switches.
  - Do not allow the disconnection of the power outlets.
  - Cut the electricity in the area.
  - Interrupt the flow of vehicles in the area. Do not allow the start of the vehicles engines located in the under control area.
- Determine how far the product has reached (liquid or vapor), both surface and underground: You need at least one combustible gas indicator for this.
- Keep unauthorized staff out of the area.
- Place the extinguishers of dry chemical powder around the spill area. You should not apply water on the spilled product.
- Try that the spilled product is confined within the area in which presented the spill, constructing dikes of sand, soil or synthetic absorbents, to prevent the spilled product to flow to other areas.
- The objective of any response to a fuel spill is the minimization of environmental impacts; therefore a proper selection for the appropriate cleaning procedure must be done, noting the following considerations: the characteristics of the hydrocarbons, season of the year, and the biophysics sensitivity (it is intended by the cleaning to restore the site to the condition as it was before the spillage).

The procedure to be followed shall be defined in the emergency card of the substance - NTC-4532.

- In case of large volumes of spills, collect the spilled product with aluminum or plastic buckets or absorbent material. Latex gloves must be used.
- If the spilled volume is small, the remaining fuel must be dried with sand, rags, sawdust, sponges or synthetic absorbents.
- In case of oil spills in the soil, areas with vegetation should be aired and conditioned by making small holes and adding nutrients to accelerate the process of biodegradation.
- In necessary cases, a call to external entities for the emergency control should be made, informing the communities located near the emergency site.
- Resume normal operation at the work front, only when the area is free of combustible vapor. The smell of petrol is very noticeable even below flammable concentration (in which can explode or ignite if turned on). A few parts per million can be detected through smell by the majority of the people; any smell is a sign of danger.

#### **9.4.3 Contingency Plan for earthquake attention.**

For the prevention of the effects caused by an earthquake, there are the facilities designs, which involve seismic resistance criteria.

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Due to the wide distribution and diversity that an earthquake effect may have, the protection of human lives and project infrastructure as a prevention task, must be focused on the decline of the vulnerability, educating workers and community toward a defensive behavior during and after the earthquake and prepare emergency communication systems, which will allow to call for support to the relief entities.

Drills must be carried out and distribute clear instructions to the workers on the procedures and actions to be taken before upon the manifestation of some of these events.

In the case of an earthquake emergency, the emergency committee will be convened to start an evaluation of the event consequences presented and if required, activate the action plans that the situation requires. If the emergency committee deems it necessary, may request support from external entities.

In principle, it must take into account the following measures:

- If they are inside any building, the site will be more secure. In addition, they must be away from objects that may fall over: glasses, fireplaces, cabinets, libraries, ornaments.
- In the event of being out of the buildings, it must immediately move away from them, looking for an open space, avoiding closeness to trees whose branches may detach and injure. Must also move away from poles, towers or machinery, light harness and other items that may fall.
- Workers must be removed from the shores of the creeks, and find high ground.
- After the earthquake, all workers must meet at the designated site meeting point. In addition the injured persons must be attended, searching for the brigade first aid staff.
- It should be noted if there are pockets of fire, whose attention is defined above.
- Following the end of the event, the buildings must be emptied if collapse risk is detected, now that the replicas of earthquakes can tear down the rest of the damaged structures.
- No one can leave the meeting point, unless the emergency coordinator authorizes it.
- Controlled the emergency, there will be an assessment of the casualties and damage.

#### **9.4.4 Contingency Plan for landslides attention and slope destabilization**

To avoid contingencies related to the formation of slopes, it should be taken into account, among other measures, the following:

- The detailed knowledge of the geological and geotechnical characteristics is the best way to prevent accidents caused by landslides.
- The use of equipment, explosives, and machinery in areas close to unstable sites must be contemplating all the precautions that it deserves.
- Advance the filling operation in accordance with the designs: cutting heights and slopes, construction of drainage facilities, among others.
- Check that the designs are consistent with what we found in the field, with the purpose of advancing the necessary modifications.
- Monitor the movement of the filling, through monitoring of the geotechnical conditions.

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- Grow grass on the slopes in the shortest time possible.
- Advance the preventive maintenance of the entire infrastructure associated with the project: interceptor channels of rain water, roads, vegetation coverage, and treatment system.
- Control the geomorphic dynamic phenomena such as mass removal, with works such as establishing trenches, ditches of slopes coronation, ditches, re-vegetation.
- In case of clogged filters of water evacuation fillings, proceed to its washing immediately to ensure the flow conditions envisaged in the design.
- The management of landslides in the fronts of underground or superficial work, that bring as a result loss of human lives or injured, it must be included the activation of the staff attention plan.
- If the event does not involve human lives the affected infrastructure should be removed and proceed to the cleaning and restoration of the area.
- Once the evacuation of the wounded is done, the technical advisory committee will evaluate with the contractor, supervising the damage caused, the possibility of a remaining risk and the necessary restoration technical measures.

#### **9.4.5 Attention Plan for technical contingency**

This contingency plan has its activation mechanism at the time of failures in the construction process or in the operation, as a result of an accidental event of anthropogenic origin, failure of equipment maintenance, or by the lack of spare parts for its repair.

If a technical problem is detected during the construction or operation of the plant, the person in charge shall evaluate the causes, will determine the possible solutions and define if it has the technical capacity to resolve the problem. If the characteristics of the failure does not allow to do so, will give notice to their immediate superior and he/she then communicate with the staff in charge of maintenance; if what happened was a failure in the equipment, designs or construction procedures; or communicates with the emergency committee if what happened was an accidental event.

If there are resources and time needed to resolve the inconvenient, it shall proceed to the repair; otherwise maintenance will be informed to be ready to solve the problem.

If because of the accidental occurrence of an event there is damage to the physical infrastructure that makes up the project, the responsible of the respective front will do an analysis of what has happened and will determine if there are the resources, both human and physical (machinery, tool, supplies) to attend the event and take the appropriate steps to resolve it.

For the implementation of corrective measures, there will be a programming of resources both human and physical, with the objective of resolving the novelty presented.

Finally there will be a report that includes all the events relevant information, which will include at least the following information: causes, consequences and management.

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#### **9.4.6 Contingency Plan for the attention of emergencies due to operational accidents.**

To prevent and respond to the operational accidents, must:

- Continuously train staff linked to the project in the standards of hygiene and industrial safety. In addition, all operators of the project, administrator, and heads of section must be trained in first aid techniques
- Provide safety equipment to workers, gloves, and boots with steel toe cap, thick fabric overalls, and helmet.
- Determine the state of consciousness of the operator and provide first aid according to the adopted program for the project.
- In case of being necessary, the operator should be taken to the hospital in one of the municipalities in the indirect influence area.

#### **9.4.7 Staff Plan Attention**

This attention plan has its trigger mechanism at the time of human lives loss or serious injury occurrence, of one or more persons.

Once the foreman of the work front has defined the characteristics of the occurred event, will give notice to the Committee on Emergency Attention by the more effective and functional communication system in the area, and simultaneously will install a command post, where work will begin to rescue the victims with the technical, physical and human resources available.

In the command post, which will be under the command of the most hierarchy professional that is present in the front; from here all activities related to the relief will be coordinated.

The Committee will contact the brigades of domestic support and will move to the emergency site, will receive the command post, which will assess the magnitude of the disaster and initiate the procedure of wounded classification; if the rescue presents difficulties, support will be requested to relief entities, either Red Cross or Civil Defense. There will be contacts same time with the available hospital attention centers.

Codes should be used to identify the treatment of the affected people. One that could be implemented is the following:

- Code Red. For those who require urgent medical attention including cardio respiratory problems, shock, burns greater than 20% of the body surface area, signs of choking, penetrating wounds in the chest or abdomen.
- Code Blue. The medical attention can wait. Occurs when there are wounds on the body and extremities whose injuries can be maintained with pressure bandages.
- Code Green. Are those that can be attended by a first aid group.

Completed the rescue work and transferred the wounded to the attention centers, the emergency committee shall submit a report in which an assessment is made of the causes that led to the event, the management and the procedures used, with the goal of optimizing the operation of the plan for future events.

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By work front there must be a first aid group and in the facilities there shall be an ambulance for the transportation of the wounded, which must be equipped with first aid equipment, oxygen balloons, and specialized equipment, which should not be limited to a small kit of first aid.

#### **9.4.8 Contingency Plan for public order attention**

This contingency plan has its trigger mechanism at the time when blockages, attacks, sabotages, assault, subjugation, assault, harassment, and infiltration during the process of construction and operation of the plant.

##### **9.4.8.1 Prevention**

Appropriate social management during the construction of the project, is the main preventive measure to prevent the occurrence of emergencies by terrorism and strikes. The projects social management plan, involves the implementation of the communication program, community participation and education whose primary objective is to seek the coexistence between region and project.

- For hiring the staff, priority will be given, as it is said in chapter 7, to the Program of labor recruitment, to people residing in the direct influence area of the project, a process that will be supported by community organizations present in the influence areas of the project, community leaders and the Community Action Board, among other entities.
- Give ID cards to the staff linked with the construction of the project.
- Perform rounds of monitoring in the project area
- Permanently check the signaling and delimitation of the fronts of labor, as the temporary facilities of the project.
- Keep the public authorities with jurisdiction in the area informed, on the activity that is taking place and interact with these agencies to maintain information on social conditions and public order in the sector. The contractor firm shall establish its own mechanisms of coordination with the public force.
- Maintain communication with the community and with the owners of the surrounding premises on a regular basis.
- During the stay in the area, the staff shall refrain from making comments in public that are loaded with political or social content that may offend sensitivities or create a political framework within the potential sectors or antagonistic groups in conflict.
- The treatment with the community will be friendly and cordial. The staff will take great attention to their behavior, since any improper act, can cause a negative attitude in the community with regard to the project.
- In the event that the contractor or an employee of the project owner, who is in charge of the construction site, is required by some criminal group outside the law, before accepting or commit, should consult with the responsible of the project.
- Avoid showing off with the money and paying excessive wages above the average rate of the work zone. Also, find a method that provides a more secure condition for the payment days of the workers, so that this activity does not become a cause of threat or assault.

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- Always use communication media and passwords to avoid putting at risk the people and the process.

#### **9.4.8.2 Control**

The contractor and the project owner will have ongoing communication with the community, in order to observe any change on social conditions and public order in the area.

When, because of undetermined reasons, a group of demonstrators, move toward the project or placed themselves in front of it, the following parameters must observe:

- The most important factor to take into account is to inform the police and army authorities immediately, ensuring entrances while you receive the required support.
- It should be taken into account if the situation needs it, suspend activities in the facilities; if necessary, bring the staff to a particular area of meeting or point of evacuation and consider strengthening the security staff.
- It must be remembered that the evacuation decision must be taken by the director of facilities with the supervising director and the priority effort should be directed toward the protection of staff.
- In the event of a strike, the emergency attention committee will communicate with the civil and military authorities in the area, in order to strengthen the surveillance on the fronts of the project's facilities and start the negotiation process with the parts involved.
- In case of violent acts, the army and the police should be present, convened by the Committee of attention, to prevent harm to the project facilities.
- In the event that the movement is not violent, will begin the process of negotiation with the parties involved; the Attention Committee shall prepare a report, including the agreements and will be responsible for the monitoring and its accomplishment.
- During the attention of the event, it should first verify the identity of the people within the work area, check that they are not carrying weapons by staff from outside the project, and ensure the machinery and equipment to prevent the movement of these.

#### **9.4.9 Contingency Plan for transportation and storage of fuels and chemicals**

This contingency plan has its trigger mechanism from the moment traffic accidents occur, storage or handling of the substances mentioned above, both during construction and operation of the project.

Before transport, storage and handling of fuels, grease, oils or chemicals, it is convenient to consider the factors involved thoroughly study the problems that may occur during its handling. It is necessary to take into consideration the following factors:

The degree of risk derived from physical, chemical and biological properties of the product, taking into account the amounts to be manipulated, the physic-chemical constants and the danger index. It should have a list of chemicals that will be handled during the construction and operation of the El Molino hydroelectric project, as well as their safety sheets.

- Need to proceed to safe packaging in tanks, containers or stowage.
- Selection and training of the staff responsible for the transport, storage and handling.

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- The necessary controls over the loading and unloading operations.
- The controls of the mechanical and electrical maintenance of vehicles used in the transportation, to ensure its perfect condition and operation.
- Adequacy of the vehicles to the requirements of transport and handling of chemical substances.
- Special measures needed for the selection of transportation routes.
- Identify the critical sites in transport routes and have a telephone master list of the civil authorities (civil defense, Red Cross, firefighter, hospitals, police and national army).
- The characteristics of the safety and first-aid equipment and the accurate materials to prevent or neutralize potential leaks and spills.
- The necessary measures to ensure that the vehicles, containers and packaging are correctly marked and labeled.
- Perform attention drills of accidents in the transportation, storage and handling of fuels and chemicals that involve or generate risk.

#### **9.4.10 Communications Program to attend contingencies**

Once the Contractor establishes the design structure and implementation of the contingency plan, the project owner will provide the contingency plan to the municipal administrations in Cocorná and Granada, for their observations, conclusion and its implementation within the overall plan for disaster relief and prevention of the Municipality, in compliance with the orders of the Law 46 of 1988 and the Decree 919 of 1989.

In the terms of reference for the construction of the project, it should include the designation, by the contractor, of a responsible entity for industrial safety, in charge of planning the contingency programs, setting them in function, constantly aware of the operations of the project, which will allow making a permanent monitoring and control of their activities. This entity, as responsible for the hygiene program, industrial safety and intern occupational safety, will be the liaison through the contractor with the municipal emergency committees, to set in operation the emergency plans.

Constant communication between the entity in charge of industrial safety, the owner of the project and the municipal committees, will allow, in the case of any eventuality, properly coordinate efforts to remedy any problem that is generated in both the site and its surroundings.

#### **9.4.11 Practices for performing drills**

It is important that within the contingencies plan, the Committee of emergency attention, in accordance with the general measures for the attention of any event, have on hand a manual of procedures for the organization of evacuation drills (simulations), according to the risk conditions identified in their facilities. The following describes some important insights to be taken into account.

- **What is a drill**

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It is a rehearsal about how one should act in the event of an emergency, following a previously set up plan, based on safety and protection procedures. A drill tests the reaction capacity of the population, and their exercise allows to evaluate and provide feedback for the plans.

- **Why are drills necessary**

The simulations are used to get people from an area to take more convenient action routines, to react in case of an emergency.

- **How to perform a drill**

It is imperative to design a scenario that defines a set of assumptions about the possible danger to this facility: place, phenomenon (seismic, fire, flood, and hazardous waste, social) times and conditions.

In order to simulate a situation closest to reality, it must be considered the above situations, about phenomena with high incidence that have occurred in the geographic area where the project is located.

- **How to plan a drill**

It must respond to a contingency plan drawn up in advance, and containing the most appropriate strategies for dealing with a contingency (each requiring its own plan). A script should be prepared stimulating the current circumstances and including a sequence of schedules, goals, relationship of participants, resources required, observation and evaluation formats.

- **Objectives of a simulation**

They must be proposed from three main aspects:

**Population.** To identify the level of its preparation, acceptance, cooperation and confidence to respond to a contingency.

**Organization.** To improve the performance and review the specialization starting from the training and updating upon a contingency.

**Instruments and activities,** to test the operation of alarms, signs, fire extinguishers, as well as the coordination of the brigade team and people's responses to the alarms.

- **Who should participate in a drill**

All the people that are linked to the project, both that are permanently or circumstantially, and should also be oriented by the designated brigade, with the aim of making an exercise more attached to a real contingency. Before the simulation the population that will participate in it must be trained, both to the contingency plans as to the particular activities to perform in the simulation.

**Who should organize the drill**

Table 9-9 defines the staff functions that must organize the drill.

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**Table 9-9 Functions of organized Personnel**

Staff	Functions
Emergency Committee Director	-Organizes the internal brigades (rescue, first aid, etc.) -Directs the manufacturing of signaling. -Assumes the direction of evacuation and rescue maneuvers. -Defines the possible outside aid, fire stations, hospitals, relief, etc.
Head of construction work front	-Coordinates the evacuation actions of the work front or process. -Emits the alarm signal. - Guide the people by the traced route to the designated meeting point. -Takes alternative solution in case of mishaps. -Monitors the evacuation routes in the work front or process.
Brigade	Will give the indications to his staff (maximum 10 min.) -Will lead them by the evacuation route verifying that all are safe.
Other participants in the Simulation	
Observers	-Observe the simulations development.
Evaluators	- Record everything that took place.
Controllers	-Monitor the implemented as planned, so that they know the hypothesis and the response that each person must execute. -Direct the scenario events, deliver the message of the doubts that arise on the event that is simulating

- **A drill scenario**

- Stick to the real conditions in which a disaster might occur.
- Tours of recognition by the operation areas of the simulation and preparation of sketches, determine areas that represent lower chances of rescue.
- Establish areas of external and internal security which can be recognized by the participants.
- Specify the place where the activity will begin, where the workers will go in each area, and which exits will occupy.
- Contemplate difficulty degrees in the simulation development.

- **Planning and Resources**

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- Planning refers to count with procedures designed to assess and update the evacuation plan, after the completion of the simulation.
- Harmonize the task with the available resources, considering which ones are most needed within a real situation.
- Foresee counting with kits, lamps, and battery-operated radios, lists of staff, fire extinguishers, and megaphones.

- **Preparation of the drill**

It is about everyone knowing what to do: follow directions, take decisions. Its preparation consists of three stages:

**Scenario Development:** Prior to the simulation, everybody must be notified of the behaviors that they must portrait, such as wait for orders from the head of area, go to safe places, walk out in order and with the quickness indicated. The procedures to be performed should be known by each one of the brigades or response group.

Functions of each member of the response group should be indicated, emergency support teams, the positions, conducts and external support that can be provided, and reach to each one of them (firefighters, red cross, police, army)

**Office Exercise:** A previous coordination meeting must be held with the group heads and the responsible, in order to describe the activities that correspond to them and the location of its operational staff. The difference between the exercise of office and drill, is that the exercise is performed in an office, where it is simulated the activity of all response members facing the real emergency.

**Diffusion:** Must inform the population around the project, about its execution, with the purpose of not to alarm and obtain the cooperation of the neighbors who might be disturbed by the exercise.

- **Drill execution**

Make real everything that was planned in the office exercise. Complete the following aspects:

- Application of alignments, established procedures and rules.
- Achievement of exercise objectives.
- Solution of the unforeseen problems derived from the emergency.
- Opportune and efficient action.
- Proper use of the resources and allocated means as well as its obtaining.

- **Evaluation of the drill**

It will be done done by observation and monitoring of the entire implementation process, and recorded in a special format. At the end, the brigade members must meet to discuss the successes and failures, with the support of the evaluation results.

The evaluation will be carried out by comparing the expected response with regard to the obtained and will be stated the actions of the brigade and the occupants. From the conclusions modifications are derived to the emergency plan and to the organization of future simulations.

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**9.5 TIMETABLE**

The contingency plan is an activity that begins once the construction of the plant begins and continues throughout the project life.

**9.6 BUDGET**

The costs of this program are associated with the equipment that is needed to attend an emergency (ambulance, fire extinguishers, stretchers, among others), which are presented in Table 9-10.

**Table 9-10 PDC Budget**

<b>Implementation</b>	<b>Unit Value</b>	<b>Unit</b>	<b>Quantity</b>	<b>Total</b>
<b>Endowment Equipment</b>				
Ambulance with basic Endowment	150,000,000	A	1	150,000,000
Office Equipment	7,000,000	SG	2	14,000,000
miller type stretcher	560,000	A	2	1,120,000
Alarm System		SG		50,000,000
Folding type stretcher	230,000	A	2	460,000
Rigid type stretcher	390,000	A	2	780,000
ABC Fire Extinguishers - Solkaflam	250,000	A	5	1,250,000
ABC Fire Extinguisher - dry chemical powder	100,000	A	12	1,200,000
Badger Fire Extinguisher - carbon dioxide	780,000	A	3	2,340,000
Elements of Personal Protection (EPP)	1,500,000	A	20	30,000,000
First aid kit	110,000	A	6	660,000
Oxygen therapy equipment	720,000	A	2	1,440,000
Fire-fighting equipment	5,780,000	A	2	11,560,000
Rescue Team	3,180,000	A	2	6,360,000
Telecommunications Equipment	350,000	A	20	7,000,000
Telecommunications equipment Maintenance	225,000	Month	24	5,400,000
<b>Training</b>				
Technical education and outreach material , health and safety	6'000.000	SG	1	6,000,000
<b>Education</b>				
Teaching Materials	3,000,000	SG	1	3,000,000
<b>Disclosure</b>				
Design of thematic notebooks and brochures	4,000,000	SG	1	4,000,000
Primers and folding	7,000		1,000	7,000,000
<b>Total Cost</b>				<b>303,570,000</b>