



British Columbia

Hazard, Risk and Vulnerability Analysis Tool Kit

2004

**Ministry of Public Safety and
Solicitor General
Provincial Emergency Program**



**BRITISH
COLUMBIA**

January 2004

National Library of Canada Cataloguing in Publication Data

Main entry under title:

Hazard, risk and vulnerability analysis tool kit

"Disaster-Resilient Communities Initiative."

ISBN 0-7726-4892-1

1. Emergency management - British Columbia - Planning.
2. Disaster relief - British Columbia. I. British Columbia.
Provincial Emergency Program.

HV551.5.C3H39 2003 363.3'48'09711 C2003-960001-7

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Provincial Emergency Program
British Columbia Ministry of Public Safety and Solicitor General
Parliament Buildings, Victoria, BC V8V 1X



Hazard, Risk and Vulnerability Analysis Tool Kit



Ministry of Public Safety and Solicitor General

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INTRODUCTION

Purpose

The purpose of Hazard, Risk and Vulnerability Analysis (HRVA) is:

to help a community make risk-based choices to address vulnerabilities, mitigate hazards and prepare for response to and recovery from hazard events.

“Risk-based” means based on informed choices of alternate unwanted outcomes. In other words, communities make risk reduction choices based on the acceptability of consequences and the frequency of hazards.

Objective

Hazard, risk and vulnerability analysis (HRVA) is not an end in itself. The purpose of hazard, risk and vulnerability analysis planning is to anticipate problems and possible solutions to help save lives and property, reduce damage, and speed a community’s recovery. HRVA helps us work towards disaster-resilient communities.

Why Conduct an HRVA?

You may think that your number one hazard is flooding because it occurs frequently. However, you may find that your greatest risk is an earthquake. Even though the chance of a large earthquake might be “highly unlikely”, the consequences could be devastating, so the overall risk is great.

You have limited time and resources, so identify risk reduction action items for your greatest risks first.

HRVA is a critical part of every emergency program and is a requirement mandated by the Local Authority Emergency Management Regulation of the BC Emergency Program Act. Section 2(1) of this regulation requires local authorities to prepare emergency plans that reflect *the local authority's assessment of the relative risk of occurrence and the potential impact on people and property of the emergencies or disasters that could affect all or any part of the jurisdictional area for which the local authority has responsibility.*

Commitment, Resources and Support

The HRVA tool kit is designed to help the HRVA committee chair lead a voluntary HRVA Advisory Committee. This committee could either be the local Emergency Program Management Committee, or a separate committee. The HRVA

committee chair might be your community's Emergency Coordinator or other skilled person. The HRVA committee chair must be able to lead the HRVA committee and train the committee in the HRVA process, manage project tasks and timelines, prepare workplans, delegate tasks, prepare progress reports, facilitate meetings and prepare and give presentations.

The community must demonstrate a commitment to the process of emergency management and have indicated a willingness to commit resources and staff time towards the completion of the HRVA process.

The HRVA committee chair must first gain the support of the local Emergency Program Executive Committee¹ and the local Management Committee².

To gain the support of the local Emergency Program Executive and Management Committees, the HRVA committee chair must first become familiar with the HRVA tool kit and the HRVA process and give a presentation to the Executive Committee and Management Committees. Further, the HRVA process is fully supported by Regional Managers and Emergency Management Analysts of the Provincial Emergency Program.

The HRVA advisory committee will provide local knowledge of hazards, vulnerabilities and existing risk reduction measures and work step-by-step through the HRVA process.

Additional resources include hazard *subject matter experts* (such as geologists or hazardous materials specialists). When examining hazard occurrence frequency, perception and recollection of event frequency can be different from the historical record. Hazards that exist but occur rarely will be difficult to assign a rank of likelihood. The online HRVA Web tool at <http://www.pep.bc.ca/hrva/hazard.html> includes help tips with contact information for hazard subject matter experts.

¹ Executive Committee – The organization authorized by the Mayor/Chair/Chief and Council to guide the local Emergency Program for the community. The Executive Committee normally consists of the Mayor/Chair/Chief, a Councilor and the Principal Appointed Officer.

² Management Committee – The organization authorized by the Executive Committee to manage the local Emergency Program on a daily basis. The Management Committee normally consists of the Coordinator (Chair), Principal Appointed Officer (or designate), a minimum of six and a maximum of ten representatives of agencies having direct functional responsibilities during a major emergency.

Acknowledgements

The Provincial Emergency Program recognizes the contributions of the following people who provided expert and best-practice advice and assisted with reviews.

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STEP 1—ADMINISTRATION

Objectives

- create an HRVA Advisory Committee;
- review the workplan checklist;
- draft the task schedule; and
- organize an initial meeting to update the workplan checklist, schedule activity, and train the Advisory Committee in the HRVA process.

Note

1. An HRVA Progress Report Form is included at the end of Step 1. This report should be completed as indicated in several steps of the HRVA process and provided to the local authority Executive Committee.

HRVA Advisory Committee Selection Checklist

<input type="checkbox"/>	Community
<input type="checkbox"/>	Appoint a Deputy Chair of HRVA Committee.
<input type="checkbox"/>	Representative(s) from emergency social services groups, e.g., ESS volunteers, Red Cross, etc.
<input type="checkbox"/>	Other interested community representatives with local knowledge and expertise in geography, engineering, science, the environment, community demographics, etc.
<input type="checkbox"/>	Private industry
<input type="checkbox"/>	Representative(s) from industry associations where a hazard exists that could impact the community, e.g., rail, trucking, manufacturing, livestock, etc.
<input type="checkbox"/>	Local government
<input type="checkbox"/>	An elected official from council and representatives from the planning or engineering department.
<input type="checkbox"/>	Emergency professionals
<input type="checkbox"/>	Representative(s) from police, fire, ambulance, medical and other emergency responders (members from existing Emergency Program Management Committee).
<input type="checkbox"/>	Subject matter experts (SMEs)
<input type="checkbox"/>	Persons with expertise in the probability or consequences of known high risk hazards threatening a community (for contact information for hazard subject matter experts, see the online HRVA Web tool at http://www.pep.bc.ca/hrva/hazard.html for the help tip option associated with each hazard "likelihood" rank choice). These people might only participate remotely, or attend the evaluation workshop in Step 6.

Participants

Name	
Representing / experience	
Address	
Telephone	
Email	

Name	
Representing / experience	
Address	
Telephone	
Email	

Name	
Representing / experience	
Address	
Telephone	
Email	

Administration

Name	
Representing / experience	
Address	
Telephone	
Email	

Name	
Representing / experience	
Address	
Telephone	
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Representing / experience	
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Representing / experience	
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Telephone	
Email	

HRVA Workplan Checklist

Pre-Requisites: Community Commitment

Obtain commitment for planning, resources, and staff time from your Executive Committee

Start Date	End Date	Duration	Assigned

Step 1 Administration

- 1.1 Review committee selection checklist
- 1.2 Create an HRVA advisory committee
- 1.3 Review this HRVA workplan checklist
- 1.4 Organize initial meeting with the HRVA advisory committee

Step 2 Training

- 2.1 Hold initial meeting
- 2.2 Complete the following with HRVA advisory committee:
 - Review HRVA objective and goals
 - Review HRVA process and definitions
 - Complete the HRVA risk ranking exercise
 - Complete the HRVA process exercise
 - Review the HRVA workplan checklist and schedule activity

Step 3 Gather risk information

- 3.1 Complete the risk information checklist
- 3.2 Assign information gathering tasks to the committee
- 3.3 Collect and log the risk information and maps
- 3.4 Provide a progress report to the Executive Committee

Step 4 Hazard and vulnerability identification

- 4.1 Hold hazard identification workshop
- 4.2 Complete the following with HRVA advisory committee:
 - Review the HRVA workplan checklist
 - Review the hazard definitions
 - Identify all hazards in the community
 - Provide detailed scenarios
 - Map the location of hazards and vulnerabilities
- 4.3 Provide a progress report to the Executive Committee

Step 5 Risk analysis

- 5.1 Hold risk analysis workshop
 - Review the HRVA workplan checklist
 - Review the qualitative risk ranking measures
 - Rank hazard severity and then likelihood
 - Complete risk profile and prioritize hazards
 - Identify risk reduction measures for high risk hazards
 - Identify uncertainty or information gaps and seek expert information
- 5.2 Provide a progress report to the Executive Committee

Start Date	End Date	Duration	Assigned

Step 6 Risk evaluation

- 6.1 Hold risk evaluation workshop
- Review the workplan checklist
 - Evaluate the risk profile, risk reduction measures and draft action items
- 6.2 Provide a progress report to the Executive Committee

Step 7 Public consultation plan

- 7.1 Identify stakeholders
- 7.2 Anticipate stakeholder issues for each high risk hazard
- 7.3 Create a public consultation action plan

Step 8 Action plans

- 8.1 Review the risk reduction measures
- 8.2 Review the HRVA, action plans and public consultation action plan with your PEP Regional Manager
- 8.3 Finalize action plans for your local Emergency Program Guide
- 8.4 Present the HRVA, action plans and public consultation action plan to your Management and Executive committees
- 8.5 Update your local Emergency Program Guide with the accepted action plans and implementation schedule

HRVA Task Schedule

Gantt Chart

Weeks/Months

Tasks	End Date*																
Step 1. Management																	
Step 2. Training																	
Step 3. Gather risk information																	
Step 4. Hazard and vulnerability identification																	
Step 5. Risk analysis																	
Step 6. Risk evaluation																	
Step 7. Public consultation plan																	
Step 8. Action plans																	

**Enter task completion date in the "End Date" column. Enter weeks or months in the square at the top of each column. For each task, draw a horizontal line indicating the duration spanning the weeks or months where work will be in progress.*

Notes:

INITIAL HRVA ADVISORY COMMITTEE MEETING

TO BE HELD AT _____

Time _____ Date _____

PROPOSED ATTENDEES:

Elected municipal representative Local government representative Members of the HRVA advisory committee	Emergency Coordinator
---	-----------------------

AGENDA:

Item	Subject	
1	Welcome/Introduction of Participants	
2	Review HRVA purpose, objective and goals	
3	Review HRVA process and definitions	
4	Complete risk ranking exercise	
5	Complete HRVA process exercise	
6	Review HRVA workplan checklist and schedule activity	
7	Way ahead - Next steps - Next meeting	
8	Adjournment	

HRVA Progress Report No. _____

Date: _____

Submitted to: _____

Submitted by: _____

(Attach a copy of the current workplan checklist)

1. Current Tasks

List work completed or in progress since the last report (refer to workplan checklist).

2. Problems encountered and their solutions

Use this section to list any road blocks to task completion, uncertainties or information gaps and describe feasible solutions.

3. Work completed to date

Summarize all HRVA steps and tasks completed to date (refer to HRVA checklist).

4. Work planned for the next period

List HRVA step(s) and tasks to be completed for the next report.

5. Outside contacts

List any contacts and their contact information.

STEP 2—TRAINING

Objectives

- review the purpose, objective and goals of HRVA;
- review the HRVA process and definitions;
- complete the HRVA risk ranking exercise;
- complete the HRVA process exercise; and
- review the workplan checklist and schedule activity.

Goals

Create the following documents:

- risk profile;
- risk reduction action plans to address vulnerabilities and moderate to high risks;
- public consultation plan; and
- action plans.

Inform your local emergency program Executive Committee, and the public.

Develop action plans to implement risk reduction measures and improve your local emergency program.

Risk Management Process

The Hazard, Risk and Vulnerability Analysis (HRVA) tool kit reflects the provincial standards and requirements of the *BC Emergency Program Act* and the *Local Authority Emergency Management Regulation* and recognizes the best practices for emergency management described in the *NFPA 1600 Standard on Disaster/Emergency Management and Business Continuity Programs* (available at <http://www.nfpa.org>).

Step by Step Process

The HRVA tool kit is a step by step process that enables an HRVA committee chair, and a small working group, to complete a hazard, risk and vulnerability analysis. There will be a time commitment to complete the analysis, make recommendations to community leaders and improve emergency plans. The "made-in-BC" HRVA process is achievable—the process is easy to understand and the tool kit is just that—it includes all the tools: forms, sample agendas, checklists and schedule. A Web HRVA tool can be used to create a preliminary

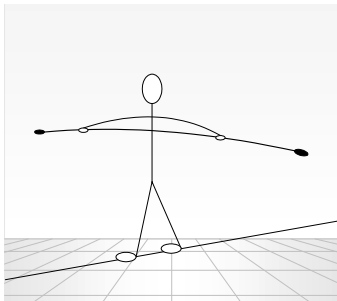
HRVA and provide immediate feedback on how changes to hazard scenarios impact on priorities for action.

Step 1	<ul style="list-style-type: none"> • Get commitment from your local authority • Establish an HRVA advisory committee • Draft the workplan checklist and schedule
Step 2	<ul style="list-style-type: none"> • Conduct HRVA training
Step 3	<ul style="list-style-type: none"> • Begin to gather hazard and vulnerability information and maps
Step 4	<ul style="list-style-type: none"> • Identify hazards and vulnerabilities
Step 5	<ul style="list-style-type: none"> • Assess hazard severity and likelihood • Identify risk reduction measures
Step 6	<ul style="list-style-type: none"> • Evaluate risk profile and estimate acceptability of risk
Step 7	<ul style="list-style-type: none"> • Public consultation • Gauge public acceptability of risk and issues
Step 8	<ul style="list-style-type: none"> • Create action items and report to local authority

You should revisit the HRVA each year or each time a change occurs in the hazards or vulnerabilities in your community.

Risk Definitions

The concept of **risk** is illustrated by the tightrope walker. Pause for a minute to think about the risk to the person on the highwire. In this example, the risk to the tightrope walker is falling off and getting killed—a high-risk activity! Now consider



that the highwire is only one metre above the ground. The falling **hazard** still exists and the chance of falling remains constant, but the risk is considerably different than if the person were 100 metres above the ground. Thus risk does not mean chance, probability or likelihood. Risk is a total concept of **likelihood** of occurrence of a hazard and the severity of possible **impacts**. Perhaps there is a crowd below the tightrope walker **vulnerable** to injury. The severity of impact to the tightrope walker and the crowd can be **mitigated** by a safety net, the chance of falling can be **reduced** by special training and the extent of injury can be **mitigated** by emergency medical response capability.

Risk—the chance of injury or loss as defined as **a measure of the probability [likelihood] and severity** of an adverse effect to health, property, the environment, or other things of value.

Risk analysis—the systematic use of information to identify hazards and to estimate the chance for and severity of, injury or loss to individuals or populations, property, the environment, or other things of value.

Hazard—a source of potential harm, or a situation with a potential for causing harm, in terms of human injury; damage to health, property, the environment, and other things of value; or some combination of these.

Hazard identification—the process of recognizing that a hazard exists and defining its characteristics.

Consequences or impacts—an adverse effect to health, property, the environment, or other things of value.

Vulnerability—people, property, infrastructure, industry and resources, or environments that are particularly exposed to adverse impact from a hazard event.

Response and recovery capability—is defined as locally available strengths and capacities to reduce the impact of adverse conditions of a disaster. Impact severity and extent of vulnerability are dependent upon the capability or capacity to reduce the severity of impact. A deficiency in response or recovery capability can create an unacceptable exposure.

Risk evaluation—the process by which risks are examined in terms of costs and benefits, and evaluated in terms of acceptability of risk considering the needs, issues, and concerns of stakeholders.

Risk reduction measure—an action intended to reduce the frequency and/or severity of injury or loss, including a decision not to pursue the activity. For example: flood control mitigation works or emergency response exercises.

HRVA Risk Ranking Exercise

Complete the following questions and statements, individually, to become familiar with HRVA definitions and the process of creating and ranking a hazard scenario. Refer to the Qualitative Risk Ranking Measures section (Step 5, page 5-8).

1. You have identified a mine explosion hazard and described a scenario where five people are killed and 60 people are injured. What is the consequence rank for this number of injuries? _____(Step 5: Risk Ranking Measures).
2. A scenario describes a loss of power to part of a small community for several days. Circle the correct rank for this impact (Step 5: Risk Ranking Measures).
High Low Very Low
3. Fill in the blanks to list the seven categories of impacts to be considered for each hazard scenario. Fatality, injury, _____, lifelines, _____, environmental impact, & economic and social impacts (Step 5: Risk Ranking Measures).
4. Dangerous chemical releases occur every year—usually without impact, but your scenario is significant and results in an evacuation. Let’s say that historical evidence shows this event occurs about every 12 years. Using the hazard likeliness ranks in the tool kit, circle the appropriate term (Step 5. Risk Ranking Measures).
Occasional Remote Rare Event
5. Focusing a hazard scenario on vulnerabilities will aid in understanding the potential severity of impacts. For example, a retirement trailer park at risk of flooding. List two types of vulnerabilities other than people.

_____ (Step 4: Hazard & Vulnerability Identification, page 4-13).

HRVA Process Exercise

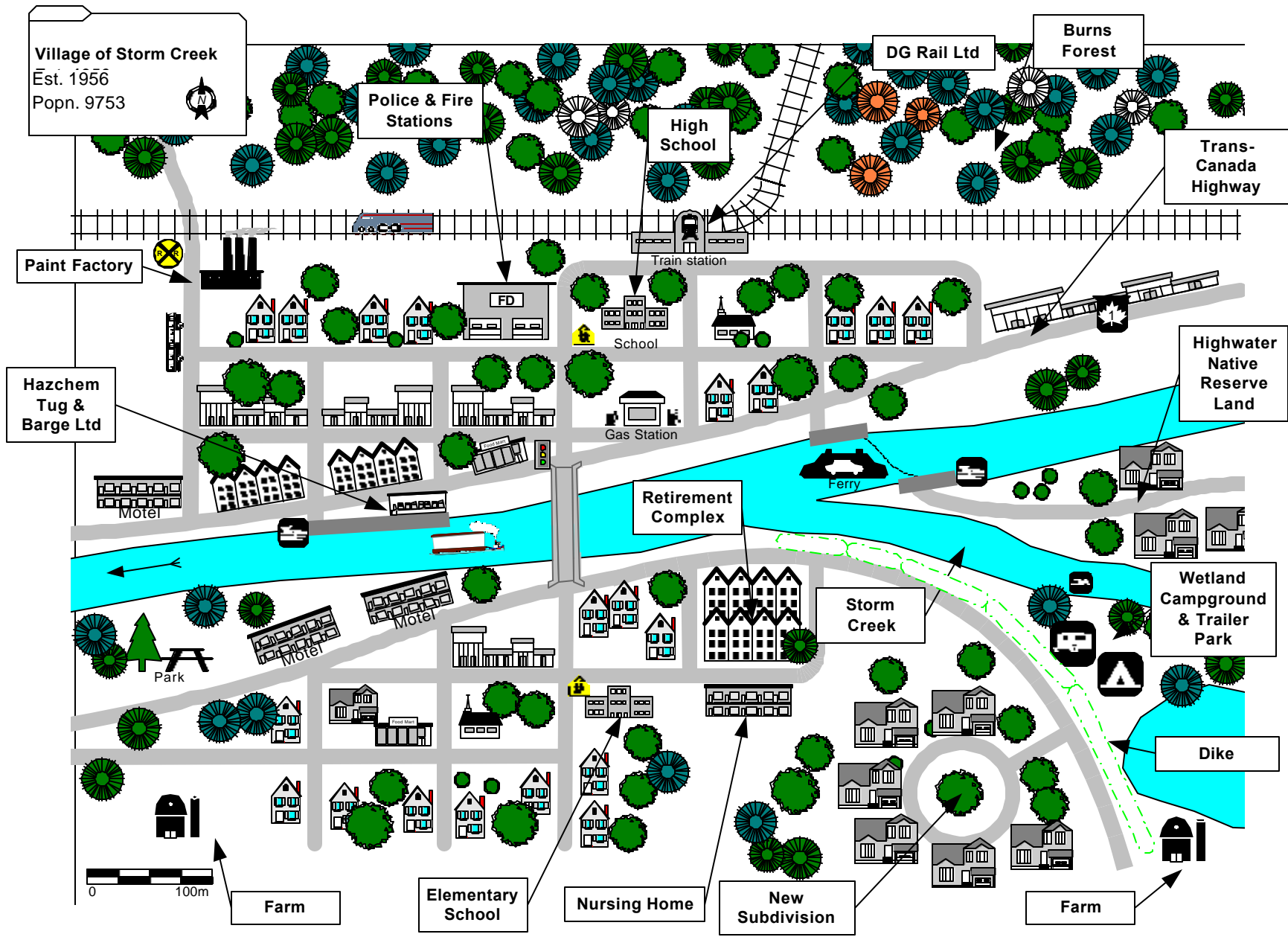
Given a basic understanding of the process to rank a hazard scenario for consequence severity and likelihood, work in a group to:

1. Identify, describe and rank two hazard scenarios using the Hazard & Risk Analysis form (page 4-4 or 5-3). Describe impacts and vulnerabilities. Transfer these hazards to the Risk Profile form (page 5-4); and
2. List possible mitigation measures on the Risk Reduction Measures form (page 5-7).

This exercise is intended to familiarize the HRVA Advisory Committee with the use of some of the HRVA forms. Use the map of the fictitious community ***Village of Storm Creek*** to complete these two tasks and then review the results. Blank forms are found in Step 5 in the tool kit.

Instructions:

1. Review the content of the sample forms.
2. Consider the severity of each of the impacts in the scenario and then give the hazard scenario a single consequence severity rank. Choose the highest severity rank of all the ranks assigned to the impacts: fatality, injury, critical facility, lifelines, property, environment, economic/social.
3. Ballpark the likeliness rank. In an actual HRVA, you should use a subject matter expert to assist with this.
4. Identify and prioritize risk mitigation measures for each hazard separately.



**HAZARD &
RISK ANALYSIS**

HRVA Committee: VILLAGE OF STORM CREEK

Date: APRIL 21, 2003

No	HAZARD	SCIENTIFIC DETAILS INCLUDING IMPACTS & VULNERABILITY	LIKELIHOOD	CONSEQUENCE SEVERITY
1	FLOODING	FRESHET FLOODING IMPACTS VILLAGES AND FAMRS CAUSING LOCALIZED AND SEVERE PROPERTY DAMAGE. VULNERABILITIES: SCHOOL, STORM CREEK BRIDGE, AND NO EVAC PLAN	4	3
2	INTERFACE FIRE	WILDFIRE THREATENS VILLAGE AND FORCES EVACUATION. VULNERABILITIES: SMOKE IRRITANT, ACCESS CUT OFF TO NORTH, EVAC TO SOUTH OK BUT NO ARRANGEMENTS IN PLACE FOR EVAC AND SHELTER TO NEAREST TOWN.	3	3 Impacts: Fatal 1 Injury 1 Crit. Inf. 2 Lifeline 2 Property 3 Envir. 2 Econ./Soc. 2
LIKELIHOOD		CONSEQUENCE: IMPACT AND VULNERABILITY		
6:	Frequent or Very Likely	4:	Very High	
5:	Moderate or Likely	3:	High	
4:	Occasional, Slight Chance	2:	Low	
3:	Unlikely, Improbable	1:	Very Low	
2:	Highly Unlikely (Rare Event)			
1:	Very Rare Event			

RISK PROFILE

HRVA Committee: VILLAGE OF STORM CREEK

Date: APRIL 21, 2003

FREQUENT OR VERY LIKELY	6				
	5				
	4			FLOODING	
	3			INTERFACE FIRE	
	2				
	1				
		1	2	3	4 VERY HIGH CONSEQUENCES
LIKELIHOOD		CONSEQUENCE: IMPACT AND VULNERABILITY			
6:	Frequent or Very Likely	4:	Very High		
5:	Moderate or Likely	3:	High		
4:	Occasional, Slight Chance	2:	Low		
3:	Unlikely, Improbable	1:	Very Low		
2:	Highly Unlikely (Rare Event)				
1:	Very Rare Event				

RISK REDUCTION MEASURES

HRVA Committee: VILLAGE OF STORM CREEK

Date: APRIL 21, 2003

No.	HAZARD	RISK REDUCTION MEASURES
1	FLOODING	<ul style="list-style-type: none"> • EVACUATION PLAN #1 • EXERCISE ALERT PLAN #2 • MOVE SCHOOL #3 • RAISE AND REINFORCE BRIDGE #4
2	INTERFACE FIRE	<ul style="list-style-type: none"> • INVESTIGATE SHELTER IN TOWNS TO SOUTH #1 • UPDATE EVACUATION PLAN #2 • INFORM PUBLIC OF FIRE RISK AND MITIGATION PRACTICES FOR PRIVATE PROPERTY #3

STEP 3—GATHER RISK INFORMATION

Objectives

- complete the risk information checklist;
- assign information gathering tasks to the committee;
- collect and log the risk information and maps; and
- provide a progress report to the Executive Committee.

In this step, you will begin the process of developing a *risk information library* to support hazard identification and risk analysis. Information gathering and documentation does not end with this step. The risk information library is a collection of all documents created or collected in the HRVA process. This includes, but is not limited to: this tool kit, minutes, all hazard documents and maps used to support the HRVA—i.e., all documents.

You can find appropriate hazard experts and sources of risk information on the Web by using the online HRVA tool at <http://www.pep.bc.ca/hrva/hazard.html>. Each hazard on the HRVA Web tool has a unique help tip. The online HRVA hazard likelihood help tip is accessed by clicking the likelihood choice control and choosing *Help Tip*.



DANGEROUS GOODS SPILL	Chemical, oil, hazardous waste, radiation	Very Low	Very Rare Event
EARTHQUAKE		Very Low	Very Rare Event
EPIDEMIC - ANIMAL	Foreign animal disease	Very Low	Highly Unlikely: Rare Event
EPIDEMIC - HUMAN	Pandemic flu	Very Low	Unlikely: Improbable
EXPLOSION OR EMISSIONS	Gas wells, pipelines	Very Low	Occasional: Slight Chance

HRVA Web tool help tips

STEP 4—HAZARD AND VULNERABILITY IDENTIFICATION

Objectives

- plan and hold a hazard identification workshop with the HRVA Advisory Committee;
- review the workplan checklist;
- review the hazard definitions;
- identify all hazards, vulnerabilities and response and recovery capabilities in your community;
- where possible, map the location of hazards and vulnerabilities;
- provide detailed scenarios; and
- provide a progress report to the Executive Committee.

Example scenarios were provided in Step 2. The scenarios should not only describe the hazardous event, scenario descriptions should list impacts and vulnerabilities:

- the description of impacts will enable the ranking of consequence severity;
- the description of impacts and a hazard scenario is a prerequisite to the ranking of hazard scenario likelihood; and
- the identification of vulnerabilities will indicate possible action items for risk reduction.

Preparation

Prior to the workshop, the HRVA Advisory Committee must review the list of hazards and vulnerabilities in this step and be conversant in the consequence types described in Step 5 in order to create plausible hazard scenarios.

- 1. You cannot proceed to ranking the likelihood of a hazard scenario without first describing the severity of impact because the more severe a scenario is, the less likely it is to occur.*
- 2. Impact severity is dependent upon the response capability and vulnerabilities.*

Hazards

- A list of hazards and definitions is provided in this step. Identify these and other hazards that may impact your community.
- Where possible, map those hazards that can be mapped in a general way. High risk hazards should receive more attention later.

- If possible, transcribe hand-drawn maps to acetate overlays of the same scale as a base map such as a road map or topographic map, or use a computer Geographic Information System.

Vulnerabilities

- A list of vulnerabilities is provided in this step following the hazard definitions. Identify vulnerabilities in your community and add others not shown. Include all categories.
- Where possible, map vulnerabilities that can be mapped. Use general information to reduce time requirements for now.
- Transcribe hand-drawn maps to the same system used for hazards.

Capacity to Respond and Recover

- Information on why capabilities to respond and recover affect your hazard scenario is provided in this step following the hazard definitions. Identify response and recovery capacity in your community and add others not shown. Include all categories.
- Where possible, map response and recovery capability that can be mapped. Use general information to reduce time requirements for now.
- Transcribe hand-drawn maps to the same system used for hazards.

Scenarios

- The consequence types described in Step 5 provide examples of different severity scenarios for fatality, injury, critical facility failure, damage to lifelines, property damage, environmental impact, and economic and social impact.
- A Hazard & Risk Analysis form is provided to record the hazard scenario. The hazards you identify will not necessarily be in order of risk. You will not be able to sort by risk until you have completed the Risk Profile in Step 5.
- However, you can save time by ranking the consequence severity at the hazard identification workshop. For instance, if you describe a scenario where there are 20 to 30 deaths, the scenario already has a consequence severity of “3” or “high”.

WARNING: There may be a tendency for some people to describe severe impacts that may not reflect the existing response and recovery capability.

**HRVA ADVISORY COMMITTEE
HAZARD IDENTIFICATION WORKSHOP**

TO BE HELD AT _____

Time _____ Date _____

PROPOSED ATTENDEES:

Members of the HRVA advisory committee	Emergency Coordinator
--	-----------------------

AGENDA

Item	Subject	
1	Welcome/Introduction of Participants	
2	Objectives: <ul style="list-style-type: none">• Review HRVA process and HRVA checklist• Complete hazard identification form• Draft progress report	
3	Review HRVA process and HRVA checklist	
4	Review risk information, hazard, vulnerability and capacity definitions and list plausible hazards and vulnerabilities to the community	
5	Where possible, map the location of hazards, vulnerabilities and response/recovery capability	
6	<ul style="list-style-type: none">• Complete hazard & risk analysis form with brief descriptions of hazard scenarios as per the example in Step 2• Time permitting, rank the consequences for each scenario as per the criteria defined in Step 5. DO NOT COMPLETE THE HAZARD LIKELIHOOD	
7	Draft the progress report	
8	Way ahead - Next steps - Next meeting	
9	Adjournment	

Hazard and Vulnerability Identification

HAZARD & RISK ANALYSIS

HRVA Committee: _____

Date: _____

No.	HAZARD	SCENARIO DETAILS INCLUDING IMPACTS & VULNERABILITY	LIKELIHOOD	CONSEQUENCE SEVERITY		
<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>LIKELIHOOD</p> <p>6: Frequent or Very Likely 5: Moderate or Likely 4: Occasional, Slight Chance 3: Unlikely, Improbable 2: Highly Unlikely (Rare Event) 1: Very Rare Event</p> </td> <td style="width: 50%; vertical-align: top;"> <p>CONSEQUENCE: IMPACT & VULNERABILITY</p> <p>4: Very High 3: High 2: Low 1: Very Low</p> </td> </tr> </table>					<p>LIKELIHOOD</p> <p>6: Frequent or Very Likely 5: Moderate or Likely 4: Occasional, Slight Chance 3: Unlikely, Improbable 2: Highly Unlikely (Rare Event) 1: Very Rare Event</p>	<p>CONSEQUENCE: IMPACT & VULNERABILITY</p> <p>4: Very High 3: High 2: Low 1: Very Low</p>
<p>LIKELIHOOD</p> <p>6: Frequent or Very Likely 5: Moderate or Likely 4: Occasional, Slight Chance 3: Unlikely, Improbable 2: Highly Unlikely (Rare Event) 1: Very Rare Event</p>	<p>CONSEQUENCE: IMPACT & VULNERABILITY</p> <p>4: Very High 3: High 2: Low 1: Very Low</p>					

Hazard List

The hazard list considered in the HRVA process is taken directly from the Emergency Program Management Regulation of the Emergency Program Act. Consider this list a starting point to assist with defining the scope of hazards affecting your community. You may wish to start with a list that includes several different scenarios for the same type of hazard, for example, a dangerous goods spill. You may find that one of these scenarios presents a greater risk, and a higher priority, than the others. While control options to reduce the risk in your emergency plan may be similar for each dangerous goods event, there may be a unique response which is worth noting—for example, evacuation routes or shelters.

Be careful when considering worst plausible scenarios. The more “worst case” a scenario, the less likely it is to occur. Therefore, your initial “worst case” scenario for a particular hazard may not be the greatest risk to your community. For example, a moderate earthquake will be a higher risk than an extremely strong earthquake in the lower mainland because it is more likely *and* will have considerable damage even though the extent of damage will be considerably less than the strongest earthquake possible.

Hazard Groups	Hazard
Accidents	<ul style="list-style-type: none"> • Air crashes • Marine accidents • Motor vehicle crashes
Atmosphere	<ul style="list-style-type: none"> • Snow storms • Blizzards • Ice storms and fog • Hailstorms • Lightning • Hurricanes • Tornadoes • Heat waves
Dam failure	<ul style="list-style-type: none"> • Dam failure (includes foundations and abutments)
Disease and epidemics	<ul style="list-style-type: none"> • Human diseases • Animal diseases • Plant diseases • Pest infestations
Explosions and emissions	<ul style="list-style-type: none"> • Gas and gas leaks (pipeline) • Gas and gas leaks (gas wells) • Mine • Other explosions
Fire - urban and rural	<ul style="list-style-type: none"> • Fire (urban and rural - excludes interface fire)
Fire - wildfire and interface	<ul style="list-style-type: none"> • Wildfire (includes interface fire)
Geological	<ul style="list-style-type: none"> • Avalanches: <ul style="list-style-type: none"> - highways - other • Debris avalanches and debris flows • Landslides:

Hazard and Vulnerability Identification

	<ul style="list-style-type: none">- highways- other• Submarine slides• Land subsidence
Hazardous materials	<ul style="list-style-type: none">• Hazardous spills<ul style="list-style-type: none">- general (on site or transport routes)- radiation- infectious materials
Hydrologic	<ul style="list-style-type: none">• Drought• Erosion and accretion• Flooding• Ice jams• Storm surges
Power outage	<ul style="list-style-type: none">• Electrical power outage
Riots	<ul style="list-style-type: none">• Riots/public disorder
Seismic	<ul style="list-style-type: none">• Ground motion effects• Tsunamis
Space object	<ul style="list-style-type: none">• Space object crash
Structural	<ul style="list-style-type: none">• Structural collapse
Terrorism	<ul style="list-style-type: none">• Terrorism (hostile act against state)
Volcanic	<ul style="list-style-type: none">• Ash falls• Pyroclastic flows• Lava flows• Mudflows

There may be other hazards. Do not limit yourself to this list, however, you may wish to constrain the scope of risk analysis work to the highest risks. If so, include those hazards with a potential to have at least an occasional possibility of occurring and a high level of impact.

Pay particular attention to the failure of critical infrastructure (such as a water supply) or facility (such as a hospital) resulting from an engineering or system failure or a human factor leading to a structural failure, power outage, explosion or emission or hazardous spill.

Hazard Definitions

The following hazard definitions were originally prepared by the Disaster Preparedness Resources Centre at the University of British Columbia at the request of the Provincial Emergency Program in order to provide information to municipalities, provincial and federal ministries and departments, local area coordinators and emergency planners. Some changes have been made to the original text.³

³ See Pearce, L. 1997. British Columbia: Hazard, Risk and Vulnerability Analysis. Vol. 1 - Updated 1997.

Accidents

Air crash is an accident involving one or more aircraft that results in damage to aircraft, property or human injury or death. Most crashes occur near airports, however, they occur anywhere in the rugged terrain of British Columbia.

Marine accidents include collisions, groundings, strikings, explosions and fires, structural failures as well as accidental spills of petroleum products or chemicals, loss of cargo and human death or injury. Marine accidents can have local or widespread environmental and economic impact.

Motor vehicle crashes that involve a large number of passengers, or carry hazardous or explosive products that have the potential for a severe human or environmental impact are of concern.

Rail accidents occur when a train derails or collides with another train, motor vehicle, or obstruction on the rail tracks. Rail accidents have potential for a severe human or environmental impact.

Atmospheric Hazards

Snowstorms vary from light sprinkles of snow to accumulations of several metres. Similar to the effects of blizzards, snowstorms are, however, not often associated with high winds. Snowstorms impact upon transportation, powerlines and communications infrastructure, and agriculture.

Blizzards combined high winds (typically in the 90 to 130 kilometres per hour range), blowing snow, and low temperatures. The effects of the storm are always intensified by the wind chill factor associated with the high winds. Blizzard conditions occur most often in unforested areas where there are no trees present to break the effects of the wind. Blizzards impact upon transportation, buildings, powerlines and communications infrastructure, and agriculture. Blizzard conditions are often accompanied by freezing rain.

Ice storms and *ice fogs* cause accumulation of ice on structures. An ice storm combines high wind, freezing temperatures, and freezing rain or drizzle. An ice fog combines very cold temperatures, and a source of warm moisture. Ice accretion impacts upon transportation, buildings, powerlines and communications infrastructure.

Hailstorms are precipitation in the form of ice balls of five millimetres or more in size. Hailstorms impact upon agriculture and property.

Lightning can occur where there is moisture-laden instable air, ascending air and thunderclouds. Lightning impacts air transportation, powerlines and communications infrastructure and causes forest fires.

Hurricanes, or tropical cyclones are defined as storms with wind speeds in excess of 110 kilometres per hour. Hurricanes cause injury as well as property and infrastructure damage because of high winds, flooding from heavy and rapid rain fall and storm surges from wind and low pressure.

Tornadoes are funnel clouds of very rapidly rotating air. At the centre is an intense low pressure of rapidly rising air. The tornado is a secondary formation of vortex activity in a higher cloud layer. The extreme wind velocities severely impact upon people, property and infrastructure.

Heat waves can be characterized by temperatures significantly above the mean for an extended period, or by a combination of high temperatures with high humidity and a lack of air motion. Heat waves impact upon the very young, the elderly and those with cardiovascular conditions. Heat waves also impact upon agriculture.

Dam Failure

Dam failure is a breach in the dam itself, its foundations, abutments, or spillway, which results in large or rapidly increasing, uncontrolled releases of water from the reservoir.

Disease and Epidemics

Human diseases are diseases and epidemics that affect people, cause death, have serious economic implications and form the basis for a mass casualty emergency response. These include epidemics such as meningitis, pandemic flu, hepatitis, E. coli, and other communicable diseases.

Animal diseases can be spread between animals and sometimes to humans. The threat of foreign animal disease, such as foot and mouth disease, is catastrophic impact on the economy.

Plant diseases caused by pathogens such as viruses, bacteria, fungi and algae impact upon crops, residential trees, and forests. A widespread outbreak could have severe economic consequences.

Pest infestations are classified as foliage feeding or root feeding. A widespread outbreak could have severe economic consequences.

Explosions and Emissions

Pipeline and gas well leaks and explosions occur when natural gas or gasoline pipelines, valves or components rupture, by accident, by mechanical failure or corrosion. Gas leaks can also be caused by natural hazards such as earthquakes or landslides.

Mine explosions are usually caused by a buildup of explosive gases underground in the mine. These gases can be set off by a spark or by miners entering, working or leaving the area. Errors with the handling of explosives underground can also cause life-threatening explosions.

Fire—Urban and Rural

Urban fires are fires that occur in a residential, commercial or industrial community. Rural and urban fires occur on a frequent basis in many parts of the province, and of provincial concern are the fires that cause a large number of deaths or injuries, those that are beyond the ability of the local resources to respond or those that cause severe economic losses. For interface fires, see wildfires.

Geological

Avalanche is a movement of snow and ice in response to the force of gravity down an incline. Factors such as the type or nature of snow, ambient temperature and wind conditions are critical in avalanche potential. Conditions such dense, wet snow falling on dry, loosely packed snow may give risk to an avalanche. Avalanches impact upon people engaged in recreation as well as transportation and communications infrastructure.

Debris avalanches and debris flows. Debris flows are a form of rapid mass down-slope movement of a slurry of loose soils, rocks and organic matter. Debris avalanches are extremely rapid debris flows of mud, rock, brush, trees and other debris propelled by torrential rains. About one half of damaging landslides in British Columbia are debris flows which impact life and/or property.

Landslide is a general term used to describe the down-slope movement of soil, rock and organic materials under the influence of gravity. It also describes the landform that results. Landslides cause property damage, injury and death and adversely affect a variety of resources. For example, water supplies, fisheries, sewage disposal systems, forests, dams and roadways can be affected for years after a slide event. The negative economic effects of landslides include the cost to repair structures, loss of property value, disruption of transportation routes, medical costs in the event of injury, and indirect costs such as lost timber and lost fish stocks. Water availability, quantity and quality can be affected by landslides.

Submarine slides involve the underwater down slope movement of slope materials under the influence of gravity. They may be triggered by seismic events or by the gradual deposition and slumping of sediments. A submarine slide may impact underwater infrastructure or generate a tsunami.

Land subsidence occurs when a surface has been undermined by natural or human causes and deformation and ground movement occur. Subsidence can impact upon property, facilities and ground water.

Hazardous materials

Hazardous materials spills on site or transport route is any uncontrolled release of material posing a risk to health, safety, and property. Transport routes include air, marine, rail and roads. Spills are classified in British Columbia as Urgent (Code II) or Non-Urgent (Code I). Code II spills pose a threat that may require evacuation. Other hazardous materials include radiation and infectious materials.

Hydrologic

Drought results from an abnormal water deficiency. The impact can be crop failure, forest fire conditions, dust storms, insufficient and polluted water supplies and other ecological and economic effects.

Erosion and accretion is the wearing away and accumulation of land by natural forces such as wave action, river and tidal currents and precipitation. Accretion in rivers increases the risk of flooding. Erosion of shoreline slopes increases the risk of slope failure. These processes can result in property damage.

Local flooding may be associated with an extreme hydrologic event such as a record rainfall or by poor or blocked drainage. Flooding impacts upon transportation, property and agriculture.

Freshet flooding is a late spring event caused by the melting of snow pack. Flooding impacts upon transportation, property and agriculture.

Ice jams are an accumulation of broken river ice caught in a channel, usually at a shallow, narrow or curved portion, frequently producing local floods during the spring breakup. Ice jams can also occur on freeze-up. Ice jams impact communities and agriculture by flooding behind the ice jam, or by flash flooding by its sudden release.

Storm surges are increases in water levels which exceed normal tide heights. They are caused by winds driving water shoreward and often by a rise in water level due to a low pressure system. Storm surge flooding impacts people and property.

Power Outages

Power outages occur on a regular basis, however, they become a concern when the power outage is for a significant amount of time, when the temperatures are very low, or critical infrastructure, persons, livestock or businesses are affected.

Riots

Riots are violent public disorders by a group of persons with either a common or random intent to destroy property, assault persons, or otherwise disturb the peace.

Seismic

Earthquake or *ground motion* is defined as violent shaking of the ground accompanying movement along a fault rupture. Seismic energy traveling in waves may cause damage to structures, trigger landslides, liquefaction or other geologic event, or generate tsunamis. Impacts from earthquakes can be widespread and severe.

Tsunamis or seismic sea waves result from offshore earthquakes where there is sudden subsidence or uplift. Impacts include coastal flooding, which can be intensified in inlets. This can destroy homes and property. Possible death and suffering may be mitigated with warning. Proximity to the source of the tsunami defines the warning period. A local event may provide 15 minutes warning; a distant event may provide five or more hours warning.

Space Objects

Space objects crash is the result of either a technological or natural object from space penetrating the earth's atmosphere and crashing on earth causing damage. This can be a meteor, meteorite, asteroid or other naturally occurring space object, or it can be a man-made satellite, space station, or space craft.

Structural

Structural collapse occurs when a building or structure collapses due to engineering or construction problems, metal fatigue, changes to the load bearing capacity of the structure, human operating error or other cause such as earthquake, flood, fire, explosion, snow or ice buildup.

Terrorism

Terrorism is considered to be a hostile act committed against the state and designed to exercise the use of terror, especially as a means of coercion. Most

common forms include bomb threat, explosions from bombs, sabotage, kidnapping or hostage situations. Other terrorism threats include those from chemical, biological, radiological or nuclear (CBRN) weapons.

Volcanic

Ash falls occur where fine volcanic ash has been ejected out of a vent into the atmosphere, possibly transported by upper level winds, and deposited on the earth. Impacts include health hazards, pollution of water supplies, disruption of transportation and structural collapse.

Pyroclastic flows are sudden and very rapid flows of hot gas, ash and rock particles down the slopes of a volcano associated with explosive eruptions. They destroy everything in their path.

Lava flows are slow speed flows of molten rock. People can evacuate, but structures are usually destroyed when in the path of a lava flow.

Mud flows are slurries of water and rock particles. These can occur long after an eruption has deposited ash. Mud flows are extremely destructive but usually confined to valley bottoms.

Wildfire

Wildfire exists when there is uncontrolled burning in grasslands, brush or woodlands. Interface fire is wildfire that impacts or threatens adjacent property and infrastructure or human lives.

Vulnerability

Vulnerability is defined as people, property, infrastructure, industry and resources, or environments that are particularly exposed to adverse impact from a hazard event.

Consider a hazard scenario with a vulnerable population, such as an elementary school along an earthquake fault where a large number of casualties might occur. This scenario might have a consequence magnitude rating of "very high". The recognition of vulnerabilities identifies opportunities for risk reduction. For example, if a risk reduction measure were implemented to give the school a seismic upgrade, then the consequence rank is lower and the overall risk might become acceptable.

There are four groups of vulnerabilities to consider in your hazard scenarios: social, physical, economic and environmental. Some examples include:

Social

- Confined – penitentiaries or jails
- Elderly – group homes or retirement complexes
- Gender – mothers and children, violence against women
- High density – shopping malls, theatres, stadiums, high-rise buildings
- Infirm – hospitals
- Language – ethnic centres
- Persons with disabilities – vision, hearing, mobility, mental, dependency
- Young – schools or recreation centres

Physical

- Bridges
- Communications systems – telephone, radio, cellular, television
- Critical infrastructure
- Gas and oil transmission and distribution pipelines
- Hazardous waste sites
- Historic sites
- Mobility of population
- Power transmission towers
- Property and infrastructure in close proximity to hazard
- Trailer parks and campgrounds
- Transportation – routes, terminals, systems: road, rail, air, water
- Water reservoirs and hydro dams

Economic

- Farm land and animals
- Lack of economic diversity – single major employer or tourism
- Limited access to credit
- Minimal access to critical services
- No insurance
- Poor – social housing or low-rent areas

Environmental

- Areas of biodiversity and ecological value – wetlands
- Parks
- Resource degradation or depletion – forests
- Sensitive areas – coastline or fisheries

Capability to Respond and Recover

Impact severity and extent of vulnerability are dependent upon the capability or capacity to reduce the severity of impact.

Consider existing response and recovery capacity when describing a realistic hazard scenario.

The capability to respond and recover is defined as locally available strengths and capacities to reduce the impact of adverse conditions of a disaster. A deficiency in response or recovery capability can create an unacceptable exposure or vulnerability.

A few examples of response and recovery capacity include:

- first responders – fire, police, ambulance;
- emergency social services – reception centres;
- alert plan and system;
- evacuation plan;
- training and equipment – emergency operations centres;
- response and recovery plan; and
- hazard specific contingency plan.

Further examples of measures which reduce the likelihood or severity of a hazard are provided in the Risk Reduction Measures Checklist on page 5-5.

More examples of risk reduction capacity can be found in the on-line Community Emergency Program Review at <http://www.pep.bc.ca/cepr/review.html>.

STEP 5—RISK ANALYSIS

Objectives

- hold a risk analysis workshop with HRVA Advisory Committee;
- review the workplan checklist;
- review the Qualitative Risk Ranking Measures;
- complete the ranking of hazard severity and likelihood;
- complete the Risk Profile to prioritize the hazards;
- identify risk reduction measures for each high risk hazard;
- identify uncertainty or information gaps and seek expert information; and
- provide a progress report to the Executive Committee.

HRVA ADVISORY COMMITTEE
RISK ANALYSIS WORKSHOP

TO BE HELD AT _____

Time _____ Date _____

PROPOSED ATTENDEES:

Members of the HRVA advisory committee	Emergency Coordinator
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AGENDA

Item	Subject	
1	Welcome/Introduction of Participants	
2	Objectives: <ul style="list-style-type: none">• Review workplan checklist and risk ranking measures• Complete risk profile and identify risk reduction measures• Identify missing information• Draft progress report	
3	Review workplan checklist	
4	Review the Qualitative Risk Ranking Measures	
5	<ul style="list-style-type: none">• Rank hazard severity and then likelihood• The Web HRVA tool can be used to provide immediate feedback on changes to the risk profile (http://www.pep.bc.ca/hrva/hazard.html)	
6	Complete risk profile	
7	Identify risk reduction measures for each high risk hazard	
8	Identify information gaps and task individuals to seek information from hazard experts	
9	Draft progress report	
10	Way ahead - Next steps - Next meeting – Adjournment	

**HAZARD &
RISK ANALYSIS**

HRVA Committee: _____

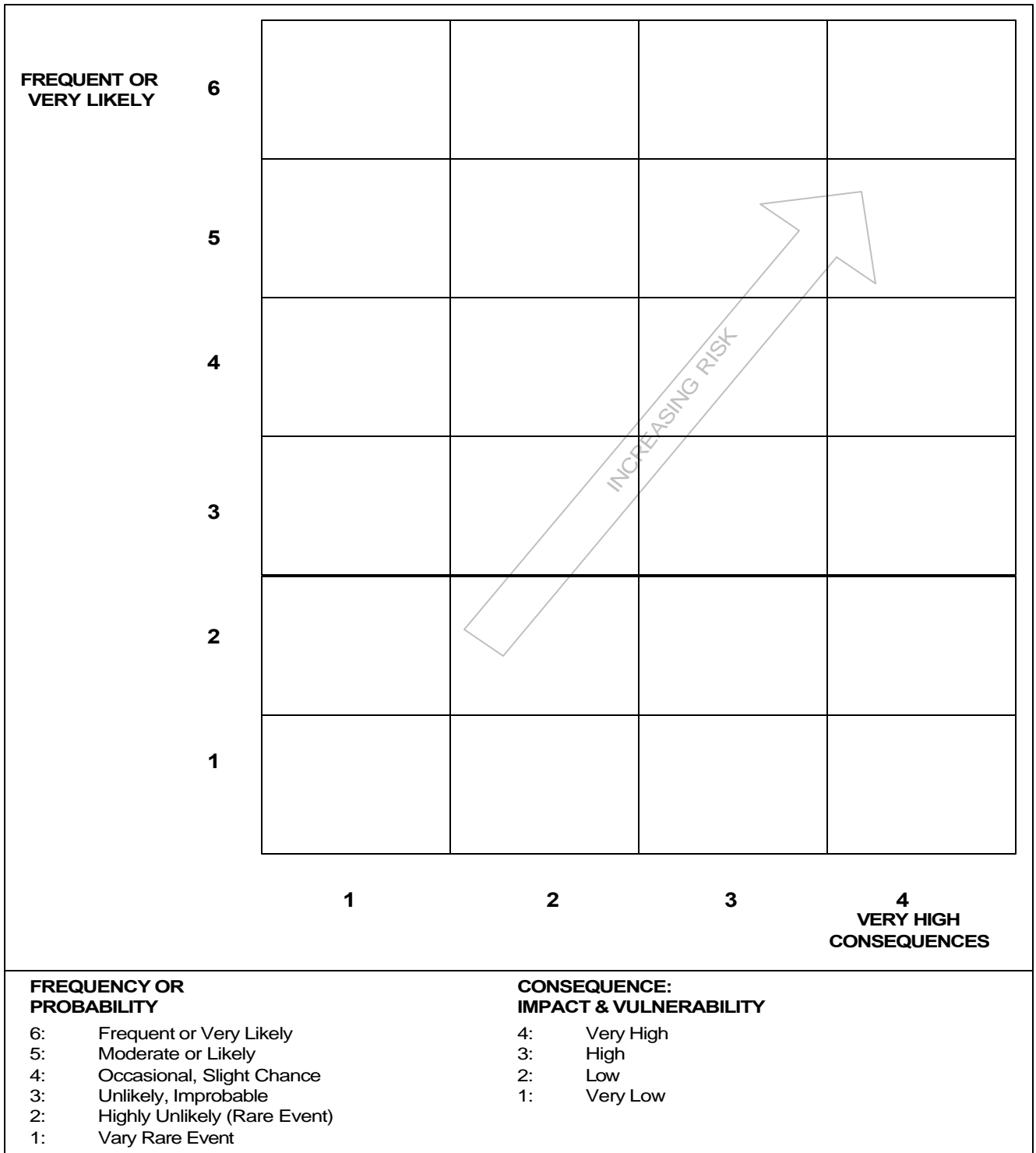
Date: _____

No.	HAZARD	SCENARIO DETAILS INCLUDING IMPACTS & VULNERABILITY	LIKELIHOOD	CONSEQUENCE SEVERITY
<p>LIKELIHOOD</p> <p>6: Frequent or Very Likely 5: Moderate or Likely 4: Occasional, Slight Chance 3: Unlikely, Improbable 2: Highly Unlikely (Rare Event) 1: Very Rare Event</p>		<p>CONSEQUENCE: IMPACT & VULNERABILITY</p> <p>4: Very High 3: High 2: Low 1: Very Low</p>		

RISK PROFILE

HRVA Committee: _____

Date: _____



Risk Reduction Measures Checklist

This checklist is provided to assist with brainstorming risk reduction measures. Most are all-hazard in nature. You should provide details of measures that apply to the hazards in your community. For example: construction: flood control works to target a spring freshet flooding hazard.

These measures are intended to either reduce the likelihood of a hazard event, reduce the severity of impact of the hazard, or both.

Strategy	Risk Reduction Measure	Details	Target Hazards
Mitigation	<i>Construction</i>		
Mitigation	<i>Emergency program guide</i>		
Mitigation	<i>Forecasts</i>		
Mitigation	<i>Hazard, risk and vulnerability analysis</i>		
Mitigation	<i>Hazard, vulnerability and response capability mapping</i>		
Mitigation	<i>Standards – building, engineering</i>		
Mitigation	<i>Update HRVA and emergency program guide</i>		
Mitigation	<i>Zoning and regulations to avoid hazard</i>		
Mitigation & preparedness	<i>Public education - community</i>		
Mitigation & preparedness	<i>Public education - schools</i>		
Mitigation & preparedness	<i>Public information</i>		
Mitigation & response	<i>Technical information sources</i>		
Preparedness	<i>Exercises & drills</i>		
Preparedness	<i>Training - government</i>		
Preparedness	<i>Training – local emergency program</i>		
Preparedness	<i>Training - volunteers</i>		
Response	<i>Alert and notification plan</i>		
Response	<i>Communications & warning systems</i>		

Risk Analysis

Strategy	Risk Reduction Measure	Details	Target Hazards
Response	<i>Damage assessment documentation</i>		
Response	<i>Emergency operations centre</i>		
Response	<i>Emergency operations staff</i>		
Response	<i>Emergency services capability</i>		
Response	<i>Evacuation plan and routes</i>		
Response	<i>Hazard specific contingency plan</i>		
Response	<i>Hazmat response capability</i>		
Response	<i>Incident command system</i>		
Response	<i>Liaison with external agencies</i>		
Response	<i>Mutual aid agreements</i>		
Response	<i>Public communication plan</i>		
Response	<i>Rapid damage assessment capability</i>		
Response	<i>Reception centres</i>		
Response	<i>Resource list</i>		
Response	<i>Response information management</i>		
Response	<i>Search and rescue volunteers</i>		
Response	<i>State of local emergency declaration</i>		
Response	<i>Urban search and rescue plan</i>		
Response & Recovery	<i>Emergency social services organization</i>		
Response & Recovery	<i>Financial organization</i>		
Response & recovery	<i>Psychological trauma capability</i>		
Recovery	<i>Business continuity plan</i>		
Recovery	<i>Debris removal, mortality plan</i>		
Recovery	<i>Financial and humanitarian assistance</i>		
Recovery	<i>Insurance</i>		
Recovery	<i>Reconstruction assistance</i>		

RISK REDUCTION MEASURES

HRVA Committee: _____

Date: _____

No.	HAZARD	RISK REDUCTION MEASURES

Qualitative Risk Ranking Measures

Assessing the likelihood of hazard scenarios and the magnitude of impacts requires the application of a consistent method of measurement. This section provides a means of ranking different hazards and examples to help with selection of an appropriate rank.

You should not rank the likelihood of a hazard scenario without first ranking the severity of consequences because the more severe a scenario is, the less likely it is to occur.

Consequences

There may be multiple impacts for a hazardous event. After you rank the severity of each applicable consequence you will need to input the “overall” severity rank into the Hazard & Risk Analysis form. If the highest consequence severity rank was “high” for any of the types of impacts, then choose this rank as the overall severity.

Likelihood

The likelihood rank chosen for a hazard is the occurrence frequency for the hazard scenario. The reason hazard likelihood is estimated after ranking consequence severity is best explained by an example.

Let the historical recorded frequency of a natural gas leak that causes a small evacuation, but no injury or death, be once every three years. If your hazard scenario includes one fatality then the likelihood is no longer “every three years”—it might be once every 10 or 20 years. Do not overestimate the likelihood of a “worst-case” scenario.

You may require assistance from a hazard expert. You can find appropriate hazard experts and sources of risk information on the Web by using the online HRVA tool at <http://www.pep.bc.ca/hrva/hazard.html>. Each hazard on the HRVA Web tool has a unique help tip. The online HRVA hazard likelihood help tip is accessed by clicking the likelihood choice control and choosing *Help Tip*.

DANGEROUS GOODS SPILL	Chemical, oil, hazardous waste, radiation	Very Low	Very Rare Event
EARTHQUAKE		Very Low	Very Rare Event
EPIDEMIC - ANIMAL	Foreign animal disease	Very Low	Highly Unlikely: Rare Event
EPIDEMIC - HUMAN	Pandemic flu	Very Low	Unlikely: Improbable
EXPLOSION OR EMISSIONS	Gas wells, pipelines	Very Low	Occasional: Slight Chance

The dropdown menu is open, showing the following options: Very Rare Event, Highly Unlikely: Rare Event, Unlikely: Improbable, Occasional: Slight Chance, Moderate or Likely, Frequent or Very Likely, Don't Know, Help Tip, and Very Rare Event.

HRVA Web tool help tips.

Consequence Severity

There are seven categories of impacts to be assessed for each hazard:

- fatality;
- injury;
- critical facilities;
- lifelines;
- property damage;
- environment; and
- economic and social.

Fatality:

Rank	Description	Criteria	Example
1	very low	0-4	No deaths
2	low	4-10	Avalanche
3	high	10-50	Mine explosion
4	very high	50+	Plane crash

Injury:

Rank	Description	Criteria	Example
1	very low	0-4	Auto accident
2	low	4-50	Bus accident
3	high	50-2000	Contaminated water
4	very high	2000+	Pandemic flu

Critical facilities (hospitals, fire/police services, etc.):

Rank	Description	Criteria	Example
1	very low	temporary relocation	Evacuation of a shelter
2	low	closure of a few days	School
3	high	loss of 50% of capability	First responders
4	very high	long term disruption	Hospital destroyed

Lifelines (water, gas, power, etc.):

Rank	Description	Criteria	Example
1	very low	temporary interruption	Ferry service
2	low	interruption for a few days	Power
3	high	interruption for a week	Water supply
4	very high	long term disruption	Bridge collapse

Property damage:

Rank	Description	Criteria	Example
1	very low	minimal damage	Flood damage—2 homes
2	low	localized damage	Mud slide—several homes
3	high	localized and severe	Interface fire—community
4	very high	widespread and severe	Dam failure

Environmental impact:

Rank	Description	Criteria	Example
1	very low	minimal damage	House fire
2	low	localized damage	Harbour oil spill
3	high	localized and severe	Toxic chemical spill
4	very high	widespread and severe	Radiation contamination

Economic and social impact:

Rank	Description	Criteria	Example
1	very low	temporary impact	Power loss
2	low	temporary and widespread	Loss of lifeline
3	high	extended and widespread	Pandemic flu
4	very high	long term disruption	Foot and mouth disease

Hazard Likelihood

Measure of likelihood	Return period in years
Frequent or very likely	Every 1 – 3 years
Moderate or likely	Every 3 – 10 years
Occasional, slight chance	Every 10 – 30 years
Unlikely, improbable	Every 30 – 100 years
Highly unlikely, rare event	Every 100 – 200 years
Very rare event	Every 200 – 300 years

Frequent or very likely to occur events usually have a high number of recorded incidents or anecdotal evidence. For example, a rural valley that is subject to some degree of flooding every year or so.

Moderate or likely to occur hazards also have a historical record but occur with a frequency of three to ten years. For example, an urban interface fire threat in a region that experiences forest fires every year.

Occasional or slight chance means events are those that occur infrequently. There may be little recorded historical evidence and a return interval of 10 to 30 years is possible. For example, a rail accident where dangerous goods are released.

Unlikely or improbable refers to hazards that are not expected to occur more frequently than once every 30 to 100 years. There may be no historical incidents in the community. For example, a commercial airplane ground collision with a total loss of life.

Highly unlikely or rare events are extremely unlikely and have a return period of 100 to 200 years. For example, a "one hundred year flood."

Very rare events may happen every 200+ years. For example, a magnitude 8 earthquake might occur every 200 years somewhere in coastal British Columbia.

STEP 6—RISK EVALUATION

Objectives

- review the workplan checklist;
- invite the PEP Regional Manager and a wider group of stakeholders to a Risk Evaluation workshop;
- hold a workshop to evaluate the risk profile and risk reduction measures and draft action plans; and
- provide a progress report to the Executive Committee.

Risk Evaluation Workshop

The purpose of this workshop is to gain input on the HRVA work to date from a wider group of stakeholders than the HRVA Advisory Committee. The workshop will:

- review risk profile and proposed risk reduction measures;
- record issues, concerns and acceptability of risk; and
- consider which mitigation measures should become draft action plans.

**HRVA ADVISORY COMMITTEE
RISK EVALUATION WORKSHOP**

TO BE HELD AT _____

Time _____ **Date** _____

PROPOSED ATTENDEES:

Members of the HRVA advisory committee, Consider inviting a wider group of stakeholders	Emergency Coordinator, PEP Regional Manager, Subject matter expert(s)
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AGENDA:

Item	Subject	
1	Welcome/Introduction of Participants	
2	Objectives: <ul style="list-style-type: none">• Review HRVA checklist• Review the risk profile and risk reduction measures• Draft action plans• Draft progress report	
3	Review HRVA checklist	
4	<ul style="list-style-type: none">• Review risk profile and proposed risk reduction measures.• Record issues, concerns and acceptability of risk	
5	Consider mitigation measures for action plans	
6	Draft progress report	
7	Way ahead - Next steps - Next meeting	
8	Adjournment	

STEP 7—PUBLIC CONSULTATION PLAN

Objectives

- identify stakeholders;
- for each high risk hazard, anticipate stakeholder issues; and
- create a public consultation action plan to gauge public acceptance of risk and risk reduction measures.

Risk reduction requires resources and the public will need to be informed about the risk profile, vulnerabilities and action items. The public consultation action plan is a key deliverable to the local Executive Committee and is an action item in your local emergency program guide.

Stakeholders

Create a list of key individuals, local media representatives, community groups, government representatives, industry and other publics likely to be interested in the results of the HRVA.

Applicable	Stakeholder group	Details of stakeholders
<input type="checkbox"/>	<i>Emergency social services</i>	
<input type="checkbox"/>	<i>General population</i>	
<input type="checkbox"/>	<i>Local business</i>	
<input type="checkbox"/>	<i>Local government</i>	
<input type="checkbox"/>	<i>Local industry</i>	
<input type="checkbox"/>	<i>Local interest groups</i>	
<input type="checkbox"/>	<i>Media</i>	
<input type="checkbox"/>	<i>Native government</i>	
<input type="checkbox"/>	<i>People at risk</i>	
<input type="checkbox"/>	<i>Provincial Emergency Program</i>	
<input type="checkbox"/>	<i>Provincial government</i>	
<input type="checkbox"/>	<i>Provincial health authority</i>	
<input type="checkbox"/>	<i>Provincial interest groups</i>	
<input type="checkbox"/>	<i>Regional government</i>	
<input type="checkbox"/>	<i>Regional interest groups</i>	
<input type="checkbox"/>	<i>Schools</i>	
<input type="checkbox"/>	<i>Special needs groups</i>	
<input type="checkbox"/>	<i>Vulnerable people</i>	
<input type="checkbox"/>		
<input type="checkbox"/>		
<input type="checkbox"/>		

Level of Concern of Stakeholders

List the highest risk hazards from Step 5, identify the key stakeholders and highlight the major issues for each. Consider vulnerabilities, impacts and the effect of any risk reduction measure on stakeholders.

High risks	Stakeholders	Issues
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Public Consultation Plan

Public Consultation Action Plan

Schedule of public consultation activities.

Activity	Target Date	Personnel Resource	Funding or logistical requirement												
<i>Draft public consultation plan - local authority</i>															
<i>Letter - government representatives</i>															
<i>Letter - vulnerable population</i>															
<i>News release - media</i>															
<i>Advertising in local paper - general public</i>															
<i>Newsletter - general public</i>															
<i>Meetings - first responders, industry</i>															
<i>Town hall exhibit and meeting - general public, interest groups, industry, business, media</i>															

Weeks/Months

**Enter Task completion date in the "Target Date" column. Enter week or months in the square at the top of each column. For each activity, draw a horizontal line indicating the duration spanning the weeks or months where public consultation activities will be in progress.*

STEP 8—ACTION PLANS

Objectives

- review the risk reduction measures;
- review the HRVA, draft **action plans** and **public consultation action plan** with your PEP Regional Manager;
- finalize **action plans** for your local Emergency Program Guide;
- present the HRVA, **action plans** and **public consultation action plan** to your Management and Executive Committees; and
- update your local Emergency Program Guide with the accepted **action plans** and implementation schedule.

More information on action plans can be found in the *Local Authority Emergency Management Guide*.

Each Action Plan should be described in terms of six elements:

- **Rationale** – Explains why the effort is required and how it serves the objectives or overall mission of the Emergency Program;
- **Project** – Summarizes the action to be taken to clarify the intent of the effort. Where appropriate, this section outlines the scope of the action and any limitations to consider in issuing assignments;
- **Tasks** – Lists the recommended actions to consider in selecting personnel, estimating time requirements, and setting a budget. In some tasks, several persons may be required to work together to accomplish the intended results;
- **Responsible** – Identifies the individual with the responsibility and authority to cause or to carry out the Action Plan. In some plans, the responsible person will facilitate or oversee the work of others, such as volunteers or contractors;
- **Due Date** – Names the target year or date for completion of the Action Plan; and
- **Budget** – Estimates the funds required to complete the actions. Dollar figures shown do not include time commitments of the Emergency Coordinator or volunteers.

An action plan form is included.

Action Plan

<i>Action plan</i>	
<i>Objective</i>	
<i>Rationale</i>	
<i>Project</i>	
<i>Tasks</i>	
<i>Responsible</i>	
<i>Dates</i>	
<i>Budget</i>	



January 2004/500 copies