TIPCK02

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Address : CR3-01242 / MAIL CODE: N/A
DC DESK-ATTN: DENNIS HAGAN
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**From** : CR3DOCSVCS Attention: DOCSVCS NA1E / PLNTSUPT NR2
Address : PROGRESS ENERGY FLORIDA
CRYSTAL RIVER COMPLEX
15760 WEST POWERLINE STREET
City : CRYSTAL RIVER State: FL Postal Code: 34428-6708
Country : UNITED STATES
Email :
Contact :

Date/Time : 03/25/2009 14:42 Transmittal Group Id: 0000047675
Trans No. : 000340148 Title:
**Total Items:** 00002

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Page: 1

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CRYSTAL RIVER UNIT 3

PLANT OPERATING MANUAL

EMERGENCY PLAN IMPLEMENTING PROCEDURE

# EM-210A

## DUTIES OF THE RADIATION MONITORING TEAM: CR3 AND ENERGY COMPLEX PERSONNEL AND AREA MONITORING

TABLE OF CONTENTS

## 1.0 PURPOSE

1.1 Provides instructions for the Radiation Monitoring Team (RMT) performing personnel and area monitoring for the Energy Complex, in the event of a radiological emergency.

## 2.0 REFERENCES

### 2.1 Developmental References

2.1.1 10CFR20, Standards for Protection against Radiation, Appendix B, Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage

2.1.2 10CFR50.47, Emergency Plans

2.1.3 10CFR50, Appendix E, Emergency Planning and Preparedness for Production and Utilization Facilities

2.1.4 American Conference of Governmental Industrial Hygienists Handbook, Threshold Limit Value

2.1.5 EM-104, Operation of the Operational Support Center

2.1.6 EM-210B, Duties of the Radiation Monitoring Team: Environmental Sampling and Plume Tracking

2.1.7 HPP-409, Inventory and Availability of Emergency Supplies/Equipment

2.1.8 Manual of Protective Action Guides and Protection Actions for Nuclear Incidents, EPA-400-R-92-001, Environmental Protection Agency (October, 1991)

2.1.9 NGGM-PM-0002, Radiation Control and Protection Manual

2.1.10 NUREG-0654, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants

2.1.11 Radiological Emergency Response Plan

2.1.12 Response Technical Manual, "RTM-96," Vol. 1 Rev. 4, Section J, Use of Potassium Iodide and Thyroid Monitoring

2.1.13 RSP-101, Basic Radiological Safety Information and Instructions for Radiation Workers

2.1.14 HPP-515, IAP-2 Operation and Maintenance

## 3.0 PERSONNEL INDOCTRINATION

### 3.1 Definitions

3.1.1 **Qualified** - Successfully completed appropriate Radiation Monitoring Team training and currently listed on Emergency Call Roster.

3.1.2 **Radiation Controls Coordinator** - Lead TSC Chemistry or Radiation Protection designee directing Chemistry and Radiological assessment personnel and advising the Emergency Coordinator on these issues.

3.1.3 **Threshold Limit Value/Time-Weighted Average (TLV/TWA)** - The time-weighted average concentration for a normal 8-hour workday and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

### 3.2 Responsibilities

3.2.1 The Emergency Coordinator (EC) or designee:

- o Determines where the RMT is to be dispatched.
- o Authorizes exposure limits in excess of administrative limits.
- o Ensures ALARA considerations are stressed.
- o Seeks guidance from the Radiation Controls Coordinator, as required, on radiological matters.
- o Approves Emergency Radiation Work Permit (ERWP) and Emergency Team Authorization (ETA) forms according to EM-104.

3.2.2 The Radiation Controls Coordinator or designee:

- o Determines areas to be surveyed.
- o Updates the OSC Health Physics Coordinator of current or changing plant conditions.
- o Assesses survey results and keeps the EC informed of in-plant radiological conditions.

3.2.3 The OSC Health Physics Coordinator directs activities of all RMT members except those performing environmental sampling and plume tracking. RMT members performing environmental sampling and plume tracking are directed by the Environmental Survey Team Dispatcher in accordance with EM-210B.

3.2.4 The RMT members dispatched from the OSC provide monitoring for the Energy Complex personnel as required and ensure implementation of this procedure.

### 3.3 Limits And Precautions

3.3.1 The RMT complies with the re-entry requirements of and follows the guidelines for exposure of emergency workers during re-entry activities according to EM-104.

3.3.2 Personnel shall not enter evacuated areas without portable survey instruments and personnel monitoring devices. Personnel accompanied by a member of the RMT are NOT required to carry a portable survey instrument.

3.3.3 RMT members must be listed on the current Emergency Roster to be qualified.

3.3.4 OSC Health Physics Coordinator must be notified if thyroid dose received is 5 rem or is projected to reach 25 rem.

## 4.0 INSTRUCTIONS

### 4.1 OSC Health Physics Coordinator Functions

The OSC Health Physics Coordinator and RMT leader functions are described in EM-104, Operation of the Operational Support Center. REFER TO EM-210A Enclosure 1 for RMT checklist. Items containing action verbs are completed by the RMT and items written passively are performed by the OSC HP Coordinator and verified by the RMT.

### 4.2 RMT Functions

**NOTE**

The RMT receives verbal or written instructions from the OSC Health Physics Coordinator. Additional written instructions for the RMT are inside monitoring kits.

4.2.1 ASSEMBLE at Health Physics area (95' Control Complex) during an Alert Classification for assignment to the OSC or Control Room.

4.2.2 REPORT directly to the OSC for assignment to RMT during a Site Area Emergency or General Emergency declaration.

4.2.3 OBTAIN instruments, dosimetry, portable transceiver(s), clothing, and supplies from the Health Physics area or from the Emergency Kits if in the TSC/OSC.

4.2.4 ESTABLISH Radiation Control Areas and appropriate access and work precautions where elevated levels of radiation, contamination, or airborne radioactivity may exist.

4.2.4.1 IF a Site Area Emergency has been declared,
THEN access controls are established by specific Emergency Team Authorizations per EM-104.

4.2.5 PREVENT personnel from crossing lines of controlled access and REQUEST unauthorized individuals to evacuate from the controlled area.

4.2.6 SUPERVISE the release of personnel who evacuate on-site assembly areas and DECONTAMINATE as necessary.

4.2.7 ISSUE respiratory protection equipment and personnel monitoring devices as required.

4.2.8 SUPPORT the Medical Response Team and Fire Brigade to include contamination control, as required.

4.2.9 FILL out Emergency Team Authorization (ETA) form according to EM-104.

4.2.10 REVIEW any survey data available for the area(s) to be traversed.

4.2.11 OBTAIN dose limit for entry from OSC HP Coordinator.

4.2.12 ATTEND pre-job briefing and review re-entry checklist before dispatch according to EM-104.

4.2.13 PERFORM radiological surveys as directed by the OSC Health Physics Coordinator.

**NOTE**

An ion chamber is the preferred instrument; however, other instruments may be used as appropriate.

Enclosures may be completed remotely by TELCOM or other available communications technology.

4.2.14 MONITOR areas traversed en route to designated areas using ion chamber survey meter and note any area where unusual dose rates exist. RECORD results on Enclosure 5 or on a form with equivalent information.

**NOTE**

1) Air samples must be at least 60 cubic feet.

2) Air samples must be acquired at flow rates determined during instrument calibration. The design maximum flow rate for collecting a gross iodine sample is 5 cfm if using silver zeolite or 10 cfm if using charcoal.

3) The use of charcoal cartridges should be avoided if possible because of noble gas interference.

4.2.15 Upon arrival at the designated area, CONDUCT a dose rate, contamination, and airborne survey, as needed. ENSURE results are recorded on Enclosure 5. [NOCS 1030]

4.2.16 REPORT dose rate survey results to OSC by cellular telephone, portable transceiver or plant communications, as requested.

4.2.16.1 IF dose rates exceed predetermined values,
THEN RETREAT to a low dose area and NOTIFY the OSC HP Coordinator for further instructions.

4.2.16.2 IF survey is complete,
OR if there are any type of stress related problems (i.e., physiological, psychological).
THEN RETURN to the OSC.

4.2.17 REPORT any of the following to the OSC Health Physics Coordinator:

- o Personnel over exposures or suspected over exposures.
- o Contamination or airborne problems in the TSC/OSC.
- o Changing conditions in the field.
- o Shortage of equipment or materials due to failure or contamination, especially dose rate instruments and breathing air cylinders.

4.2.18 COLLECT and REPLACE TLDs as appropriate.

4.2.19 ENSURE Emergency Team Authorization is updated upon return.

4.2.20 IF the TSC/OSC or Alternate TSC/OSC $CO_2$ level reaches 5000 ppm or $O_2$ levels reach 19.5%,
THEN CONSIDER ventilating, reducing staff, or evacuating the area,
AND CALCULATE the 8 hour Time Weighted Average (TWA) for $CO_2$

4.2.21 IF the 8 hour TLV/TWA for $CO_2$ is exceeded,
THEN ensure the TSC Radiation Controls Coordinator is notified of possible overexposure.

4.2.22 IF the TSC/OSC or Alternate TSC/OSC $CO_2$ level reaches 20,000 ppm or $O_2$ levels drop to <19.5%,
THEN VENTILATE or EVACUATE the building within two hours.

4.2.23 IF the TSC/OSC or Alternate TSC/OSC $CO_2$ level reaches 30,000 ppm,
THEN VENTILATE,
OR EVACUATE the building within the next 15 minutes.

4.2.24 IF the TSC/OSC is evacuated to Control Complex,
THEN TAKE the $CO_2/O_2$ instrument to Control Room for monitoring.

**4.3 Sample Analysis**

4.3.1 TAKE samples to an appropriate counting station.

> **NOTE**
>
> Enclosure 2, "Formulas and Instrumentation Data Sheet" lists the proper formulas and appropriate efficiencies and conversion factors.

4.3.2 Using normal counting techniques, ANALYZE samples collected, using whatever counting system is available. Refer to a, b, c below when using TSC/OSC counting station.

a. Particulate filter from air sample
*MS-2/RM-14 or L-177/E-120/Ludlum 3 with SH-4 sample holder.

b. Iodine (Silver Zeolite) cartridge
MS-2/*RM -14 or L-177/E-120/Ludlum 3 with SH-4 sample holder/SAM-II.

c. Smears
*MS-2/RM-14 or L-177/E-120/Ludlum 3 with SH-4 sample holder.

(*) Indicates preferred counting instrument.

4.3.3 RETAIN selected used filters in envelopes (available in the emergency kits) for precise laboratory analysis. LABEL samples with as much information as possible (e.g., time, location, weather conditions, etc.).

4.3.4 REPORT results of survey data to the OSC Health Physics Coordinator AND ENSURE results are recorded on Enclosure 5.

4.3.5 REPORT results of any radioiodine sample analysis taken in an occupied area (Control Room, TSC/OSC, etc.) in which the results are in excess of $8.0 \times 10^{-7}$ µCi/cc I-131 or if an exposure of 5 rem to the thyroid is received or greater than 25 rem to the thyroid is projected, for consideration of use of Potassium Iodide (KI) blocking.

4.3.6 USE the formula on Enclosure 2 to estimate thyroid dose from air sample results.

4.3.7 IDENTIFY radiation instruments used and ENSURE calibration due dates are documented on Enclosure 1.

**4.4 Rapid Thyroid Dose Estimate by Direct Measurement Using a Pancake GM Probe**

4.4.1 ENSURE frisker pancake probe background counts are ≤ 1000 cpm.

4.4.2 RECORD the demographic data on Enclosure 3 for each individual being assessed for thyroid dose.

4.4.3 MEASURE the thyroid count rate by holding the pancake probe adjacent to the thyroid using a minimum count time of approximately 1 minute to let the meter count rate stabilize. Enclosure 6 shows the location of the Thyroid.

4.4.4 RECORD the thyroid count rate in cpm on Enclosure 3.

4.4.5 ESTIMATE the thyroid dose by:

> Thyroid dose in rem = (thyroid count rate from step 4.4.4 divided by 2,749 cpm per µCi) x (6.5 rem per µCi adult).

4.4.6 RECORD the estimated thyroid dose on Enclosure 3.

4.4.7 IF the thyroid dose estimate is greater than 5 rem (cladding failure or core melt conditions), THEN NOTIFY the OSC Health Physics Coordinator for consideration of the use of KI blocking, as administered by the TSC Radiation Controls Coordinator.

**4.5 Vehicle Decontamination**

4.5.1 Personal Vehicles

| **NOTE** |
| --- |
| The following should take place before dismissing personnel to the parking lot for evacuation. |

4.5.1.1 IF a radiological release has occurred or is in progress,

THEN PERFORM a quick beta-gamma survey of a representative sample on the exterior of vehicles in the parking lot.

4.5.1.2 IF the results of this survey indicates NO contamination,
THEN NOTIFY the OSC Health Physics Coordinator that personnel are cleared for unrestricted egress.

4.5.1.3 IF results of this survey indicates contamination,
THEN CONTACT the OSC Health Physics Coordinator,
AND REPORT personal vehicle contamination levels.

4.5.1.4 CONSIDER one of the following for implementation:

- On-site decontamination and monitoring.

- DIRECT employees to take cars to Citrus or Levy County washdown stations for decontamination and monitoring.
  IF this method is chosen,
  THEN REQUEST OSC Health Physics Coordinator to have the Radiation Controls Coordinator coordinate with the EOF.

- IF personnel vehicles are unavailable for use,
  THEN REQUEST coordination with the EOF for transportation off-site.

**4.6 Documentation**

4.6.1 FORWARD documentation and surveys created as a result of this procedure to the OSC Health Physics Coordinator. Care must be taken to ensure the documents are free from contamination before transmittal. Contaminated documents must be bagged, copied, and the originals discarded as radioactive waste. The copies must then be marked "ORIGINALS CONTAMINATED."

4.6.2 TRANSMIT documentation and surveys to Document Services under EM-210A.

ENCLOSURE 1

# RADIATION MONITORING TEAM CHECKLIST [NOCS 24200]

OSC Operational Date: _____ Time: _____

OSC Health Physics Coordinator: _____

| CHECK (as completed) | TASK |
|---|---|
| ☐ | Technician assigned to Main Assembly Area (personnel frisking/decontamination) |
| ☐ | Technician assigned to Control Complex ERT |
| ☐ | OBTAIN sufficient EDs from 95' Control Complex |
| ☐ | ESTABLISH Control Point in TSC/OSC |
| ☐ | SET-UP Counting Station |
| ☐ | SET-UP $CO_2/O_2$ Monitor (Refer to Enclosure 4 for symptoms) |
| ☐ | ENSURE sufficient equipment & supplies are available |
| ☐ | VERIFY Computer Database with Dose Records Available (If "NO", see Note 1) |
| ☐ | VERIFY OSI-PI or SPDS Available (If "NO", see Note 1) |
| ☐ | Technician Call-out completed (if required) & Work Schedules established. |
| ☐ | REVIEW Technician doses |
| ☐ | VERIFY Emergency RWP written / approved |
| ☐ | ENSURE sufficient number of SCBAs available (If "NO", see Note 2) |
| ☐ | ENSURE sufficient number of spare SCBA bottles (If "NO", see Note 3) |
| ☐ | ENSURE sufficient number of Dose Rate Instruments (If "NO", see Note 2) |
| ☐ | OBTAIN Master Key at HP office AND TRANSPORT to the OSC. |
| ☐ | TRANSPORT sufficient RMT supplies to Alternate TSC if OSC is evacuated. |

**NOTES:**

1) Notify the OSC HP Coordinator that Dose Margins/OSI-PI/Power Block Radiation Levels are unavailable.
   Date: _____ Time: _____ Initials: _____

2) Notify the OSC HP Coordinator that a Re-entry should be made to obtain additional equipment.
   Date: _____ Time: _____ Initials: _____

3) Notify the OSC HP Coordinator that arrangements must be made to have SCBA bottles refilled. Refer to HPP-515, IAP-2 Operation and Maintenance.
   Date: _____ Time: _____ Initials: _____

DOCUMENT calibration due dates below of radiation instruments used.

| INSTRUMENT | CALIBRATION DUE DATE |
|---|---|
| | |
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# FORMULAS AND INSTRUMENTATION DATA SHEET

## FORMULAS:

Note: Minimum air sample volume is 60 cubic feet.

$$\mu Ci/cc = \frac{\text{Gross cpm - Background cpm}}{\text{Volume (cc) x Detector Eff. x FCE x 2.22 E6 (dpm/}\mu Ci)}$$

$$dpm = \frac{\text{Net cpm}}{\text{Efficiency}}$$

Net cpm = Gross cpm – Background cpm

Volume cc = Volume $ft^3$ x 2.832 E4 $cc/ft^3$

FILTER COLLECTION EFFICIENCY (FCE):

| FLOW RATE (CFM) * | SILVER ZEOLITE | CHARCOAL | PARICULATE FILTER |
|---|---|---|---|
| 1 | .90 | .90 | .95 |
| 2 | .90 | .90 | .95 |
| 3 | .85 | .80 | .95 |
| 4 | .80 | .70 | .95 |
| 5 | .75 | .60 | .95 |

*Should use calibrated flow rates when possible.

EFFICIENCIES:

| | MS-2 | RM-14 / L-177 / E-120/Ludlum 3 |
|---|---|---|
| PARTICULATE | .20 | .10 |
| IODINE | .0015 | .0015 |

$$LLD\ For\ MS-2 = \frac{3.29\sqrt{r_b t_s\left(1+\frac{t_s}{t_b}\right)}+3}{t_s}$$

$r_b$ = Background count rate cpm

$t_S$ = Sample count time in minutes

$t_b$ = Background count time in minutes

## INSTRUMENT START-UPS:

NOTE: LLD/MDCR calculations are NOT required if background ≤1000 cpm.

MS-2

- Power unit up – switch in back
- Verify dial settings per calibration sticker
- Response check detector
- Ensure proper shielded G-M probe used with SH-4 sample holder
  - IF TSC: Run background (5 minute minimum) and calculate LLD.
  - IF ESV: Run 1-minute background at each sample counting location and calculate LLD.

RM-14/L-177/E-120/Ludlum 3

- Check battery response
- Response check detector
- If used for air sample counting, use SH-4 sample holder for proper geometry
- Maximum Background: 1,000 cpm

Frisker Minimum Detectable Count Rate (MDCR), cpm

$$MDCR = 4.66\sqrt{\frac{R_b}{2\tau}}$$

Where :

$R_b$ = background count rate, cpm

$\tau$ = instrument time constant, min to reach 90% meter deflection

Ludlum L-177, RM-14 = 0.16 min

E-120 = 0.072 min

AMS-4

- Power up – air pump and electronics (switches are on the back of the unit).
- Inspect/change filter; detector operational checks are done electronically.
- Flow verification performed by software based on type of air pump used.
- Verify green ready light is illuminated.

RO-20/RO-2A or equivalent

- Check batteries
- Response check with source

**THUMB RULES:** Dose rate can be estimated as follows: 20 mR/minute for each R/HR.

THYROID DOSE FROM AIR SAMPLE RESULTS: (based on 24 hour exposure)

rem Thyroid = (I-131 μCi/cc) (2.88E+7 cc breathed/24 hrs) (1 rem/μCi)

ENCLOSURE 3

# THYROID DOSE ESTIMATE, DIRECT MEASUREMENT FRISKER

Name: _____ EID: _____

Time and date of measurement: _____/_____

**Counting Information:**

GM Probe Serial Number: _____RM-14 or E-120/Ludlum 3 SN#: _____

Calibration Date: _____ Background: Sat [ ] Unsat [ ]
(≤1000 cpm)

Observed net thyroid count rate: _____ cpm

**Calculate thyroid dose from net frisker count rate (ncpm) by:**

(Thyroid cpm _____ ÷ 2, 749 cpm/μCi) x (6.5 rem/μCi) = _____ rem
**If the calculated thyroid dose is ≥ 5 rem, NOTIFY the OSC HP Coordinator.**

Estimated time since start of intake: _____ hours

(If estimated time since start of intake < 5 hours, the calculated dose is non-conservative.)

**Comments:**

Completed by: _____ Date: _____

Verified by: _____ Date: _____

## EFFECTS AND SYMPTOMS OF ($CO_2$)

| Percent $CO_2$ | |
|---|---|
| 0.04% | Normal air (0.04% = 400 ppm) |
| 2.0% | Deeper Breathing (20,000 ppm)[1] |
| 4.0% | Deeper breathing, considerable discomfort |
| 5.0% | Very labored breathing, nausea |
| 7.0-9.0% | Absolutely the limit of tolerance |
| 10.0-11.0% | Lose coordination, may lose consciousness |
| 15.0-20.0% | Brain damage can occur within minutes |
| 25.0-30.0% | Death within a minute |

## EFFECTS AND SYMPTOMS OF OXYGEN DEFICIENCY

| Oxygen by Volume | |
|---|---|
| 15-19% | Decreased ability to work strenuously. May impair coordination and may induce early symptoms in workers with coronary, pulmonary, or circulatory problems.[2] |
| 12-14% | Respiration increases with exertion, pulse increases, impaired coordination, perception, and judgment. |
| 10-12% | Respiration further increases in rate and depth, poor judgment, lips turn blue. |
| 8-10% | Mental failure, fainting, unconsciousness, ashen face, blueness of lips, nausea and vomiting. |
| 6-8% | 8 minutes 100% fatal; 6 minutes 50% fatal; 4-5 minutes recovery with treatment. |
| 4-6% | Coma in 40 seconds, convulsions, respiration ceases, death. |

---

1) 2.0% (20,000 ppm) $CO_2$ is an action level per step 4.2.22.

2) <19.5% is an action level per step 4.2.22.

ENCLOSURE 5

# EMERGENCY MONITORING SHEET

| TIME | Team Name | APPROXIMATE LOCATION | OPEN WINDOW (β,γ) READING mR/hr | CLOSED WINDOW (γ) READING mR/hr | β uncorrected (β,γ)-(γ) READING mR/hr | SMEARS cpm/100cm$^2$ | AIR SAMPLES | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Particulate (uCi/cc) | Iodine (uCi/cc) |
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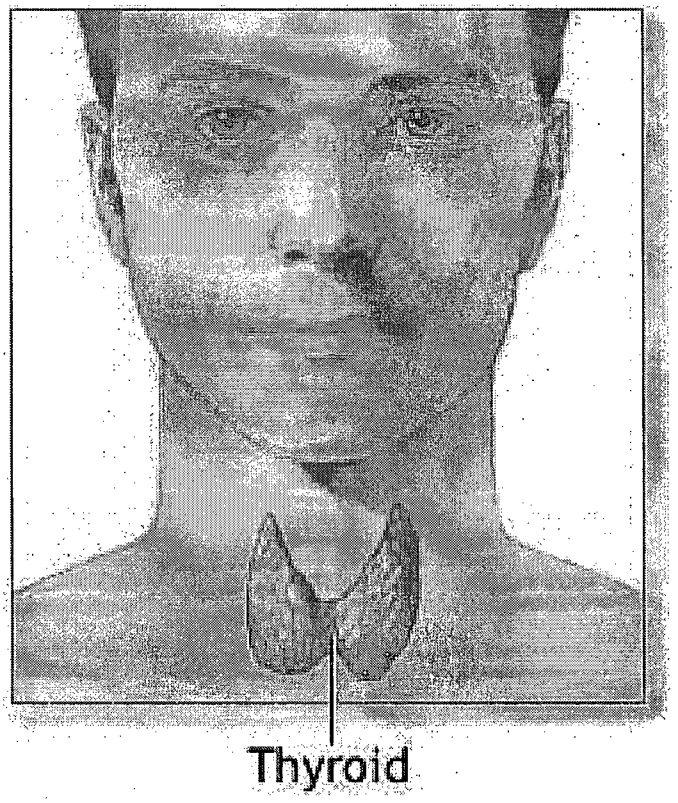
# Location Of Thyroid



## REVISION SUMMARY

**January, 2009 (PRR's 266255, 310617, 313786)**

| Procedure Section | Changes and Reason |
|---|---|
| Throughout | Added reference to Ludlum 3 frisker. The Ludlum 3 will replace the Eberline E-120 as they age beyond repair. The vendor no longer supports the E-120. |
| Step 4.2.15 (Note) | Changed minimum air sample volume from 12 $ft^3$ to 60 $ft^3$ to meet detection limit requirements |
| Step 4.4 | Changed title to specify a GM probe versus the SAM-II with a RD-22 |
| Step 4.4.1 | Set background criteria for using a pancake probe. Deleted reference to SAM-II |
| Step 4.4.1 | Deleted the step. The SAM-II instrument is no longer required for E-Plan |
| Step 4.4.4 | SAM-II with RD22 changed to pancake GM probe |
| Step 4.4.5 | Denominator factor changed from 54,970 cpm to 2,749 cpm to account for the smaller efficiency of the pancake probe versus the SAM-II. The pancake probe is 5% as efficient for iodine |
| Enclosure 2 | Reference to the SAM-II deleted. Removed "YF" factor from the equation as it applied only to the SAM-II<br>Added maximum allowed background for the RM-14/L-177/E-120/Ludlum 3 as 1000 cpm<br>MDC changed to LLD. MDC formula changed to LLD formula<br>Changed minimum air sample volume from 12 $ft^3$ to 60 $ft^3$ to meet detection limit requirements<br>Added MDCR equation<br>Added reference to Ludlum 3 as being equivalent to the E-120 |
| Enclosure 3 | References to SAM-II deleted and replaced with GM pancake probe |
| Enclosure 6 | Added picture showing the location of the thyroid |

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CRYSTAL RIVER UNIT 3

PLANT OPERATING MANUAL

EMERGENCY PLAN IMPLEMENTING PROCEDURE

# EM-210B

# DUTIES OF THE RADIATION MONITORING TEAM: ENVIRONMENTAL SAMPLING AND PLUME TRACKING

TABLE OF CONTENTS

## 1.0 PURPOSE

1.1 Provides instructions for the Radiation Monitoring Team (RMT) performing environmental sampling and plume tracking in the event of a radiological emergency.

## 2.0 REFERENCES

### 2.1 Developmental References

2.1.1 10CFR50.47, Emergency Plans

2.1.2 10CFR50, Appendix E, Emergency Planning and Preparedness for Production and Utilization Facilities

2.1.3 EM-104, Operation of the Operational Support Center

2.1.4 EM-210A, Duties of the Radiation Monitoring Team: CR-3 and Generating Complex Personnel and Area Monitoring

2.1.5 EM-219, Duties of the Dose Assessment Team

2.1.6 NGGM-PM-0002, Radiation Control and Protection Manual

2.1.7 NUREG 0654, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants

2.1.8 Radiological Emergency Response Plan

2.1.9 RSP-101, Basic Radiological Safety Information and Instructions for Radiation Workers

2.1.10 HPP-409, Inventory and Availability of Emergency Supplies/Equipment

## 3.0 PERSONNEL INDOCTRINATION

### 3.1 Definitions

3.1.1 **Environmental Survey Team (EST) Dispatcher -** Health Physics Supervisor or designee coordinating activities for the EST. The term "Dispatcher" is also used for this position.

3.1.2 **EST/RMT** - The portion of the RMT that tracks the plume and performs environmental sampling within the Crystal River Energy Complex and within the 10-mile Emergency Planning Zone (EPZ). RMT and EST will be used interchangeably throughout the procedure.

3.1.3 **ESV** - Environmental Survey Vehicle

3.1.4 **Plume Tracking** - Locating, tracking, and monitoring of radiological characteristics (e.g., dose rates and radioactivity levels) of airborne radioactive material.

3.1.5 **Qualified -** Successfully completed appropriate emergency team training and currently listed on Emergency Call Roster.

3.1.6 **Radiation Controls Coordinator** - Lead Technical Support Center (TSC) Chemistry or Radiation Protection designee directing Chemistry and Radiological assessment personnel and advising the Emergency Coordinator on these issues.

3.1.7 **Team Leader** - A qualified, Radiation Monitoring Team member performing the lead responsibilities for the Environmental Survey Team.

**3.2 Responsibilities**

3.2.1 The Emergency Coordinator (EC) or his designee:

- o Authorizes exposure limits in excess of administrative limits.
- o Ensures ALARA considerations are stressed.
- o Seeks guidance from the Radiation Controls Coordinator, as required, on radiological matters.
- o Approves Emergency Radiation Work Permit (RWP) and Emergency Team Authorization (ETA) forms in accordance with EM-104.
- o Authorizes on-site and off-site plume monitoring.
- o Directs EST to support State of Florida sampling team(s), if requested.

3.2.2 The Radiation Controls Coordinator or designee:

- o Determines the need and makes recommendations to the EC about the feasibility of dispatching the (ESTs), based upon available radiological data and physical plant conditions.
- o Provides the Dispatcher with any special instructions before the Team's departure.
- o Keeps the Dispatcher appraised of current or changing conditions affecting the members of the EST.
- o Relays the information provided by the Dispatcher to the EC.

3.2.3 The Dispatcher directs activities of the EST performing environmental sampling and plume tracking, either from the TSC or from the Emergency Operations Facility (EOF), in accordance with Section 4.1. The Dispatcher should be Dose Assessment Team qualified.

3.2.4 The EST Leader and EST members perform environmental sampling and plume tracking and ensure implementation of this procedure.

3.2.5 The EST Members collect, analyze and package samples obtained in the field, notifying the EST Leader or Dispatcher about any condition that could hamper the team's effort to track the plume (e.g., inadequate supplies, instrument malfunctions, etc.).

## 3.3 Limits and Precautions

3.3.1 Drive safely and comply with traffic laws at all times.

3.3.2 The EST complies with the requirements of and follows the guidelines for exposure of emergency workers during re-entry activities as contained in EM-104.

3.3.3 EST members must be qualified - listed on current emergency roster.

3.3.4 An EST shall consist of at least two (2) persons.

3.3.5 Assessment of location and radiological characteristics of a plume or radioactive material is one factor for determination of emergency classification, determination of what (if any) protective action guides (PAGs) are being approached or exceeded, and to verify and supplement CR-3's other dose assessment capabilities. [NOCS 1592]

3.3.6 Wind shift caused by the sea breeze effect is one occurrence that can seriously affect the ability of the team to track the plume. This phenomenon usually occurs in the daylight hours during the months of March through October. A buildup of a line of heavy clouds or thunderstorms normally takes place at the point of the wind shift caused by the sea breeze.

3.3.7 A westerly wind could indicate a sea breeze. Visual aids (e.g., smoke, low cloud movement, etc.) may provide a means of detecting when and where this wind shift is occurring.

3.3.8 The team should consider exposure when trying to determine a plume's highest dose rate. Considerable exposure could be received looking for the "highest" gamma dose rate.

3.3.9 The RMT has no authority to evacuate personnel outside of the Owner-Controlled Area, except through specific instructions from the EC.

3.3.10 During count rate determination, if the given count rate is less than background, do NOT calculate activity, call it background.

## 3.4 Equipment

3.4.1 Available Equipment:

- o EST supplies as identified in HPP-409.
- o Vehicle (ESV or backup). [NOCS 7450]
- o Transceiver (plant radio) and batteries.
- o Cellular telephone taken to ESV.
- o 800 MHz Citrus County radio.

## 4.0 INSTRUCTIONS

### 4.1 EST Dispatcher

#### 4.1.1 Activation

4.1.1.1 REPORT to the TSC upon the declaration of an Alert, Site Area or General Emergency.

4.1.1.2 BADGE in at TSC/OSC Card reader.

4.1.1.3 NOTIFY Radiation Controls Coordinator of your arrival.

4.1.1.4 OBTAIN procedures as needed. (EM-104, EM-219)

4.1.1.5 VERIFY operability of available communication equipment.

4.1.1.6 OBTAIN Tampa Weather data as needed.

#### 4.1.2 Operation

4.1.2.1 Upon direction from the Radiation Controls Coordinator, DETERMINE manpower needs and REQUEST qualified personnel to form the EST from the HP Coordinator.

4.1.2.2 ENSURE EST members are listed on an Emergency Team Authorization form.

4.1.2.3 CONDUCT a pre-job briefing prior to the team's departure according to EM-104, Enclosure 4 .

4.1.2.4 NOTIFY the Radiation Controls Coordinator of teams' readiness to depart.

4.1.2.5 ESTABLISH contact with the EOF Field Team Liaison as needed for EST dispatch coordination.

4.1.2.6 ACT as communication liaison between the EST, the Radiation Controls Coordinator, the Dose Assessment Team and the EOF Field Team Liaison.

4.1.2.7 DIRECT the plume tracking activities with guidance from the Radiation Controls Coordinator and DAT in accordance with EM-219.

4.1.2.8 NOTIFY the EST Leader of current or changing conditions, especially meteorological.

4.1.2.9 ENSURE the EST Leader reports apparent conflicts with projected plume location and observed meteorological conditions.

4.1.2.10 PROVIDE information regarding the location and radiological conditions (e.g., dose rates and airborne radioactivity levels) of a plume or radioactive material to the Radiation Controls Coordinator.

4.1.2.11 ENSURE comparisons for field team measurements versus calculated dose rate estimates are completed in accordance with EM-219, Enclosure 1.

4.1.2.12 ENSURE copies of environmental survey results are maintained and transmitted to the EOF. [NOCS 24110]

4.1.2.13 ACT as communications backup if the EOF assumes direction of EST.

**4.2 Environmental Survey Team Leader**

4.2.1 PERFORM Team Leader responsibilities according to EM-104, Enclosure 4.

4.2.2 FILL OUT the ETA in accordance with the requirements of the ERWP and any instructions given at the pre-job briefing. REFER to EM-104, Enclosure 4.

4.2.3 DIRECT plume monitoring and sampling beyond the site boundary until the State of Florida arrives on the scene and assumes this responsibility. [NOCS 1136]

4.2.3.1 DIRECT plume monitoring and sampling activities within the Site boundary until authorization from the EC or EOF Director that the team is recalled.

4.2.4 ENSURE the team takes Potassium Iodine (KI) tablets with them in case there is a need to take them, as directed by the Radiation Controls Coordinator.

4.2.5 TRACK the EST's accumulative exposure.

**4.3 EST Preparations (At TSC/OSC)**

4.3.1 REPORT to Local Assembly Area (Health Physics 95' Control Complex) during an Alert declaration. Upon assignment to respond as an emergency team member, REPORT to the TSC/OSC and badge in.

4.3.2 REPORT directly to the TSC/OSC for assignment during the declaration of a Site Area Emergency or General Emergency.

4.3.3 FORM the EST as directed by the Radiation Controls Coordinator.

4.3.4 OBTAIN keys for the ESV from the key locker in the Health Physics Office (95' Control Complex), Health Physics Calibration Lab, or the TSC/OSC Emergency Kit. A personal vehicle may be used as a back-up or second ESV. The additional Kit in the ESV should be left at the site for use in a second ESV. [NOCS 24290]

4.3.5 OBTAIN survey instruments and both Global Positioning Satellite (GPS) units from the Emergency Kit in the TSC/OSC. CHANGE/REPLACE batteries as needed. [NOCS 24290]

4.3.6 OBTAIN any additional supplies/equipment that may be needed that are NOT part of the supplies located in the ESV (e.g., SCBAs and spare bottles, counting system, count rate instrument, cell phone, etc.).

4.3.7 IF radio transceiver(s) and spare battery(s) are NOT available in the ESV, THEN OBTAIN from TSC/OSC emergency supplies. [NOCS 24290]

4.3.8 DETERMINE operability of radiation instruments to be used and DOCUMENT calibration due dates below:

| INSTRUMENT | CALIBRATION DUE DATE |
|---|---|
| | |
| | |
| | |
| | |
| | |

4.3.9 USE efficiency values listed on Enclosure 1 of this procedure.

4.3.10 OBTAIN Electronic Dosimeters (EDs).

**NOTE**

The Emergency RWP and Emergency Team Authorization (ETA) are defined in EM-104, Operation of the Operational Support Center.

4.3.11 ATTEND pre-job briefing and ENSURE the Emergency RWP and ETA is filled-out and signed-in accordance with EM-104.

4.3.12 DON protective clothing, if required, in accordance with the Emergency RWP and ETA.

**4.4 Team Preparations (At ESV)**

4.4.1 PROCEED to ESV.

4.4.2 FOLLOW GPS operation instructions on laminated card attached to the unit.

**4.5 Plume Tracking and Sample Collection** [NOCS 1126, 7450]

**NOTE**

An Environmental Survey Team map may be used for plume tracking and locating pre-designated monitoring points.

4.5.1 PROCEED to area specified by the Dispatcher.

**NOTE**

An E-120 or Ludlum 3 or equivalent instrument as determined by Health Physics Technician may be necessary to detect very small releases.

4.5.2 MONITOR beta and gamma dose rates en route to the designated area. Dose rates above background could indicate:

- o Outer fringes of the plume have been reached.
- o Plume is overhead.
- o Plume was in area and has deposited sufficient amounts of radioactive materials so that dose rates are elevated.

4.5.3 IF elevated dose rates are located in other than the designated plume area, THEN DOCUMENT on map (Enclosure 2 or Enclosure 3) or on an environmental survey map (available in ESV Kit), AND REPORT this information to the Dispatcher for evaluation. (These locations may be chosen as collection sites for environmental samples by the State of Florida.)

4.5.4 Upon arrival at the designated area, LOCATE the fringe of the plume by continuously monitoring dose rates with an ion chamber (open window) or E-120/Ludlum 3.

4.5.5 CONTACT the Dispatcher for further instructions if dose rate readings do NOT indicate that the plume is in the vicinity.

4.5.6 IF the encountered dose rates exceed the limits set, THEN RETURN to an area of lower radiation levels, AND EVALUATE alternatives with the Dispatcher.

4.5.7 LOCATE the highest dose rate after the fringe has been identified by traversing the area, as directed by the Dispatcher. Continuously monitor the dose rates, using an ion chamber (window closed).

4.5.8 OBTAIN a closed and open window reading using the ion chamber at the highest dose rate area identified in Step 4.5.7 and perform the following:

- o RECORD time and dose rates on Enclosure 4. Distances and sectors for pre-designated sample locations outside the Energy Complex are listed in Enclosure 5 as references. Recording of data can be performed by relaying the information to a remote location.
- o SUBTRACT the closed window (gamma) reading from the open window (beta, gamma) reading.
- o If there is NO significant difference, this indicates that the plume is overhead. CONTACT the Dispatcher for further instructions.
- o If there is a significant difference, this indicates that the plume is at ground level.

**NOTE**

Silver Zeolite cartridges must be used if available. Air sample volume should be at least 60 cubic feet.

4.5.9 After the highest dose rate of the plume has been identified, PERFORM the following:

- o COLLECT a small number of 100 $cm^2$ smears on horizontal surfaces. If dose rates are high, smears may be omitted.
- o SET-UP the air sampling equipment and obtain a particulate and iodine air sample.
- o USE GPS unit and RECORD distance (from RB landmark) on Enclosure 4.
- o RECORD the GPS coordinates and approximate location by known landmark on Enclosure 4 (e.g., 4&5 Cooling Towers).

4.5.10 MOVE to a low dose area and NOTIFY dispatcher of GPS information. STAY in low dose area until the specified air sample volume has been obtained. If possible, try to keep the flashing light in sight which indicates proper generator operation.

4.5.11 RETURN to the sample collection point and retrieve equipment. NOTIFY the Dispatcher if dose rates have varied.

**NOTE**

Samples are counted in the lowest available background area for statistical accuracy.

4.5.12 IF the count rate is less than background,
THEN DO NOT calculate activity,
AND call the activity background.

4.5.13 DETERMINE a low background counting station near the specified area.

**4.6 Sample Analysis**

4.6.1 Upon arrival at the designated counting station, TAKE any necessary precautions to ensure counting station equipment remains as contamination free as possible.

**NOTE**

Background must be $\leq$ 1000 cpm so that the minimum detectable activities (MDAs) of 1.0 x E-9 uCi/cc for gross particulates and 1.0 x E-7 uCi/cc for gross iodine can be obtained. [NOCS 7461, 24290]

4.6.2 RUN a one-minute background on the counting system. See Enclosure 1, Formulas and Instrumentation Data Sheet.

4.6.3 ANALYZE samples collected using normal counting techniques and report results to the Environmental Survey Dispatcher.

4.6.4 IF sample is >5 mRad/hr CW smearable,
THEN CONSIDER storage of smear in lead lined metal box located in the ESV.

4.6.5 RETAIN used filters in envelopes (available in the emergency kits) for precise laboratory analysis. LABEL samples with as much information as possible (time, location, weather conditions, etc.).

4.6.6 LOAD counting equipment in ESV for transport.

**4.7 Vehicle Decontamination**

| NOTE |
| --- |
| The EST Leader, in conjunction with the Environmental Survey Team Dispatcher, decide at what point ESV contamination levels will begin to hinder plume tracking activities or cause excessive exposure to the team, as noted in Section 4.6. |

4.7.1 PERFORM a quick beta-gamma survey of the exterior of the ESV and the vehicle's air filter.

4.7.2 NOTIFY Dispatcher of vehicle contamination levels.

4.7.3 PROCEED as directed by Dispatcher to any county wash down station or return to the Crystal River Energy Complex for wash down of the ESV, if required.

**4.8 Team Recall**

4.8.1 RETURN to the TSC/OSC or the EOF when notified by the Dispatcher.

4.8.2 IF a physical turnover is made to the State of Florida representatives,
THEN PROVIDE survey data as necessary,
AND KEEP a record of anything exchanged.

4.8.3 MAKE arrangements for the ESV to be surveyed, decontaminated and restocked in case needed again.

4.8.4 NOTIFY the Dispatcher of any problems or when ESV has been readied for re-use.

4.8.5 REPORT total exposure received by the EST members to Dosimetry located in the TSC/OSC (internal and external) and UPDATE Emergency Team Authorization form.

4.8.6 INFORM the EST Dispatcher of your availability.

**4.9 Documentation**

4.9.1 FORWARD documentation and surveys created as a result of this procedure to the OSC Health Physics Coordinator in the OSC. Care must be taken to ensure the documents are free from contamination before transmittal. Contaminated documents must be bagged, copied, and the originals discarded as radioactive waste. The copies must then be marked "ORIGINALS CONTAMINATED."

4.9.2 FORWARD a copy of the above survey package to the EOF for use by the State of Florida.

# FORMULAS AND INSTRUMENTATION DATA SHEET

## FORMULAS:

Note: Minimum air sample volume is 60 cubic feet.

$$\mu Ci/cc = \frac{\text{Gross CPM - Background CPM}}{\text{Volume (cc) x Detector Eff. x FCE x 2.22 E6 (DPM/}\mu Ci)}$$

$$dpm = \frac{(\text{Net cpm})}{(\text{Eff.})}$$

Net cpm = Gross cpm – Background cpm

Volume cc = Volume $ft^3$ x 2.832 E4 $cc/ft^3$

FILTER COLLECTION EFFICIENCY (FCE):

| FLOW RATE (CFM) * | SILVER ZEOLITE | CHARCOAL | PART. FILTER |
|---|---|---|---|
| 1 | .90 | .90 | .95 |
| 2 | .90 | .90 | .95 |
| 3 | .85 | .80 | .95 |
| 4 | .80 | .70 | .95 |
| 5 | .75 | .60 | .95 |

*Should use calibrated flow rates when possible.

EFFICIENCIES:

| | MS-2 | RM-14/E-120/Ludlum 3 |
|---|---|---|
| PART | .20 | .10 |
| IODINE | .0015 | .0015 |

LLD for MS-2:

$$LLD\ For\ MS-2 = \frac{3.29\sqrt{r_b t_s\left(1+\frac{t_s}{t_b}\right)}+3}{t_s}$$

$r_b$ = Background count rate cpm

$t_S$ = Sample count time in minutes

$t_b$ = Background count time in minutes

## INSTRUMENT START-UPS:

MS-2

- Power unit up – switch in back
- Verify dial settings per calibration sticker
- Response check detector
- Ensure proper shielded G-M probe used with SH-4 sample holder

IF TSC: Run background (5 minute minimum) and calculate LLD.

IF ESV: Run 1 minute background at each sample counting location and calculate LLD.

RM-14/E-120/Ludlum 3

- Check battery response
- Response check detector
- Maximum allowed background is 1000 cpm
- If used for air sample counting, use SH-4 sample holder for proper geometry

Frisker Minimum Detectable Count Rate (MDCR), cpm

$$MDCR = 4.66\sqrt{\frac{R_b}{2\tau}}$$

Where :

$R_b$ = background count rate, cpm

$\tau$ = instrument time constant, min to reach 90% meter deflection

Ludlum L-177, RM-14 = 0.16 min

E-120 = 0.072 min

AMS-4

- Power up – air pump and electronics (switches are on the back of the unit).
- Inspect/change filter; detector operational checks are done electronically.
- Flow verification performed by software based on type of air pump used.
- Verify green ready light is illuminated.

RO-20/RO-2A or equivalent

- Check batteries
- Response check with source

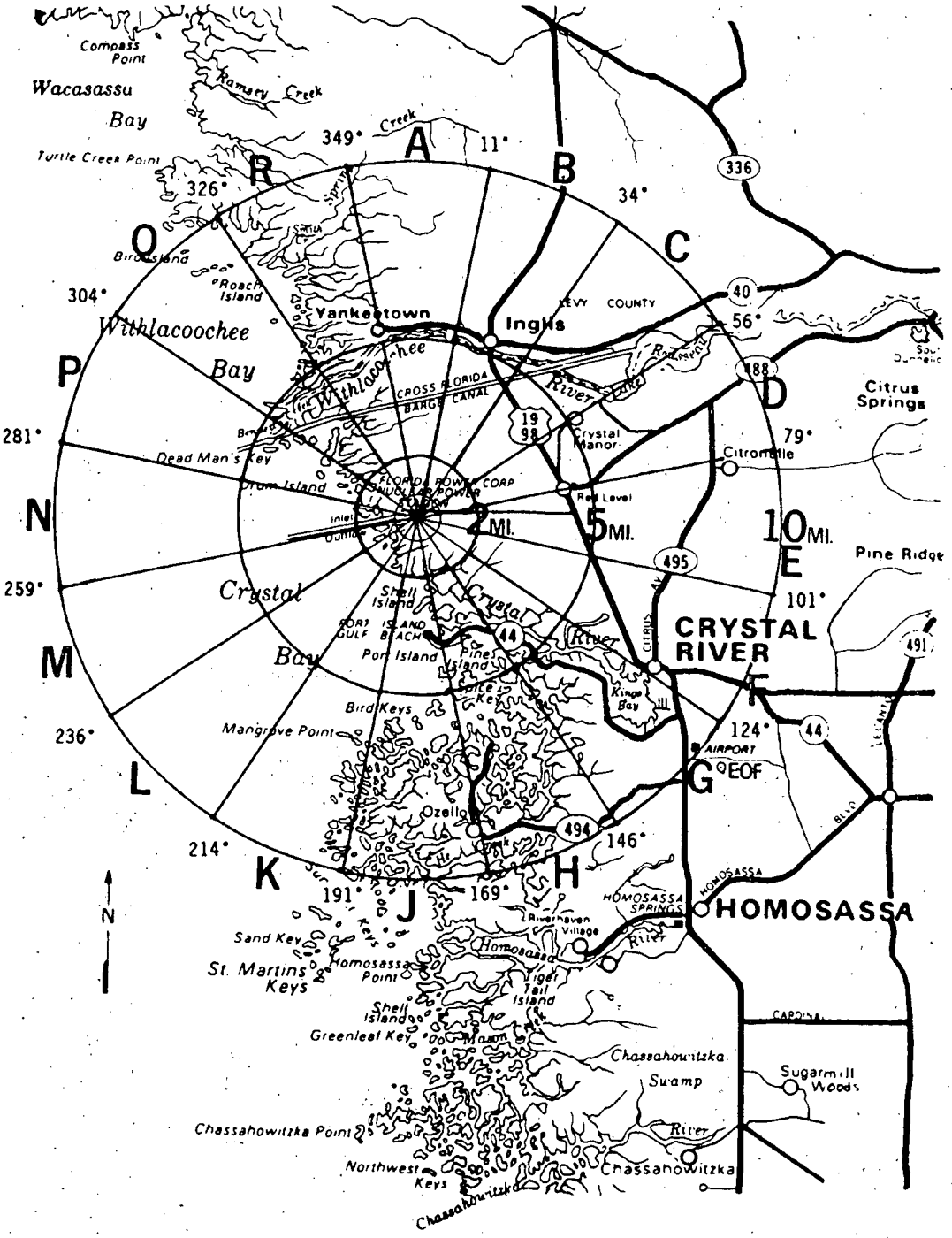
**THUMB RULES:** Dose rate can be estimated as follows: 20 mR/min for each R/HR.

THYROID DOSE FROM AIR SAMPLE RESULTS: (based on 24 hour exposure)

REM Thyroid = (I-131 μCi/cc) (2.88E+7 cc breathed/24 hrs) (1 REM/μCi)

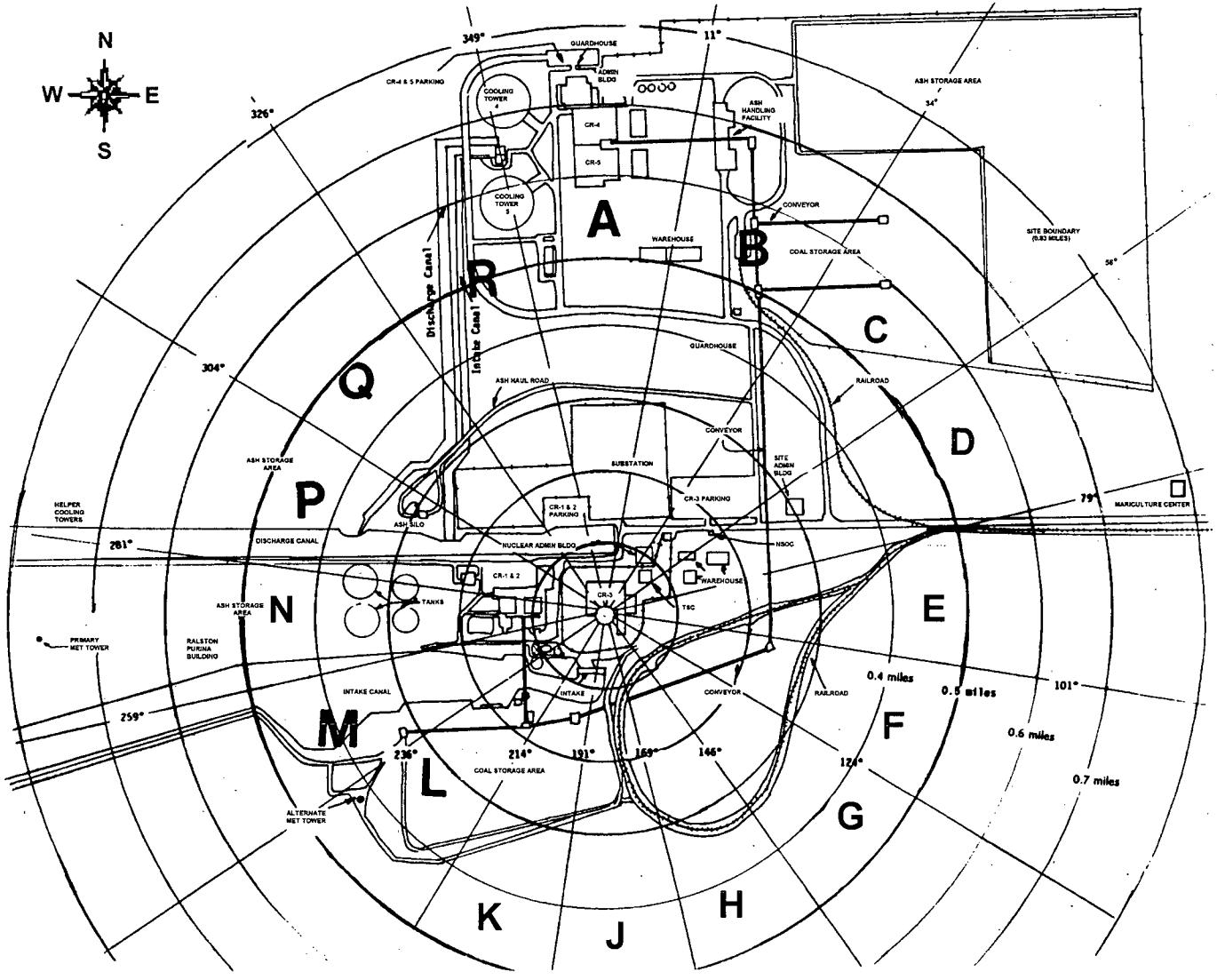
# CRYSTAL RIVER AREA MAP

ENCLOSURE 2

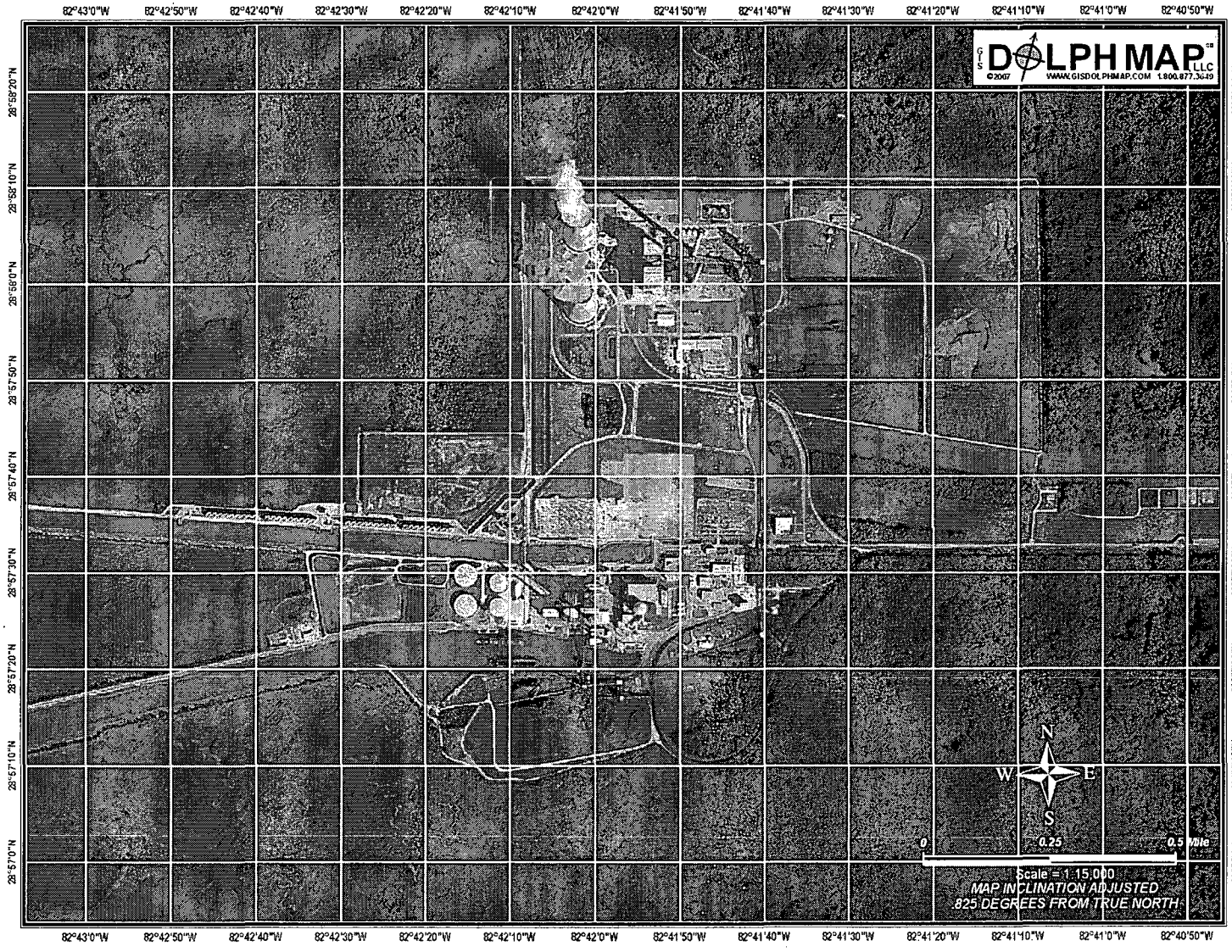



If available, utilize an "Environmental Survey Team" map for plume tracking and locating predesignated monitoring points.

# OWNER CONTROLLED AREA MAP



# OWNER CONTROLLED AREA WITH GPS GRID



ENCLOSURE 4

# EMERGENCY MONITORING SHEET

| *TIME | DISTANCE MILES | GPS COORDINATES | APPROXIMATE LOCATION | OPEN WINDOW (β,γ) READING mR/hr | CLOSED WINDOW (γ) READING mR/hr | β uncorrected (β,γ)-(γ) READING mR/hr | SMEARS cpm/100cm$^2$ | AIR SAMPLES Particulate (uCi/cc) | AIR SAMPLES Iodine (uCi/cc) |
|---|---|---|---|---|---|---|---|---|---|
| | | : : -N | | | | | | | |
| | | : : -W | | | | | | | |
| | | : : -N | | | | | | | |
| | | : : -W | | | | | | | |
| | | : : -N | | | | | | | |
| | | : : -W | | | | | | | |
| | | -N | | | | | | | |
| | | -W | | | | | | | |
| | | : : -N | | | | | | | |
| | | : : -W | | | | | | | |
| | | -N | | | | | | | |
| | | -W | | | | | | | |
| | | : : -N | | | | | | | |
| | | : : -W | | | | | | | |
| | | : : -N | | | | | | | |
| | | : : -W | | | | | | | |

REMARKS _____

*Consider using cellular telephone time for consistency.

# ENVIRONMENTAL SURVEY TEAM
# PREDESIGNATED SAMPLE POINTS (10 MILE EPZ)

| *DESIGNATION | LOCATION | DISTANCE FROM CR-3 (Air Miles) |
|---|---|---|
| | **CITRUS COUNTY:** | |
| B-4 | Intersection of U.S. 19 and Cross Florida Barge Canal. | 4.5 |
| C-6B | At Old Hydro Dam on N. Riverwood Dr. on Withlacoochee River. | 6.4 |
| D-4 | On U.S. 19 Approx. 2.25 Miles North of Energy Complex Access Rd. at Entrance to Crystal Manor. | 4.0 |
| D-7 | On S.R. 488 at Entrance to Holiday Heights Subdivision. | 7.0 |
| D-9 | Intersection of S.R. 495 and S.R. 488. | 8.8 |
| E-4 | Intersection of U.S. 19 and Energy Complex Access Rd. (Powerline St.). | 4.4 |
| E-7 | On S.R. 495 at Shamrock Farm House Approx. 3 Miles North of U.S. 19. | 7.4 |
| E-8 | Intersection of S.R. 495 and SCL Railroad Track. | 7.6 |
| F-5 | Intersection of W. State Park St. and N. Sailboat Ave. Approx. 1.6 Miles From U.S. 19 at Southeast Corner of Hollingswood Ranch. | 4.8 |
| F-6 | Intersection of U.S. 19 North and W. State Park St. | 6.4 |
| F-8 | Downtown Crystal River at Intersection of U.S. 19 and S.R. 495. | 7.8 |
| F-10 | Intersection of S.R. 44 East and S.R. 486. | 10.0 |
| G-5 | Bridge Over Salt River on S.R. 44 West. | 5.0 |
| G-7A | End of Dixie Shores Dr. Off S.R. 44 West at The Islands Subdivision. | 7.0 |
| G-7B | Intersection of S.R. 44 West and W. Pine Bark Lane at Crystal Shores Subdivision. | 7.0 |
| G-9 | Intersection of S.R. 44 West and U.S. 19. | 9.0 |

*Designation provides sector & approximate distance from CR-3.

# ENVIRONMENTAL SURVEY TEAM
# PREDESIGNATED SAMPLE POINTS (10 MILE EPZ) (Continued)

| *DESIGNATION | LOCATION | DISTANCE FROM CR-3 (Air Miles) |
|---|---|---|
| | **CITRUS COUNTY: (Continued)** | |
| G-10A | Water Dept. Bldg. on S.R. 494 Approx. 1.5 Miles from U.S. 19. | 9.8 |
| G-10B | Intersection of U.S. 19 and W. Seven Rivers Drive at Crystal River-Homosassa Airport. | 9.9 |
| H-7 | End of S.R. 494 at Ozello. | 6.8 |
| H-9 | Intersection of S.R. 494 and John Brown Dr. | 9.0 |
| J-3 | Fort Island Beach at End of S.R. 44 West. | 3.4 |
| | **LEVY COUNTY:** | |
| A-5 | Intersection of County Rd. 40 West and Riverside Dr. | 5.0 |
| A-7 | Intersection of Butler Rd. (County 325) And Jordan Rd. | 6.8 |
| B-6 | Intersection of County Rd. C-40-A and U.S. 19. | 6.2 |
| B-8 | On U.S. 19 Approx. 2.5 Miles North of Inglis at Levy County Sheriff Station. | 7.8 |
| C-6A | Intersection of County Rd. 40 East and County 345. | 5.5 |
| C-10 | Intersection of County Rd. 40 East and County 330 (Peaceful Acres) | 9.8 |
| Q-5 | County Park at End of County Rd. 40 West. | 4.8 |
| R-4 | On County Rd. 40 West Approx. 1.5 Miles From County Park. | 4.8 |
| R-5 | Intersection of County Rd. 40 West And County Rd. C-40A | 5.0 |

* Designation provides sector & approximate distance from CR-3.

## REVISION SUMMARY

January 2009 (PRR 266256, 281764, 310618 and 313791)

| Procedure Section | Change and Reason |
|---|---|
| Throughout | Ludlum 3 frisker added wherever an E-120 referenced. The E-120 will eventually be phased out as it is no longer supported by the vendor. |
| Step 4.5.9 | In the note before this step the minimum air sample volume was changed from 12 $ft^3$ to 60 $ft^3$ to meet detection limit requirements (PRR 310618) |
| Note above 4.6.2 | Changed counting station criteria to $\leq$1000 cpm versus < 1000 cpm to be consistent with EM-210A. |
| Enclosure 1 | References to the SAM-II were deleted. This instrument is no longer used for E-Plan. (PRR 313791)<br>MDC equation replaced with LLD equation. References to MDC replaced with LLD (PRR 310618)<br>Added the maximum allowed RM-14/L-177/E-120/Ludlum 3 background is 1,000 cpm (PRR 266256)<br>Changed minimum air sample volume from 12 $ft^3$ to 60 $ft^3$ to meet detection limit requirements (PRR 310618)<br>MDCR formula added |
| Enclosure 4 | Added additional lines (PRR 281764) |