TROJAN NUCLEAR PLANT

PLANT OPERATING MANUAL

RADIOLOGICAL EMERGENCY RESPONSE PLAN IMPLEMENTING PROCEDURES

Volume 4, Section 3

TABLE OF CONTENTS

*Safety Related

Procedure	Title	Date
* EP-8.11	EOF Dose Assessment Staff	08/23/82
* EP-8.12	Radiation Protection EOF Team	08/23/82
* EP-8.13	Office Director	08/23/82
* EP-8.14	EOF Clerical Staff	08/23/82
* EP-8.15	VIC Staff	10/29/81
* EP-8.16	Security Staff	08/23/82
* EP-8.17	Radiation Protection Field Team	10/29/81
* EP-8.18	EOF State and County Agency Representatives	08/23/82
* EP-8.19	EOF Federal Agency Representatives	08/23/82
* EP-8.20	EOF Dose Assessment State Agency Representatives	08/23/82
* EP-8.21	Alternate Emergency Operations Facility	08/24/82
* EP-9	Operation of the Operational Support Center	10/26/81
* EP-10	Accident Dose Assessment Work Sheet Method	10/29/81
* EP-10.1	Accident Dose Assessment Computer Analysis Method-Deleted	12/08/80
* EP-10.2	Instructions for Use of Computer Terminal - Deleted	02/12/81
* EP-10.3	Use of the Subin Computer Code - Deleted	04/14/81
* EP-10.4	Use of the Ingest Computer Code - Deleted	02/12/81
* EP-10.5	Use of the Liquid Computer Code - Deleted	02/12/81
* EP-11	Onsite Radiological Surveys	10/28/81
* EP-12	Offsite Radiological Surveys	09/01/82
* EP-13	Personnel Monitoring and Decontamination	02/12/82
* EP-14	Potassium Iodide (KI) Administration	02/12/82
* EP-15	Emergency Supply Lists	03/12/82
* EP-16	Drills and Exercises	03/12/82
* EP-17	Medical	12/15/81

*Safety Related

Procedure	Title	Date
* EP-18	Fire Fighting	06/15/82
* EP-19	Communications	10/28/81
* EP-19.1	Operation of Ground Radio System	10/28/81
* EP-19.2	Operation of Dedicated Telephone System	10/28/81
* EP-19.3	Operation of Trojan Commercial Phone System	10/28/81
* EP-19.4	Emergency Notification System (ENS)	10/28/81
* EP-19.5	Health Physics Network (HPN)	10/28/81
* EP-19.6	Operation of Aerial Radio System (ARS)	10/28/81
* EP-20	Site Security	10/28/81
* EP-21	Reentry/Search and Rescue	12/10/80
* EP-22	Public Relations Department	10/13/81
* EP-23	Control Room Protective Action Recommendations	11/02/81
* EP-23.1	Protective Action Implementation - Deleted	12/24/80
* EP-24	Long-Term Emergency Organization	10/28/81
* EP-24.1	Emergency Response Manager	10/28/81
* EP-24.2	Radiological Manager	10/28/81
* EP-24.3	Emergency Response Manager's Support Group	10/28/81
* EP-24.4	Procedure Support Supervisor	10/28/81
* EP-24.5	Data Facility Supervisor	10/28/81
* EP-24.6	Construction Manager	10/28/81
* EP-24.7	Planning and Scheduling Manager	10/28/81
* EP-24.8	Purchasing Manager	10/28/81
* EP-24.9	Quality Assurance Manager	10/28/81
* EP-24.10	Radiation Control and Shielding Group	10/28/81

*Safety Related

	Procedure	Title	Date
*	EP-24.11	Radwaste Systems Group	10/28/81
*	EP-24.12	Systems Group	10/28/81
*	EP-24.13	Analysis Group	10/28/81
*	EP-24.14	Licensing Group	10/28/81
*	EP-24.15	Environmental Monitoring/Dosimetry Group	10/28/81
*	EP-24.16	Design Team	10/28/81
*	EP-24.17	Advisory Support Group	10/28/81
*	EP-24.18	Legal Advisor	10/28/81
*	EP-24.19	Insurance Advisor	10/28/81
*	EP-24.20	Technical Representative at Oregon EOC	10/28/81
*	EP-24.21	Westinghouse Emergency Team	10/28/81
*	EP-25	Operation of Company Support Center	11/03/81
*	EP-25.1	Company Support Center Director - Deleted	02/25/81
*	EP-25.2	Public Information Advisor	11/03/81
*	EP-25.3	Environmental Sciences Advisor - Deleted	12/24/80
*	EP-25.4	Legal Advisor - Deleted	12/24/80
*	EP-25.5	Insurance Advisor - Deleted	12/24/80
*	EP-25.6	Communications Advisor	11/03/81
*	EP-25.7	TSC Communicator - Deleted	12/24/80
*	EP-25.8	ECC Communicator - Deleted	12/24/80
*	EP-25.9	General Communicator - Deleted	12/24/80
*	EP-25.10	CSC Clerical Staff - Deleted	12/24/80
*	EP-25 11	Plant Modifications Director	11/03/81
*	EP-25.12	Technical Support Director	11/03/81

*Safety Related

Procedure	Title	Date
* EP-25.13	Administrative and Logistics Director	11/03/81
* EP-25.14	Accident Analysis Manager	11/03/81
* EP-25.15	Licensing Manager	11/03/81
* EP-25.16	Design Manager	11/03/81
* EP-25.17	Off Site Power Supply Advisor	11/03/81
* EP-25.18	Bechtel Emergency Team Leader	11/03/81
* EP-25.19	CSC Assistants	11/03/81
* EP-26	Medical Health Physicist	10/28/81
* EP-27	Headquarters Training	01/22/82
* EP-28	Onsite Training	01/26/82
* EP-29	EOF Offsite Dose Assessment Computer Analysis Method	09/02/82
* EP-29.1	Instructions for Use of Computer Terminal	08/23/82
* EP-29.2	Use of the Subin Computer Code	08/23/82
* EP-29.3	Use of the Ingest Computer Code	11/02/81
* EP-29.4	Use of the Liquid Computer Code	11/02/81
* EP-30	EOF Off Site Protective Action Recommendations	09/03/82
* EP-31	Implementation of the INPO Voluntary Assistance Agreement for Transportation Accidents	04/20/82

*Safety Related

UPDATED
MAINTAINED BY COPY HOLDER

RADIOLOGICAL EMERGENCY RESPONSE PLAN IMPLEMENTING PROCEDURE

EP-12

SAFETY-RELATED

OFFSITE RADIOLOGICAL SURVEYS

APPROVED BY C.A.A. Limstead for PV DATE 9/1/82

A. PURPOSE

This procedure describes the methods for conducting offsite radiological surveys, air sampling, and sampling soil, vegetation, milk and water. These surveys are to be performed by Trojan plant personnel during an emergency, in accordance with the time criteria specified in Paragraph B. below.

B. RADIATION PROTECTION FIELD TEAM

The team consists of two C&RP Technicians or one C&RP Technician and one Radiation Protection Engineer. The team reports to the Dose Assessment Director in the Emergency Operations Facility (EOF). The field team determines radiation levels in the environment and reports results to the Dose Assessment Director. The field team begins its monitoring functions within 30 minutes of the declaration of an Alert, Site Area Emergency or General Emergency on the day shift and within 60 minutes on the off-hours shifts.

C. TRANSPORTAITON

Transportation for the field team consists of a vehicle kept at the Visitors Information Center (VIC) parking area. Maintaining this vehicle in an emergency-ready condition is the responsibility of the Manager, Plant Services.

D. EQUIPMENT

1. Field Monitoring Team

The equipment used by the Field Monitoring Team for radiation surveys is included in a Field Monitoring Kit stored with the emergency supplies in the VIC Auditorium storeroom cabinet. An inventory of the field team kit is given in Table 15-3 of Emergency Procedure EP-15. An inventory list is also posted in the field team kit.

2. Equipment check out to be done before leaving the VIC:

a. Check the calibration sticker on each instrument to ensure that each has been calibrated within the past 3 months. DO NOT USE AN OUT-OF-CALIBRATION INSTRUMENT. If an instrument is out of calibration, obtain a calibrated replacement from the EOF maintenance room cabinet or from the Plant, if available, or inform the Dose Assessment Director.

b. Battery check each instrument by placing the selector switch in the battery position and observe that the needle indicates in the operating band. Replace the batteries with spares if required.

c. Perform a background measurement with each instrument.

d. See Section E.3.b.2.(b) of this procedure for operational checkout of SAM-2 gamma spectrometer. Turn the SAM-2 on and leave on to allow for warm-up during transit.

e. Check operation of the portable radio in the field kit. If the radio is inoperable, replace with the spare radio from the auditorium storeroom cabinet.

E. SURVEYS

1. Field Surveying and Sampling

Field surveys will include continuous monitoring (during field team transit) and point surveying and sampling.

a. Continuous Monitoring.

While in transit between point sampling locations (directed by the EOF), or in the absence of specific directions from the EOF, field teams will perform continuous monitoring according to the following guidance:

1) Travel with the E-530 turned on and near an open car window the beta window on the instrument should be closed. When the reading increases to about 10 times normal background (or 0.1 mR/hr, which ever is less), stop the vehicle and perform a point survey as described below. Use the field team grid maps (Figures 12-1 and 12-2) to determine exact location of survey. Report the results to the EOF.

NOTE: The plume boundary is defined as the location where the main gamma dose rate first exceeds 10 times background.

2) Continue driving with the E-530 turned on and the beta window closed. When the reading exceeds 1 mR/hr, stop and perform a point survey. Thereafter, each time readings increase by an order of magnitude (i.e., 10 mR/hr, 100 mR/hr, etc.) stop and perform a point survey. If the E-530 goes off scale, use the RO-2A with the beta window closed.

CAUTION: Readings taken in transit can be affected by contamination of personnel and equipment (including the vehicle) and by noble gases trapped inside the vehicle.

3) Repeat this above procedure in reverse. When readings are decreasing.

b. Point Surveys and Sampling.

Points of surveying and sampling are determined by the field team using survey instruments and by the EOF. Grid maps of the 2.5-mile and 10-mile radius areas (Oregon and Washington) around the Plant are kept in the field team kit and will be used to determine exact locations of surveys.

2. Beta-Gamma Survey Techniques

Field surveys of beta-gamma external dose rates are made with an Eberline E-530 survey meter with energy compensated probe, and an Eberline RO-2A dose rate meter.

a. E-530 Beta-Gamma Survey Meter.

1) Start on the lowest meter scale first and increase scales as radiation levels increase.

2) Conduct the general area survey by taking gamma and beta plus gamma readings in a 360-degree arc at 3 feet above the ground and recording the highest reading.

3) If instrument reads off-scale, repeat measurement with RO-2A as described below.

4) Record grid map location and the highest readings in mR/hr on survey form in ink (Table 12-1).

b. RO-2A Beta-Gamma Dose Rate Meter.

1) Only use RO-2A if E-530 readings are off-scale.

2) Place the meter selector switch to the zero position and adjust the zero adjust knob so the indicator needle reads zero.

NOTE: The zero adjust should also be checked in a radiation field during the survey.

3) Start on the lowest meter scale first and increase scales as radiation levels increase.

4) Hold instrument with the detector window in a vertical position. Conduct the general area survey by taking gamma and beta plus gamma readings in a 360-degree arc at 3 feet above the ground and recording the highest reading.

5) Record grid map location and the highest readings in mR/hr on survey form in ink (Table 12-1).

3. Sampling for Radioiodine and Air Particulates

In sampling for airborne radioactivity, it is assumed that all activity collected on charcoal or zeolite cartridges is I-131. However, noble gases can interfere with the field determination of radio-iodines on a charcoal cartridge. Determine initial concentrations of radio-iodines by drawing a known volume of air through an upstream paper filter and a silver zeolite cartridge. Silver zeolite cartridges are counted on the SAM-2 NaI detector.

NOTE: The dose assessment director may instruct the field teams to use charcoal cartridges if the noble gas interference is determined to be minimal.

Field sampling for radioiodine and particulates utilizes a RADeCO H809C Portable Air Sampler and a SAM-2 Gamma Spectrometer.

a. Air Sampling.

1) Insert a clean 47mm filter paper with the spongy side facing outward and a clean charcoal (or zeolite) cartridge into air sampler.

2) Connect the sampler to a 12-volt car battery. Record starting time.

3) Turn sampler on and check flow rate. Run sampler for a sufficient time to collect at least a 2-cu-ft sample, if possible.

NOTE: This sample volume insures a minimum detectable activity of 5×10^{-8} µCi/cc if background is less than or equal to 300 cpm. At the direction of the EOF, greater sensitivity may be obtained utilizing the sample volumes and counting times listed in Table 12-4. Higher background count rates will result in lower sensitivity, as described in Table 12-4.

4) Again check air flow rate and turn power switch "OFF". Note sample time and average flow rate on Table 12-2.

5) Remove air filter with forceps and place in a plastic bag. Remove cartridge and count in the SAM-2 as described below.

b. Air Sample Analysis.

The Eberline SAM-2 is used for emergency radioiodine counting.

1) Precautions.

a) Particulates must be removed from the air with a filter prior to air entering the iodine cartridge.

b) To minimize the collection of noble gas, silver zeolite will be used as the iodine cartridge.

c) Retention of the iodine drops as the sample flow rate increases (see Table 12-2 footnote).

d) To minimize background interference, move to a location out of the effluent plume (gamma exposure rate less than 10 times normal background and as near background as possible) before counting an air sample. Multiple samples may be taken prior to moving to a low background area.

e) Instrument should be warmed up for 10 min prior to use.

2) Analysis.

a) Setup.

(1) Connect to battery power through BATTERY connector (pin 1 negative, pin 2 positive).

(2) Connect detector (detector and meter are matched during calibration).

(3) Set switch (on bottom of case) to appropriate power source (115V or battery pack).

(4) Set STABILIZER switch to ON (back of case).

(5) Set H.V. ADJUST at 750.

(6) Set CH 1 THRESHOLD at 360.

(7) Set CH 1 window at 100.

(8) Set CH 1 to +.

(9) Set CH 1 to IN.

(10) Set CH 2 to OFF.

(11) Set DISPLAY to ON.

(12) Set ratemeter as required.

(13) Set TIMED-STOP-MANUAL to TIMED.

(14) Set COUNT TIME IN MINUTES as required.

(15) Set POWER to ON (back of case).

b) Operational Check (to be performed before leaving the EOF).

(1) Perform Step (2)(a) (Setup).

(2) Obtain 1-min background count.

(3) Count the Ba-133 source included with the instrument for one minute (centered on probe and identification side out).

(4) The source net CPM (ccpm) ÷ the source DPM must be ± 20 percent of the Ba-133 efficiency posted on the instrument.

NOTE: 2.22E6 x μCi = DPM.

NOTE: Correct source for decay (see Figure 12-3).

(5) Record the data on Table 12-3 and make calculations.

(6) If Step 5 is greater or less than 20 percent of the posted efficiency, the instrument must be repaired and/or recalibrated prior to use.

c) Counting.

(1) Obtain a 1-min background count.

(2) With the filter removed, count the charcoal or silver zeolite cartridge for one minute.

NOTE: This counting time assures a minimum detectable activity of 5×10^{-8} µCi/cc (with a 2-cu-ft sample) if background is less than or equal to 300 cpm. At the direction of the EOF, greater sensitivities may be obtained utilizing the sample volumes and counting times listed in Table 12-4. Higher background count rates will result in lower sensitivity, as described in Table 12-4.

NOTE: Count the cartridge with the filter side (upstream side) toward, and centered on, the end of the RD-22 probe.

(3) Record grid map location and data on Table 12-2. Complete calculations on Table 12-2 and report results to the EOF.

NOTE: The current efficiency for I-131 is posted on the instrument.

(4) Count filter using the method described in steps (c)1.-(c)2. Record data on Table 12-2 and complete calculations on Table 12-2. DO NOT report the result to the EOF unless directed by the EOF.

(5) Place cartridge in plastic bag with a filter and label bag with date, time and location of sample.

4. Soil, Vegetation, Milk and Water Sampling Procedures

a. Soil.

Equipment and Supplies:

1) Small garden spade or shovel.

2) 30 x 40 cm (approximate) plastic bags.

3) Rubber bands.

4) Disposable rubber gloves.

5) Grease pencil.

6) Labeling tape.

Procedure:

1) Proceed to the sample location as directed by the EOF.

2) Document each sample type and location on the sample container and in log book (Table 12-5).

3) Remove all vegetation and large rocks before collecting sample. (Vegetation may be used for sample of Section 4.b.).

4) Obtain soil from an area of 1 sq ft to a maximum of 1-in. soil depth. Place the soil in plastic bag.

5) Compress the plastic bag so that air may escape holding the opening away from the body, and then seal the bag with a rubber band.

6) Return samples to a sample collection point as directed by the EOF for transportation to a laboratory.

b. Vegetation (Grass).

Equipment and Supplies:

1) Vegetation cutting tool (pair of hand clippers).

2) 30 x 40 cm (approximate) plastic bags.

3) Rubber bands.

4) Disposable rubber gloves.

5) Grease pencil.

6) Labeling tape.

Procedure:

1) Proceed to the sample location as directed by the EOF.

2) Document each sample type and location on the container and in log book (Table 12-5).

3) Grass should be removed to ground level with aid of clippers. If possible, obtain enough vegetation to fill a 30 x 40 cm plastic bag.

4) Vegetation should be a composite obtained from an area of 1 square ft.

5) Do not include plant roots or vegetation covered with soil that has been either dropped or dragged.

6) Compress the plastic bag so that the air may escape, holding the bag away from the body and then seal the bag with a rubber band.

7) Return samples to a sample collection point as directed by the EOF for transportation to a laboratory.

c. Milk.

Equipment and Supplies:

1) Cubitainers (1 quart).

2) Plastic funnels.

3) Plastic bags or sheeting.

4) Disposable rubber gloves.

5) Grease pencil.

6) Labeling tape.

Procedure:

1) Proceed to the sample collection point as directed by the EOF.

2) Document sample location and type on the sample container and in log book (Table 12-5).

3) Where milk is in a large collection tank, the tank should be at least one-quarter full and agitated for 10 min before taking a sample.

4) Fill a quart cubitainer with fresh, raw milk. Pour milk into the cubitainer using a clean plastic funnel.

5) Do not contaminate the outside of the cubitainer.

6) To ensure cleanliness, set the cubitainer on a plastic bag or sheeting while filling the cubitainer.

7) Any external contamination could result in erroneous positive readings and result in needless protective actions.

8) Return samples to a sample collection point as directed by the EOF for transportation to a laboratory.

d. Water (for a liquid release accident only).

1) Proceed to the Rainier water supply intake on the Rainier waterfront.

2) Fill a quart cubitainer from the supply system.

3) Return water sample to a sample collection point as directed by the EOF for transportation to a laboratory.

e. Collections of other environmental samples (surface and ground water, sediment, precipitation, fish and animals) are performed as needed by the Environmental Monitoring/Dosimetry Group following routine procedures.

5. Contamination Surveys

a. If directed by the EOF, to perform reentry/recovery contamination surveys, return to the EOF and obtain an RM-14 or E-140N with an HP-260 (shielded-preferrable) or HP-210 probe.

b. At monitoring locations specified by the EOF, perform the following surveys:

1) A general area gamma survey using the E-530 (window closed) as described in E.2 above. Record the location and results on Table 12-1.

2) A contamination survey.

a) Select a patch of level ground with minimal vegetation (if possible).

b) Hold the probe about 1/2-inch from the ground. DO NOT TOUCH THE PROBE TO THE GROUND. Repeat in several locations in the immediate area and select the highest reading.

CAUTION: Airborne radioactivity may interfere with the contamination survey. If airborne activity

is suspected, perform an additional survey with the probe near the ground, but pointed toward the sky. If the readings from the ground and from the air are identical or similar, report to the EOF that a contamination survey is not possible due to airborne radioactivity interference.

c) Multiply the cpm by the efficiency factor of 10 and record the results (in dpm/100 cm^2) on Table 12-1.

d) Report the general area dose rate and the contamination results (if obtainable) to the EOF (see Section F below).

6. Overexposure and Contamination Avoidance

a. Minimize the amount of time spent in high dose rate areas (greater than 100 mR/hr) and when possible, avoid areas where dose rates exceed 5,000 mR/hr. Check PICs frequently, and keep the EOF appraised of doses being received.

b. Caution should be used when surveying and sampling to avoid or minimize contact with vegetation and other surfaces which could be contaminated. Periodically, perform contamination surveys of the team personnel, vehicle and equipment using the RM-14/E-140N (if available) or the E-530 (window open). A reading of twice background on the E-530 or 100 cpm above background on the RM-14/E-140N indicates that decontamination should be considered.

7. TLD Collection

Posted TLDs are located at predesignated areas within a 10-mile radius of the Plant site. Collection of these devices is performed by the Environmental Monitoring/Dosimetry Group using routine procedures. A listing of TLD locations is kept in the PGE Offsite Dose Calculation Manual.

F. COMMUNICATION OF RESULTS

1. Communications between field teams and the EOF within the plume exposure EPZ are by portable two-way radio if possible. If radio contact cannot be made with the EOF, field teams will communicate within the EOF via commercial telephone. Communications procedures for field teams are given in EP-19.

2. Information to be Transmitted by Field Teams to EOF

Field teams will transmit only the following information to the EOF in the following order:

a. Field team identification: e.g., "PGE-1".

b. Grid map location (e.g., H-12) including identification of grid map used (2.5-mile or 10-mile). (See Figures 12-1 and 12-2.)

c. Any landmark on the grid map that will aid the EOF in more accurately locating your position (e.g., "corner of 1st and Main Street").

d. Results of measurements:

1) Beta plus gamma dose rate (window open) (mR/hr).

2) Gamma dose rate (window closed) (mR/hr).

3) Measured I-131 air concentration (μCi/cc).

4) Environmental samples taken, if any.

5) Results of contamination surveys (if performed).

6) PIC readings if appropriate.

7) Any additional important information (e.g., dose to field team members reaching PAG limit or members of public contacted who are in need of assistance).

TABLE 12-1

FIELD MEASUREMENTS GAMMA WORKSHEET

Field Team Name*:

Date	Time (24-hr Clock)	Measurement Locations[a]			Survey Meter Reading[b]	
		Map ID* (2.5- or 10-mi)	Grid Coordinates* and Landmarks	Instrument Used[c]	Gamma only* (mR/hr)	Gamma + Beta* (mR/hr or dpm/100 cm^2)

[a] Map ID is the name of map you are using to locate measurement locations (i.e., 2.5- or 10-mile). Example: Map ID = 10 mile, grid coordinates = Y, 25 (next to Goble Tavern/Store).

[b] Reading taken with meter held about 3 ft above ground in vertical position (i.e., detector facing out and away from you). Record the maximum reading obtained in a 360-degree arc.

[c] E-530 or RO-2A survey meter, or RM-14 or E-140N frisker.

* Report to EOF Dose Assessment Staff.

TABLE 12-2

FIELD MEASUREMENTS AIR SAMPLING WORKSHEET

Field Team Name:

Date	Time (24-hr Clock)	Sample Location		Air Sampler Operation			
				Sampling Time			
		Map ID (2.5- or 10-Mi)	Grid Coordinates and Landmarks	On	Off	Number of Min	Flow Rate (cfm)

Calculate volume of air sampled (cc): _____ cfm x 2.83E+4[a] x _____ min = _____ cc

COUNT CARTRIDGE

Counting Time (min)	Gross Counts From Detector	Gross cpm	Background cpm	Net cpm (Gross - Bkgd)	I-131[b] Retention Factor (CF)	I-131[c] Efficiency Factor (EFF)

Calculate radioactivity: $\frac{\text{net cpm} \times \text{CF} \times 4.55\text{E-}7^{[a]}}{\text{cc} \times \text{EFF}}$ = _____ µCi/cc

COUNT FILTER

Counting Time (min)	Gross Counts From Detector	Gross cpm	Background cpm	Net cpm (Gross - Bkgd)

Report to EOF:

Sample location: _____ map, _____ grid location

Time sample obtained: _____ (hour) Cartridge radioactivity: _____ µCi/cc

Mark this information on plastic bag containing cartridge and filter, using labeling tape.

[a] Exponential notation: 2.83E+4 = 2.83 x 10^4 = 28300.
4.55E-7 = 4.55 x 10^{-7} = .000000455.

[b] I-131 retention correction factor (CF) for zeolite and charcoal cartridges is 1.1 for sample flows of 3 cfm or less and 1.2 for flows of 3 to 5 cfm.

[c] Efficiency correction factor (EFF) is found on calibration sticker on portable detector.

TABLE 12-3

SAM-2 OPERATIONAL CHECK WORKSHEET

Field Team Name:

Date	Time (24-hr Clock)	Gross Counts From Detector in 1 min	Background Counts in 1 min	Net cpm (Gross - Background)	Ba-133 Source Net DPM[a]	Detector Ba-133 Efficiency (EFF)[b]	$\frac{\text{Net cpm} - 1[c]}{\text{DPM} \times \text{EFF}}$

[a] Net DPM = source μCi (marked on source) x 2.2E6 x decay correction factor (see Figure 12-3).

[b] Marked on instrument.

[c] If this value is greater than +0.20 or less than -0.20, the instrument must be repaired and/or recalibrated prior to use.

TABLE 12-4

SAM-2 MINIMUM DETECTABLE ACTIVITY (MDA)
VERSUS SAMPLE VOLUME AND COUNTING TIME

I-131 MDA (μCi/cc)	Sample Volume (cu ft)[a]	Counting Time (min)[a]
5×10^{-8}	2	1
9×10^{-9}	5	2
1×10^{-9}	15	20

[a] Assumes a 300-cpm background. For higher backgrounds, the MDA will increase by a factor of $\sqrt{\frac{\text{Background (cpm)}}{300}}$.

TABLE 12-5

FIELD MEASUREMENTS ENVIRONMENTAL SAMPLE LOG SHEET

Field Team Name:

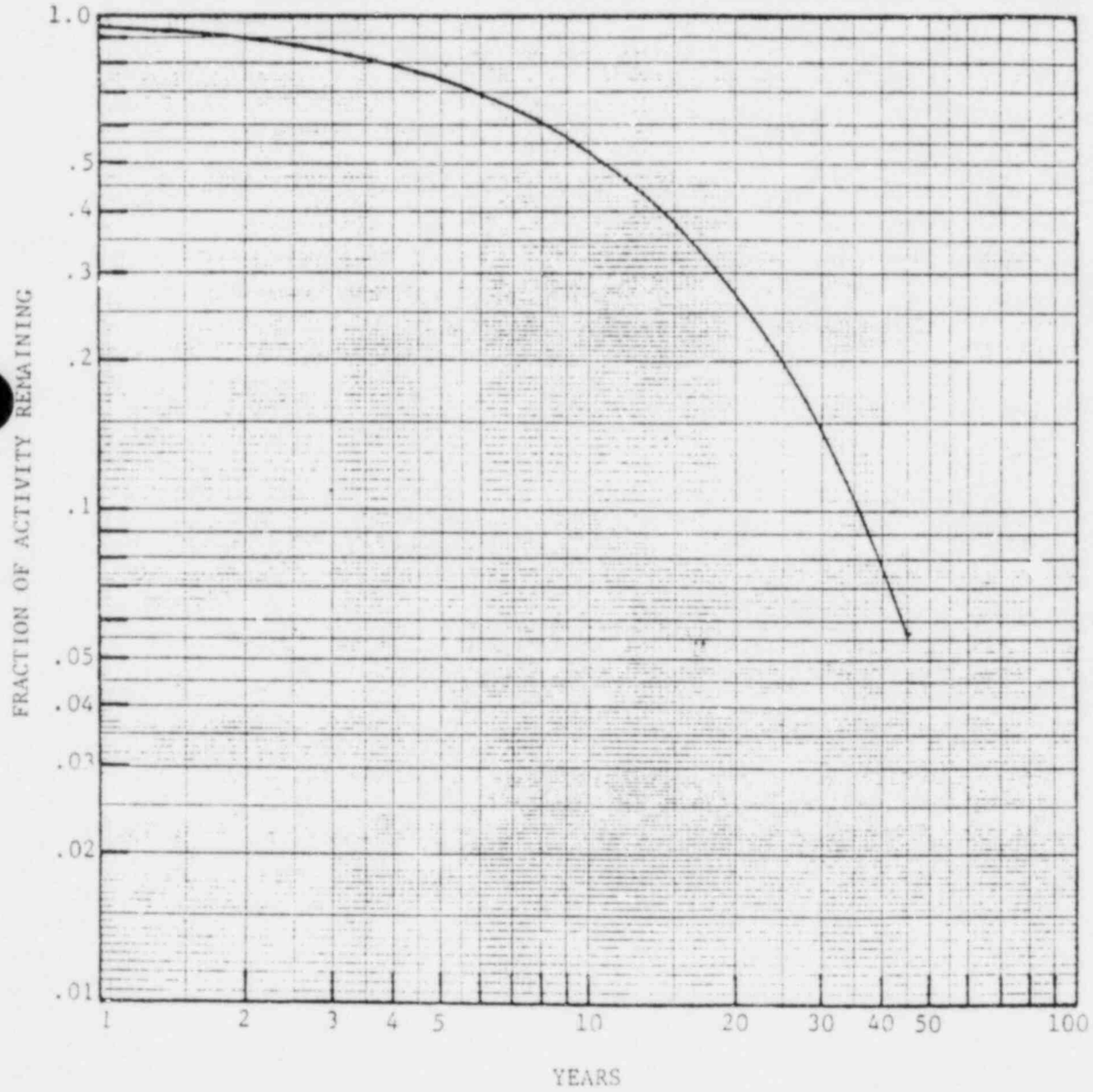
Date	Time (24-hr Clock)	Sample Locations		Type of Sample Taken[b]	Comments
		Map ID[a]	Grid Coordinates and Landmarks		

[a] 2.5-mile, or 10-mile

[b] Eg, water, vegetation, milk, TLD collected, etc.

FIGURE 12-1

Decay Curve for Ba-133



UPDATED
MAINTAINED BY COPY HOLDER

RADIOLOGICAL EMERGENCY RESPONSE PLAN IMPLEMENTING PROCEDURE

EP-29*

SAFETY-RELATED

EOF OFFSITE DOSE ASSESSMENT COMPUTER ANALYSIS METHOD

APPROVED BY C P Gundt DATE 9/2/82

A. PURPOSE

The purpose of this procedure is to describe offsite dose assessment using computer analysis. This procedure is to be followed whenever the Emergency Operations Facility (EOF) Dose Assessment computer terminal is available and functioning. This procedure is also to be used in the Technical Support Center (TSC) if the TSC is performing dose assessments, and a computer terminal is being used.

B. DEFINITIONS

1. PRM: Process and Effluent Monitor
2. ARM: Area Radiation Monitor
3. PORV: Power-Operated Relief Valve
4. RCS: Reactor Coolant System
5. CSS: Containment Spray System
6. TLD: Thermoluminescent Dosimeter
7. FI: Flow Indicator
8. FR: Flow Recorder

C. DESCRIPTION OF FACILITY AND COMPUTER CODES

1. Computer Facility

The EOF Dose Assessment computer facility consists of a hard-copy computer terminal connected to a dedicated telephone line in the dose assessment area of the EOF (see EP-8). Instructions for connecting and operating the terminal are given in Procedure EP-29.1.

*This procedure has been extensively revised.

2. Computer Codes

Three computer codes are available for offsite dose assessment at the EOF. These are:

a. SUBIN - Calculates external whole body, skin and inhalation thyroid doses using either Plant effluent data or field monitoring data.

b. INGEST - Calculates ingestion pathways doses using either Plant effluent data or field monitoring data.

c. LIQUID - Calculates liquid pathways doses using Plant effluent data.

The computer codes are totally interactive and prompt the user for all required input data. Procedure EP 29.1 lists instructions for logging on the computer system and running the computer codes. Procedures EP 29.2, 29.3 and 29.4 describe the operation of the SUBIN, INGEST and LIQUID codes respectively.

3. CAUTION: The calculational methods utilized in this procedure contain certain inherent inaccuracies that will likely result in generally conservative projections of offsite radiation doses. Some of the conservatisms include:

a. Gaussian diffusion model.

b. Use of plume centerline doserates as characteristic of the entire plume.

c No credit for possible elevated releases.

d. Conservative iodine release assumptions from Containment and steam systems.

e. Default values for release rates and durations.

In addition, the meteorological dispersion model contains only a crude set of correction factors for the river valley terrain surrounding the Plant. Conservative assumptions were used in its development, particularly with respect to the transport of effluents up the "side" valleys (Kalama, Rose, Tide-Merrill) that flow into the Columbia River Valley. Also, the dispersion model cannot handle real-time changes in wind speed, direction or stability classification; the plume is assumed to proceed in a path determined by the meteorological conditions at the Plant. In particular, reversal of flow in the river valley cannot be modeled accurately by the codes. These inaccuracies

may introduce non-conservatisms into the dose projections. While the above situations can be conservatively modeled using multiple computer runs, care must be taken to compare all computer dose projections with field team data whenever possible. Further, dose assessments must be integrated with Plant conditions in developing protective action recommendations (see EP-30).

D. INITIATION OF DOSE ASSESSMENT

An offsite dose assessment will be performed under any of the following emergency conditions (as determined by the Dose Assessment Director):

1. Any of the following PRM readings or analysis of effluent samples persisting for longer than 15 minutes (indicate effluent release rates exceeding 10 times the Technical Specification limits):

   a. Gaseous releases:

      PRM-1C:off-scale high (purge mode)
      PRM-1D:6.5E+4 cpm (pressure relief mode)
      PRM-2C:2.0E+5 cpm
      PRM-2D:20x background
      PRM-6A:off-scale high
      PRM-6B:6.6E+3 cpm
      I-131 concentration in effluent $\geq$ 1.2E-6 μCi/cc for Containment purge or 5.8E-7 μCi/cc for Auxiliary Building vent.

   b. Liquid releases:

      PRM-9: 10x high alarm setpoint established in discharge permit and isolation valve not closed.

      PRM-10: 3.7E+4 cpm above background while steam generator blowdown is directed to the river (not through the condensate demineralizers)

2. Containment ARM (ARM-15A or B) readings indicate greater than 20 R/hr (1-percent core gap activity release to the Containment atmosphere), and Containment pressure is greater than 5 psig (see Figure 10-2 of EP-10).

3. An Alert, Site Area Emergency, or General Emergency has been declared, and radioactive effluent has been released to the environment through an unmonitored liquid or gaseous pathway, or the radioactive effluent release is through a liquid or gaseous pathway with a malfunctioning PRM.

4. The TSC or EOF Director requests an offsite dose projection, based on projected Plant conditions or projected evolutions (e.g., results of venting the Containment).

E. COMPUTER DOSE ASSESSMENT PROCEDURE

1. The dose assessment staff Recorder/Communicator obtains the following radioactive material release data and meteorological data from the TSC via telephone and other Plant status data from the EOF status boards:

   a. Gaseous Effluent Release Data

      1) Radionuclide Concentrations in Effluents

         a) Table 29-1 lists the methods available to the control room staff, in order of priority, for obtaining an estimate of noble gas (Xe-133) and iodine (I-131) concentrations in effluent releases for each potential release point. At least one of these measurements or combinations of measurements should be received from the TSC for noble gases and iodine. If none of these data are available, utilize field team measurements (see F.5 below).

            CAUTION: Containment ARM readings or gamma exposure rates outside Containment should only be used if no other method of estimating Containment radionuclide concentrations is available (i.e., grab samples or PRM readings). These methods will only give rough, conservative approximations; in particular, iodine concentrations will likely be considerably overestimated due to the use of a Design Basis Accident iodine source term (25 percent of iodines) and should be verified using field team data as soon as possible (see Section F below).

         b) Once the data are received and recorded on Form 29A, any required calculations of radioactive releases through steam pathways should be performed using the conversion factors in Table 29-3 (if the event is a steam generator tube rupture). Enter the conversion factor used on Form 29A. The results should be entered on Form 29A in the spaces labeled "Effluent Noble Gas Concentration" and/or "Effluent Iodine Concentration".

         c) Fill in PRM calibration factors (Table 29-2), if required on Form 29A.

2) Effluent Flow Rate (cfm).

a) Table 29-1 lists the methods available to the control room staff, in order of priority, for obtaining an estimate of the effluent flow rate (cfm). Enter the appropriate value on Form 29A.

3) Estimated Release Duration (hr).

a) If the release duration has not been determined (i.e., the release is still going on) use Table 29-5 to obtain default values.

4) Time elapsed since reactor shutdown (hr).

b. Meteorological Data.

1) Record the following meteorological data on Form 29A as relayed from the TSC:

a) Wind direction (both toward and from which wind is blowing).

b) Wind speed (mph).

c) Stability data: primary - ΔT (200-33)(C°)
backup - $\sigma\theta$ (°)

2) If meteorological instrumentation is not functional, estimate data as follows:

a) Wind speed: Obtain from instrumentation mounted on wind generator tower outside the EOF.

b) Wind direction: Estimate from wind vane mounted on wind generator tower.

c) Stability class: Estimate using wind speed and Table 29-6; convert to ΔT (°C) by using Table 29-7.

d) Inform the EOF Director to request the PGE Load Dispatcher to contact the National Weather Service, Portland office, and obtain the following information for the Trojan area:

(1) Low-level wind speed and direction.

(2) Stability class.

Use this data to update the meteorological data obtained in Section E.1.b.1)a) above.

3) Record the form of precipitation, if known.

NOTE: This information can be used to resolve differences between dose projections and field team results, since precipitation increases iodine and particulate plume depletion.

c. Liquid Effluent Release Data.

1) Obtain isotopic concentrations of nuclides in effluent or a gross nuclide concentration from the TSC and record on Form 29C. If a gross nuclide concentration is used, assume the effluent is all I-131.

NOTE: This will result in a conservative estimate of drinking water thyroid doses.

2) Obtain effluent stream flow rate (gpm) and estimated release duration (hr). Record on Form 29C. If release duration is not known, use a default value of 3 hr;

or

3) Obtain total batch release (gal). Record on Form 29C.

2. The dose assessment staff Dose Assessor determines which computer code to run, as well as other particulars:

a. Distances for dose calculations: For SUBIN, the EAB, 2.5, 5 and 10 miles are standard. For INGEST, 10, 20, 30, 40 and 50 miles are standard. Other distances may be chosen if desired.

b. Short or long output: The short output is standard. The long output should be selected only when a detailed breakdown of doses and doserates by nuclide is desired.

c. The use of structure shielding and ventilation reduction factors in SUBIN: Normally, no shielding or ventilation factor credit should be taken (factors = 1.0) for initial dose assessments aimed at determining protective action recommendations. However, these factors can be used if dose assessments are needed for portions of the offsite population who have been sheltered. Either default values (structure factor = 0.75, ventilation factor = 0.65) or other values can be used as necessary.

NOTE 1: The structure factor of 0.75 is a conservative value based on an average house. This factor is applicable for the entire duration of the release. Buildings built of concrete or brick will have lower shielding factors (<0.75).

NOTE 2: The ventilation isolation factor (0.65) is a conservative value based on air change rate of 0.5 hr^{-1}, and is applicable for about 2 hours. Use 1.0 after 2 hours.

d. Record all instructions on the Standard Message Form (Table 8-3 of EP-8), attach Forms 29A and 29B (if used), and forward to the Computer Operator.

3. The Computer Operator performs dose calculations using the data recorded on Forms 29A and 29B as input with the appropriate computer code and options as directed by the Dose Assessor.

NOTE: If radioactive material release data is received for more than one release pathway (e.g., air ejector plus steam generator PORV), separate dose calculations should be made for each pathway and the results added together.

a. SUBIN calculates the downwind distances (if any) at which Protective Action Guide (PAG) doses are exceeded and the plume widths at the specified distances.

b. INGEST calculates the downwind distances (if any) at which the preventive and emergency PAG doses are exceeded.

c. LIQUID calculates the water ingestion doses at the Rainier water supply intake on the Columbia River.

d. Record the results and appropriate parameters on the Accident Assessment Report Form (Table 8-2 of EP-8). Attach code short output(s) (both copies) to report form and return to Dose Assessor.

4. The Protective Action Evaluator will use Procedure EP-30 for protective action recommendations. Record recommendations on the Accident Assessment Report Form (Table 8-2 of EP-8).

5. Dose assessment results and protective action recommendations (Accident Assessment Report, Table 8-2 of EP-8) are then passed through the Dose Assessment Director to the Recorder/Communicator.

6. Recorder/Communicator:

a. Retain one copy of Table 8-2 and the computer output, and forward the remaining copy to the EOF Director.

b. Plot the following information of the 10-mile wall map:

1) Wind direction.

2) Plume extent (transport path and width) out to 10 miles.

3) Projected doses (whole body and thyroid at the EAB, 2.5, 5 and 10 miles).

4) Sectors recommended for shelter and evacuation.

c. Post dose calculation results on the dose assessment area status board.

F. UPDATING OF DOSE ASSESSMENTS

1. Update dose assessment calculations if any of the following parameters change significantly (20 percent or more for numerical parameters):

a. PRM reading.

b. Containment radiation level.

c. Effluent grab sample analysis results.

d. Measured effluent flow rate.

e. Containment pressure.

f. Containment Spray System (operational status).

NOTE: System is operational if at least one train is operating.

g. Wind speed.

h. Wind direction (cardinal compass direction change).

i. Temperature difference (or sigma).

j. Estimated duration of release.

2. Obtain frequent updates of the above parameters from the TSC (about every 30 minutes when parameters are changing).

3. NOTE: Significant changes in the above parameters can be accommodated by using multiple runs of SUBIN, INGEST or LIQUID. This will typically involve making a run using the data from the last data update, but with a duration of release equal to the time between data updates (e.g., 30 minutes). Then, a second run is made using the updated data with the appropriate projected release duration (use Table 29-5 if no other data is available). The results can then be added together manually to give total projected integrated doses. This technique may introduce uncertainties into the results, and should be checked using field team data (see Section F above).

G. USE OF FIELD TEAM DATA

1. The Field Team Coordinator will direct the field monitoring teams (ground and aerial) to obtain the following data:

   a. Plume EPZ.

      1) Ground Teams

         a) Whole body gamma doserates (mR/hr).

         b) Air concentrations of I-131 (μCi/cc).

         c) Ground contamination levels (dpm/100 cm^2).

      2) Aerial Team (if available).

         a) Whole body gamma doserates (mR/hr).

         b) Plume boundaries and centerline.

            NOTE: The "plume boundary" is defined as the location(s) where the whole body doserate exceeds 10 times background levels (about 10^{-1} mR/hr).

   b. Ingestion EPZ (Ground Teams Only).

      1) Collect samples of:

         a) Water.

         b) Milk.

         c) Vegetation.

         d) Soil.

      2) Collect TLDs (PGE, state or federal).

      3) Collect fixed air sampler cartridges and filters (PGE).

   c. Environmental TLD data are reported in units of mR of exposure over a time period. Fixed air sampler cartridge data are reported in units of PCi/m^3 * time of exposure. These values can be used in population dose calculations (see G., below). Figure 32-2 of EP-32 shows the locations of fixed TLD and air sampler locations used for routine environmental monitoring.

d. Computer projections of plume location and offsite doses shall be used by the Field Team Coordinator in directing field teams to monitoring/sampling locations.

2. Field team results for the plume EPZ will be communicated to the Field Team Coordinator via radio (see EP-19) and recorded, on Form 29A and on the dose assessment area viewgraph projector (if available) or the field team status board.

3. Ingestion EPZ sampling laboratory analysis results and state TLD readings shall be communicated from the Washington EOC and the Oregon State Health Division Operations Center (Oregon Health) to the Recorder/Communicator via telephone. Results may also be transmitted to the EOF via the hard-copy circuit (if available). PGE TLD and air sampler cartridge readings shall be communicated to the Recorder/Communicator by the PGE Environmental Monitoring/Dosimetry Group (see EP-24.15). The Recorder/Communicator shall record the results on Form 29D.

4. Field team results (Form 29A or Form 29D) shall be forwarded to the Dose Assessor.

5. The Dose Assessor shall use SUBIN or INGEST to calculate doserates and doses at monitoring/sampling locations from field team data (ie, I-131 air concentrations and milk or vegetation samples). LIQUID may be used to calculate ingestion doses from water sample results. The doserates and doses shall be forwarded to the Dose Assessment Director.

6. Field Team data shall be utilized in the following manner:

   a. To verify and/or assess computer dose projections. It should be emphasized that field team data reflects actual offsite conditions, although not necessarily at the location(s) of maximum (plume centerline) dose rates or iodine concentrations. The Dose Assessment Director shall compare field team data with computer dose projections and shall resolve any differences, if possible, before utilizing either set of data to make protective action recommendations. If the differences cannot be resolved, the most conservative results shall be utilized.

   b. To provide a method of determining Plant radionuclide release rates for dose projections if no Plant release data is available. Both SUBIN and INGEST (long output only) will back-calculate radionuclide release rates if field team data is used as input. The sample/monitoring points should be as close to the EAB and the plume center line as possible in order to minimize meteorological modeling errors.

   c. To provide documentation of offsite doses throughout the accident for later use in calculating total integrated doses (man-rem).

d. Computer projections of plume location and offsite doses

7. Upon direction of the Dose Assessment Director the Protective Action Evaluator shall update protective action recommendations previously made from computer projections based on Plant release data (see EP-30).

H. OTHER COMPUTER CALCULATIONS

1. In addition to the three computer codes described in this procedure, the computer resources of the PGE Headquarters Radiological Engineering Branch (REB) are also accessible from the EOF.

2. Members of the REB will be dispatched by the Company Support Center to relieve Plant personnel in the EOF dose assessment area. The REB personnel are capable of accessing and running the REB computer codes as needed by the EOF, including calculating population dose commitments.

I. REFERENCES

1. EP-8, "Operation of Emergency Operations Facility".

2. EP-10, "Accident Dose Assessment - Work Sheet Method".

3. EP-19, "Communications".

4. EP-24.15, "Environmental Monitoring/Dosimetry Group".

5. EP-30, "EOF Offsite Protective Action Recommendations".

6. EP-32, "Reentry and Ingestion Pathways Monitoring/Sampling Plan".

TABLE

GASEOUS EFFLUENT RELEASE MEASUREMENT METHODS

Release Point	Effluent Noble Gas Concentration (μCi/cc)			Effluent Iodine Concentration (μCi/cc)			Release Flow Rate (cfm)	
	Primary	1st Backup	2nd Backup	Primary	1st Backup	2nd Backup	Primary	Backup
1. Plant Vent	PRM-2C, -2D	Grab sample of effluent	Field team data	Grab sample of effluent	Field team data	-	Table 29-4	-
2. Containment Purge or Hydrogen Vent System	PRM-1C, -1D, or -1E	Grab sample of Containment atmosphere	Field team data	Grab sample of effluent[a]	Grab sample of Containment atmosphere[a]	ARM-15A, -15B	FR-3180 (Panel C-06)	Table 29-4
3. Containment Leakage (Unmonitored)	Grab sample of Containment atmosphere[a]	ARM-15A or -15B	Doserate outside Containment [contact]	Grab sample of Containment atmosphere[a]	ARM-15A or -15B + CSS status	doserate outside Containment + CSS status	Containment pressure[c] [isolated Containment only]	Field Team Data
4. Air Ejector [only if offsite power is available]	PRM-6A, -6B or -6C	Grab sample of effluent[a]	PRM-16 reading[b] + Table 29-3	0.0	0.0	0.0	Table 29-4	-
5. Steam Generator PORV or Safety Valves	PRM-16A, -16B, -16C or -16D	Grab sample of steam[a]	RCS sample[b]	Grab sample of steam[a]	RCS sample[b] + PRM-16 reading	RCS sample[b]	Table 29-4	-
6. Turbine Auxiliary Feedwater Pump (while operating)	PRM-16A, -16B, -16C or -16D	Grab sample of steam[a]	RCS sample[b]	Grab sample of steam[a]	RCS sample[b] + PRM-16 reading	RCS sample[b]	Table 29-4	-
7. Main Steam Line Break	PRM-16A, -16B, -16C or -16D	Grab sample of steam (unaffected loop)	Field team data	Grab sample of steam (unaffected loop)	Field team data	-	[FI - (512 or 513)[d][e] + (522 or 523) + (532 or 533) + (542 or 543)] *0.45	Table 29-4

[a] For fast initial calculations, use backup method(s).

[b] See Table 29-3. For initial calculations, use most recent pre-accident sample results.

[c] Indicator on Panel C-19 in Control Room. For non-isolated Containment, use field team data.

[d] Take one reading per steam line (there are two indicators per line), add together and multiply by 0.45 ($\frac{lb}{hr}$ to cfm conversion).

[e] Use only if steam is being released to the atmosphere through Main Steam Line PORV or relief valves. If release is only through ruptured line to atmosphere, use Table 29-4.

TABLE 29-2

PRM CALIBRATION FACTORS

PRM Name	PRM Number	Calibration Factor (cpm/μCi/cc)
Containment low-level noble gas	PRM-1C	3.5E+7
Containment intermediate-level noble gas	PRM-1D	4.0E+3
Containment high-level noble gas	PRM-1E	2.3E-1[a]
Auxiliary Building low-level noble gas	PRM-2C	3.5E+7
Auxiliary Building intermediate-level noble gas	PRM-2D	4.0E+3
Air ejector low-level noble gas	PRM-6A	3.5E+5
Air ejector intermediate-level noble gas	PRM-6B	4.0E+3
Air ejector high-level noble gas	PRM-6C	2.3E-1[a]
Main steam line monitors	PRM-16A	9.3E+1[b]
	PRM-16B	9.3E+1[b]
	PRM-16C	4.8E+1[b]
	PRM-16D	4.8E+1[b]

[a] Temporary monitors; units = mR/hr/μCi/cc.

[b] Units - mR/hr/μCi/cc.

TABLE 29-3

CONVERSION FACTORS FOR STEAM RELEASES
FROM STEAM GENERATOR TUBE RUPTURE

Release Point	Conversion Factor[a] Noble Gases (Xe-133)	Iodine (I-131)
A. PRM-16 Reading Available		
1. Steam generator PORV or safety valves, or turbine auxiliary feedwater (AFW) pump exhaust.	NA	$\frac{[\text{PRM-16A or B}]}{[\text{RCS Xe}]} * 8.2E\text{-}6$[b]
	NA	$\frac{[\text{PRM-16C or D}]}{[\text{RCS Xe}]} * 1.6E\text{-}5$[b]
2. Air ejector	5.1[c] 9.8[d]	0.0
B. PRM-16 Reading Not Available		
1. Steam generator PORV or safety valves, or turbine AFW pump exhaust	1.7E-3	1.7E-5
2. Air ejector	1.1	0.0

[a] Conversion Factors are used as follows:

1. Xe-133:

   $\frac{\mu Ci}{cc}$ equivalent Xe-133 in steam = RCS Xe-133 concentration ($\frac{\mu Ci}{gm}$) * Factor

2. I-131:

   $\frac{\mu Ci}{cc}$ equivalent I-131 in steam = RCS I-131 concentration ($\frac{\mu Ci}{gm}$) * Factor

[b] PRM-16 = PRM-16A, -16B, -16C, or -16D reading (loop with failed tube).
RCS Xe = Reactor Coolant System Xe-133 concentration ($\mu Ci/gm$).

[c] Use of this conversion factor:

$\frac{\mu Ci}{cc}$ equivalent Xe-133 in effluent = [PRM-16A or B] * Factor

[d] Use of this conversion factor:

$\frac{\mu Ci}{cc}$ equivalent Xe-133 in effluent = [PRM-16C or D] * Factor

TABLE 29-4

DEFAULT VALUES FOR EFFLUENT FLOW RATES

Pathway	Default Flow Rate (cfm)
Containment Purge	5.0E+4[a][b]
Hydrogen Vent System	1.4E+2[b][c]
Auxiliary Building Ventilation System	1.1E+5[a]
Air Ejector	6.0E+1[a]
Steam Generator Power Operated Relief Valves (PORVs)	3.8E+4[d]
Steam Generator Safety Valves	3.8E+4[d]
Turbine-Driven Auxiliary Feedwater Pump	5.7E+3[a]
Main Steam Line Br_ak (Outside Containment)	2.2E+4[e]

[a] Based on maximum design flow rate.

[b] For leakage through closed or partially open purge or hydrogen vent system valves, a lower value may be appropriate if the Containment is not pressurized; a higher value may be appropriate if the Containment is pressurized. Consult the TSC for an estimate.

[c] Per train, based on maximum design flow rate with normal Containment pressure.

[d] Per valve, for affected steam generator (based on design basis steam flow rates for single steam generator tube rupture with loss of offsite power).

[e] Based on design basis steam line break flow rate through broken line.

TABLE 29-5

DEFAULT VALUES FOR RELEASE DURATION[a]

	Accident	Release Duration (hr)
1.	Steam Generator Tube Rupture	0.5
2.	Tube Rupture With Stuck Steam Generator PORV or Safety Valve	1.0
3.	Tube Rupture With Stuck Pressurizer PORV	3.0
4.	Steam Line Break With Offsite Power	0.5
5.	Steam Line Break Without Offsite Power	2.0
6.	Gas Decay Tank Rupture	0.5
7.	Fuel Handling Accident	0.5
8.	LOCA With Isolated Containment[b]	0.5
9.	LOCA With Failure of Containment Isolation [b]	3.0
10.	Core-Melt With Intact Containment	10.0
11.	Core-Melt With Containment Over-pressure Failure	1.5
12.	Other Accidents	3.0

[a] CAUTION: These valves are based on theoretical evaluations of these accidents. Unforeseen events may increase or decrease the release durations. Use for estimates of release duration if no other data is available.

[b] No core melting; at least one train of Containment sprays and air coolers operate.

TABLE 29-6

DEFAULT VALUES FOR STABILITY CLASS[a]

Wind Speed		Pasquill Stability Class	
(mph)	(m/sec)	Daytime	Nighttime
< 4.5	< 2	B	G
4.5-8.9	2-4	C	F
8.9-13.4	4-6	C	E
> 13.4	> 6	D	D

[a] Reference - Meteorology and Atomic Energy 1968, Table 3.3, U.S. Atomic Energy Commission, 1968.

TABLE 29-7

ATMOSPHERIC STABILITY CATEGORIES

Classification	Pasquill Stability Category	$\sigma\theta$ (degree)	ΔT (°C)
Extremely unstable	A	$\geq$ 22.5	$<$ -0.96
Moderately unstable	B	22.5 to 17.5	-0.96 to 0.86
Slightly unstable	C	17.5 to 12.5	-0.86 to -0.76
Neutral	D	12.5 to 7.5	-0.76 to -0.25
Sli ly stable	E	7.5 to 3.8	-0.25 to 0.76
Moderately stable	F	3.8 to 2.1	0.76 to 2.0
Extremely stable	G	$<$ 2.1	$>$ 2.0

TABLE 29-8

DISTANCES FROM CONTAINMENT TO
EXCLUSION AREA BOUNDARY

Wind From	Degrees	Wind Toward	Distance to Exclusion Area Boundary (meters)	(miles)
N	348.75 - 11.25	S	1.3E+3	0.81
NNE	11.25 - 33.75	SSW	1.2E+3	0.75
NE	33.75 - 56.25	SW	1.3E+3	0.81
ENE	56.25 - 78.75	WSW	1.4E+3	0.87
E	78.75 - 101.25	W	9.5E+2	0.59
ESE	101.25 - 123.75	WNW	1.0E+3	0.62
SE	123.75 - 146.25	NW	8.1E+2	0.50
SSE	146.25 - 168.75	NNW	6.7E+2	0.42
S	168.75 - 191.25	N	6.6E+2	0.41
SSW	191.25 - 213.75	NNE	6.8E+2	0.42
SW	213.75 - 236.25	NE	8.2E+2	0.51
WSW	236.25 - 258.75	ENE	6.9E+2	0.43
W	258.75 - 281.25	E	6.3E+2	0.42
WNW	281.25 - 303.75	ESE	8.1E+2	0.50
NW	303.75 - 326.25	SE	1.0E+3	0.62
NW	326.25 - 348.75	SSE	1.6E+3	0.99

FORM 29A

DOSE ASSESSMENT DATA RECORD
ATMOSPHERIC RELEASE

Sheet No. _____

Date	Time (24-Hr Clock)	PRM No.	PRM Reading (cpm or mR/hr)	PRM Calibration Factor (Table 29-2)	ARM No.	ARM R/hr	RCS Concentration		Steam Conversion Factor (Table 29-3)		Effluent Noble Gas Concentration[a] (μCi/cc)	Effluent Iodine Concentration[a] (μCi/cc)
							Xe-133 (μCi/g)	I-131 (μCi/g)	Xe-133	I-131		

Containment Exposure Rate at Contact (R/hr)	Containment Spray System (CSS) Status	Containment Pressure (psig)	Effluent Flow Rate (cfm)[b]	Estimated Release Duration (hr)[c]	Windspeed (mph)	Wind direction[d]		Stability Data		Time Elapsed Since Reactor Shutdown (hr)
						From	Toward	ΔT (°C)	σθ (°)	

Field Team Data

Field Team Name	Location		Distance[f] From Containment (miles)	Altitude (ft)	Dose Rates		I-131 Concentration (μCi/cc)	Comments
	Map Type[e]	Grid Coordinates			Gamma (mR/hr)	Gamma + Beta (mR/hr)		

[a] Isotopic analysis data recorded on Form 29B.
[b] See Table 29-4 for default values.
[c] See Table 29-5 for default values.
[d] Give as one of the 16 cardinal compass directions (N, NNE, etc).
[e] 2.5-, 10-, or 50-mile grid map.
[f] Determine at EOF.

FORM 29B

GRAB SAMPLE DATA RECORD

ATMOSPHERIC RELEASE

Date _____

Time _____

Sheet No. _____

Number	Isotope	Effluent Concentration (μCi/cc)
1	I-131	
2	I-132	
3	I-133	
4	I-134	
5	I-135	
6	Kr-83m	
7	Kr-85	
8	Kr-85m	
9	Kr-87	
10	Kr-88	
11	Kr-89	
12	Kr-90	
13	Xe-131m	
14	Xe-133	
15	Xe-133m	
16	Xe-135	
17	Xe-135m	
18	Xe-137	
19	Xe-138	
20	Xe-139	

D. Enter values into SUBIN or INGEST (iodines only).

FORM 29C

GRAB SAMPLE DATA RECORD

LIQUID RELEASE

Date _____

Time _____

Sheet No. _____

A. Effluent Release Rate = . E _____ gpm (1)

Total Release (batch release only) _____ gal (2A)

B. Estimated Duration of Release[a] = _____ hr (2B)

C. Nuclide Concentrations:

Number	Isotope	Concentration (3) (μCi/cc)
1	H-3	
2	Cr-51	
3	Mn-54	
4	Mn-56	
5	Co-58	
6	Co-60	
7	Fe-59	
8	Zn-65	
9	Sr-89	
10	Sr-90	
11	Zr-95	
12	Mo-99	
13	Ru-103	
14	Ru-106	
15	I-131	
16	I-132	
17	I-133	
18	I-134	
19	I-135	
20	Cs-134	
21	Cs-137	
22	Ba-140	
23	Ce-141	
24	Ce-144	

D. Enter (1), (2A) or (2B) and (3) into LIQUID.

[a] Default = 3 hr.

FORM 29D

Date _____

LABORATORY DATA RECORD

Sheet No. _____

Sample Type[a]	Date/Time Sample Taken	Sample Location		Laboratory Results Record correct units (e.g., μCi/cc, pCi/m^3, pCi/l, μCi/kg)					
		Map[b]	Grid Coordinates	I-131	I-133	Cs-134	Cs-137	Sr-89, 90	Other (specify)

[a] e.g.: soil, vegetation, milk, air sampler cartridge, air sampler filter.
[b] 2.5-, 10-, or 50-mile grid map.

RADIOLOGICAL EMERGENCY RESPONSE PLAN IMPLEMENTING PROCEDURE

EP-30*

SAFETY-RELATED

EOF OFFSITE PROTECTIVE ACTION RECOMMENDATIONS

APPROVED BY C. A. Mangan Jr. DATE 9/3/82

A. PURPOSE

1. This procedure will be used by the EOF for making protective action recommendations to the state and county EOCs. This procedure will also be used by the TSC for making early protective action recommendations until the EOF dose assessment area is operational. In addition, the state EOCs may use this procedure for making decisions on actions to implement for protecting the public from radiation exposure.

2. The TSC will recommend plume EPZ protective actions to the EOF based on Plant conditions, unless the EOF is not operational; in that case, the TSC will also recommend plume EPZ protective actions based on projected or actual offsite doses. The TSC will not normally make protective action recommendations for the ingestion EPZ.

3. The EOF dose assessment area will recommend both plume EPZ and ingestion EPZ protective actions based on offsite doses. Plume EPZ protective actions will have priority until after the release has terminated, or until initial plume EPZ protective action decisions have been made by the state and/or county EOCs. If time permits, the dose assessment area will then evaluate ingestion pathways doses and determine whether preventive level ingestion protective recommendations are warranted (such as taking cows off pasture). Figure 30-1 shows the plume EPZ.

4. The Emergency Coordinator, in consultation with the state EOF liaisons will integrate protective action recommendations based on Plant conditions and dose assessments, and determine the appropriate recommendation to transmit to the state and county EOCs.

B. PLUME EPZ PROCEDURE

1. TSC Staff

a. Utilize Table 30-1 and Figures 30-1, 30-2 and 30-3 to determine protective action recommendations based on Plant conditions. Record on Table 7-2 of Procedure EP-7.

*This procedure has been extensively revised.

b. Communicate recommendations to the EOF Director or the duty Plant General Manager in the TSC if the EOF is not operational.

c. If the EOF is not operational, utilize the EOF procedure, below, to recommend protective actions based on offsite doses.

d. Update recommendations about every 30 minutes when Plant conditions change sufficiently to warrant a change in recommendations.

2. EOF Dose Assessment Staff

a. Perform dose assessments using Procedure EP-29. Use EP-10 if the computer terminal is unavailable or inoperable.

b. Determine the protective action recommendations for the public within the plume EPZ using Table 30-1 and Figures 30-1 and 30-2.

1) If the emergency has been classified as a Site Area Emergency or General Emergency, the public will already be sheltered as a result of initial notification and instructions, and the Columbia River will be evacuated out to 10 miles in both directions.

2) If the release is still occurring, utilize Table 30-2 to determine if the release may be short-term (30 minutes or less). Continued sheltering is the preferred protective action if the release persists for 30 minutes or less. If the release persists, (or is expected to persist) for longer than 30 minutes, evacuation is the preferred protective action. CAUTION: The accidents listed in Table 30-2 have been determined to generally involve short-term releases, based on design basis evaluations. Therefore, they should be assumed to have short-term releases only for the initial evaluation of offsite protective actions.

3) Evacuation recommendations will include the following:

a) Evacuation of downwind evacuation sectors where projected or measured doses exceed PAG levels (1 rem whole body or 5 rem thyroid). Table 30-3 lists the downwind evacuation sectors for each wind direction, and Figure 30-1 shows the evacuation sectors.

b) Evacuation of the 2.5-mile radius (Sectors A, B, C and D).

c) Evacuation of the river valley evacuation sectors (see Table 30-1) out to the same distance as in a) above.

NOTE: The above recommendations will be made concurrently, although the EOCs may decide to implement the recommendations sequentially or over some time period.

4) If thyroid doses are projected to exceed 5 rem, include a recommendation on the use of KI for special populations who cannot be evacuated. Figure 30-1 shows locations of special populations; Tables 30-4 and 30-5 list the special populations for which KI is available

c. Record recommended protective actions on the Accident Assessment Report Form (Table 8-2 of Procedure EP-8).

d. Determine the protective action recommendations for emergency workers using Table 30-6.

1) Record recommendations on the Accident Assessment Report Form (Table 8-2 of Procedure EP-8).

2) Communicate recommendations to the field and aerial monitoring teams over the radio systems (see Procedure EP-19).

3) Transmit recommendations for other workers to the EOF Director for communication to all EOCs.

e. Determine protective action recommendations to be communicated to the Coast Guard.

1) The U. S. Coast Guard is to be instructed to evacuate the Columbia River within 10 miles of Trojan for <u>any</u> Site Area Emergency or General Emergency condition.

2) All boat ramps within the evacuated area are to be used by boaters.

3) The Coast Guard is to be instructed on the radiation levels its response personnel (helicopter crew) may be exposed to (if available):

a) Use the Exclusion Area Boundary (EAB) dose rates as the maximum level they could receive.

b) Recommend self-administration of KI if the thyroid dose rate at the EAB exceeds 0.25 rem/hr, or I-131 air concentration exceeds 1.4E-7 μCi/cc.

4) Record boater and Coast Guard protective action decisions on the Accident Assessment Report Form (Table 8-2 of Procedure EP-8).

f. Transmit the protective action recommendations (Accident Assessment Report Form) to the Engineering Coordinator, or in his absense to the EOF Director.

g. Update dose assessments about every 30 minutes when conditions change and/or new data becomes available.

h. Determine if additional areas need to be evacuated or ongoing evacuation recommendations are still warranted.

3. EOF Director.

a. If the Emergency Response Manager has not assumed the position of Emergency Coordinator, communicate protective action recommendations for the public, boaters, and emergency workers to the duty Plant General Manager in the TSC.

b. After the Emergency Coordinator (in consultation with the state representatives at the EOF, if present) approves the protective action recommendations, direct the EOF communications staff to transmit the Accident Assessment Report Form and computer output(s) to the state and county EOCs over the hardcopy data transmission (HDT) circuit (see EP-8 and EP-19).

c. Direct the Security Supervisor to communicate the Columbia River protective action recommendations and other information listed above to the Coast Guard via commercial telephone.

d. Direct the Communications Staff to keep the TSC informed of all protective action recommendations which have been forwarded to the EOCs.

4. Emergency Coordinator.

a. Receive protective action recommendations from the EOF Director based on Plant conditions (from the TSC) and based on projected or measured doses (from the EOF dose assessment area).

NOTE: Emergency worker protective actions are based solely on dose.

b. Consult with the state representatives at the EOF (if present) in deciding upon the proper protective action recommendation.

c. Direct the EOF Director to fill in the appropriate protective action recommendation on Table 8-2 of EP-8 (if required) for transmittal to the state and county EOCs.

d. Transmit the protective action recommendations to the state and county EOCs over the automatic ringdown (ARD) telephone. Include the reason for the recommendation. Participate with the state and county EOCs in discussion of the protective action recommendations, if required, over the ARD telephone.

5. Security Supervisor.

Communicate protective action recommendations for boaters to the U. S. Coast Guard via telephone.

C. SHORT-TERM INGESTION EPZ PROCEDURE

1. This procedure is to be used during the short-term phase of the emergency (ie, release still occuring or Plant not in a controlled condition) if time permits.

2. EOF Dose Assessment Area Staff:

a. Perform initial dose assessments using Emergency Procedure EP-29. If computer terminal is unavailable, use EP-10. Utilize environmental sampling data for subsequent calculations if possible.

b. Determine the appropriate protective action distances using Tables 30-7 and 30-8 for preventive and emergency measures.

c. Identify the geographic areas included in each protective action recommendation using the gridded 50-mile area maps. (See maps posted on walls in the EOF.) The downwind 22.5-degree sector, plus the two adjacent 22.5-degree sectors, should be included in the initial protective action areas. Field team sampling data will be used to confirm this recommendation.

d. Record recommended protective actions on the Accident Assessment Report Form and transmit report to the EOF Director.

e. Update dose assessments as required and determine changes to protective actions as needed.

f. Utilize the above results and the Ingestion Pathways Producers Listing maintained at the EOF to decide upon the environmental sampling plan (see Procedure EP-32 for details). Direct sampling teams according to EP-32 procedures.

3. Emergency Coordinator - Receive protective action recommendations from the dose assessment area and discuss recommendations with state representatives at the EOF. Direct the EOF Director to transmit the approved recommendations to the EOCs and the Oregon State Health Division Operations Center (Oregon Health) via the ARD telephone and HDT circuit.

4. EOF Director - Direct the EOF communications staff to communicate protective action recommendations approved by the Emergency Coordinator to the state EOCs and Oregon Health over the ARD telephone and the hard-copy circuit.

5. Washington EOC and Oregon Health - Assist the EOF in identifying the individual food and dairy producers and processors and the community water systems within the geographic areas included in the recommendations by utilizing the detailed Ingestion Pathways Procedures Listings maintained at the EOCs and Oregon Health. Provide analysis of environmental samples and implement ingestion protective actions according to Oregon and Washington procedures.

D. RECOVERY/REENTRY PROCEDURES

1. EOF Dose Assessment Staff

After the release has terminated and the TSC has determined that the Plant is in a controlled condition (ie, no further releases likely in excess of Technical Specification limits), determine reentry/recovery recommendations as follows:

a. Plume EPZ.

1) Direct field teams according to the procedures described in EP-32 to sample ground contamination and monitor external dose rates.

2) Compare the survey results with the limits in Table 30-9 and determine recommendations for:

a) Evacuation sectors which were evacuated and must remain evacuated (see Figure 30-1).

b) Additional areas which need to be evacuated and/or additional access restrictions which need to be established (see Figure 30-1).

c) The evacuation sectors for which an evacuation order can be lifted (see Figure 30-1).

d) Specific areas that may be in need of decontamination (see Figure 30-1).

3) Determine emergency worker protective action recommendations (use Table 30-6).

a) Identify the protective actions that can be lifted.

b) Identify the protective actions that should be continued.

c) Determine additional protective actions that should be implemented.

b. Ingestion EPZ.

1) Direct field teams to sample food and water pathways and obtain analysis results from Oregon Health, Washington EOC or other laboratories according to the procedures described in EP-32.

2) Compare the survey results with the limits in Tables 30-7 and 30-8 (for food) and 30-10 (for water) and determine recommendations for:

a) The specific ingestion control measure(s) that can be lifted.

b) Which specific ingestion control measure(s) should be continued.

c) Additional ingestion control measure(s) needed.

3) Record reentry/recovery recommendations on the Accident Assessment Report Form (Table 8-2 of EP-8). Transmit to the EOF Director.

2. Emergency Coordinator - Review and discuss reentry/recovery recommendations with the state representatives at the EOF before giving approval. Direct the EOF Director to communicate recommendations to the state and county EOCs and Oregon Health.

3. EOF Director - Direct the EOF communications staff to communicate reentry/recovery recommendations approved by the Emergency Coordinator to the state and county EOCs and Oregon Health via the ARD telephone and the HDT circuit.

4. Oregon Health and Washington EOC - Assist the EOF in identifying the individual food and dairy producers and processors and the community water systems within the geographic areas included in the recommendations using the detailed Ingestion Pathways Producers Listings. Provide analysis of environmental samples, and implement ingestion pathways reentry/recovery actions.

5. Washington Reentry and Recovery Task Force - Decide upon and direct reentry and recovery actions in Washington. NOTE: The PGE Emergency Response Manager is a member of this task force.

6. Oregon EOC - Decide upon and direct reentry and recovery actions in Oregon.

7. County EOCs - Implement reentry/recovery actions within the plume EPZ.

E. REFERENCES

1. EP-8, "Operation of Emergency Operations Facility".

2. EP-19, "Communications".

3. EP-32, "Reentry and Ingestion Pathways Monitoring/Sampling Plan".

TABLE 30-1

GENERAL POPULATION PLUME EXPOSURE
PROTECTIVE ACTIONS

Basis	Emergency Classification	Protective Action Guides: Projected Offsite Doses	Protective Action Guides: Plant Conditions	Recommended Protective Actions[a]
NA	Unusual Event	NA	NA	1) None.[b]
NA	Alert	NA	NA	1) None.[b]
Recommended Protective Actions Based on Projected Offsite Doses	Site Area Emergency or General Emergency	Whole Body Dose <1 rem or Thyroid Dose <5 rem	NA	1) Notify public within plume exposure EPZ to shelter and await instructions.[c] 2) Evacuate the Columbia River in the Plume EPZ.
		Whole Body Dose ≥1 rem or Thyroid Dose ≥5 rem AND Short-Term Release (≤30 min)[d]	NA	1) Notify public within plume exposure EPZ to shelter and await instructions.[c] 2) Evacuate the Columbia River in the Plume EPZ.
		Whole Body Dose ≥1 rem or Thyroid Dose ≥5 rem AND Long-Term Release (≥30 min)[d]	NA	1) Notify public within plume exposure EPZ to shelter and await instructions. 2) Evacuate the Columbia River in the Plume EPZ. 3) Evacuate downwind evacuation sectors where PAG doses are exceeded (see Table 30-3). 4) Evacuate 2.5-mile radius. (Sectors A, B, C, D). 5) Evacuate River Valley Sectors (E, F I, J, M, N, Q, R) where PAG doses are exceeded. 6) Administer KI to special population who cannot be evacuated.
Recommended Protective Actions Based on Plant Conditions	General Emergency	NA	Security incident causing loss of physical control of facility	1) Notify public within plume exposure EPZ to shelter and await instructions. 2) Evacuate the Columbia River in plume EPZ. 3) Evacuate 2.5-mile radius (Sectors A, B, C, D).
			Loss of core cooling indicated by: 1) Valid readings on incore thermocouple above 700°F OR 2) Core ΔT rapidly increasing or no ΔT across core.	1) Notify public within plume exposure EPZ to shelter and await instructions. 2) Evacuate the Columbia River in plume EPZ. 3) Evacuate 2.5-mile radius (Sectors A, B, C, D).
			Fuel melting indicated by: 1) ARM -15A, -15B or -20 reading >2.0 E3 R/hr; OR 2) Dose rate at Containment surface >7.5 E-3 R/hr.	1) Notify public within plume exposure EPZ to shelter and await instructions. 2) Evacuate the Columbia River in plume EPZ. 3) Evacuate 5-mile radius (Sectors A through L).
			1) Fuel melting indicated (see above) and loss of Containment integrity occurring or imminent. Examples: a. Containment sprays and air coolers not functional. b. Containment pressure ≥70 psig and rising steadily. c. Containment not isolated.	1) Notify public within plume exposure EPZ to shelter and await instructions. 2) Evacuate the Columbia River in plume EPZ. 3) Evacuate 10-mile radius (all sectors).

NA - Not applicable.
[a] - Recommendations for planning purposes. Protective action decisions made during incident must consider existing conditions and special populations.
[b] - State and county EOCs may implement low-impact protective actions.
[c] - State and county EOCs may order precautionary evacuations of additional areas within the 10-mile radius.
[d] - See Table 30-2 for accidents with short-term releases.

TABLE 30-2

ACCIDENTS WITH SHORT-TERM RELEASES[a]

1. Steam generator tube rupture.[b]
2. Fuel handling accident.[c]
3. Gas decay tank rupture.[c]
4. LOCA with Containment isolation and operation of Containment sprays and air coolers.

---

[a] "Short-term" means generally 30 min or less.

CAUTION: The above accidents are assumed to have a "short" release period for initial release duration estimates only. Unforeseen events during an accident may increase the release durations beyond 30 min.

[b] With no complications (eg, stuck-open relief valves or failure of ECCS).

[c] Assumes Fuel and Auxiliary Building ventilation system is operating; with system not operating, release will be long-term (>30 min).

TABLE 30-3

EVACUATION SECTORS CORRESPONDING TO
DOWNWIND DIRECTIONS

Wind Direction		Downwind Evacuation
From	Toward	Sectors Affected[a]
N	S	C, D, I, J, Q, R
NNE	SSW	C, D, J, K, R, S
NE	SW	C, D, J, K, R, S
ENE	WSW	A, D, K, L, S, T
E	W	A, D, K, L, S, T
ESE	WNW	A, D, E, L, M, T
SE	NW	A, B, E, F, M, N
SSE	NNW	A, B, E, F, M, N
S	N	A, B, E, F, M, N
SSW	NNE	A, B, F, G, N, O
SW	NE	B, C, G, H, O, P
WSW	ENE	B, C, G, H, O, P
W	E	B, C, G, H, O, P
WNW	ESE	B, C, H, I, P, Q
NW	SE	C, D, I, J, Q, R
NNW	SSE	C, D, I, J, Q, R

[a] For sector locations, see Figure 30-1.

TABLE 30-4

OREGON SPECIAL POPULATIONS FOR WHICH KI IS AVAILABLE[a]

Special Population	Location	Approximate Number of Persons	Additional Information
Reichold Chemical	North of Columbia City	10	Two persons are required to remain on duty after shutdown.

NOTE: One hundred doses of KI are available from the Oregon Health Division for distribution to special populations that may be identified during the emergency response.

[a] For State EOC use only.

TABLE 30-5

WASHINGTON SPECIAL POPULATIONS FOR WHICH KI IS AVAILABLE[a]

Special Population	Location	Approximate Number of Persons	Additional Information
Weyerhauser	Longview	120	Will keep a security force of about ten personnel until ordered out or replaced by law enforcement or National Guard personnel.
Reynolds Metal Company	Longview	100	Will keep a security force of about three personnel until ordered out or replaced by law enforcement or National Guard personnel.
Longview Fibre Company	Longview	100	Will keep a security force of about ten personnel until ordered out or replaced by law enforcement or National Guard personnel.
Pacific Northwest Bell	Longview	50	Will keep a security force of about six personnel until ordered out or replaced by law enforcement or National Guard personnel.
Cowlitz County Public Utility District No. 1.	Longview	25	These 25 personnel will consist of a radio dispatcher, supervisors, and maintenance crews. They will remain behind to assure electrical power to essential services.
Kalama Chemical	Kalama	12	No security force is required to remain behind.
Monticello Medical Center	Longview	120	Eight to ten patients require special medical transportation.
St John's Hospital	Longview	224	Eight to ten patients require special medical transportation.

[a] For State EOC use only.

TABLE 30-6

EMERGENCY WORKER PROTECTIVE ACTIONS

Projected or Actual Dose or Dose Rate	Recommended Protective Actions
Whole body $\leq$ 5 rem	Each response agency shall continuously monitor and control exposure to its emergency workers by limiting the time each worker is exposed to the radiation.
Whole body 5 to 25 rem	Specific authorization is to be provided by the State EOC before exceeding 5 rem dose. Control exposure by limiting time spent in the plume and/or contaminated area.
Whole body 75 rem (life-saving mission only)	Specific authorization is to be provided by the State EOC for each life saving mission. Control exposure to this level by limiting the time each emergency worker is exposed to the radiation.
Whole body $\geq$ 5 rem/hr	Avoid sectors where this dose rate is present.
Thyroid projected dose $\geq$ 250 mrem/hr, or radioiodine air concentration in work area (projected or measured) $\geq$ 1.4×10^{-7} μCi/cc	Each emergency worker in the identified area(s) is to self-administer potassium iodide tablets.
Thyroid projected dose rate $\geq$ 25 rem/hr or radioiodine air concentration in work area projected or measured to be $\geq$ 1.4×10^{-5} μCi/cc	Control exposure by limiting time spent in the plume and/or contaminated area. If potassium iodide is not available, avoid sectors where this dose rate could be received.

TABLE 30-7

PREVENTIVE LEVEL PROTECTIVE ACTION GUIDES

A. General Guidance

Whole body projected dose commitment	0.5 rem
Thyroid projected dose commitment	1.5 rem

B. Concentration Guides

	Concentrations			
	I-131	Cs-137	Sr-90	Sr-89
Initial Deposition (microcuries/sq meter)	0.14	1.7	0.34	6
Peak Pasture Activity (microcuries/kilogram)	0.05	0.7	0.14	2.6
Peak Milk Activity (microcuries/liter)	0.012	0.34	0.007	0.13
Total Intake (microcuries)	0.09	7	0.2	2.6

TABLE 30-7

PREVENTIVE LEVEL PROTECTIVE ACTIONS

Item	Recommended Control Measure
Pasture	1) Remove lactating dairy cows from contaminated pasturage and substitute uncontaminated stored feed. 2) Substitute source of uncontaminated water.
Milk	1) Withhold contaminated milk from the market to allow radioactive decay of short-lived radionuclides. This may be achieved by storage of frozen fresh milk, frozen concentrated milk, or frozen concentrated milk products. 2) Divert fluid milk to production of dry whole milk, nonfat dry milk, butter, or evaporated milk.
Fruits and vegetables	1) Wash, brush, scrub or peel to remove surface contamination. 2) Preserve by canning, freezing or dehydrating and store to permit radioactive decay of short-lived radionuclides.
Meats and meat products	Withhold suspected contaminated item from the market pending radiochemical analysis. Consider on a case-by-case basis.
Grains and other food products	1) Process to remove surface contamination. 2) Store to permit radioacive decay of short-lived radionuclides.
Drinking water	Restrict access and use. Substitute with noncontaminated sources.
Animal feeds	See Grains and Pasture. Other actions relative to amimal feeds should be carried out on a case-by-case basis.

TABLE 30-8

EMERGENCY LEVEL PROTECTIVE ACTION GUIDES AND CONTROL MEASURES

I. Protective Action Guide

A. General Guidance

Whole body projected dose commitment	5 rem
Thyroid projected dose commitment	15 rem

B. Concentration Guides

	Concentrations			
	I-131	Cs-137	Sr-90	Sr-89
Initial Deposition (microcuries/sq meter)	1.4	17	3.4	60
Peak Activity:				
Pasture (microcuries/kilogram)	0.5	7.0	1.4	26
Milk (microcuries/liter)	0.12	3.4	0.08	1.3
Total Intake (microcuries)	0.9	70	2	26

II. Control Measures

A. Isolate the food containing radioactivity to prevent its introduction into commerce.

B. Determine whether condemnation or another disposition of the contaminated food is appropriate. (See Preventive Level Actions, Table 30-7.)

TABLE 30-9

SURFACE RADIOACTIVITY CONTAMINATION AND REENTRY GUIDE

Areas and/or items that have radioactive contaminants exceeding the levels specified in this guide shall be decontaminated; restricted from access and/or use by the public; or removed, packaged, and disposed of as radioactive waste. This guide also applies to personnel that may become contaminated.

Item	Action Level[a]	Action
1. Personnel	< 100 cpm[b]	Unconditional release.
	100-1000 cpm[b]	Decontaminate if time allows; may be released without decontamination if necessary.
	> 1000 cpm[b]	Decontamination required.
2. Personal belongings; equipment; tools; vehicles; other materials/items	< 1000 cpm[b]	Unconditional use.
	> 1000 cpm[b] and/or $\geq$ 1 mR/hr	Decontaminate; hold for radioacative decay, or disposal as radioactive waste.
3. Areas	< 1 mR/hr general area or < 1000 dpm[c]/100cm^2 β-γ contamination	Uncontrolled access to area.
	$\geq$ 1 mR/hr general area or $\geq$ 1000 dpm[c]/100cm^2 β-γ contamination	Control access to area until decay to below these levels, or decontaminate area.

[a] Above background.
[b] At 1/2 in. using beta-gamma pancake or thin-end-window G/M survey meter; cpm = counts per min as read from the survey meter.
[c] dpm = disintegrations per min determined by correcting the cpm observed by the appropriate background, efficiency, and geometric factors for the counting instrument used.

TABLE 30-10

WATER RADIOACTIVITY CONTAMINATION GUIDE

Community or individual water supplies that have radioactive contaminants exceeding the levels specified in this table shall be restricted from use by the public or decontaminated to levels below these limits.

Nuclide	Concentration[a] (pCi/l)
H-3	2.0 E+4
Sr-90	8.0 E0
I-131	3.0 E0
Gross Beta	5.0 E+1

[a] Values for these nuclides are from the USEPA Primary Drinking Water Standard. Also refer to Oregon Administrative Rule 333-61-030 and Washington Administrative Code 248-54, paragraph 740(8)(d). These concentrations are equivalent to a dose of 4 mrem/yr to the whole body or any organ.

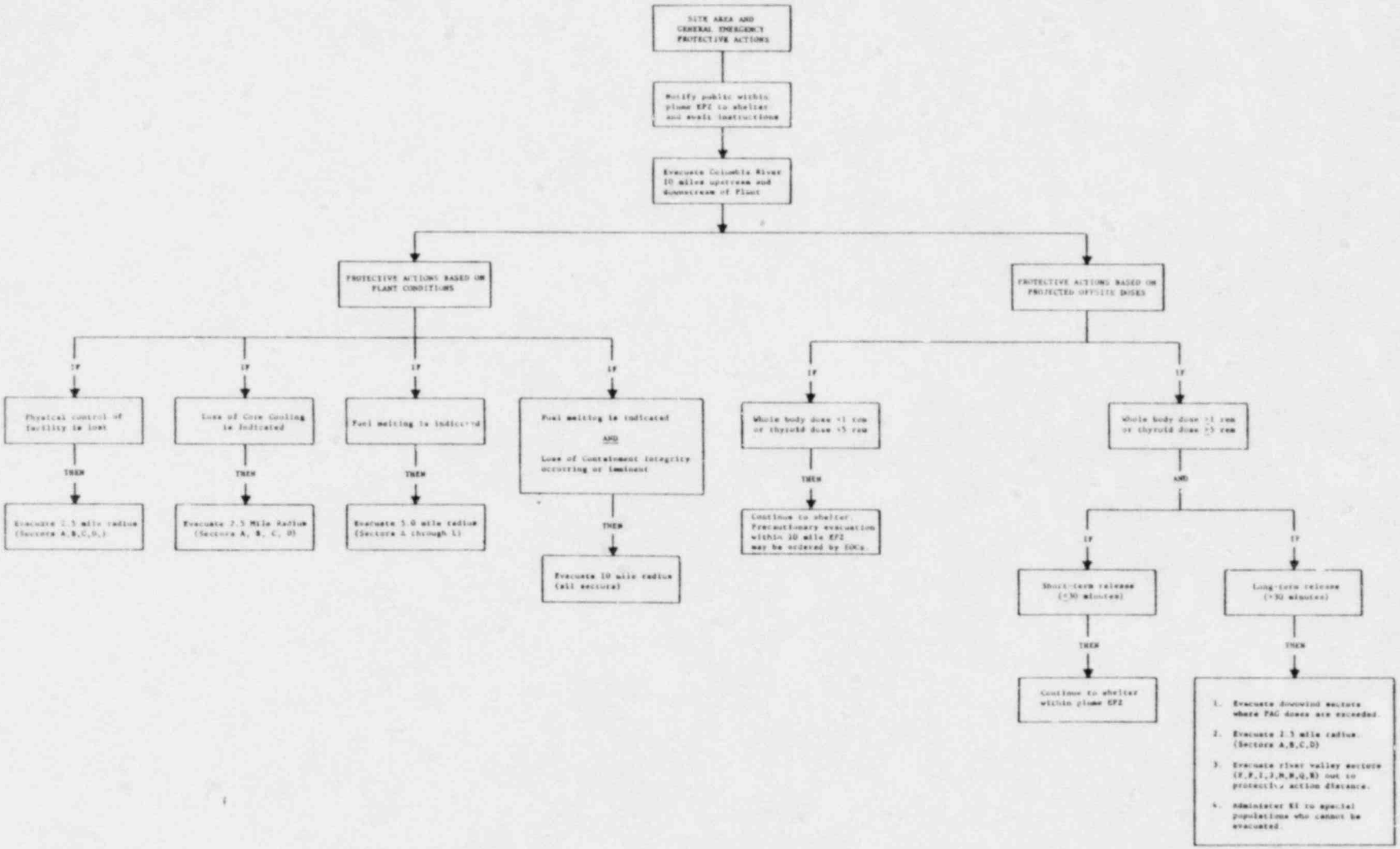


Figure 30-2 Site Area and General Emergency Protective Actions