Ontario

PROVINCIAL NUCLEAR EMERGENCY RESPONSE PLAN

IMPLEMENTING PLAN

FOR A

TRANSBORDER NUCLEAR

EMERGENCY

May 2011

Prepared by Emergency Management Ontario
Ministry of Community Safety and Correctional Services

Ontario
Executive Council
Conseil exécutif

Order in Council
Décret

On the recommendation of the undersigned, the Lieutenant Governor, by and with the advice and concurrence of the Executive Council, orders that:

Sur la recommandation de la personne soussignée, le lieutenant-gouverneur, sur l'avis et avec le consentement du Conseil exécutif, décrète ce qui suit :

WHEREAS section 8 of the *Emergency Management and Civil Protection A*ct R.S.O. 1990 c. E.9, as amended, requires the Lieutenant Governor in Council to formulate an emergency plan respecting emergencies arising in connection with nuclear facilities;

AND WHEREAS the Provincial Nuclear Emergency response Plan – Master Plan (the "Master Plan") was approved by the Lieutenant Governor in Council by Order in Council 260/2009;

AND WHEREAS the Master Plan provides for the approval of a series of Implementing Plans to directly address emergencies in respect of specific nuclear facilities or radiological issues;

NOW THEREFORE the document entitled "Provincial Nuclear Emergency Response Plan – Implementing Plan for a Transborder Nuclear Emergency" and dated May 2011, be approved as an emergency plan under section 8 of the *Emergency Management and Civil Protection Act*.

Recommended _____
Minister of ~~Community~~ Safety and Correctional Services

Concurred _____
Chair of Cabinet

Approved and Ordered JUN 22 2011
Date

_____
Lieutenant Governor

O.C./Décret 1252/2011

FOREWORD

The Province of Ontario's Nuclear Emergency Response Plan has been developed pursuant to Section 8 of the ***Emergency Management and Civil Protection Act*, R.S.O. 1990, c. E. 9 (hereafter referred to as the *Emergency Management and Civil Protection Act or EMCPA*)**. The current edition of this plan supersedes and replaces all older versions which should be destroyed.

Holders of the Provincial Nuclear Emergency Response Plan Implementing Plan for Transborder Nuclear Emergency are responsible for keeping it updated by incorporating amendments, which may be issued from time to time.

This public document is administered by the **Minister of Community Safety and Correctional Services of Ontario**. All comments and suggestions relating to it should be directed to:

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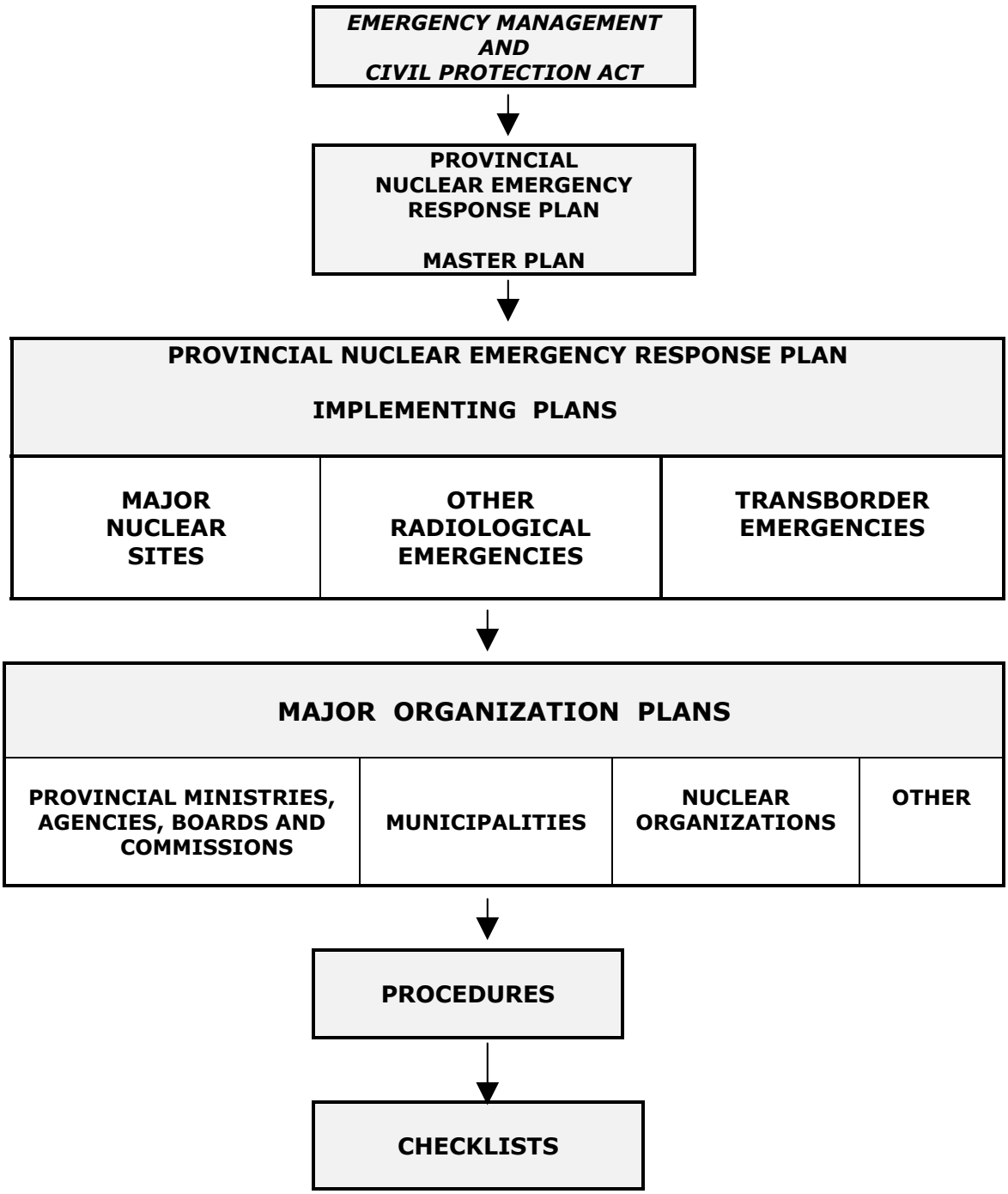

FIGURE I : PROVINCE OF ONTARIO NUCLEAR AND RADIOLOGICAL EMERGENCY RESPONSE PLANNING STRUCTURE

PROVINCE OF ONTARIO NUCLEAR AND RADIOLOGICAL EMERGENCY RESPONSE PLANNING STRUCTURE

The structure for nuclear and radiological emergency response planning in Ontario, which is illustrated in **Figure I** (**page ii**), consists of the following components:

- The ***Emergency Management and Civil Protection Act*** (EMCPA) requires and authorizes the formulation of the plan.

- **The Provincial Nuclear Emergency Response Plan (PNERP)**:
  Developed pursuant to Section 8 of the EMCPA and subject to Cabinet approval:

  - **The Master Plan:** sets out the overall principles, policies, basic concepts, organizational structures and responsibilities.

  - **The Implementing Plans**: the elements of the Master Plan are applied to each major nuclear site, transborder emergencies and other types of radiological emergencies, and detailed provincial implementing plans developed.

- **Major Organization Plans :** Each major organization involved (provincial ministries, agencies, boards and commissions, municipalities, and nuclear organizations, etc.) develops its own plan to carry out the relevant roles, responsibilities and tasks agreed to by them and consistent with their mandate.

- **Procedures :** Based on all of the above plans, procedures are developed for the various emergency centres to be set up and for the various operational functions required.

- **Checklists :** The culmination of the planning process is the development of checklists based on the requirements of the procedures, e.g., individual position or function-specific checklists.

It is necessary that everyone involved in the preparation and implementation of the Provincial Nuclear Emergency Response Plan employ common terminology. The terminology contained in the **Glossary**, **Annex E**, should be used for this purpose by all concerned. Further reference information can be found in the Incident Management System(IMS) doctrine at www.ontario.ca/ims.

PROVINCE OF ONTARIO

TRANSBORDER NUCLEAR EMERGENCY RESPONSE PLAN

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ACRONYMS AND ABBREVIATIONS

ADM	-	Assistant Deputy Minister
AECL	-	Atomic Energy of Canada Limited
AIM	-	Abnormal Incident Manual
ALARA	-	'As low as reasonably achievable'
AMG	-	Assurance Monitoring Group
AGPWMGP	-	Assurance/General Province-Wide Monitoring Group Plan
BWR	-	Boiling Water (nuclear) Reactor
CANDU	-	The name of the Canadian developed nuclear power reactor system (from Canada Deuterium Uranium)
CCEM	-	Cabinet Committee on Emergency Management
CEMC	-	Community Emergency Management Coordinator
CEM	-	Commissioner of Emergency Management
CESC	-	Corporate Emergency Support Centre
CEOC	-	Community Emergency Operations Centre
CEOF	-	Corporate Emergency Operations Facility
CNSC	-	Canadian Nuclear Safety Commission
CRC	-	Corporate Response Centre
CRL	-	Chalk River Laboratories
CZ	-	Contiguous Zone
DNGS	-	Darlington Nuclear Generating Station
EB	-	Emergency Bulletin
ECI	-	Emergency Coolant Injection
EFADS	-	Emergency Filtered Air Discharge System
EMCPA	-	Emergency Management and Civil Protection Act
EIC	-	Emergency Information Centre
EI	-	Emergency Information
EIS	-	Emergency Information Section
EMO	-	Emergency Management Ontario
ENERGY	-	Ministry of Energy
EOC	-	Emergency Operations Centre

EPZ - Emergency Planning Zone
ERAP - Emergency Response Assistance Plan
ER - Emergency Response
ERMG - Environmental Radiation Monitoring Group
FADS - Filtered Air Discharge System
FDA - Food and Drug Administration
FNEP - Federal Nuclear Emergency Plan
GOC - Government Operations Centre
Gy - Gray. See definition of Absorbed Dose in **Glossary, Annex E**
HAZMAT - Hazardous Material
HC - Health Canada
IAEA - International Atomic Energy Agency
INES - International Nuclear Event Scale
JTCC - Joint Traffic Control Centre
JTCP - Joint Traffic Control Plan
KI - Potassium Iodide
km - Kilometre
LGIC - Lieutenant Governor In Council
LHDR - Laurentian/Hills Deep River
LHDRRNEPC - Laurentian Hills/Deep River Regional Nuclear Emergency Preparedness Committee
LOCA - Loss-of-Coolant Accident
LOECI - Loss of Emergency Coolant Injection
MCSCS - Ministry of Community Safety and Correctional Services
MCSS - Ministry of Community and Social Services
MDU - Monitoring & Decontamination Unit
MEMC - Ministry Emergency Management Coordinator
MEOC - Ministry Emergency Operations Centre
Met - Meteorology, meteorological

MMAH - Ministry of Municipal Affairs and Housing
MNDMF - Ministry of Northern Development Mines and Forestry
MNR - Ministry of Natural Resources
MOE - Ministry of the Environment
MOHLTC - Ministry of Health and Long-Term Care
MOL - Ministry of Labour
mSv - Millisievert
MTO - Ministry of Transportation, Ontario
NIG - Nuclear Incident Group
NEMCC - Nuclear Emergency Management Coordinating Committee
OMAFRA - Ontario Ministry of Agriculture, Food and Rural Affairs
OPG - Ontario Power Generation
OPP - Ontario Provincial Police
PAL - Protective Action Level
PNERP - Provincial Nuclear Emergency Response Plan
PNGS - Pickering Nuclear Generating Station
PWR - Pressurized Water (nuclear) Reactor
PHWR - Pressurized Heavy Water (nuclear) Reactor
PEOC - Provincial Emergency Operations Centre
PZ - Primary Zone
rad - See definition of Absorbed Dose in **Glossary, Annex E**
RAG - Regional Action Group
RD - Radiological Device
RDD - Radiological Dispersal Device
rem - See definition of Equivalent Dose in **Glossary, Annex E**
RHRP - Radiation Health Response Plan
RNEMCC - Regional Nuclear Emergency Management Coordinating Committee
SRP - Site Reference Plan
SMC - Site Management Centre

Sv	-	Sievert. See definition of Equivalent Dose in **Glossary, Annex E**
SZ	-	Secondary Zone
TRF	-	Tritium Removal Facility
TLD	-	Thermoluminescent Dosimeter
UTM	-	Universal Transverse Mercator
WHO	-	World Health Organization

CHAPTER 1

GENERAL

1.1 Aim of Plan

The aim of the Provincial Nuclear Emergency Response Plan (PNERP) Implementing Plan for a Transborder Nuclear Emergency, is to prescribe the measures that should be undertaken to deal with a nuclear emergency caused by an accident or event occurring at a nuclear installation* outside Ontario, which could affect the province.

(***Note** : A nuclear emergency caused by the Fermi 2 Nuclear Generating Station in Michigan State is covered in the Fermi 2 Nuclear Emergency Response Plan, and is **not** considered in this plan*).

1.2 Scope of Plan

1.2.1 This Implementing Plan should be read and applied in the context of the PNERP, Master Plan.

1.2.2 In case of any apparent differences between the provisions of the PNERP Master Plan and this Implementing Plan, the latter being more detailed and specific is applicable.

1.2.3 Together, these two plans focus on provincial level actions and should therefore be supplemented by the appropriate municipal and other plans and procedures (**section 1.3** below).

1.3 Other Plans and Procedures

1.3.1 Any jurisdictions and organizations that have, or are assigned responsibility for responding to a transborder nuclear emergency should develop appropriate plans/procedures for carrying out their roles and tasks.

1.3.2 Municipalities with areas within the Secondary Zone (**section 2.5**) of a transborder nuclear installation should include an appropriate reference to the relevant provisions of this plan in their Municipal Emergency Plan.

* a facility containing a nuclear reactor

CHAPTER 2

CHARACTERISTICS OF A TRANSBORDER INCIDENT

2.1 The Potential Hazard

2.1.1 A transborder nuclear incident or event involving the release of radioactive material to the atmosphere* could result in such material being transported towards Ontario and its deposition on certain areas of the Province.

2.1.2 Because of the distances involved, a transborder incident would likely not pose any direct hazard to people through external exposure to radioactivity and therefore would not require exposure control protective measures such as sheltering and/or evacuation.

2.1.3 The main hazard would most likely be the radiological contamination of food and water supplies that could, depending on the levels, pose a hazard to people and animals if ingested. The main concern would be those areas lying within 80 km (50 miles) of the nuclear facility at which an accident occurs.

2.1.4 The pattern of radiological contamination within Ontario resulting from a transborder accident would vary, depending on the distance to the source of the released radioactive material. From an operational perspective, two types of incidents can be identified, as discussed below.

2.2 Near Incident

2.2.1 **For emergency management purposes, a Near Incident shall be defined as a nuclear accident or event at a site within the states and provinces adjacent to Ontario.**

2.2.2 The radioactive emission resulting from a Near Incident could reach Ontario in two modes:

(a) As a plume. In this case the emission is likely to have a greater impact on areas over which it passes which are closer to its source than those farther away.

(b) Transported by higher altitude winds and deposited in a dispersed pattern over any part of the province.

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* Release of radioactive material to a lake adjoining Ontario would not pose a hazard because of the massive dilution effect of the lake water. Any risk through contamination of marine life would be dealt with under existing environmental control programs.

2.2.3 Near Incident Sites

(a) **Annex A**, **Appendix 1** lists the nuclear installations located within the states and provinces adjacent to Ontario that are within 80 kilometres, which could cause a Near Incident. These sites are shown in **Figures 2.1 and 2.2**.

(b) **Annex A**, **Appendix 2** lists the nuclear installations in jurisdictions adjoining Ontario that are beyond 80 km. These sites are shown in **Figure 2.3**.

2.3 Far Incident

2.3.1 **For emergency management purposes, a Far Incident shall be defined as a nuclear accident or event anywhere in the world which could affect Ontario, other than a Near Incident**.

2.3.2 The radioactive emission resulting from a Far Incident would likely only reach Ontario through transport by upper layer winds. Whether any such radioactive material reaches the province would depend on:

- the nature of the accident (especially the amount of radioactive material released and the energy in the release),
- the distance to the source, and
- meteorological conditions.

2.3.3 If any radioactive material did reach Ontario, it would be deposited fairly evenly over the province, except where precipitation brought down radioactive material in a more concentrated form.

2.4 Protective Measures

Ingestion Control Measures may be required to deal with the possible hazard from a transborder nuclear emergency:

(a) Milk, Food and Water Control

Banning the consumption of milk, food and water that may have been contaminated, and banning their export outside the affected area.

(b) Pasture Control

Removing milk and meat producing animals from pasture and access to open water sources, and supplying them with uncontaminated feed and water.

(c) Produce and Crop Control

Restricting the harvesting or processing of potentially or actually contaminated crops, vegetables and fruits, and banning their export outside the affected area.

(d) Livestock Control

Ordering the quarantine of livestock in the affected area to prevent movement to other areas, and banning slaughter of such animals for food.

2.5 Secondary Zone Municipalities

2.5.1 The Secondary Zone is defined as the area within which it is necessary to plan and prepare for taking ingestion control measures, as per **section 2.4** above.

2.5.2 In terms of ingestion control protective measures it is likely that, only this Secondary Zone will be considered in a transborder nuclear emergency. The radius of the Secondary Zone shall be 80 km from the nuclear installation.

2.5.3 The municipalities within the Secondary Zone of the Near Incident Sites within 80 kilometres of Ontario are listed in **Annex B**.

2.6 Emergency Organization

2.6.1 Province

(a) The emergency management organization shall be based on the Incident Management System (the **PNERP Master Plan**, **Chapter 4**) and shall include some of the elements of that organization (see **paragraph 3.3.2**).

(b) Liaison Arrangements

(i) In the event of a Near Incident at a nuclear installation lying within 80 kilometres of Ontario, the PEOC will contact the affected municipality(ies) in Ontario and the affected U.S. State Emergency Operations Centre and discuss the option of deploying liaison teams:

- to the affected Secondary Zone municipalities (**Annex B**).
- to the jurisdiction in which the incident has taken place.

(ii) These teams may be comprised of:

- EMO Field Officers
- Technical Staff
- Emergency Information (EI) Officers

As appropriate to the situation.

(c) Municipalities

Secondary Zone municipalities should be able to carry out their roles in a transborder nuclear emergency (implementing and/or assisting in the implementation of ingestion control measures (**section 2.5**)) using their normal organizational structure. Only in exceptional cases would it become necessary for a Secondary Zone municipality to set up a full emergency response organization.

2.7 Arrangements with Other Jurisdictions

Ontario is developing agreements with adjoining jurisdictions containing Near Incident sites regarding the arrangements for mutual aid assistance in the event of a nuclear emergency originating in one of them (or in Ontario).

These agreements include the following items:

(a) Notification arrangements.

(b) Exchange of information.

(c) Agreement to receive, accommodate and provide facilities to provincial staff deployed to other jurisdictions (**paragraph 2.6** above).

(d) Coordination of Emergency Information.

2.8 International Arrangements

2.8.1 Canada and the United States have adopted a Joint Radiological Emergency Response Plan which provides for early notification, coordination of activities, and provision of mutual aid between the two countries in the event of a nuclear emergency that could affect or involve both of them.

2.8.2 Canada is a signatory to various international conventions sponsored by the International Atomic Energy Agency (IAEA). These include those covering international notification of a nuclear accident, and the provision of information and assistance in such a situation.

2.8.3 The Chief , Emergency Management Ontario, will ensure that arrangements are in place so that relevant notifications received by the Government of Canada under **paragraphs 2.8.1** and **2.8.2** above, are promptly conveyed to the PEOC.

2.9 Nuclear Emergency Response in the United States

Annex C outlines the roles of the various jurisdictions and organizations in responding to an accident/event at a nuclear installation in the USA.

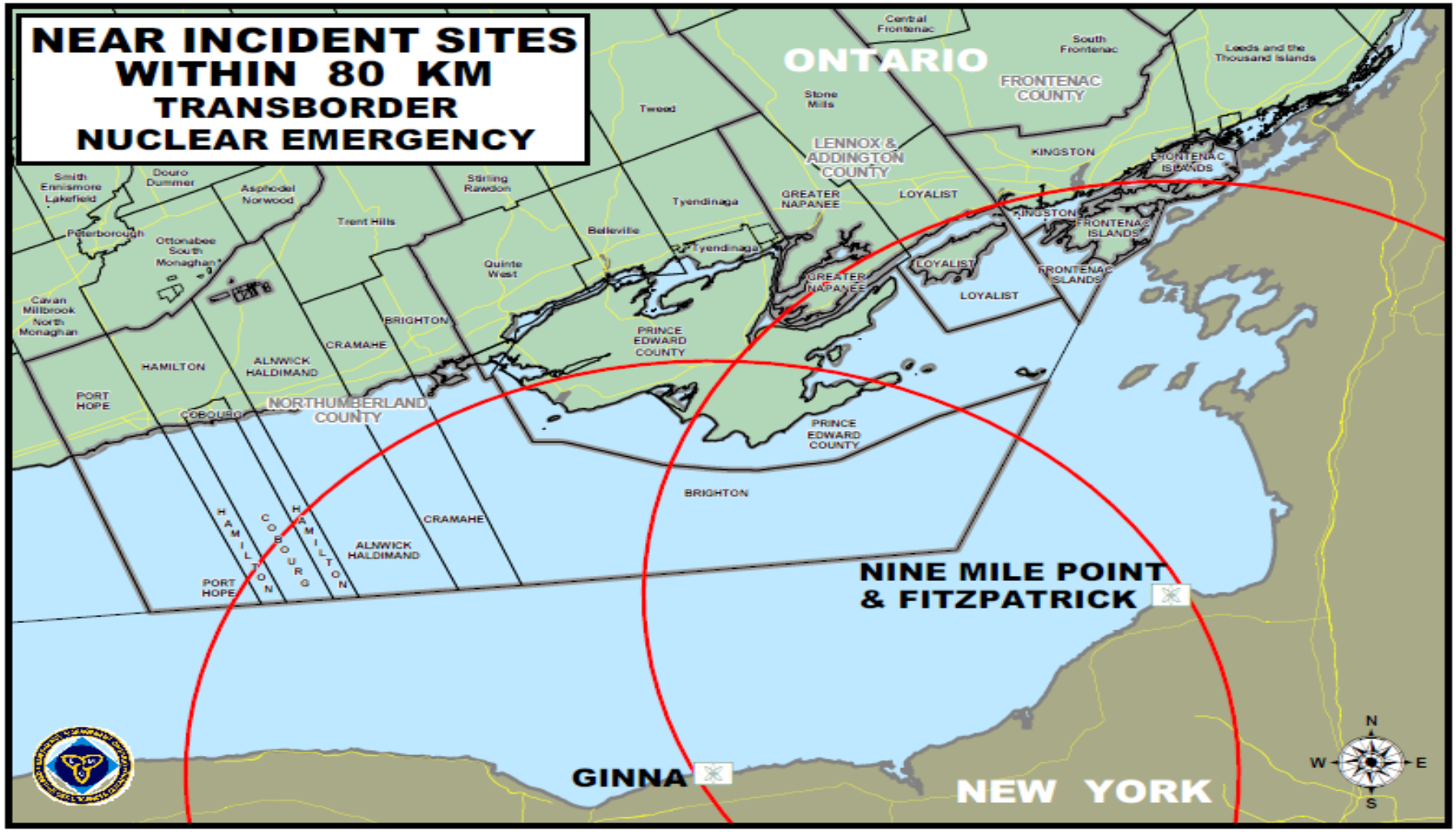

FIGURE 2.1 : NEAR INCIDENT SITES (within 80 kms) - Part I
(continued)

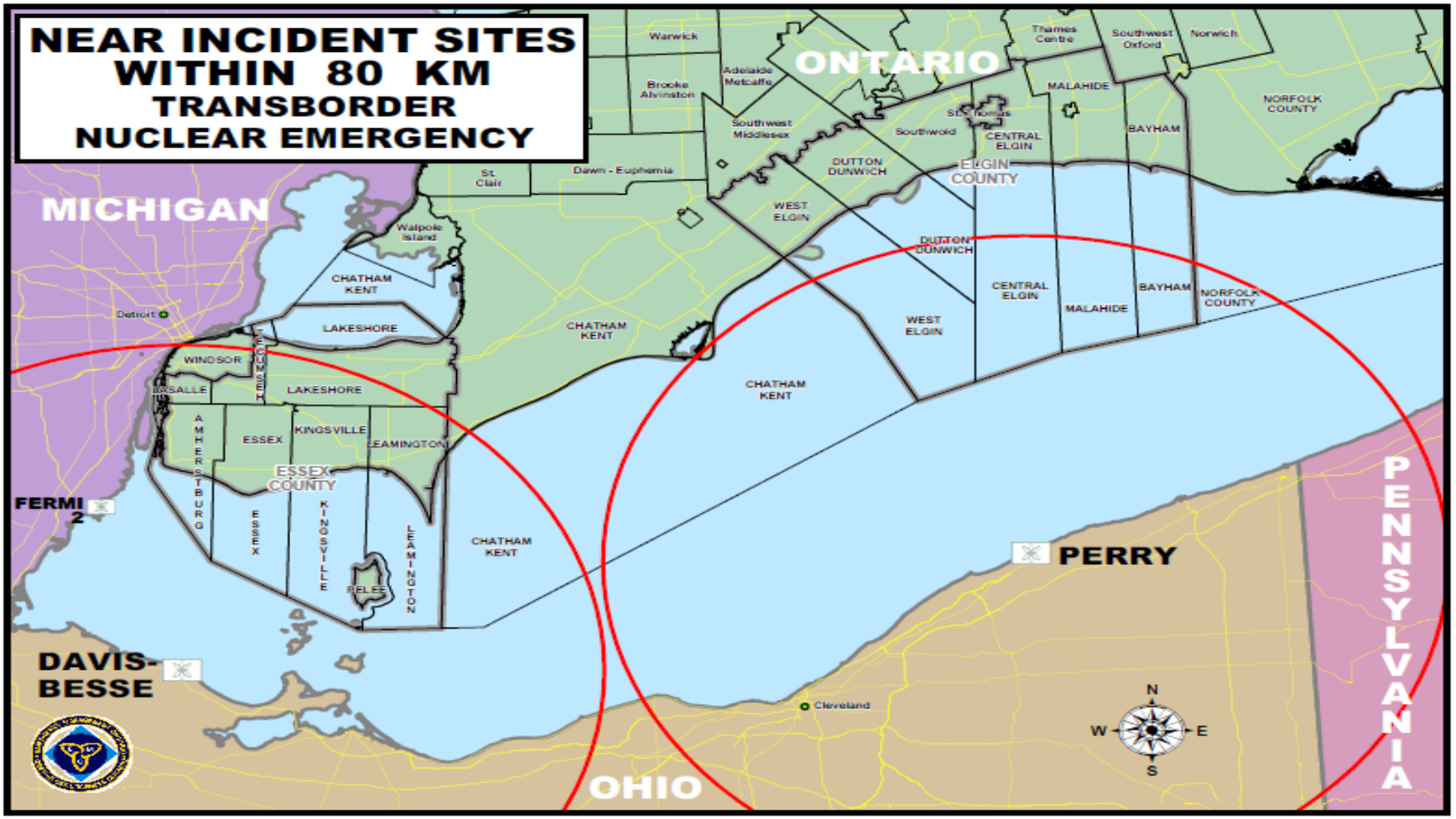

FIGURE 2.2 : NEAR INCIDENT SITES (within 80 kms) - Part II

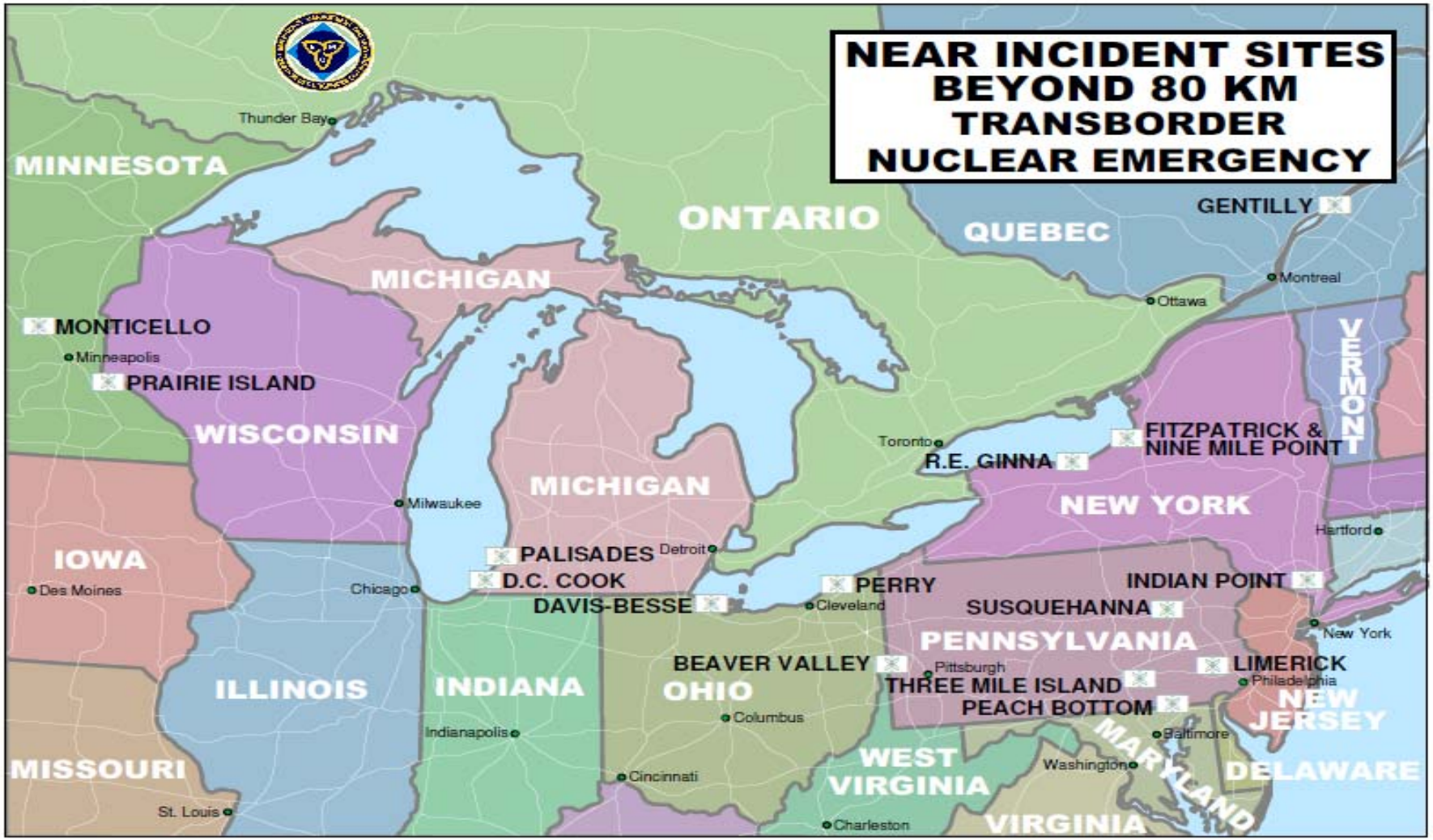

FIGURE 2.3 : NEAR INCIDENT SITES (beyond 80 kms)

CHAPTER 3

NOTIFICATION AND INITIAL RESPONSE

3.1 Initial Notification

3.1.1 Near Incident

(a) Under the agreements entered into by Ontario with adjoining Near Incident jurisdictions, those jurisdictions will notify the PEOC whenever one of their nuclear installations initiates an emergency notification. (In some cases notification of the lowest level event will not be made).

(b) A backup notification should also be received by the PEOC from the Government of Canada (Public Safety Canada).

(c) The notification categories used by the Near Incident sites are explained in **Annex D**.

3.1.2 Far Incident

(a) Official notification of a Far Incident will be received by the PEOC from the Government of Canada (Public Safety Canada).

(b) The information likely to be contained in such a notification is covered in **Annex D**.

(c) It is conceivable that the first indication of the occurrence of a Far Incident may be a report by the media, in which case the PEOC shall seek confirmation from Public Safety Canada of any such events.

3.2 Initial Response

3.2.1 The *initial* response to a notification of a transborder incident is shown in **Figure 3.1**.

3.2.2 The main actions required to be taken under each type of initial response level are given in **Table 3.2**.

3.2.3 The response level initially adopted, or in effect at any time, can be changed to another level, if considered appropriate, by the PEOC. All concerned or affected shall be notified of any such change.

3.2.4 The response to a transborder incident may be terminated, when considered appropriate, by the PEOC and all concerned shall be informed.

3.3 Internal Notifications

3.3.1 Whenever the PEOC receives a notification resulting in Routine Monitoring, the normal PEOC Duty Staff procedures shall apply.

3.3.2 Whenever the PEOC adopts Enhanced Monitoring, the appropriate staff will be notified, as follows:

(a) Command

- Commander
- Chief, Operations
- Chief Scientist
- Chief, Emergency Information
- Emergency Information staff
- MOHLTC Representative
- Emergency Management Assistant

(b) Operations Section

- Chief, Operations
- Operations Officers
- Emergency Management Assistants
- Community Assistance Team

Provincial ministries and Federal departments that could be required include:

Provincial ministries:

- OMAFRA
- MOHLTC
- MNR
- MOE
- MOL
- MTO
- OPP Duty Office

Federal departments:

- Public Safety Canada
- Health Canada
- Canadian Nuclear Safety Commission

Other Representatives:

- as deemed appropriate

(c) Elements of the Scientific Section
(see **Section 5.5** and **Figure 3.3**):

- Chief Scientific Section
- Environmental Radiation Monitoring Group
- Assurance Monitoring Group
- General Province-Wide Monitoring Group
- Others, as deemed appropriate

3.3.3 Other Organizations

(a) Each ministry/jurisdiction/organization receiving a notification of plan activation should issue an appropriate internal notification to its agencies and individuals who are required to respond.

(b) In some cases, ministries may need to activate their MEOCs.

3.4 External Notifications

When the PEOC receives notification of a Near Incident requiring adoption of Enhanced Monitoring, it shall notify the following departments within the Federal government:

- Health Canada
- Public Safety Canada
- Canadian Nuclear Safety Commission
- Canadian Coast Guard

3.5 Implementation of Transborder Plan

This Transborder Implementing Plan shall be implemented whenever the PEOC receives notification of a Transborder incident that may affect Ontario.

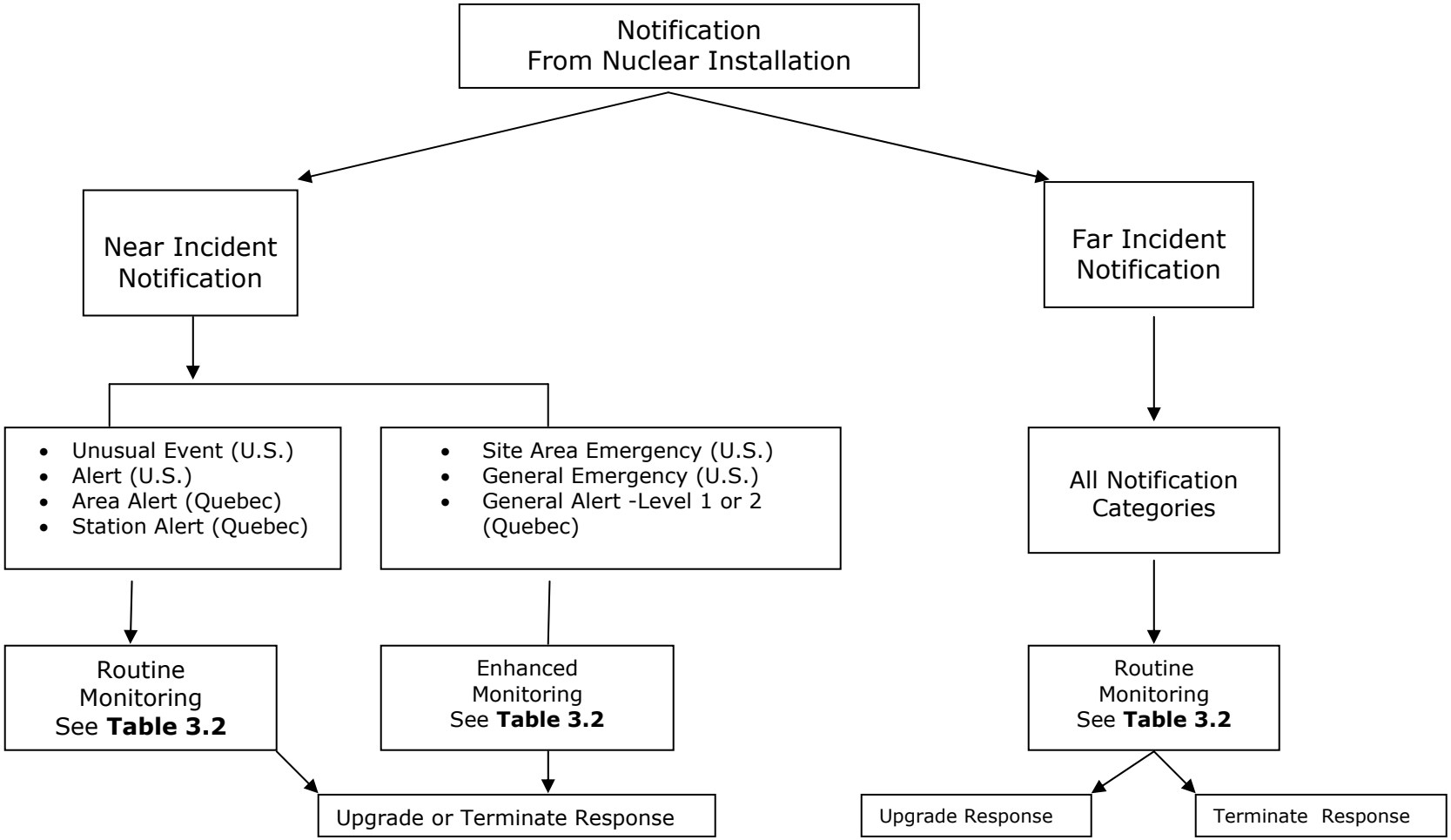

FIGURE 3.1 : NOTIFICATION AND INITIAL RESPONSE

RESPONSE LEVEL	MAIN ACTIONS TO BE TAKEN
ROUTINE MONITORING (ref: **Chapter 4**)	1. PEOC duty staff monitors the situation. 2. Ongoing assessments carried out regarding the following issues: (a) Has there been a release of radioactive material? (b) Is there a reasonable possibility that this radioactive material could reach Ontario? (For the factors involved, see **paragraph 2.2.2**). 3. If at any stage the probable answer to **both** these questions is in the affirmative, proceed to *Enhanced Monitoring* (see below). Otherwise, reference **Chapter 4** and, terminate the offsite response at an appropriate time. 4. Near Incident If the notification category is changed to *Site Area Emergency/ General Emergency/General Alert Level 1 or 2,* proceed to *Enhanced Monitoring*. (see below).
ENHANCED MONITORING (ref: **Chapter 5**)	1. PEOC to assemble the organization as per **section 3.3** and make the necessary notifications. 2 Near Incident a. Municipalities in the Secondary Zone (**Annex B**) to be notified b. Operations as per **Chapter 5** initiated. 3. Far Incident Operations as per **Chapter 5** initiated, as appropriate.

TABLE 3.2 : INITIAL PROVINCIAL RESPONSE

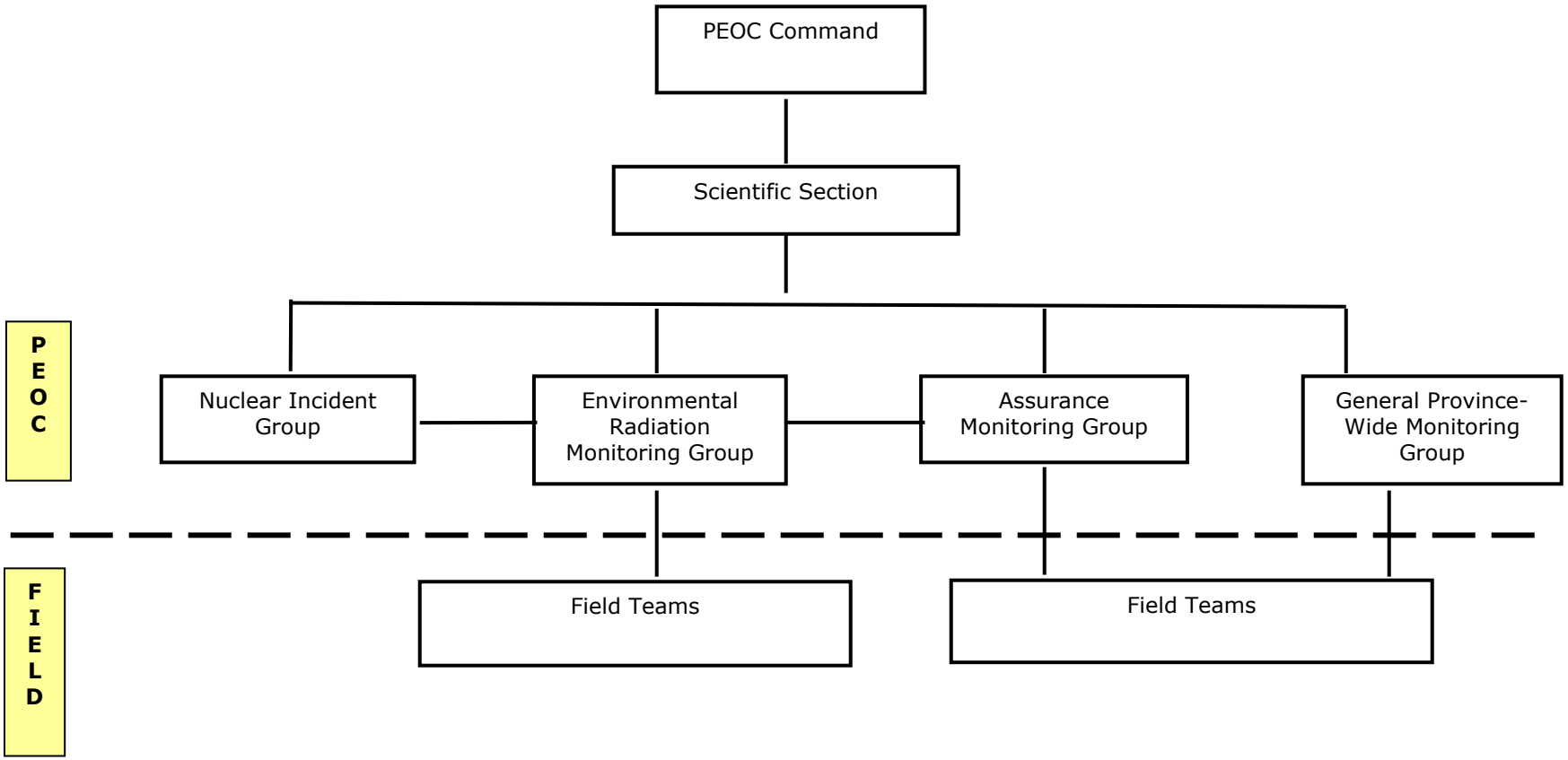

FIGURE 3.3.: SCIENTIFIC SECTION

CHAPTER 4

OPERATIONS - ROUTINE MONITORING

4.1 Overview of Operations

4.1.1 Normally, a Routine Monitoring response would be adopted for:

- Any Far Incident notification
- A Near Incident, where the notification category was limited to either an Unusual Event/Alert (U.S.) or Area Alert/Station Alert (Quebec).

4.1.2 During this Routine Monitoring response, the PEOC will carry out ongoing assessments (as deemed appropriate) to determine whether there is a reasonable possibility of radioactive material from the incident reaching Ontario. Assistance in this regard will be obtained from federal and provincial meteorological agencies.

4.1.3 In the event that assessments indicate radioactive material is likely to reach Ontario, the PEOC should upgrade the response to Enhanced Monitoring (see **Table 3.2**) and the appropriate operations will be conducted (**Chapter 5**).

4.1.4 Otherwise, Routine Monitoring for this event should continue until the event is no longer considered a potential threat to the citizens of Ontario. The response to the incident should then be terminated.

4.1.5 Emergency Information

The PEOC will arrange for information on the incident, and the measures being taken to deal with it, to be issued to the media and the public, as deemed appropriate.

4.1.6 Restriction on Food Imports

a. The Federal government may impose restrictions on the import of food items from abroad that may have been contaminated. The Ministry of Agriculture, Food and Rural Affairs (OMAFRA), may be required to assist in the implementation.

b. If significant levels of contamination are known to have occurred in some part of Canada, the PEOC should consider whether any restrictions need to be applied on the import into the province of food items from that area, and discuss appropriate recommendations and actions with the following PEOC representatives:

- MOL
- MOE
- OMAFRA
- MTO
- Ministry of Intergovernmental Affairs (MIA)
- MOHLTC
- OPP
- Federal Representatives

CHAPTER 5

OPERATIONS - ENHANCED MONITORING

5.1 Overview of Operations

5.1.1 If the PEOC receives notification of a Near Incident (as defined in **section 2.2**), the associated response will depend on the notification category of the incident:

- For an Unusual Event/Alert (U.S.) or an Area Alert/ Station Alert (Quebec) notification, the response should be Routine Monitoring (see **Chapter 4**).

- For Site Area/General Emergency (U.S.) or a General Alert 1 or 2 (Quebec) notifications, the response should be Enhanced Monitoring.

The remainder of this chapter will focus on the Enhanced Monitoring response.

5.1.2. In order to gather radiological information about the contamination (e.g. plume and deposition, air and ground concentrations, exposure rates, etc.) the PEOC will direct radiation monitoring for:

(a) the area within the Secondary Zone boundary (i.e. 80 km from the incident station)

(b) selected sites around the Province.

5.1.3 Hybrid teams comprising members from federal, provincial, Ontario's nuclear facilities and private sector organizations, will be assembled to jointly carry out the radiation monitoring activities. The PEOC will have the overall responsibility of organizing and coordinating the radiation monitoring resources and utilization of findings.

5.1.4 Initially, **aerial** field-monitoring teams will be deployed to perform radiation monitoring to:

(a) identify the type of radioactive contaminants;

(b) determine how far they have spread and in what direction; and

(c) determine if additional resources are needed.

The information can then be used to direct **ground** monitoring resources to carry out more detailed field surveys, in areas of concern to develop a more refined contamination picture.

5.1.5 Based on this radiological information, the PEOC can establish the initial boundaries of various response zones (**section 5.6**) within which appropriate ingestion control measures can be ordered.

5.1.6 The radiological picture of the contaminated area will continue to change over time due to radioactive decay, natural processes of weathering, dispersion, dilution, etc. as well as human activities and intervention. It will therefore be necessary to continue an elaborate field-monitoring program to keep track of this changing radiological situation. As more accurate data is accumulated, the boundaries of these zones and therefore ingestion control measures will be appropriately adjusted.

5.2 Initial Operations

5.2.1 PEOC Assembles: The PEOC organization described in **Section 3.3** is notified and begins operations, under the direction of the Commander (see **Section 5.3** below).

5.2.2. Based on the initial information received, the PEOC may decide to order precautionary ingestion control measures in the Secondary Zone municipalities (**Section 5.4** below).

5.2.3 Following discussions with the applicable provincial or State EOC, and if considered appropriate, provincial staff may be deployed to the State or Provincial Emergency Operations Centre dealing with the incident. If not deployed, ongoing communication linkages will be established and maintained to obtain regular updates on the situation. See **Section 5.8** below.

5.2.4 Liaison with Municipalities: Communication will be established with the Secondary Zone municipalities (**Annex B**), and they will be kept informed of the situation. Following discussions with affected municipality(ies) and if considered appropriate, provincial staff will be dispatched. See **Section 5.9** below.

5.2.5. Public Direction & Emergency Information:

If ingestion control measures are required and operational directives are issued (or in the event of a declared emergency, advising of such orders), the PEOC will consider:

(a) Issuing an Emergency Bulletin.

(b) Issuing an initial news release. **See Section 5.10** below.

5.2.6 Provincial Emergency Declaration: The PEOC will advise government whether declaration of an emergency under the *Emergency Management and Civil Protection Act*, is warranted.

5.2.7 Scientific Section: Under the direction and guidance of the Scientific Section, monitoring teams will be deployed to measure airborne radiation as well as radioactive material on the ground to determine the need and extent of ingestion control measures required (see **Section 5.4** below).

5.2.8 Protective Measures: The PEOC will consider the need to implement ingestion control measures (**Section 5.4** below), based on the assessments from the Scientific Section (**Section 5.5** below) and will issue operational directives (or, in the event of a declared emergency, advising of such orders) as appropriate.

5.3 Command

Under the direction of the Commander, the Command Section will be responsible for:

a) Set over all response goals and strategies.

b) Identification and resolution of operational issues.

c) Ensuring implementation of the emergency response decisions, including upgrading, reducing or terminating response level.

d) Issuing operational directives and guidance, including advisories and Emergency Bulletins.

e) Consultation with commanders of municipal/ministry/provincial/ federal/U.S. Emergency Operation Centres.

f) Command and control of all allocated emergency response resources.

5.4 Precautionary/Protective Measures

Based on a preliminary assessment of the situation, some or all of the following precautionary measures should be considered and applied in the Secondary Zone as, when and where appropriate :

- Sheltering pets and other animals.
- Banning consumption of any item of food or water that could have been contaminated.
- Banning the export of milk, meat, produce, and milk and meat producing animals from areas that could have been contaminated.
- Removing milk and meat producing animals from outside pasture and exposed water sources.
- Closing of beaches, parks, recreation areas etc.

5.5 Radiation Monitoring

5.5.1 Radiation monitoring surveys shall be carried out, under the auspices of the Scientific Section of the PEOC, in order to determine the following information:

(a) Exposure rates and contamination levels

(b) Identification of radionuclides

(c) Appropriate sampling locations

5.5.2 Monitoring and data analysis details shall be provided in the operating procedures of the Scientific Section and the groups operating under it (Nuclear Incident, Environmental Radiation Monitoring, Assurance Monitoring, and General Province-Wide Monitoring Groups).

5.5.3 Field Monitoring Resources

Upon request from the PEOC's Scientific Section, **Environmental Radiation Monitoring Group**, Health Canada will arrange aerial monitoring to determine the path of the radioactive plume and the location of ground contamination (**see paragraph 5.1.4**). This will support ground monitoring positioning and deployment.

5.5.4 Provincial Agencies

(a) Assurance Monitoring Group

Headed by the Radiation Protection Service of the Ministry of Labour, this group implements monitoring programs, in areas adjacent to a radioactive release which do not require protective measures against radiation. The Programs are aimed at assuring the public that air, food and water are safe (refer to MOL Assurance/General Province-Wide Monitoring Group Plan).

(b) General Province-Wide Monitoring Group

Headed by the Radiation Protection Service of the Ministry of Labour, this group monitors province-wide sampling to determine the extent of radionuclide dispositions and foodstuff contamination (refer to MOL Assurance/General Province-Wide Monitoring Group Plan).

5.6 Delineation of Radiation Contamination Zones

5.6.1 Field Monitoring will be carried out under the direction of the Scientific Section and will result in the delineation of radiation contamination zones as outlined below. **However, it is expected that for a**

transborder incident, the only zone to be delineated will be the Buffer Zone (**5.6.2** (**b**) below).

5.6.2 Protective Measures will be directed, based on the delineation of these zones:

a) Restricted Zone

The area within which exposure control measures are likely to be needed, based on the results of field monitoring. These measures would be applied within this Restricted Zone as per the Protective Action Levels (**PNERP, Master Plan, Annex E**).

b) Buffer Zone

This zone provides a buffer area beyond the Restricted Zone, where limited measures of radioactivity are detected. The buffer zone is initially delineated based on the results of preliminary field monitoring. Ingestion control measures may be applied within this zone based on guidance provided by the Protective Action Levels (**PNERP Master Plan**, **Annex E**), and in accordance with direction provided by Health Canada and the Canadian Food Inspection Agency.

5.7 Ongoing Assessment of the Situation

5.7.1 The PEOC will carry out an ongoing assessment of the situation based on information and data received from the State/Provincial Emergency Operations Centre (either from State/Provincial officials or the Ontario Emergency Response Team, when deployed), as well as the results of radiation monitoring carried out within Ontario (**section 5.5** above).

5.7.2 The main aims of this ongoing assessment will be:

(a) To develop, modify as necessary, and implement a field monitoring plan.

(b) To decide on the need for ingestion control measures (**section 5.4**).

(c) To modify the ingestion control measures implemented, based on the results of the ongoing field monitoring.

(d) To adjust the response level and/or staffing level, as required.

5.8 Provincial Staff Deployment to U.S.

5.8.1 A team may be deployed, if considered appropriate, to the State /Province in which the Near Incident has occurred. As arranged by the

host EOC, this team will base itself at the State or Provincial Emergency Operations Centre (EOC).

5.8.2 The role of this team will be to:

a) Maintain close liaison with U.S./Provincial authorities dealing with the emergency (**Annex C** contains an outline of the U.S. response structure).

b) Obtain and transmit to the PEOC all relevant data and information on the emergency and its potential effect on Ontario.

c) Provide information to U.S./Provincial officials on the actions being taken by Ontario.

5.9 Provincial Staff Deployment - Ontario

5.9.1 A team may be deployed, if considered appropriate, to the Secondary Zone municipality(ies) affected by the incident.

5.9.2 The role of this team will be to:

(a) Maintain close liaison with the municipality(ies) dealing with the emergency (**Annex B** contains a list of Secondary Zone municipalities).

(b) Provide direction/guidance to the municipality(ies) on actions they may need to take.

(c) Obtain and transmit, to the PEOC, all relevant information on the local situation.

(d) Provide information to the municipality(ies) on the actions being taken by the Province.

5.10 Emergency Information

a) The PEOC will arrange for emergency information to be regularly issued to the media and the public and will ensure coordination of news releases with Secondary Zone municipalities.

b) Emergency information will be exchanged with deployed provincial staff members to ensure, as far as possible consistency in the public messaging.

5.11 Emergency Worker Safety

All survey teams will be equipped with radiation monitoring and personal protective equipment, by their parent organization, and should restrict their doses to as low as reasonably achievable.

5.12 Restrictions on Food Imports

5.12.1 The Federal government may impose restrictions on the import of food and other items from abroad which may have been contaminated. The Ministry of Agriculture, Food and Rural Affairs may be required to assist in their implementation.

5.12.2 If significant levels of contamination are known to have occurred in some part of Canada, the PEOC should consider whether any restrictions need to be applied to the import into the province, of food and other items from that area. Appropriate recommendations and actions will be discussed amongst the following PEOC representatives:

- Federal
- MOL
- MOE
- OMAFRA
- MTO
- MOHLTC
- OPP and
- Ministry of Intergovernmental Affairs (MIA)

5.13 Compensation

The Province, through the Ministry of Municipal Affairs and Housing, together with the Federal government, will assist those seeking fair compensation for their losses, as a result of this emergency.

5.14 Termination of Response / Transition to the Recovery Phase

(a) At a suitable stage the PEOC will terminate the response and, if deemed appropriate, will consult with the major organizations involved in the emergency response regarding the need to transition to a Recovery Phase.

(b) Based on these consultations, the PEOC will set a time for the ending of the Response Phase (and the commencement of Recovery Phase) and inform all concerned in advance.

(c) At the change-over time the Response Phase will end, and, if required, the Recovery Phase will commence, and the required organizational and other changes will be made by all those affected as prescribed separately in recovery plans and procedures.

(d) If no Recovery is required, the PEOC will terminate the response and inform all concerned.

ANNEXES

ANNEX A : NUCLEAR INCIDENT SITES

- APPENDIX 1 - Near Incident Sites (within 80 kilometers)
- APPENDIX 2 - Near Incident Sites (beyond 80 kilometers)

ANNEX B : SECONDARY ZONE MUNICIPALITIES

ANNEX C : NUCLEAR EMERGENCY RESPONSE IN THE UNITED STATES

ANNEX D : NOTIFICATION CATEGORIES OF TRANSBORDER EVENTS

- APPENDIX 1 – United States Notification Categories
- APPENDIX 2 - Quebec Notification Categories
- APPENDIX 3 – International Atomic Energy Agency (IAEA) Notifications

ANNEX E : NUCLEAR/RADIOLOGICAL GLOSSARY

ANNEX A
Appendix 1
(Ref : **Section 2.2.3 (a)**)

NEAR INCIDENT SITES (WITHIN 80 KM)

SRL.	States	Nuclear Facility	Location	Commenced Operation	Reactor Type Power Output – Net Megawatt (electric) MW(e)
1	**NEW YORK**	J.A. FITZPATRICK	13 km North-East of Oswego	1975	Boiling Water Reactor (BWR) Mark 1 780 MW(e)
2		NINE MILE POINT 1	9.5 km North-East of Oswego	1969	Boiling Water Reactor (BWR) Mark 2 621 MW(e)
3		NINE MILE POINT 2	9.5 km North-East of Oswego	1988	Boiling Water Reactor (BWR) Mark 2 1140 MW(e)
4		GINNA	32 km North-East of Rochester	1970	Pressurized Water Reactor (PWR) 498 MW(e)
6	**OHIO**	DAVIS-BESSE	33.5 km East-South-East of Toledo	1978	Pressurized Water Reactor (PWR) 879 MW(e)
7		PERRY 1	11 km North-East of Painesville	1987	Boiling Water Reactor (BWR) Mark 3 1245 MW(e)
8	**QUÈBEC**	GENTILLY 2	13 km East of Becancour, Trois-Rivières	1983	CANDU Pressurized heavy Water Reactor (PHWR) 675 MW(e)

ANNEX A
Appendix 2
(Ref : **Section 2.2.3 (b)**)

NEAR INCIDENT SITES (BEYOND 80 KM)

Sr.	State/ Province	Nuclear Facility	Location	Commenced Operation	Reactor Type (Power Output - Net Megawatts (electric) MW(e)
9	**MICHIGAN**	D.C. COOK 1	17.5 km South of Benton Harbor	1975	Pressurized Water Reactor (PWR) 1009 MW(e)
10		D.C. COOK 2	17.5 km South of Benton Harbor	1978	Pressurized Water Reactor (PWR) 1060 MW(e)
11		PALISADES	8 km South of South Haven	1971	Pressurized Light Water Reactor (PWR) 778 MW(e)
12		FERMI 2 Note: *Response to Fermi 2 emergency is prescribed separately in the Fermi 2 Nuclear Emergency Response Plan*	North of Point Aux Peaux – Western shore of Lake Erie in Monroe County, Michigan	1986-87	General Electric Boiling Water Reactor (GEBW) 1093 MW(e)
13	**NEW YORK**	INDIAN POINT 2	38.5 km North of New York City	1974	Pressurized Light Water Reactor (PWR) 1020 MW(e)
14		INDIAN POINT 3	38.5 km North of New York City	1976	Pressurized Light Water Reactor (PWR) 1025 MW(e)
15	**PENNSYLVANIA**	BEAVER VALLEY 1	40 km West of Pittsburgh	1976	Pressurized Water Reactor (PWR) 892 MW(e)
16		BEAVER VALLEY 2	40 km West of Pittsburgh	1987	Pressurized Water Reactor (PWR) 846 MW(e)
17		LIMERICK 1	33.5 km North-West of Philadelphia	1986	Boiling Water Reactor (BWR) Mark 2 1134 MW(e)

Sr.	State/ Province	Nuclear Facility	Location	Commenced Operation	Reactor Type (Power Output - Net Megawatts (electric) MW(e)
18	**PENNSYLVANIA**	LIMERICK 2	33.5 km North-West of Philadelphia	1990	Boiling Water Reactor (BWR) Mark 2 1134 MW(e)
19		PEACH BOTTOM 2	28.5 km South of Lancaster	1974	Boiling Water Reactor (BWR) Mark 1 1112 MW(e)
20		PEACH BOTTOM 3	28.5 km South of Lancaster	1974	Boiling Water Reactor (BWR) Mark 1 1112 MW(e)
21		SUSQUEHANNA 1	11 km North-East of Berwick	1983	Boiling Water Reactor (BWR) Mark 2 (1149)
22		SUSQUEHANNA 2	11 km North-East of Berwick	1985	Boiling Water Reactor (BWR) Mark 2 1140 MW(e)
23		THREE MILE ISLAND 1	16 km South-East of Harrisburg	1974	Pressurized Water Reactor (PWR) 786 MW(e)
24	**MINNESOTA**	MONTICELLO	30 miles northwest of Minneapolis	1981	Boiling Water Reactor (BWR) Mark 1 572 MW(e)
25		PRAIRIE ISLAND 1 and 2	28 miles southeast of Minneapolis	- 1973 - 1974	- Pressurized Water Reactor (PWR) 551 MW(e) - Pressurized Water Reactor (PWR) 545 MW(e)
26	**WISCONSIN**	KEWAUNEE POWER STATION	35 miles southeast of Green Bay	1974	Pressurized Water Reactor (PWR) 556 MW(e)
27		POINT BEACH NUCLEAR POWER PLANT 1 AND 2	Near Two Rivers and Manitowoc	- 1970 - 1972	Pressurized Light Water Reactors (PWR) - 512 MW(e) - 514 MW(e)

ANNEX B
(Ref : **Paragraph 2.5.3**)

SECONDARY ZONE MUNICIPALITIES

Nuclear Facility	**Ontario Municipality/County/Township/City/Town**
Davis-Besse (Ohio)	- County of Essex - Town of Amherstburg - Town of Lakeshore - Town of LaSalle - Municipality of Leamington - Town of Kingsville - Town of Tecumseh - Township of Pelee - City of Windsor - Municipality of Chatham-Kent
Perry (Ohio)	- Elgin County - Norfolk County - Municipality of Bayham - Municipality of Central Elgin - Municipality of Dutton-Dunwich - Municipality of West Elgin - Township of Malahide - Township of Southwold - City of St. Thomas
Ginna (New York)	- Prince Edward County - Northumberland County - Township of Alnwick/Haldimand - Municipality of Brighton - Town of Cobourg - Township of Cramahe - Township of Hamilton - Municipality of Port Hope - Municipality of Trent Hills
Nine Mile Point and J.A. Fitzpatrick (New York)	- Prince Edward County - County of Lennox and Addington - Township of Addington Highlands - Town of Greater Napanee - Township Loyalist - Township of Stone Mills - Frontenac County - Township of Central Frontenac - Township of Frontenac Island - City of Kingston

ANNEX C
(Ref : **Section 2.9**)

NUCLEAR EMERGENCY RESPONSE IN THE UNITED STATES

1.0 General

1.1 This annex gives an outline of the general structure of the U.S. response to an incident considered in this plan, and the responsibilities and functions of the various agencies involved.

1.2 The roles and actions of state and local governments are prescribed in their emergency plans, while those of federal agencies are covered in the Nuclear/Radiological Incident Annex (NRIA) to the National Response Framework (NRF).

1.3 The Department of Homeland Security (DHS/Federal Emergency Management Agency (FEMA) is responsible for the NRIA annex to the NRF.

2.0 Federal Responsibility

2.1 Responsibility for coordinating Federal operations within the U.S. to prepare for, respond to and recover from terrorist attacks, major disasters or other emergencies rests with the Secretary of the Department of Homeland Security (DHS), the principle federal official for domestic incident management. The Secretary is supported by other coordinating and cooperating agencies in his/her role as principle federal official.

2.2 However, for incidents at nuclear facilities which fall below the General emergency classification and are not as a result of a terrorist attack, the coordinating agency will be either the Nuclear Regulatory Commission (NRC) for NRC licensed facilities or, the Department of Defense (DOD) or Department of Energy (DOE) for facilities owned or operated by these agencies.

2.3 Responsibilities of the main federal agencies involved in a nuclear/radiological response are described in Appendix 1 to this Annex.

3.0 State Responsibility

3.1 The state Governor provides direction and control of off-site emergency activities and is responsible for the safety of its citizens.

3.2 The state Emergency Management Agency (EMA) will set up an EOC and, in the Governor's absence, the executive lead of the EMA will provide direction and control and carry out the state's response to protect public health and safety during a nuclear emergency.

3.3 The state EMA will request federal assistance and make requests for emergency and disaster declarations.

3.4 During an emergency, the state EMA dispatches representatives to the incident utility's Emergency Operations facility (EOF), the Local Government Emergency Operations Centre (EOC) and the Joint Information Centre (JIC) and provides field radiological measurements, accident assessment information and recommends protective action responses.

4.0 Local Government Responsibility

4.1 Based upon state and nuclear facility recommendations, local governments have decision-making control over the entire local emergency response effort.

4.2 The local government will activate and staff an EOC to coordinate the emergency response effort at that level.

5.0 Nuclear Facility Responsibility

5.1 The nuclear facility at which the accident/event occurs is responsible for:

(a) Notifying local, state and federal authorities (**Annex D** outlines the notification categories used).

(b) If necessary, providing recommendations on protective actions to state and/or county officials.

(c) Controlling the onsite situation, taking all necessary measures to minimize radiation exposure of the public, and returning the facility to a safe condition.

5.2 <u>Corporate Emergency Operations Facility (CEOF)</u>

The nuclear facility activates its CEOF from which the response to the emergency is controlled and directed, and other facility responsibilities carried out.

5.3 Joint Public Information Centre (JIC)

(a) The nuclear facility establishes and operates the JIC near the accident site.

(b) This centre serves as the main clearing house for emergency information to the media.

(c) Representatives at the JIC include:

(i) the nuclear facility
(ii) the state
(iii) local government
(iv) federal agencies (coordinated by the NRC representative)

ANNEX C
Appendix 1

UNITED STATES FEDERAL AGENCIES

1.0 Nuclear Regulatory Commission (NRC)

1.1 The NRC may become the Lead Federal Agency (LFA) under the Federal Plan, responsible for coordinating all federal on scene actions as well as federal assistance to States and local organizations.

1.2 However, if the President declares an emergency under the Stafford Act, the NRC role is to coordinate the management of the radiological response in support of the Federal Coordinating Officer (see paragraph 5.1 below).

1.3 The NRC oversees the onsite response, and can direct the nuclear facility to take certain actions, as necessary.

1.4 The NRC assists the state in the interpretation and analysis of technical information as a basis for making protective action decisions. If requested, the NRC will make protective action recommendations.

1.5 The NRC coordinates the release of federal information to the media and others. Most public information activities will be conducted from the Joint Information Centre (**paragraph 4.3** above).

2.0 Department of Homeland Security (DHS)/Federal Emergency Management Agency (FEMA)

2.1 If the President declares an emergency under the Stafford Act, the Secretary of Homeland Security is the principal Federal official responsible for the coordination of all Federal response activities.

2.2 Disaster Field Office (DFO)

The focal point for carrying out the response is the Disaster Field Office, which the agency establishes at an on scene location in consultation with State and local authorities. Other federal agencies provide representation at the DFO.

2.3 DHS coordinates and maintains the 24/7 joint-agency National Operations Centre (NOC).

3.0 Department of Energy (DOE)

3.1 The DOE coordinates offsite radiological monitoring and assessment during the initial phases of the emergency through the Federal Radiological Monitoring and Assessment Centre (see below).

3.2 Federal Radiological Monitoring and Assessment Centre (FRMAC)

(a) The FRMAC is established by DOE at an appropriate on scene location to gather, evaluate, coordinate and disseminate field monitoring data.

(b) A key element of the FRMAC is the Aerial Measuring System which uses specially equipped fixed wing aircraft and helicopters to carry out radiological monitoring.

(c) Advisory Team

Based at the FRMAC, the Advisory Team for the Environment, Food and Health provides guidance and advice on matters associated with environmental, food and health issues. The Advisory Team consists of representatives of the Environmental Protection Agency (**section 4.0** below), the Department of Agriculture and the Department of Health and Human Services.

4.0 Environmental Protection Agency (EPA)

4.1 EPA is the coordinating agency for the Federal environmental response to incidents that occur at facilities not licensed, owned or operated by a federal agency or an Agreement State.

4.2 In the early stages of the emergency, the EPA provides assistance to DOE and, and in later stages will take over the management of the FRMAC from DOE (**paragraph 3.2** above).

ANNEX D

NOTIFICATION

CATEGORIES OF

TRANSBORDER EVENTS

(NEAR INCIDENT SITES)

ANNEX D
Appendix 1
(Ref : **Section 3.1**)

UNITED STATES NOTIFICATION CATEGORIES

CATEGORY*	DEFINITION
UNUSUAL EVENT	First of four emergency classification levels, meaning that events are in process or have occurred which indicate a potential degradation of the level of safety of the plant or indicate security threat to facility protection. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.
ALERT	Second of four emergency classification levels, meaning events are in process or have occurred which involve an actual or potential substantial degradation in the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of intentional malicious dedicated efforts of a hostile act. Any releases are expected to be limited to small fractions of the U.S. Environmental Protection Agency (EPA) Protective Action Guideline (PAG) exposure level.
SITE AREA EMERGENCY	Third of four emergency classification levels, meaning that events are in process or have occurred which involve an actual or likely major failures of plant functions needed for protection of the public or security events that result in intentional damage or malicious act: (1) toward site personnel or equipment that could lead to the likely failure of (2) prevents effective access to equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed U.S. EPA PAG exposure levels beyond the site boundary.
GENERAL EMERGENCY	Fourth of four emergency classification levels, meaning that events are in process or have occurred which involve actual or imminent substantial core degradation or melting with a potential for loss of containment integrity or security events that result in an actual loss of physical control of the facility. Releases can reasonably be expected to exceed U.S. EPA PAG exposure levels offsite for more than the immediate site area.

***** In US terminology these are called Emergency Classifications. It is the responsibility of the nuclear facility to classify the onsite event and issue the appropriate notification.

ANNEX D
Appendix 2
(Ref : **Section 3.1**)

QUEBEC NOTIFICATION CATEGORIES

LEVEL	DEFINITION
AREA ALERT	Dangerous or potentially dangerous situation within a limited area of the power station
STATION ALERT	Dangerous or potentially dangerous situation within an important area of the power station
GENERAL ALERT LEVEL 1	Dangerous or potentially dangerous situation with radioactive materials released to the environment - low risk to the population and the environment - no protective measures required for the population
GENERAL ALERT LEVEL 2	Dangerous or potentially dangerous situation with radioactive materials released to the environment - significant risk to the population and the environment- protective measures recommended for the population by Gentilly-2

ANNEX D
Appendix 3
(Ref : **Section 3.1**)

INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA) NOTIFICATIONS

1.0 General

1.1 The International Atomic Energy Agency (IAEA) sponsors a convention on Early Notification of a Nuclear Accident (which came into force in 1986). Most states with nuclear programs, including Canada, have adopted the convention.

1.2 Under the convention, signatories have agreed to notify the IAEA and other countries which could be affected in case of a nuclear emergency that could result in a transboundary radiological release. In return, the IAEA has undertaken to inform other states which may be affected.

1.3 The convention does not specify the form or content of the notification. However, the IAEA has produced an International Nuclear Event Scale (INES) and made it available to member states for adoption. States **may** use the INES in making notifications under the convention. The INES is described in **section 3.0** below.

1.4 The convention also requires signatories to promptly provide to the IAEA and the states notified (as per **paragraph 1.2** above) relevant information to assist them in dealing with the effects of the event. The IAEA will also transmit this information to affected states.

2.0 Information Required

2.1 Under Article 5 of the convention a state having a nuclear accident shall promptly provide (see **paragraph 1.4** above) the following information/data as then available:

a) The time, exact location where appropriate, and the nature of the nuclear accident.

b) The facility or activity involved.

c) The assumed or established cause and the foreseeable development of the nuclear accident relevant to the transboundary release of the radioactive materials.

d) The general characteristics of the radioactive release, including, as far as is practicable and appropriate, the nature, probable physical and chemical form and the quantity, composition and effective height of the radioactive release.

e) Information on current and forecast meteorological and hydrological conditions, necessary for forecasting the transboundary release of the radioactive materials.

f) The results of environmental monitoring relevant to the transboundary release of the radioactive materials.

g) The offsite protective measures taken or planned.

h) The predicted behaviour over time of the radioactive release.

2.2 The initial information provided is to be supplemented at appropriate intervals by further relevant information as the situation develops, including the foreseeable or actual termination of the emergency.

3.0 International Nuclear Event Scale – General Description

3.1 Events are classified on the scale at seven levels; levels 1-3 are termed as 'incidents' and Levels 4-7 are termed 'accidents'. Events without safety significance are classified as 'below Scale/level 0'.

3.2 For communication of events to the public, a description has been attributed to each level of INES. In order of increasing severity, these are: anomaly, incident, serious incident, accident and local consequences, accident with wider consequences[1], serious accident and major accident.

3.3 The structure of the scale is shown in the table below. Events are considered in terms of their impact on three different areas: impact on people and the environment; impact on radiological barriers and controls at facilities; and impact on defence in depth (with examples of past accidents). Principles of INES criteria and detailed definitions of the levels are provided in INES Manual 2008:

[1] For example, a release from a facility likely to result in some protective action, or several deaths resulting from an abandoned large radioactivity source. (ref: INES Manual 2008)

GENERAL CRITERIA FOR RATING EVENTS IN INTERNATIONAL NUCLEAR EVENT SCALE

INES Level	Description	People and the Environment	Radiological barriers and controls at Facilities	Defence in Depth	Examples
ACCIDENTS					
7	**Major Accident**	Major release of radioactive material with widespread health and environmental effects requiring implementation of planned and extended countermeasures.			Chernobyl NPP, USSR (now Ukraine), 1986
6	**Serious Accident**	Significant release of radioactive material likely to require implementation of planned countermeasures			Kyshtym Reprocessing Plant, USSR (now in Russia), 1957
5	**Accident with Wider Consequences**	• Limited release of radioactive material likely to require implementation of some planned countermeasures • Several deaths from radiation	• Severe damage to reactor core • Release of large quantities of radioactive material within an installation with a high probability of significant public exposure. This could arise from a major critically accident or fire		- Three Mile Island, USA, 1979 (*criteria under Radiological Barriers and Controls at Facilities – first bullet)* - Windscale Pile, UK, 1957 (*Criteria under Radiological Barriers and Controls at Facilities – second bullet)*
4	**Accident with Local consequences**	• Minor release of radioactive material unlikely to result in implementation of countermeasures other than local food controls • At least one death from radiation	• Fuel melt or damage to fuel resulting in more than 0.1% release of core inventory • Release of significant quantities of radioactive material within an installation with a high probability of significant public exposure		Tokaimura,Japan, 1999 (*Criteria under People and the Environment – second bullet*)
INCIDENTS					
3	**Serious incident**	• Exposure in excess of ten times the statutory annual limit of workers	• Exposure rates of more than 1 Sv/hr in an operating area	• Near accident at a nuclear plant with no safety provisions remaining	- Sellafield, UK, 2005 (*Criteria under Radiological Barriers and Controls at Facilities – second bullet)*

INES Level	Description	People and the Environment	Radiological barriers and controls at Facilities	Defence in Depth	Examples
ACCIDENTS					
		• Non-lethal deterministic health effect (e.g. burns) from radiation	• Severe contamination in an area not expected by design, with a low probability of significant public exposure	• Lost of stolen highly radioactive sealed source • Misdelivered highly radioactive sealed source without adequate radiation procedure in place to handle it.	- Vandellos, Spain, 1989 (*Criteria under Defence in Depth – first bullet)*
2	**Incident**	• Exposure of a member of the public in excess of 10 mSv. • Exposure if a worker in excess if the statutory annual limits.	• Radiation levels in an operating area of more than 50 mSv/hr. • Significant contamination within the facility into an area not expected by design	• Significant failure in safety provisions but with no actual consequences • Found highly radioactive sealed orphan source, device or transport package with safety provisions intact • Inadequate packaging of highly radioactive sealed source	- Atucha,Argentina, 2005 (*Criteria under People and the Environment – second bullet)* - Cadarache, France, 1993 (*Criteria under Radiological Barriers and Controls at Facilities – second bullet)* - Forsmark, Sweden, 2006 (*Criteria under Defence in Depth– first bullet)*
1	**Anomaly**			• Over-exposure of a member of the public in excess of statutory limits • Minor problems with safety components with significant defence in depth remaining • Low activity lost or stolen radioactive source, device or transport package.	

No safety significance (Below scale/Level 0)

Note: refs: INES Manual 2008

ANNEX E

NUCLEAR / RADIOLOGICAL GLOSSARY

Absorbed Dose: The amount of energy absorbed in the body, or in an organ or tissue of the body, due to exposure to ionizing radiation, divided by the respective mass of the body, organ or tissue. Expressed in terms of gray (rad).

Acute Radiation Syndrome: An acute illness caused by irradiation of the entire body (or most of the body) by a high dose of penetrating radiation in a very short period of time.

Alerting: Informing the population, by means of an appropriate signal, that a nuclear emergency has occurred or is about to occur.

Collective (Equivalent) Dose: An expression for the total radiation dose incurred by a population, defined as the product of the average radiation dose to a group of exposed persons and the number of persons in the group. Generally expressed in terms of person-sievert (or person-rem).

Committed (Equivalent) Dose: The radiation dose that will be received over a period of 50 years (for adults) or 70 years (for children) after a person takes in a quantity of radioactive material (by ingestion, absorption or inhalation). The dose is expressed in terms of sievert (or rem).

Containment (System): A series of physical barriers that exist between radioactive material contained in a nuclear installation and the environment. Containment usually refers only to the reactor and vacuum buildings, and integral systems such as dousing.

Contamination: The unwanted presence of radioactive material in water or air, or on the surfaces of structures, areas, objects or people.

Contiguous Zone: The zone immediately surrounding a nuclear installation. An increased level of emergency planning and preparedness is undertaken within this area because of its proximity to the potential hazard. The actual Contiguous Zone for each designated nuclear installation is specified in the relevant Implementing plans of the Provincial Nuclear Emergency Response Plan.

Critical Group: A particular group among the relevant population which, by virtue of age, sex or dietary habits, is expected to receive the highest dose from a stated radiation source or exposure pathway.

Crop Control: *See* **Produce and Crop Control**.

Decontamination: Reduction or removal of radioactive contamination in or on materials, persons or the environment.

Derived Emission Limits: Limits for radioactive emissions to air and water from a nuclear facility which ensure that, under normal operating conditions, Canadian Nuclear Safety Commission dose limits for members of the public are not exceeded by persons exposed to those emissions.

Designated Municipality: A municipality in the vicinity of a nuclear facility which has been designated under the *Emergency Management and Civil Protection Act*, as one that shall have a nuclear emergency plan (*for list see* **PNERP Master Plan**, **Annex A**).

Designated Nuclear Installation: A nuclear installation designated under the *Emergency Management and Civil Protection Act*, as one to which the specific and detailed provisions of the Provincial Nuclear Emergency Response Plan apply (*for list see* **PNERP Master Plan**, **Annex A**).

Dose: A measure of the radiation received or "absorbed" by a target. The quantities termed absorbed dose, organ dose, equivalent dose, effective dose, committed equivalent dose or committed effective dose are used, depending on the context. The modifying terms are often omitted when they are not necessary for defining the quantity of interest.

Dose Projection: The calculation of projected dose (*see* **Projected Dose**).

Dose Rate: The amount of radiation dose which an individual would receive in a unit of time. In the context of this Plan, the measurement units are multiples or submultiples of the sievert (or rem) per hour.

Dosimeter: An instrument for measuring and registering total accumulated exposure to ionizing radiation.

Effective (Equivalent) Dose: The sum of the weighted equivalent doses received by the organs and tissues of the body, where the weighted equivalent dose is the equivalent dose to an organ or tissue of the body multiplied by the appropriate weighting factor laid down in the Nuclear Safety and Control Act and Regulations promulgated by the Canadian Nuclear Safety Commission. Expressed in terms of sievert (or rem). See Weighted Dose.

Emergency Bulletin: Directions to the public on appropriate protective and other measures to be taken during a nuclear or radiological emergency, which are issued by the province and broadcast through the media.

Emergency Workers: A person who assists in connection with an emergency that has been declared by the Lieutenant Governor in Council or the Premier, under 5.7.0.1 of the EMCPA or by the head of council of a municipality under section 4 of the EMCPA. This may include persons who are required to remain in, or to enter, offsite areas affected or likely to be affected by radiation from an accident, and for whom special safety arrangements are required. Examples of emergency workers

include police, firefighters, ambulance and personnel from the Canadian Armed Forces, and other essential services. They shall not include nuclear energy workers (pursuant to the Nuclear Safety and Control Act) or assurance (ingestion) monitoring field staff.

Emergency Worker Centre: A facility set up to monitor and control radiation exposure to emergency workers.

Emission: In the context of this plan, emission refers to the release of radioactive material to the environment from a nuclear facility in the form of either an airborne or a liquid emission.

Entry Control: The prevention of non-essential persons from entering a potentially dangerous area.

Equivalent Dose: The absorbed dose multiplied by a weighting factor for the type of radiation giving the dose. Weighting factors for use in Canada are prescribed by the Canadian Nuclear Safety Commission. This term is also sometimes called *weighted dose*. Expressed in terms of Sievert (or rem).

Evacuation: The process of leaving a potentially dangerous area.

Exposure: The act or condition of being subject to irradiation. Exposure can be either **external exposure** (irradiation by sources outside the body) or **internal exposure** (irradiation by sources inside the body).

Exposure Control: *See* **Plume Exposure Control**.

Exposure Pathways: The routes by which radioactive material can reach or irradiate humans.

External Notification: The notification of organizations and agencies (not directly part of the emergency management organization) which may be affected by a nuclear emergency, or which may be required to assist in responding to it.

Far Incident : A transborder nuclear accident or event anywhere in the world which could affect Ontario, other than a Near Incident (*see* **Near Incident**).

Field Monitoring: The assessment of the magnitude, type and extent of radiation in the environment during an emergency by such means as field surveys and field sampling.

Food Control: Measures taken to prevent the consumption of contaminated foodstuffs and control of including the supply of uncontaminated foodstuffs. Where appropriate, such control may include food storage to permit radionuclide decay, diversion of food to non-human, non-food chain use or disposal of unusable stocks.

Government Operations Centre: The federal government organization located in the National Capital Region which directs the mobilization and delivery of national support to the affected province in the case of an event in or near Canada, or which coordinates federal actions in the case of an international event.

Guaranteed Shutdown State: A reactor is considered to be in this state when there is sufficient negative reactivity to ensure sub-criticality in the event of any process failure, and approved administrative safeguards are in place to prevent net removal of negative reactivity.

Hostile Action : Any deliberate action, or threat of action, which could cause a nuclear emergency.

Host Municipality: The municipality assigned responsibility in the Provincial Nuclear Emergency Response Plan for the reception and care of people evacuated from their homes in a nuclear emergency.

Imminent Emission: A radioactive emission that will occur in 12 hours or less.

Ingestion Control: Emergency response operations in which the main aim is to avoid or reduce the risk from ingestion of contaminated food and water.

Initial Notification: The notification made by a nuclear facility to Provincial and/or municipal authorities upon the occurrence of an event or condition which has implications for public safety, or could be of concern to these authorities. The criteria and channels for making such notification are usually prescribed in emergency plans.

Internal Notification: The notification by an organization to its personnel who are required to respond to an emergency.

Land Control: Control on the use of contaminated land for growing food products or animal feed.

Livestock Control: Quarantine of livestock in the affected area to prevent movement to other areas. Slaughter of such animals for food may be banned.

Milk Control: Preventing the consumption of locally produced milk in the area affected by a nuclear emergency, and its export outside the area until it has been monitored. Collection of contaminated milk, its diversion to other uses, or its destruction, may also be involved.

Near Incident : A transborder nuclear accident or event at a site within the states and provinces adjacent to Ontario.

Notification: Conveying to a person or an organization, by means of a message, warning of the occurrence or imminence of a nuclear emergency, usually includes some indication of the measures being taken or to be taken to respond to it.

Nuclear Emergency: An emergency caused by an actual or potential hazard to public health and property or the environment as a result of ionizing radiation from a nuclear installation.

Nuclear Establishment: A facility that uses, produces, processes, stores or disposes of a nuclear substance, but does not include a nuclear installation. It includes, where applicable, any land, building, structures or equipment located at or forming part of the facility, and, depending on the context, the management and staff of the facility.

Nuclear Facility: A generic term covering both nuclear establishments and nuclear installations.

Nuclear Installation: A facility or a vehicle (operating in any media) containing a nuclear fission or fusion reactor (including critical and sub-critical assemblies). It includes, where applicable, any land, buildings, structures or equipment located at or forming part of the facility, and, depending on the context, the management and staff of the facility.

Nuclear Substance: As defined in the (Federal) Nuclear Safety and Control Act.

Offsite: Offsite refers to the area outside the boundary (fence) of a nuclear facility.

Onsite: Onsite refers to the area inside the boundary (fence) of a nuclear facility.

Operational Directives: Direction given by the emergency response organization to implement operational measures.

Operational Measures: Measures undertaken by the emergency response organization to deal with the emergency, including measures to enable or facilitate protective action for the public, e.g., public alerting, public direction, activation of plans, traffic control, emergency information, etc.

Operator: holder of a subsisting licence issued pursuant to the Nuclear Safety and Control Act for the operation of a nuclear installation.

Pasture Control: Removing milk- and meat-producing animals from pasture and from access to open water sources, and supplying them with uncontaminated feed and water.

Personal Monitoring: The use of radiation monitoring devices to assess whether persons, and their belongings, including vehicles, are contaminated or not, and, if contaminated, the type and level of contamination.

Plume: A cloud of airborne radioactive material that is transported in the direction of the prevailing wind from a nuclear facility. A plume results from a continuing release of radioactive gases or particles. (This term may also be used for

waterborne radioactive material resulting from a liquid emission. Where the context does not make it clear, this will be referred to as a **Waterborne Plume**). (*See also* **Puff**).

Plume Exposure Control: Emergency operations aimed at reducing or avoiding exposure to a plume or puff of radioactive material. Measures to deal with surface contamination and re-suspension might also be included.

Precautionary Measures: Measures which will facilitate the application and effectiveness of protective measures. (For a list of some of these, see **PNERP Master Plan**, **paragraph 2.2.7**).

Primary Zone: The zone around a nuclear installation within which planning and preparedness is carried out for measures against exposure to a radioactive plume. (The Primary Zone includes the Contiguous Zone). The actual Primary Zone for each designated nuclear installation is specified in the relevant Implementing Plans of the Provincial Nuclear Emergency Response Plan.

Produce and Crop Control: Restrictions on the harvesting or processing of potentially or actually contaminated crops, vegetables and fruits. Measures include: embargoing export outside the affected area; storage to allow radionuclide decay; diversion to non-food chain use; destruction and disposal of contaminated produce.

Projected Dose: The highest committed effective equivalent dose, or committed equivalent dose to a specified organ or tissue, likely to be received through all applicable exposure pathways by the most exposed member of the critical group in the area for which the projection is being made.

Protective Action Levels (PALs): Projected dose levels which provide technical guidance on the need to take certain protective measures. For values, see **PNERP Master Plan**, **Annex E**.

Protective Measures: Measures designed to protect against exposure to radiation during a nuclear emergency. (see **PNERP Master Plan**, **Table 2.1**).

Puff: A plume of short duration. The distinction between a puff and a plume is a matter of time. The upper limit on the duration of a puff is half an hour. (*See also* **Plume**).

Radiation: In the context of this Plan, radiation means ionizing radiation (i.e. radiation with the potential to harm human tissue or cells produced by a nuclear substance or a nuclear facility.

Radionuclide (or radioactive isotope or radioisotope): A naturally occurring or artificially created isotope of a chemical element having an unstable nucleus that decays, emitting alpha, beta and/or gamma rays until stability is reached.

Radiological Emergency: Emergency caused by an actual or environmental hazard from ionizing radiation emitted by a source other than a nuclear installation.

Radiological Device (RDs): could be lost or stolen radioactive sources which may be in locations resulting in radiation exposure and/or contamination of the public, contamination of a site and/or contamination of food and water supplies.

Radiological Dispersal Device (RDDs): A device that causes the dissemination of radioactive material.

Response Sectors: The Primary Zone is subdivided into Response Sectors to facilitate the planning and implementation of protective measures.

Restoration: Operations to restore conditions to normal after a nuclear/ radiological emergency.

Secondary Zone: The zone around a nuclear installation within which it is necessary to plan and prepare measures against exposure from the ingestion of radioactive material. (The Secondary Zone includes both the Primary and Contiguous Zones). The actual Secondary Zone for each designated nuclear installation is specified in the relevant site-specific part of the Provincial Nuclear Emergency Plan.

Selective Evacuation: The evacuation of a specified group of people, such as seriously ill patients in hospitals, bedridden residents of nursing homes, or disabled residents.

Sheltering: A protective measure which uses the shielding properties of buildings and their potential for ventilation control to reduce the radiation dose to people inside. (For details, see **PNERP Master Plan**, **section 2.2**).

Source Term: A generic term applied to the radioactive material released from a nuclear facility. It includes the quantity and type of material released as well as the timing and rate of its release. It could apply to an emission that was currently occurring, or one which had ended, or one which could take place in the future.

Special Group: A group for which special constraints arise in the application of a protective measure, such as intensive care patients in hospitals and institutions, bedridden patients in nursing homes, handicapped persons and prison inmates.

Support Municipality: Pursuant to section 7.0.2 (4) of the EMPCA, the LGIC may, by order, specify a municipality to act in a support capacity to provide assistance to designated municipality(ies).

Thyroid Blocking: The reduction or prevention of the absorption of radioiodine by the thyroid gland, which is accomplished by the intake of a stable iodine compound (such as potassium iodide) by people exposed or likely to be exposed to radioiodine.

Transborder Nuclear Emergency: A nuclear emergency involving a nuclear facility or nuclear accident or event outside the borders of Ontario that might affect people and property in the province.

Venting: The release to the atmosphere of radioactive material from the containment of a nuclear facility through systems designed for this purpose.

Vulnerable Group: A group which, because it is more vulnerable to radiation, may require protective measures not considered necessary for the general population, such as pregnant women and, in some cases, children.

Water Control: Measures taken to avoid the contamination of drinking water supplies and sources, and to prevent or reduce the consumption of contaminated water.

Weighted Dose. Expressed in terms of sievert (or rem). See Effective (Equivalent) Dose.