



Company Training Course

Session 8: Risk Analysis, Hazard Prioritization and Identification of Risk Reduction Actions

Contents

1. Background
2. Objectives
3. Hazard and Risk
4. What is a risk analysis and what is it for
5. Creation of a Risk Analysis team
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8. Topics for discussion

Object	Operation	Hazard (quantity)	Risk- type	Threat- ened object	Conse- quences	Seriousness				Probability	Priority	Comments
						L	E	P	S			
Object												

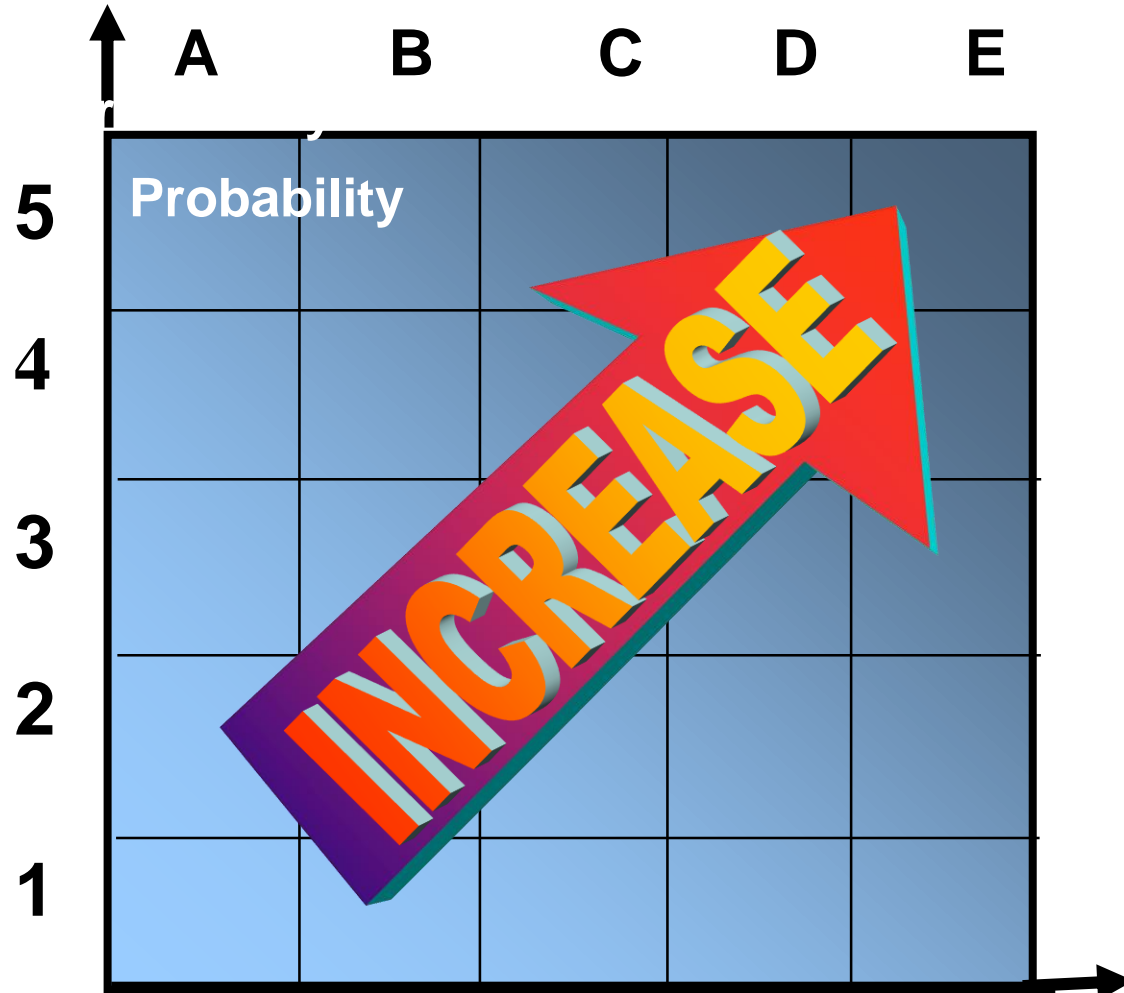
Very probable
More than once a year

Once in 1 - 10 years

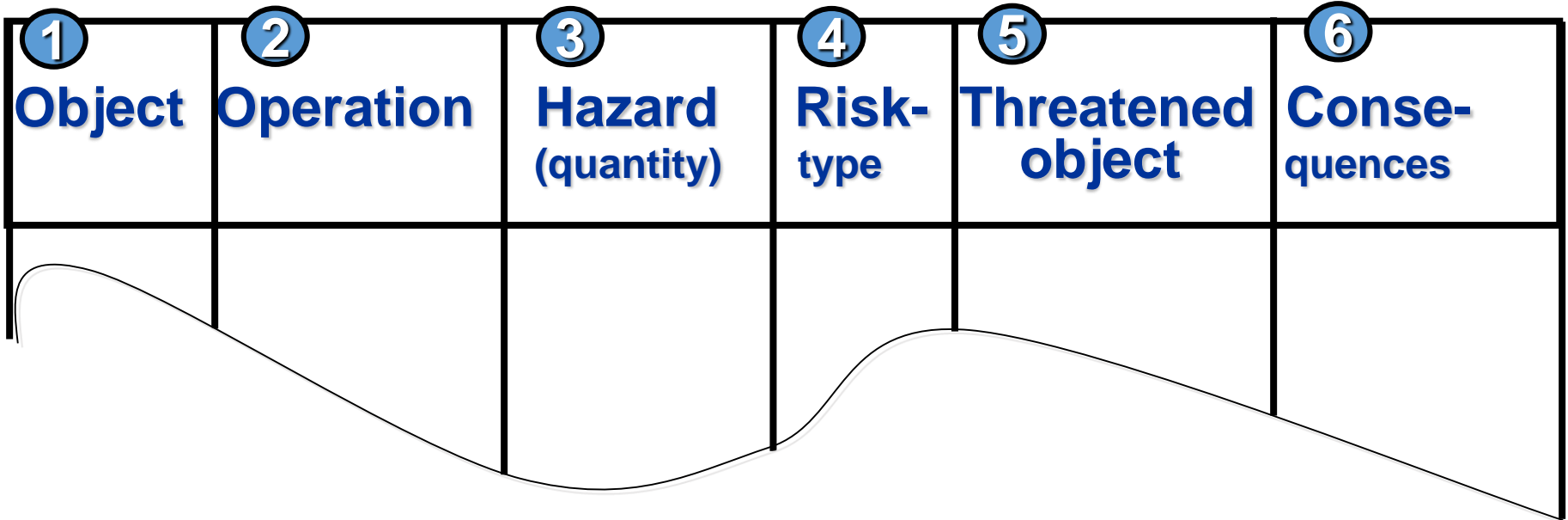
Quite probable Once per 10 to 100 years

Once per 100 to 1000 years

Improbable
Less than once per 1000 years



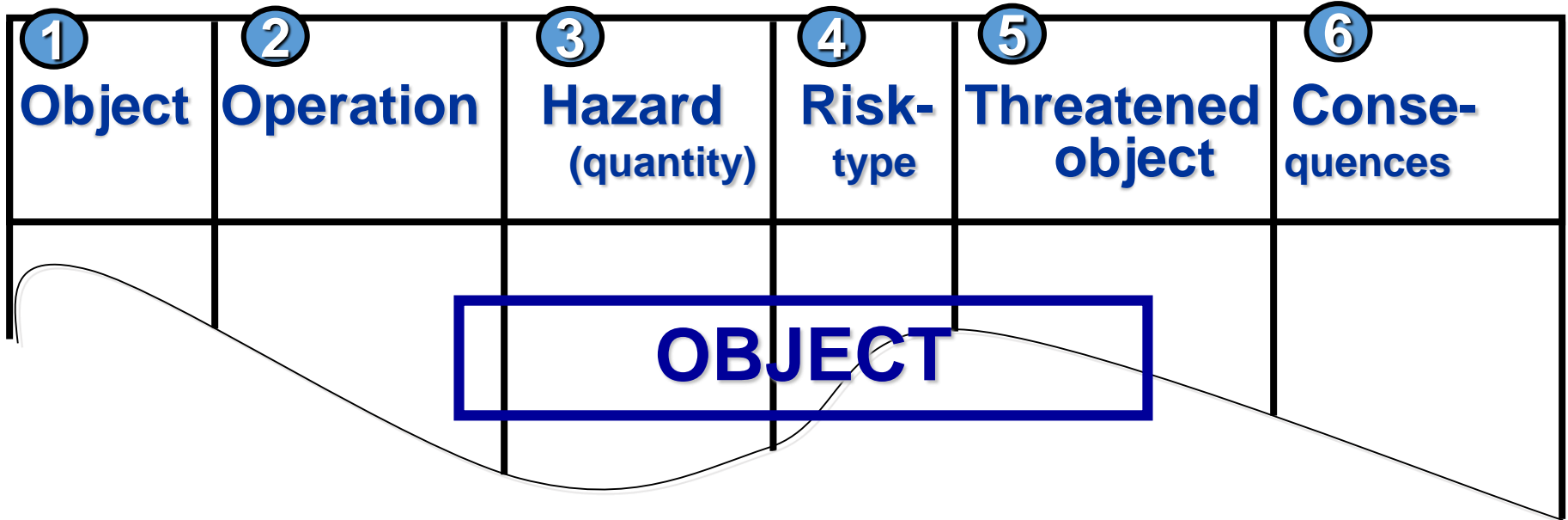
Unimportant Limited **Serious** Very serious **Catastrophic**



Identification



Evaluation



Identification



Evaluation

Seriousness				Probability	Priority	Comments ¹³
7	8	9	10	11	12	
L	E	P	S			

Classification



Ranking

7 Life

9 Property

8 Environment

10 Speed

Consequences for Life and Health

Class 1 = unimportant

**temporary slight
discomfort)**

Class 2 = limited

**a few injuries, long-lasting
discomfort**

Class 3 = serious

**a few serious injuries,
serious discomfort**

Class 4 = very serious

**>5 deaths, several (20)
serious injuries, < 500
evacuated**

Class 5 = catastrophic

**several deaths >20,
hundreds of serious
injuries, evacuation)**

Classification

Seriousness				Probability	Priority	Comments ¹³
7	8	9	10	11	12	
L	E	P	S			

Classification



Ranking

7 Life

9 Property

8 Environment

10 Speed

Consequences for the Environment

Class 1 = unimportant

- no contamination, localised effects

Class 2 = limited

- simple contamination, localised effects

Class 3 = serious

- simple contamination, widespread effects

Class 4 = very serious

- heavy contamination

Class 5 = catastrophic

- very heavy contamination, widespread effects

Classification

Seriousness				Probability	Priority	Comments ¹³
7	8	9	10	11	12	
L	E	P	S			

Classification



Ranking

7 Life

9 Property

8 Environment

10 Speed

Consequences for Property

Class 1 = unimportant	→	< 0.5 Million US\$
Class 2 = limited	→	0,5 - 1 Million US\$
Class 3 = serious	→	1 - 5 Million US\$
Class 4 = very serious	→	5 - 20 Million US\$
Class 5 = catastrophic	→	20 Million US \$

Classification

Seriousness				Probability	Priority	Comments ¹³
7	8	9	10	11	12	
L	E	P	S			

Classification



Ranking

7 Life

9 Property

8 Environment

10 Speed

Speed of development

Class 1 = easy and clear warning localised effects/ no damage

Class 2

Class 3 = Medium some spreading / small damage

Class 4

Class 5 = No warning hidden until the effects are fully developed / immediate effects (explosion)

Classification

Seriousness				Probability	Priority	Comments ¹³
7	8	9	10	11	12	
L	E	P	S			

Classification



Ranking

7 Life

9 Property

8 Environment

10 Speed

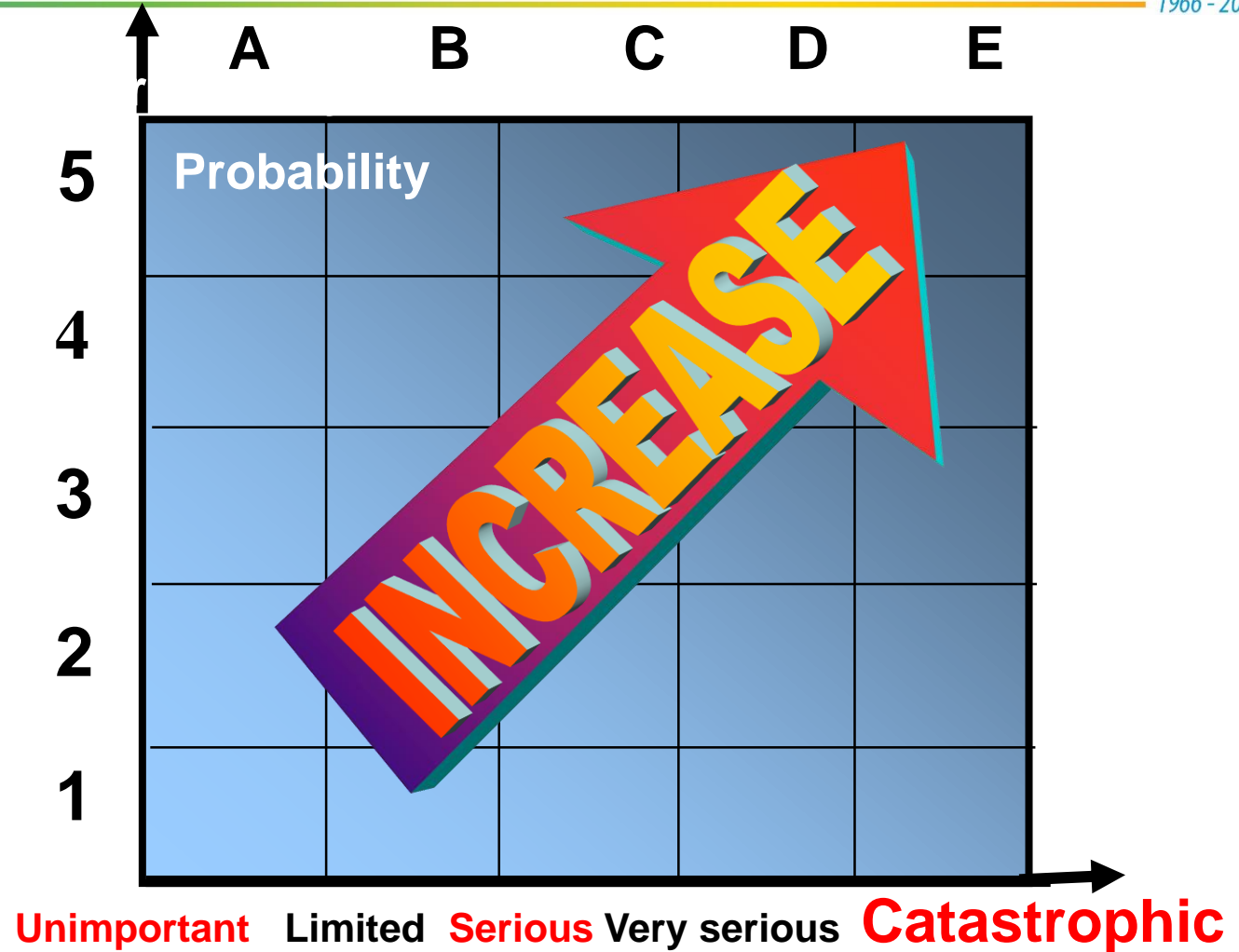
Very probable
More than once a year

Once in 1 - 10 years

Quite probable Once per 10 to 100 years

Once per 100 to 1000 years

Improbable
Less than once per 1000 years



Risk Matrix

Ranking

Estimate the probability of an accident to occur

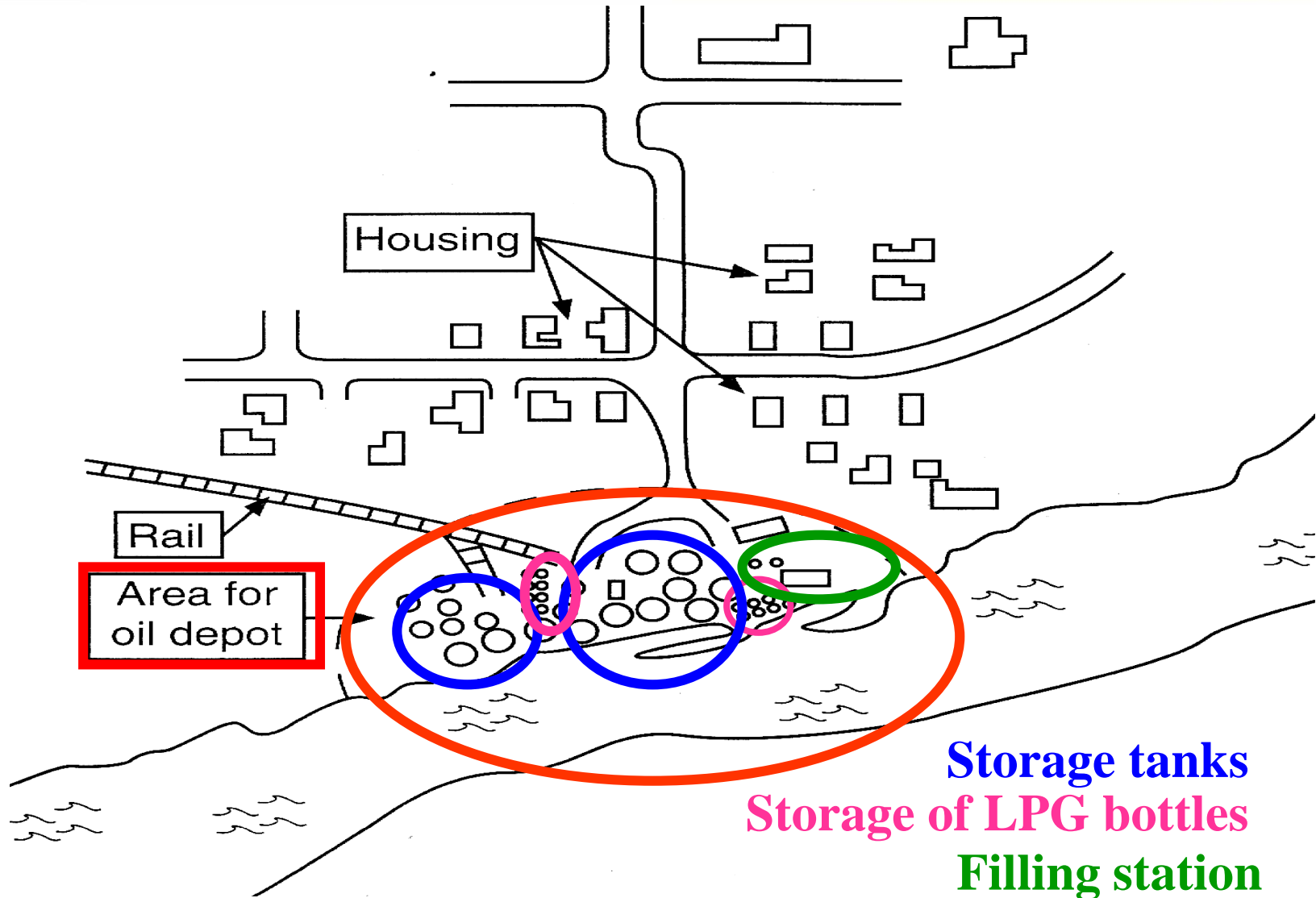
Weigh up the various consequence classes, arriving at a classification of each hazard

Classify the threats in the order:

- people,
- environment,
- property

Give the risk object an overall class based on the risk matrix

Classification



Storage tanks
Storage of LPG bottles
Filling station

Identification of Risk Reduction Actions

- Risk reduction actions aim at preventing and reducing risks posed by the hazards that were prioritized by using tools such as the PRA approach above.
- RP sequence for identifying actions for risk reduction:
 - STEP 1: REVIEW THE HAZARDS IDENTIFIED
 - Reviewing of the list of hazards and hazard hotspots identified and the risks prioritized
 - STEP 2: IDENTIFYING PREVENTATIVE MEASURES
 - Discussion with workers, supervisors, business partners and other external stakeholders (where appropriate) for identification of possible preventive actions
 - STEP 3: CHECKING OPPORTUNITIES FOR IMMEDIATE RISK REDUCTION ACTIONS
 - Reviewing of the process flow chart for identification of steps where actions for risk reduction can be implemented

Identification of Risk Reduction Actions

- Some risk reduction actions:
 - Eliminating hazards (by minimizing or avoiding toxic, flammable and explosive substances; eliminating or replacing chemicals with less hazardous ones; etc.)
 - Enclosure or isolation of hazards (enclosing equipment and providing secondary containment; separating hazardous processes and hotspots from other processes, areas and ignition sources; etc.)
 - If applicable , ventilation of areas where the hazards are located (provision of general and local ventilation to remove or reduce concentrations of hazardous fumes, gases, vapours and mists)
 - Improvement of housekeeping measures and disposal routines
 - Promoting the use of personal protection equipment

- Some risk reduction actions (continued):
 - Raising awareness to hazards and risks (informing workers about hazards and properties of hazardous chemicals; making available MSDS, first aid procedures and other informational materials on chemical safety in the language of the workforce)
 - Keeping non-authorized personnel away from hazards hotspots (improving awareness of hazards and risks; using hazard symbols, labels and warning signs; locking areas of restricted access)
 - Preventing public access to hazardous chemicals storage areas (fencing off/locking storage areas; appointing a responsible person to check regularly storage facilities; making sure that entry into storage areas is only allowed to authorized personnel)
 - Avoiding trespassing (guard and lock facilities) and implementing emergency alarms

- Some risk reduction actions (continued):
 - Re-evaluating routes used for the transport of hazardous chemicals (changing routes whenever possible to avoid driving through or in the vicinity of densely populated areas, schools and hospitals, natural protected areas, heritage areas, etc.)
 - Whenever applicable, providing police and/or emergency response teams escorts when transporting hazardous chemicals through communities or areas which present maximum risk.
 - Avoiding shipments of high-risk chemicals during rush hours to reduce accident probability and numbers of people exposed to risk.
 - Considering temporary restrictions on dangerous goods traffic during hazardous weather conditions: low visibility due to fog, high winds, or slipperiness due to heavy rain, snow or ice.

Frequency 5	(5/1)	(5/2)	(5/3)	(5/4)	(5/5)
Frequency 4	(4/1)	(4/2)	(4/3)	(4/4)	(4/5)
Frequency 3	(3/1)	(3/2)	(3/3)	(3/4)	(3/5)
Frequency 2	(2/1)	(2/2)	(2/3)	(2/4)	(2/5)
Frequency 1	(1/1)	(1/2)	(1/3)	(1/4)	(1/5)
	Gravity 1	Gravity 2	Gravity 3	Gravity 4	Gravity 5

Area where risks are considered unacceptable

Area where risks are critical and require monitoring / control

prioritize the hazard hotspots you have preliminary identified, taking into the account their assigned risk factors