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Prairie Island Nuclear Generating Plant
Operated by Nuclear Management Company, LLC

L-PI-04-022
10CFR50.4

FEB 2 0 2004

U S Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
DOCKETS 50-282 AND 50-306
LICENSE NOS. DPR-42 AND DPR-60
PRAIRIE ISLAND EMERGENCY PLAN IMPLEMENTING PROCEDURES

Furnished with this letter are the recent changes to the Prairie Island Nuclear Generating Plant Emergency Plan Implementing Procedures F3. This submittal includes the following documents:

INDEX:
Emergency Plan Implementing Procedures Table of Contents

REVISIONS

F3-9	Emergency Evacuation	Rev. 19

ADDITIONS:

F3-17.2	Long Term Core Cooling	Rev. 0

DELETIONS:
None

TEMPORARY CHANGE DELETIONS:
None

INSTRUCTIONS:
Instructions for updating the manual are included.

This letter contains no new commitments and no revisions to existing commitments.

A045

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NUCLEAR MANAGEMENT COMPANY, LLC

As per 10 CFR 50.4, two copies have also been provided to the NRC Region III Office and one to the NRC Resident Inspector. If you have any questions, please contact Mel Agen at 651-388-1121 Extension 7210.

Richard Gearha for

Joseph M. Solymossy
Site Vice President, Prairie Island Nuclear Generating Plant

CC Steve Orth, USNRC, Region III (2 copies)
NRC Resident Inspector- Prairie Island Nuclear Generating Plant
(w/o attachment)

Attachment

Mfst Num: 2004 - 0054 Date : 01/29/04
FROM : Bruce Loesch/Mary Gadient Loc : Prairie Island
TO : UNDERWOOD, BETTY J
Copy Num: 515 Holder : US NRC DOC CONTROL DESK
SUBJECT : Revisions to CONTROLLED DOCUMENTS

****

Procedure #	Rev	Title
Additions:		
F3-17.2	0	LONG TERM CORE COOLING
Revisions:		
F3-9	19	EMERGENCY EVACUATION

UPDATING INSTRUCTIONS

Place this material in your Prairie Island Controlled Manual or File. Remove revised or cancelled material and recycle it. Sign and date this letter in the space provided below within ten working days and return to Bruce Loesch or Mary Gadient, Prairie Island Nuclear Plant, 1717 Wakonade Drive E., Welch, MN 55089.
Contact Bruce Loesch (ext 4664) or Mary Gadient (ext 4478) if you have any questions.

Received the material stated above and complied with the updating instructions

________________________________ Date ________________

PRAIRIE ISLAND NUCLEAR GENERATING PLANT	Title: Emergency Plan Implementing Procedures TOC
Approved By: [signature] BPA Designee	Effective Date : 01/29/04 NOTE: This set may contain a partial distribution of this Document Type. Please refer to the CHAMPS Module for specific Copy Holder Contents.

F3	EMERGENCY EVACUATION	NUMBER: F3-9
		REV: 19

REFERENCE USE
• *Procedure segments may be performed from memory.*
• *Use the procedure to verify segments are complete.*
• *Mark off steps within segment before continuing.*
• *Procedure should be available at the work location.*

O.C. REVIEW DATE:	OWNER:	EFFECTIVE DATE
12-10-03	M. Werner	1-29-04

1.0 PURPOSE

This procedure provides instructions for implementing an emergency evacuation of affected areas within the plant buildings or areas within the site boundaries.

2.0 APPLICABILITY

This instruction **SHALL** apply to all plant personnel who are involved with evacuations caused by radiological hazards, fire, toxic gas, security threat, etc. This procedure does not apply to the evacuation of the general public located in affected areas beyond the site boundary.

3.0 PRECAUTIONS

3.1 The Emergency Director (ED) should consider radiation shine from the containments as well as other hazards when determining the habitability requirements of the assembly areas and evacuation routes.

3.2 When the evacuation alarm is heard, evacuate your work area while listening to specific evacuation instructions on the plant's Public Address (PA) system. If you cannot hear or understand the instructions, continue to leave the immediate area until you learn of the evacuation instructions.

3.3 When personnel are working inside Containment or the Shield Bldg, the Access Lead Radiation Protection Specialist (RPS) should establish communications with Containment Lead RPS and keep them informed of PA announcements (cannot understand PA due to echo).

4.0 RESPONSIBILITIES

4.1 The Emergency Director/Shift Manager (ED/SM) is responsible for ensuring that an appropriate evacuation (local, plant, or site) or an Early Dismissal is implemented when radiological or other conditions warrant such action.

4.2 The Radiological Emergency Coordinator (REC) is responsible to advise the ED/SM on choosing an appropriate Assembly Point and need for evacuation.

4.3 The Control Room is responsible to sound the evacuation alarm and make the appropriate announcement over the plant's public address system.

4.4 The Assembly Point Coordinator is responsible to coordinate the activities at the designated assembly area.

4.5 All plant personnel are responsible to follow the directions given over the plant's public address system and by the Assembly Point Coordinator.

4.6 The Security Team is responsible to assist in the personnel accountability process and plant access control.

4.7 The Technical Support Center (TSC) Coordinator is responsible for assisting work group leaders in determining nonessential personnel and reporting to ED when determination essential personnel is complete.

4.8 TSC work group leaders are responsible in determining essential and nonessential personnel.

5.0 DISCUSSION - See Attachment 1

6.0 PREREQUISITES

6.1 It has been determined that a personnel hazard exists or may exist; such as; radiological contamination, high radiological dose rates, fire, toxic gas, security threat, etc.,

<u>OR</u>

6.2 A Site Area or General Emergency has been declared.

7.0 PROCEDURE

7.1 Early Dismissal

An Early Dismissal may be warranted during an Alert classification if it is determined that the emergency may escalate to a higher level or may involve a hazardous release.

An Early Dismissal of personnel should proceed as follows:

NOTE:	No Early Dismissal of personnel is necessary if it is known that the Alert classification will be closed out in a short time (a few hours).

7.1.1 The REC should recommend to the ED the need for Early Dismissal of nonessential personnel based on whether the event has or may involve a hazardous release or escalate to a higher classification.

7.1.2 The ED should direct the TSC Coordinator to assist work group leaders in dismissing nonessential personnel.

7.1.3 The TSC group leaders are to determine which personnel are NOT needed for short term emergency support.

7.1.4 TSC Coordinator reports to ED with the TSC Group Leaders recommendation.

NOTE:	Personnel accountability is NOT necessary for Early Dismissal of nonessential personnel.

7.1.5 Once the Early Dismissal personnel have been identified, the TSC Group Leaders should direct the selected work group supervisors to instruct their selected individuals to leave the plant site and go home.

7.2 Local Evacuation

NOTE: **A Plant Evacuation should be conducted if a large employee/worker population is affected.**

7.2.1 IF during normal work hours OR an Outage AND the hazard is NOT in the RCA, THEN initiate Plant Evacuation (Step 7.3).

7.2.2 A Local Evacuation of a specific area of the plant may be necessary because of local hazards. A Local Evacuation may proceed as follows:

CAUTION: **FOR SEVERE THUNDERSTORM, HIGH WINDS, OR TORNADO WARNINGS, FOLLOW AB-2, TORNADO/SEVERE THUNDERSTORM, PROCEDURE UNTIL RADIATION PROTECTION GROUP DETERMINES DIFFERENTLY.**

A. **DETERMINE** assembly points using the table below as general guidance.

LOCAL EVACUATION FROM THESE AREAS	NORMAL WORK HOURS AND OUTAGE ASSEMBLY AREA FOR ACCOUNTABILITY	OFF HOURS NON-OUTAGE ASSEMBLY AREA FOR ACCOUNTABILITY
Containment Spent Fuel Pool	735′ Basketball Court	735′ Basketball Court
Aux Bldg	Access Control HP Office	Operational Support Center (OSC) or Security Building (Guardhouse)
Old Admin Turb Bldg New Admin NPD SBO Office Trailers Contractor Fab Shop Warehouse #1 Contractor Trailers	Initiate Plant Evacuation	

B. **SOUND** the EVACUATION ALARM.

C. **ANNOUNCE** the following over the plant page.

"ATTENTION ALL PLANT PERSONNEL. THERE IS A ______________ (hazard) OCCURING IN ______________ (specify affected area). ALL PERSONNEL SHOULD EVACUATE THE ______________ (specify affected area) USING THE NEAREST SAFE EXIT AND ASSEMBLE AT THE ______________ (assembly area)".

D. **REPEAT** the announcement.

E. **DIRECT** security (4318) to conduct Personnel Accountability using F3-10 as guidance.

7.2.3 Employees evacuating a particular area should exit via nearest "safe" exit and proceed to (designated area), as announced by PA, to aid in determining accountability.

7.2.4 The Radiation Protection Group (RPG) should:

A. IF tornado, severe thunderstorm OR high wind warning exists, THEN **notify** ED if any life threatening radiological conditions exist.

B. **Assume** control of entry into the area for exposure control purposes.

C. **Complete** surveys in the area and when conditions are returned to normal, complete surveys again.

D. **Recommend** to the ED/SM that the area be returned to normal use or relax access control to that area.

7.2.5 Work Group Leaders or Supervisors should complete Accountability for their personnel.

7.2.6 Security or Senior Work Group Leader should contact CAS when Accountability has been completed.

7.2.7 When Accountability is satisfied, security should inform ED/SM.

7.2.8 When the affected area has been released for normal use, the ED/SM should announce over the P.A., that the affected area is now returned to normal use.

7.3 Plant Evacuation

A Plant Evacuation may occur anytime and **SHALL** occur whenever a Site Area, or General Emergency is declared unless other constraints or circumstances make it impractical.

- IF the emergency is already being closed out AND there is no threat to personnel safety, THEN a Plant Evacuation is NOT necessary.
- IF both onsite Assembly Points are uninhabitable, THEN a Site Evacuation should be initiated.

CAUTION:	FOR SEVERE THUNDERSTORM, HIGH WINDS, OR TORNADO WARNINGS, FOLLOW AB-2, TORNADO/SEVERE THUNDERSTORM, PROCEDURE UNTIL RADIATION PROTECTION GROUP DETERMINES DIFFERENTLY.

All nonessential plant personnel **SHALL evacuate** to a designated onsite assembly area for accountability and monitoring, while emergency response personnel **proceed** to their respective emergency operating centers.

F3	EMERGENCY EVACUATION	NUMBER: F3-9
		REV: 19

7.3.1 The Emergency Director should **ensure** the following is performed during a Plant Evacuation:

NOTE:	During off-normal working hours when few non-shift personnel are present, the Shift Manager/Emergency Director may choose the Operations Lounge as an assembly area, if appropriate.

CAUTION:	CONSIDER RADIATION SHINE FROM THE CONTAINMENTS AS WELL AS NATURAL HAZARDS WHEN DETERMINING HABITABILITY REQUIREMENTS OF THE ASSEMBLY AREAS AND EVACUATION ROUTES.

A. **Determine** the wind direction and possible habitability problems at the onsite assembly areas. **Choose** either the **North Warehouse** or the **Receiving Warehouse.**

- May use North Warehouse if wind is from:
  236° to 360° or
  0° to 123°

- May use Receiving Warehouse if wind is from:
  123° to 360° or
  0° to 34°

B. IF conditions are acceptable, THEN **inform** the Control Room Operator of the designated Assembly Point and **direct** the Operator to sound the plant evacuation alarm per Step 7.3.2.

C. **Implement** F3-10, "Personnel Accountability." Personnel evacuation accountability **SHALL** be completed within 30 minutes after the evacuation alarm is sounded.

D. **Evacuate** the Auxiliary Building Operators to the OSC if:

1. General area radiation levels exceed 100 mR/hr, OR

2. Recommended by the Rad Protection Group or the REC.

E. **Direct** security to verify personnel that normally work outside the plant's Protected Area evacuate to the designated assembly area.

F. IF the completion of the accountability check results in missing persons, THEN **direct** a search of the plant buildings in accordance with F3-11, "Search and Rescue" and F3-12, "Emergency Exposure Control."

G. WHEN plant conditions have stabilized, THEN **direct** reentry into selected areas of the plant in accordance with F3-25, "Reentry."

H. **Consider** dismissing personnel from the assembly area when:

- Accountability has been completed.
- It has been determined which work groups or individuals may be dismissed from the site.
- 24 hour staffing plans have been determined.
- Employee Hot Line has been established and the employee's have been notified of the phone number.

7.3.2 The Control Room Operator should **perform** the following during a Plant Evacuation:

A. **Sound** the evacuation alarm.

NOTE:	During drills, the message should begin and end with "THIS IS A DRILL."

B. **Announce** the following over the plant page:

"ATTENTION ALL PLANT PERSONNEL. A PLANT EVACUATION HAS BEEN DECLARED. ALL EMERGENCY ORGANIZATION PERSONNEL REPORT TO AND REMAIN AT YOUR EMERGENCY DUTY STATIONS. ALL OTHER PERSONNEL SHALL EVACUATE TO THE (specify assembly point)."

C. **Repeat** announcement.

7.3.3 The REC should **perform** the following during a Plant Evacuation:

A. IF tornado, severe thunderstorm OR high wind warning exists, THEN **notify** ED if any life threatening radiological conditions exist.

B. **Designate** an Assembly Point Coordinator to control operations at the designated assembly area.

C. **Assist** the ED/SM in selecting an Assembly Point.

- May use North Warehouse if wind if from:
  236° to 360° or
  0° to 123°

- May use Receiving Warehouse if wind is from:
  123° to 360° or
  0° to 34°

D. **Monitor** the habitability of the Auxiliary Building and **recommend** to the ED/SM an evacuation of the Auxiliary Building Operators to the OSC if the general area radiation levels exceed 100 mR/hr.

E. Periodically **update** Assembly Point Coordinator with status of emergency.

7.3.4 The Assembly Point Coordinator should perform the following during a Plant Evacuation (may initiate at time of Emergency Center staffing):

A. **Contact** the REC and **request** the location of the designated Assembly Point.

B. WHEN directed by the REC, THEN **proceed** to the designated onsite assembly area with the appropriate keys (keys are in Security Building) and **set up** the Assembly Point as shown in the Assembly Point floor plans, Figure 2 or Figure 3.

C. **Supervise** any required monitoring or decontamination at the Assembly Point in accordance with F3-14.1, "Onsite Radiological Monitoring," and F3-19, "Personnel and Equipment Monitoring and Decontamination." **Give** priority to personnel who evacuated directly out of the Radiological Controlled Area.

D. IF contamination is highly likely AND personnel have been dismissed from the Assembly Point, THEN **monitor** all vehicles departing the site in accordance with F3-19. Monitoring and/or decontamination should be performed onsite or at the PI Academy of Learning (Training Center), whichever is most practical.

E. **Assist** in identifying personnel missed during accountability.

F. WHEN directed by ED or REC to dismiss personnel, THEN **notify** personnel:

- Who is to return to OSC or TSC.
- What the Employee Hot Line number is.

7.3.5 OSC Coordinator should:

A. **Direct** OSC supervisory staff to account for assigned essential personnel NOT evacuating.

B. **Comply** with EPIP F3-10, Personnel Accountability when the accountability report is delivered by security.

7.3.6 Emergency Organization Supervisors should:

A. **Verify** the physical location and status of their essential personnel NOT evacuating plant.

B. **Comply** with EPIP F3-10, Personnel Accountability when the OSC Coordinator commences the accountability process.

7.3.7 Emergency Organization Support Personnel should **contact** your emergency organization supervisor and **provide** your location and physical status.

7.3.8 Personnel evacuating the plant should **perform** the following during a Plant Evacuation.

A. WHEN the evacuation alarm is heard, THEN **evacuate** your work area while listening to specific evacuation instructions on the plant's public address system.

B. IF you cannot hear OR understand the instructions, THEN **continue** to leave the immediate area until you learn of the evacuation instructions.

C. IF working in a contaminated area, THEN **remove** as much protective clothing as time permits, especially gloves, booties or rubbers.

D. IF wearing a double suit, THEN **removal** of outside clothing would only be necessary.

E. IF unable to remove all protective clothing, THEN **inform** personnel in charge at the assembly area of your condition.

NOTE:	During a DRILL, remove ALL protective clothing prior to evacuating.

F. **Evacuate** via Security Building or as designated by the Security Team.

G. **Give** your badge to the Security Team member as you exit the Protected Area.

H. WHEN the North Warehouse is the designated assembly area, THEN all personnel **enter** the East Door or as directed by the Assembly Point Coordinator.

I. WHEN the Receiving Warehouse is the designated assembly area, THEN all personnel **enter** the North Door or as directed by the Assembly Point Coordinator.

7.3.9 Security Officers should **perform** the following during a plant evacuation:

A. **Assist** in personnel traffic control and perform accountability activities according to F3-10, "Personnel Accountability."

B. **Verify** personnel have evacuated all of the buildings outside the plant's Protected Area.

7.3.10 The TSC Coordinator should perform the following:

A. **Ensure** EOF Coordinator has established the Employee Hot Line.

B. **Coordinate** with Group Leaders in establishing 24 hour coverage.

C. **Coordinate** when personnel should return to relieve the shift.

7.4 Site Evacuation

A Site Evacuation of nonessential personnel should be required when a Plant Evacuation is justified, but the onsite assembly areas are NOT habitable. Personnel should be directed to evacuate to the parking lot and then using personal cars or plant vehicles, proceed to the offsite assembly area.

NOTE:	Monitoring of personnel and equipment prior to departure from plant site is NOT necessary because of possible offsite contamination

7.4.1 The Emergency Director should **perform** the following during a Site Evacuation:

A. **Designate** the Prairie Island Academy of Learning (Training Center) as the offsite assembly area, if possible.

NOTE:

1. **In the extreme rare case that the PI Academy of Learning (Training Center) is NOT usable as an offsite assembly area, reassess, with input from the Radiological Emergency Coordinator, and Site Evacuation Instructions, Figure 1.**
2. **A caravan may be led to the Red Wing Service Center or to either the Goodhue or Dakota County Emergency Worker Monitoring & Decon Centers for monitoring and decon. Appropriate notifications to the county sheriffs' departments should be made.**
3. **The evacuees may be sent directly to their homes without monitoring, if appropriate.**
4. **If the general public has been evacuated, evacuees may be sent directly to the state's public reception center for monitoring & decon.**

B. **Notify** the Emergency Manager (EM) of the Site Evacuation and **request** EOF support. The EOF will be responsible for assisting the Assembly Point Coordinator.

C. **Inform** the Control Room Operator of the offsite assembly point and **direct** the Operator to sound the evacuation alarm.

D. **Implement** F3-10, "Personnel Accountability." Personnel accountability should be completed within 30 minutes.

E. **Evacuate** the Auxiliary Building Operators to the OSC if:

1. General area radiation levels exceed 100 mR/hr, <u>OR</u>
2. Recommended by the Rad Protection Group or the REC.

F. **Ensure** that the Security Force has warned all personnel within the Owner Controlled Area, including all trailers, warehouse and construction sites.

F3	EMERGENCY EVACUATION	NUMBER: F3-9
		REV: 19

G. IF the completion of the accountability check results in missing persons, THEN **direct** a search of the plant buildings in accordance with F3-11, "Search and Rescue" and F3-12, "Emergency Exposure Control."

H. WHEN plant conditions have stabilized, THEN **direct** a reentry into selected areas of the plant in accordance with F3-25, "Reentry."

I. **Consider** dismissing personnel at the assembly area when accountability has been completed.

- Key personnel may be requested to return into the plant to augment the TSC or OSC staff.
- Return of personnel to the plant will have to be coordinated with Security and Rad Protection Group.

7.4.2 The Control Room Operator should **perform** the following during a site evacuation:

A. **Sound** the evacuation alarm.

NOTE:	During drills, the message should begin and end with "THIS IS A DRILL."

B. **Announce** the following over the plant page.

"ATTENTION ALL PLANT PERSONNEL. PERSONNEL WITHOUT EMERGENCY ASSIGNMENTS SHALL EVACUATE THE PLANT SITE IMMEDIATELY. GET YOUR CAR KEYS AND EVACUATE TO THE PARKING LOT. USE YOUR CAR OR PLANT VEHICLE AND PROCEED TO THE (specify assembly point). ALL EMERGENCY PERSONNEL SHOULD REMAIN AT YOUR EMERGENCY OPERATING CENTERS"

C. **Repeat** the announcement.

7.4.3 The Radiological Emergency Coordinator should **perform** the following during a Site Evacuation:

A. **Assist** the ED in selecting an offsite assembly area. In most cases the Prairie Island Academy of Learning (Training Center) should be used. **See** the note after 7.4.1.A for possible alternatives.

B. **Direct** an Assembly Point Coordinator to report to the offsite assembly area.

C. **Monitor** the habitability of the Auxiliary Building.

D. IF Auxiliary Building general average dose rates exceed 100 mrem/hr, THEN **recommend** to ED and evacuation of the Auxiliary Building Operators to OSC.

E. **Consider** establishing a secondary access control point in accordance with F3-21, "Establishment of a Secondary Access Control Point."

7.4.4 The Assembly Point Coordinator should **perform** the following during a Site Evacuation:

A. WHEN directed by the REC, THEN **proceed** to the offsite assembly point (Training Center) and **set up** the assembly area.

B. **Supervise** any required monitoring or decontamination at the Assembly Point in accordance with F3-14.1, "Onsite Radiological Monitoring," and F3-19, "Personnel and Equipment Monitoring and Decontamination." **Give** priority to personnel who evacuated directly out of the Radiological Controlled Area.

C. IF contamination is highly likely AND personnel have been released, THEN **monitor** all vehicles departing from the site in accordance with F3-19 or **perform** monitoring and decontamination at a location further from the PI Academy of Learning (Training Center).

7.4.5 Personnel evacuating the plant site should **perform** the following during a Site Evacuation:

A. WHEN the evacuation alarm is heard, THEN **evacuate** your work area while listening to specific evacuation instructions on the plant's public address system.

B. IF you cannot hear or understand the instructions, THEN **continue** to leave the immediate area until you learn of the evacuation instructions.

C. IF working in a contaminated area, THEN **remove** as much protective clothing as time permits, especially gloves, booties or rubbers.

D. IF wearing a double suit, THEN **removal** of outside clothing would only be necessary.

E. IF unable to remove all protective clothing, THEN **inform** personnel in charge at the assembly area of your condition.

NOTE:	When an evacuation alarm sounds during a DRILL, remove ALL protective clothing prior to evacuating.

F. **Retrieve** your personal car keys, if appropriate.

G. **Evacuate** via Security Building (Guardhouse) or as designated by the Security Force.

H. **Give** your badge to the Security Force member as you exit the Protected Area.

I. **Proceed** to your car or to the Assembly Point via other means.

J. IF the Prairie Island Academy of Learning (Training Center) is the offsite assembly area, THEN all personnel **proceed** to the PI Academy of Learning (Training Center)'s parking lot and **enter** the Southwest Door or as directed by the Assembly Point Coordinator.

K. IF the PI Academy of Learning (Training Center) cannot be used, THEN **assemble** in an evacuation caravan on the plant access road and follow the Assembly Point Coordinator to an offsite assembly area.

7.4.6 Security Officers should **perform** the following during a Site Evacuation:

A. **Assist** in personnel traffic control and **perform** accountability activities according to F3-10, "Personnel Accountability."

B. **Direct** all personnel within owner controlled area to proceed to offsite assembly area.

Figure 1 Site Evacuation Instructions

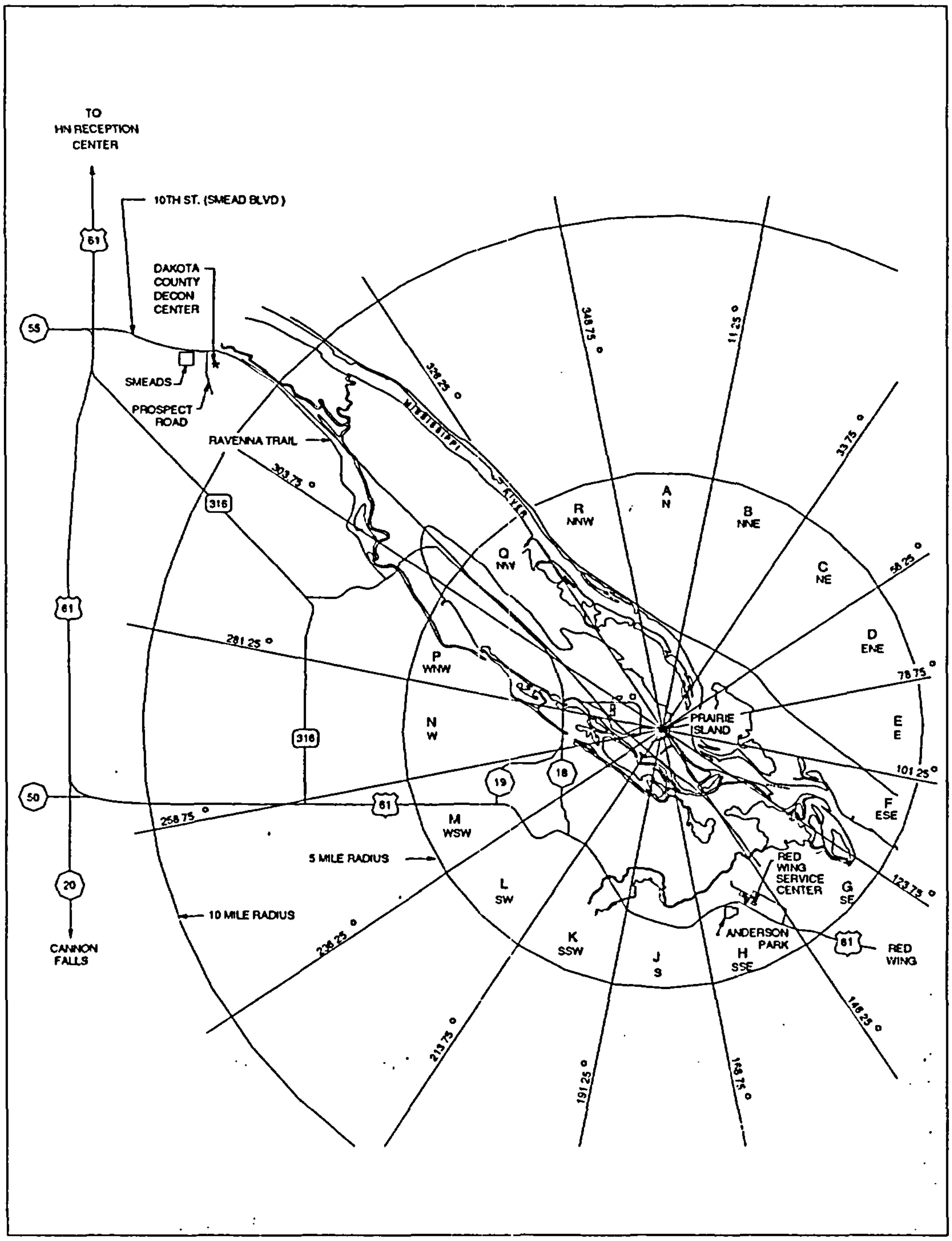


Figure 1 Site Evacuation Instructions
Evacuation Routes

To near-site EOF

1. Exit Plant Parking Lot
2. Turn left on Wakonade Dr.
3. Proceed to PI Academy of Learning (Training Center)
4. Use Southwest Entrance

To Red Wing Service Center

1. Exit Plant Parking Lot
2. Take the Plant Road to Wakonade Dr.
3. Left on Wakonade Dr. to County 18
4. Left on Country 18 to Hwy 61
5. Left on Hwy 61 Cannon River Road in Red Wing
6. Turn left on Cannon River Road to Pepin Street
7. Turn left on Pepin Street to Red Wing Service Center on the right.

To Hastings Public Works Building using Ravenna Trail

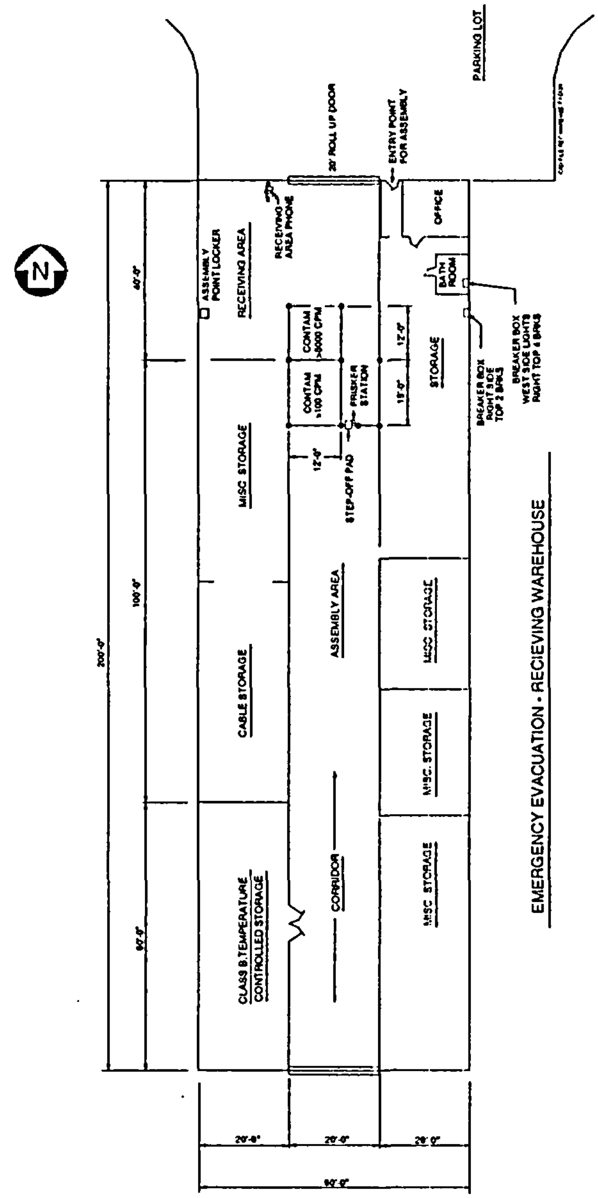
1. Exit Plant Parking Lot
2. Take the Plant Road to Wakonade Drive
3. Left on Wakonade Dr. to County 18
4. Right on Country 18
5. Right on Ravenna Trail to 10th Street / Smead Blvd. [Road Changes Names]
6. 10th Street / Smead Blvd to Progress Drive
7. Left on Progress Drive to Hastings Public Works Building on the right.

To Hastings Public Works Building using Hwy 316

1. Exit Plant Parking Lot
2. Take the Plant Road to Wakonade Dr.
3. Left on Wakonade Dr. to Country 18
4. Right on County 18 to 200th Street [Road Changes Names]
5. 200th Street to Hwy 316
6. Right on Hwy 316 to Hwy 61
7. Right on Hwy 61 to 10th Street
8. 10th Street / Smead Blvd. To Progressive Drive
9. Right on Progress Drive to Hastings Public Works Building on the right.

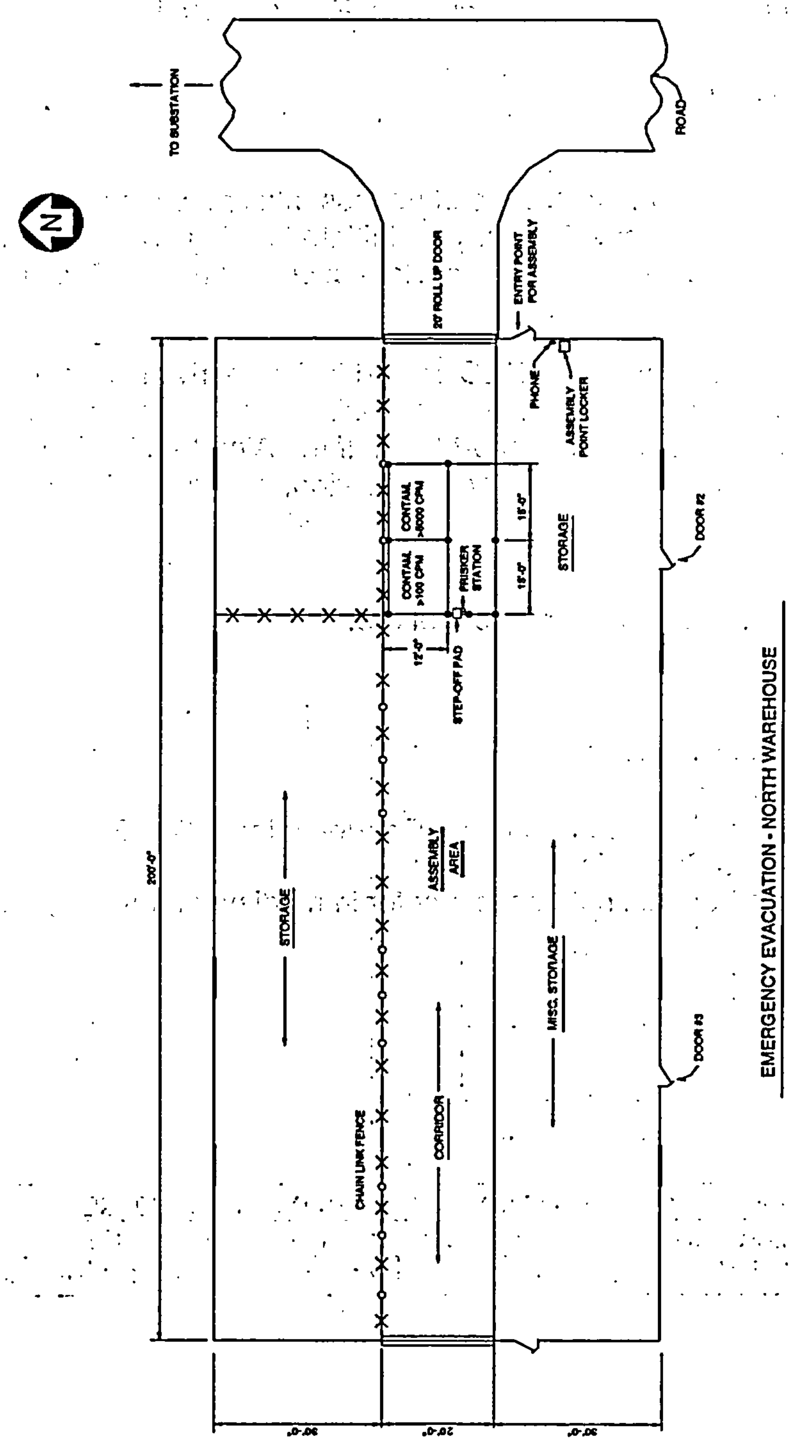
F3	EMERGENCY EVACUATION	NUMBER: F3-9
		REV: 19

Figure 2. Receiving Warehouse



EMERGENCY EVACUATION - RECEIVING WAREHOUSE			
PRAIRIE ISLAND NUCLEAR PLANT RED WING, MINNESOTA	DRAWN BY: JLB	REVISION: 0	F3-9
	CNTRL. NO.	DATE: 2-22-02	FIGURE 2 / PG. 1 OF 1

Figure 3 North Warehouse



EMERGENCY EVACUATION - NORTH WAREHOUSE

Attachment 1 Discussion

The Emergency Director has four (4) options in removing personnel from an area or the plant determined by the type of emergency condition and/or magnitude of a release. The options are Early Dismissal, Local Evacuation, Plant Evacuation, or Site Evacuation.

1. Early Dismissal

This is directing designated groups of nonessential personnel to leave the plant site and return to their homes. This may be initiated during an Alert classification when it is determined that conditions may escalate such that a Plant Evacuation may occur.

When an Alert is declared, the REC should initiate early dismissal assessment and advise the Emergency Director. No Early Dismissal is necessary if it is known that the Alert will be closed out in a short time. If the Alert termination time is unknown or the plant may escalate to a higher classification, then an Early Dismissal should be considered.

Examples of Early Dismissal personnel are:

Visitors
Vendors & Consultants
Student Interns
Selected Admin Staff, Document Control, Information Systems personnel
Selected QC Specialists
Selected personnel not necessary for immediate emergency support

Attachment 1 Discussion

2. Local Evacuation

This is an evacuation of a specific area of a plant building to a safe area within the plant. This may be done at any emergency level to protect plant personnel from a localized hazard.

If a large employee/worker population is affected (i.e., Turbine Bldg or New Admin Bldg), a Plant Evacuation should be considered, to facilitate accountability in a timely manner.

During OFF HOURS with the fewer personnel on site it is better to get everyone in one location that would make accountability easier.

- The OSC is probably the best location. Personnel will show up on the list as being there and they are available to assist.

- The Security Building (Guardhouse) should be the next choice. Personnel will be log off site and will NOT show up on the list. The drawback is they need to get back on site to assist.

Attachment 1 Discussion

3. Plant Evacuation

This is an evacuation of plant buildings inside the Protected Area to a designated Assembly Point outside the Protected Area (**North Warehouse or Receiving Warehouse**). Personnel already outside the Protected Area should be asked to evacuate to the designated Assembly Point.

A Plant Evacuation **MAY** be initiated at an Alert classification and **SHALL** be initiated at the Site Area or General Emergency classification unless there are other constraints or circumstances that make a Plant Evacuation impractical, such as:

A. If the Site Area or General Emergency is already being closed out, then no Plant Evacuation is necessary.

B. If both onsite assembly points are uninhabitable, then a Site Evacuation should be warranted.

C. If there are high winds or tornado, then an evacuation may not be feasible.

Once plant accountability is completed, personnel at the assembly point should be sorted out according to those who go home, go to the OSC, or go to the TSC.

If the event was a contaminating event, personnel and cars should be monitored and decontaminated onsite or at the Academy of Learning (Training Center), whichever is most practical. If contamination exists beyond the site boundary or at the Training Center, personnel may use the Xcel Red Wing Service Center or the county's Emergency Worker Monitoring and Decon Centers.

F3	EMERGENCY EVACUATION	NUMBER: F3-9
		REV: 19

Attachment 1 Discussion

4. Site Evacuation

This is an evacuation of all plant buildings onsite (inside & outside the Protected Area) to the Academy of Learning (Training Center). This should be initiated when a Plant Evacuation is justified, but the onsite assembly areas are not habitable.

Once plant accountability is completed, personnel at the Assembly Point should be sorted out according to those who go home, go to the OSC, or go to the TSC.

If the event was a contaminating event, personnel and cars should be monitored and decontaminated, as necessary and practical. If contamination exists beyond the site boundary and at the Academy of Learning (Training Center), personnel may use the Red Wing Service Center or the county's Emergency Worker Monitoring and Decon Centers.

If the emergency resulted in evacuation of the general public, plant evacuees may be directed to the public reception center for monitoring and decontamination, as appropriate.

F3	LONG TERM CORE COOLING	NUMBER: F3-17.2
		REV: 0

REFERENCE USE
• *Procedure segments may be performed from memory.*
• *Use the procedure to verify segments are complete.*
• *Mark off steps within segment before continuing.*
• *Procedure should be available at the work location.*

O.C. REVIEW DATE:	OWNER:	EFFECTIVE DATE
1-21-04	M. Werner	1-29-04

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ATTACHMENTS

1.0 PURPOSE

The purpose of this procedure is to provide guidance for monitoring and enhancing long-term post-LOCA recirculation operation.

Core decay heat reduction following a LOCA may enable ECCS flow reductions similar to RHR flow adjustments made during operation of RHR in a shutdown cooling lineup. It may also be possible at some point to align one or both trains of RHR for shutdown cooling and terminate recirculation. This procedure monitors core decay heat removal and determines if and how ECCS flow or alignment changes are warranted.

N[1,2] The possibility exists for containment debris to be ingested into the recirculation system during post-LOCA recirculation operation. This debris has the potential to adversely affect post-LOCA recirculation operation. This instruction provides guidance for detecting and mitigating these affects.

2.0 APPLICABILITY

This procedure **SHALL** apply to TSC staff and Control Room operators.

Control Room or TSC personnel may implement this procedure. Control Room **SHALL** implement this procedure until the TSC is staffed, at which time the TSC should assume responsibility for monitoring long term core cooling.

3.0 PRECAUTIONS

High radiation levels may be present in the Auxiliary Building.

4.0 RESPONSIBILITIES

4.1 Control Room Operators are responsible for the following:

- Implementation of this procedure until it is turned over to the TSC.
- Directing or approving the manipulation of any plant equipment.
- Implementing contingency actions for sump recirculation blockage indications.

4.2 When the TSC is staffed, the Engineering and Operations Group Leaders are responsible for the following:

- Monitoring post-LOCA recirculation indications.
- Making recommendations to control room staff on performance of actions within this procedure.
- Recommending and developing, as necessary, contingency actions in the event that adverse affects from debris ingestion in the recirculation system are detected.

5.0 DISCUSSION

This procedure provides instructions and guidance for monitoring long-term core cooling flow requirements and mitigating core cooling issues during post-LOCA sump recirculation. Specifically, the following guidelines are provided:

- Instructions for monitoring and reducing ECCS flow based on reduced decay heat generation.
- Instructions for refilling the RWST following the initiation of long-term recirculation operation. After long-term recirculation has been established, the RWST inventory has been depleted. The purpose of the RWST refill is to provide inventory for charging system operation and re-establishment of the ECCS injection mode operation capability.
- Instructions on re-establishing containment spray flow if necessary to inject additional NaOH to ensure a basic pH (pH > 7) in the sump solution.
- Instructions for monitoring ECCS recirculation mode of operation.
- Instructions for mitigating potential blockage in the ECCS system during recirculation system operation.

6.0 PREREQUISITES

- ECCS has been aligned for recirculation.

7.0 PROCEDURE

NOTE	Procedure sections may be performed concurrently and in any order.

7.1 Monitoring Long Term Recirculation Operation

7.1.1 Monitor the following parameters using Control Board and ERCS (TOC ECCS, RH1, TC):

- Containment Sump Level
- RHR Pump Suction Pressure
- RHR Pump Discharge Pressure
- RHR Flow Rate
- SI Pump Discharge Pressure
- SI Flow Rate
- Core exit T/Cs
- Subcooling
- RVLIS
- RHR Pump motor current
- RHR Pump vibration (ERCS 1Y0631A & 1Y0632A [2Y0631A & 2Y0632A]

NOTE

The indications and mitigation strategies on Table 1 and Table 2 address the most susceptible flow blockage locations:

- **RHR Heat Exchangers**
- **SI throttle valves/orifices**
- **Fuel assembly top and bottom nozzles**

Indications and strategy for Sump B screen blockage is provided, but not expected due to the large opening size and significant plugging necessary to result in degraded RHR Pump suction.

7.1.2 Compare actual parameter changes to trends provided on Table 1 for high head recirculation or Table 2 for low head recirculation.

7.1.3 IF any trends indicate flow blockage per Table 1 or Table 2, THEN perform the following:

A. Verify ERO staff, if available, consulted with mitigation strategy provided in Table 1 or Table 2

B. Initiate charging flow to RCS using either of the following while continuing with Step 7.1.3C.

- Suction aligned to VCT at available VCT makeup capability
- Suction from RWST if level greater than 8%

C. Implement mitigation strategy provided in Table 1 or 2.

D. Reduce setpoint on CC heat exchanger outlet temperature controllers as low as possible.

7.2 RHR Flow Adjustment For Decay Heat Reduction

NOTE:	Long-term RHR flow should be maintained greater than 750 gpm.

7.2.1 IF the following conditions are satisfied, THEN reduce one train RHR flow or stop one RHR pump:

- Both SI pumps stopped
- Both RHR pumps on recirculation
- Core exit T/Cs less than 140 degrees
- Core exit T/C stable or decreasing
- RCS inventory stable or increasing

7.2.2 IF the following conditions are satisfied, THEN adjust RHR flow to maintain RCS temperature stable, as necessary:

- Both SI pumps stopped
- One RHR pump on recirculation
- Core exit T/Cs less than 140 degrees
- Core exit T/Cs stable or decreasing
- RCS inventory stable or increasing

7.2.3 IF the following conditions are satisfied, THEN consider aligning one RHR train for shutdown cooling using guidance provided in ES-1.1, Post LOCA Cooldown And Depressurization:

- Both SI pumps stopped
- One RHR pump stopped
- RVLIS full range greater than 82%
- RVLIS stable or increasing
- RCS subcooling greater than 35°F
- RCS subcooling stable or increasing

7.3 Refilling The RWST

NOTE:	**The purpose of this section is to refill the RWST following the alignment to long-term sump recirculation. The additional water in the RWST provides a source for charging or a source to reinitiate injection, if required.**

CAUTION:	**ALL OF THESE TRANSFER PROCEDURES REQUIRE ENTRY TO AREAS WITH POTENTIALLY VERY HIGH RADIATION FIELDS. FOR THE OUT-PLANT OPERATOR ACTIONS, AN RP TECHNICIAN SHOULD BE PRESENT TO IDENTIFY RADIATION FIELDS AND RECOMMEND TRAVERSE ROUTES. TO THE EXTENT PRACTICAL, TIME SHOULD BE MINIMIZED FOR ANY OPERATIONS OF SI-17-1 [2SI-17-1].**

CAUTION:	**THE COMBINED CONCENTRATION OF WATER TRANSFERRRED TO THE RWST SHALL BE SUCH THAT THE RESULTANT RWST BORON CONCENTRATION IS BETWEEN 2000 AND 3500 PPM.**

Fill the RWST to greater than or equal to 50% using one or more of the following:

- Transfer water from the other unit RWST per C16.
- Transfer water from the CVCS Hold-Up Tank(s) per C12.8.
- Transfer water from the CVCS Monitor Tank(s) per C12.8.
- Refill the RWST using the BA Blender per C12.5.

7.4 Adjusting Containment Sump B pH

NOTE:	During performance of E-1 and ES 1.2 or 1.3, sufficient NaOH may not have been injected to ensure that the pH of the sump solution is greater than 7. A pH greater than 7 is necessary to retain iodine in the sump liquid solution and minimize the potential for stress corrosion cracking of stainless steel.

NOTE:	IF the level indication in the Caustic Standpipe is greater than 45% AND a second RWST is to be injected using charging system or ECCS, THEN it may be necessary to adjust sump pH by establishing containment spray.

IF Containment Sump B pH adjustment is necessary, THEN perform the following:

7.4.1 Check caustic standpipe level greater than 45%

7.4.2 Verify RWST level is greater than 50%

7.4.3 Manually actuate containment spray

7.4.4 IF only one train CS is desired, THEN perform the following:

A. Reset containment spray

B. Stop one containment spray pump

7.4.5 WHEN caustic standpipe level is less than 45% OR RWST level is less than 8%, THEN perform the following:

A. Reset containment spray

B. Stop containment spray pumps

8.0 REFERENCES

8.1 NRC Bulletin 2003-01, Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized Water Reactors.

8.2 COM027522, Commitment from response to NRC Bulletin 2003-01. Implement a procedure revision to address potential debris ingestion. (N^1)

8.3 COM027520, Commitment from response to NRC Bulletin 2003-01. Implement a procedure to enhance operator guidance for refilling the RWST from alternative water sources. (N^2)

8.4 OTH026878, Engineering Evaluations for NRC Bulletin 2003-01.

8.5 OTH026879, Identify RHR System Potential Blockage Locations.

8.6 OTH026881, Identify SI System Potential Blockage Locations.

8.7 OTH026882, Identify Core Passages Potential Blockage Locations.

8.8 EOP Setpoint Calculation J.5, Maximum Time Period for Interrupting SI Flow During Switchover to Recirculation.

8.9 CALC ENG-ME-005, Revision 3, Analysis of Available NPSH to the RHR Pumps from the Containment Sump.

8.10 CALC ENG-ME-557, Rev. 0, Containment Sump Liquid pH.

F3	LONG TERM CORE COOLING	NUMBER: F3-17.2 REV: 0

Table 1 High Head Recirculation Flow Blockage

NOTE: The indications and mitigation strategies address the most susceptible flow blockage locations: RHR Heat Exchangers, SI throttle valves/orifices, and fuel assembly bottom nozzles.

Indication - Trend	Mitigation Strategy
SI Pump Suction Blockage	
SI Pump Discharge Pressure – DECREASING OR FLUCTUATING SI Flow Rate – DECREASING OR FLUCTUATING RHR Pump Discharge Pressure - INCREASING	• IF one train idle, THEN start idle train RHR and SI pump on recirculation and stop affected train SI and RHR pump. • IF both trains operating, THEN stop affected train SI and RHR pumps. • IF only affected train available, THEN stop RHR and SI pumps for time period not to exceed six minutes. • Align RHR HX bypass line on affected train. • Align SI pump flow to vessel rather than cold legs. • Expedite post-LOCA C/D and depressurization. • IF RWST level greater than 8%, THEN align RHR suction to RWST as follows (Limit time of total flow stoppage to less than 6 minutes): a. Stop SI pump b. Stop RHR pump c. CLOSE Sump B to RHR suction valves d. OPEN RWST to RHR suction valves e. Start RHR pump f. Start SI pump g. Refer to ECA-1.1
SI Pump Discharge Blockage	
SI Pump Discharge Pressure - INCREASING SI Flow Rate - DECREASING RHR Pump Discharge Pressure - INCREASING	• Align SI flow to vessel rather than cold legs. • Attempt cold leg flow re-initiation after settling period. • Expedite post-LOCA C/D and depressurization.
Fuel Assembly Blockage (bottom)	
Core Exit Thermocouples – INCREASING SI Pump Discharge Pressure - STABLE SI Flow Rate – STABLE	• Align SI flow to vessel rather than cold legs. • Attempt cold leg flow re-initiation after settling period. • Expedite post-LOCA C/D and depressurization.

Table 2 Low Head Recirculation Flow Blockage

NOTE: **The indications and mitigation strategies address the most susceptible flow blockage locations: RHR Heat Exchangers and fuel assembly top nozzles. Sump B screen blockage strategy is provided, but screen blockage is not likely.**

Indication - Trend	Mitigation Strategy
RHR HX Blockage	
RHR Pump Discharge Pressure - INCREASING RHR Flow Rate - DECREASING	• IF one train idle, THEN start idle train RHR pump on recirculation and stop affected train RHR pump. • IF both trains operating, THEN stop affected train RHR pump. • IF only affected train available, THEN stop RHR pump for time period not to exceed six minutes. • Throttle RHR flow as low as possible while maintaining RCS temperature stable. • Align RHR HX bypass line on affected train.
Fuel Assembly Blockage (Top)	
Core Exit T/Cs – INCREASING OR DIVERGING RHR flow/pressure - STABLE	• Align for High Head Recirculation as follows: a. CLOSE SI Pump suction from RWST b. OPEN RHR Pump discharge to SI Pump suction c. Start SI Pump d. CLOSE RHR vessel injection valve • OPEN RHR to Loop B cold leg return
Sump B Screen Blockage	
RHR Pump Discharge Pressure - DECREASING OR FLUCTUATING RHR Pump Suction Pressure - DECREASING OR FLUCTUATING RHR Pump Motor Current - DECREASING OR FLUCTUATING	• IF both trains operating, THEN stop one train RHR pump. • Throttle RHR flow as low as possible while maintaining RCS temperature stable or core covered. • IF only affected train available, THEN stop RHR pump for time period not to exceed six minutes. • IF RWST level greater than 8%, THEN align suction to RWST as follows (Limit time of total flow stoppage to less than 6 minutes): a. Stop RHR Pump b. CLOSE Sump B to RHR suction valves c. OPEN RWST to RHR suction valve d. Start RHR pump e. Refer to ECA-1.1.

Attachment 1 Background Information for F3-17.2, Long Term Core Cooling

SUMMARY

Following a loss of coolant accident (LOCA), continued core cooling may be provided using post-LOCA recirculation from the containment sump. This procedure provides guidance for the following:

- Monitoring long-term post-LOCA recirculation operation: Numerous parameters are available to monitor long-term core cooling performance. Selected parameters are compared to expected trends for degrading recirculation flow conditions. Mitigating strategies are provided for recirculation flow blockage in the most susceptible locations.
- RHR flow adjustments for decay heat reduction: This section provides for RHR flow reductions and possible alignment of RHR for shutdown cooling based on decay heat reduction and system performance.
- Refilling the RWST: Refilling or raising RWST level following transfer to recirculation may be desirable to ensure an adequate source of water is available for ECCS pump operation if sump recirculation flow is challenged or if containment spray pump operation is needed for sump pH adjustment and provide another source of water to the charging pumps. This section provides direction for raising RWST level.
- Adjusting containment sump pH: For some event sequences it may be possible to inject the contents of the RWST without actuation of containment spray. Additional RWST water could be injected due to ECCS pump realignment to address recirculation flow issues. For each of these conditions it may be necessary to adjust containment sump pH by operation of the containment spray system. This section provides direction for operation of containment spray to raise sump pH.

The monitoring aspects of this procedure can be performed from either the Control Room or the TSC. The TSC is the preferred location for monitoring and trending long-term recirculation operation. Operation of plant equipment is performed by or with direction from the Control Room.

NRC Generic Safety Issue (GSI) 191 has identified several potential concerns regarding post-LOCA recirculation operation. In June 2003 the NRC issued Bulletin 2003-01 to request that licensees implement compensatory measures to reduce the potential risk associated with post-LOCA sump recirculation operation. Prairie Island responded to Bulletin 2003-01 in a letter dated August 6, 2003 (T-Track Item OE026823). In the response to Bulletin 2003-01, several commitments were made regarding implementation of procedural actions for long-term post-LOCA recirculation operation. This procedure implements actions to close several of these commitments.

Attachment 1 Background Information for F3-17.2, Long Term Core Cooling (Continued)

BASES FOR ACTIONS

Step 7.1 Note:

The procedure steps address different issues and are written such that they can be performed in any order as the condition or need arises.

Step 7.1

This step provides guidance for monitoring long-term recirculation operation by observing parameters for any indication, or trends, of possible degradation, comparing selected parameters to expected trends for degrading recirculation capability, and implementing appropriate mitigating strategies for degrading recirculation flow.

The most susceptible form of degradation during recirculation operation would be due to the ingestion of debris from the containment sump into the recirculation system. Due to the relatively large opening size of the recirculation sump screen (3/4"x 3-11/16"), blockage of the sump screen is not expected. Thus, most of these strategies focus on mitigation of flow reduction caused by debris ingestion. Mitigation strategies are provided for sump screen blockage during RHR recirculation, as this is the time period where significant debris buildup on the screens may have a noticeable affect.

Step 7.1.1

This step provides a listing of indications of recirculation operation that can be monitored using ERCS from either the Control Room or TSC. In order to detect possible degradation of recirculation operation it is necessary to monitor several parameters. The parameters are expected to trend to stable, equilibrium values. Although selected ERCS display turn on codes are listed, the information can be obtained using other ERCS displays and trend functions or PI Process Book. Several of the parameters are also available on meters or panel displays in the Control Room.

Attachment 1 Background Information for F3-17.2, Long Term Core Cooling (Continued)

Note for Step 7.1.2

Based on the smallest size openings in the recirculation system, the most likely locations for flow blockage are the RHR heat exchanger (0.652 inch), SI throttle valves or orifices (0.54 inch), fuel assembly top nozzle (0.472 inch), and fuel assembly bottom nozzles (0.188 inch). Due to the large surface area of the sump screens, the large opening size in the screens (3/4" X 3 11/16") and the concrete "lip" around the sump, large pieces of debris and metallic items are prevented from entering the sump and flow blockage of the screens is not expected. Significant screen blockage must occur with high flow rates to have any noticeable affect on RHR pump operation. Mitigating strategies are provided in Table 2 for sump screen blockage when high recirculation flow conditions exist (i.e., low head recirculation).

Step 7.1.2

Table 1 and Table 2 compare selected parameters with expected trends indicating ECCS recirculation flow degradation. Several options for mitigating strategies are provided for each susceptible flow blockage location. Table 1 provides indications for high head recirculation and Table 2 provides indications for low head recirculation. Although only selected parameters and trends are listed on the tables, other parameters are being monitored and can be used when evaluating recirculation flow status.

Personnel evaluating recirculation flow status need to be aware of and take into account other actions that have an affect on these parameters. For example, securing ECCS pumps or adjusting flow rates based on the post-LOCA cooldown and depressurization procedure or Step 7.2 of this procedure will affect many of the parameters and trends may be indicative of control based on those procedures steps and not degradation of recirculation flow.

Mitigation strategies for susceptible flow blockage locations are provided on Table 1 and Table 2. Implementation of the strategies and bases for the strategies is described in the next section.

Attachment 1 Background Information for F3-17.2, Long Term Core Cooling (Continued)

Step 7.1.3

If degradation of ECCS recirculation flow is identified, then mitigating strategies should be implemented to ensure continued long-term core cooling capability. Since several options are available for each flow blockage location, available plant staff should be consulted as to the most appropriate or best method to use. Based on parameter trends, system alignments and availabilities, local component access, and personnel availability, one of the options may be preferred over another. The strategies are not listed in order of priority on the tables. Consulting available ERO staff ensures that input from operations and engineering personnel is used to correct the situation or provide compensatory measures.

Charging flow is established to the RCS to provide a diverse flow path for decay heat removal. Within a relatively short time period (after the first initial hours), the decay heat rate is within the capacity of two charging pumps. Thus, provided that the flow path exists between the charging connection to the RCS and the reactor assembly, adequate core cooling can be provided with two charging pumps. Charging flow can also be aligned to the pressurizer for flow to the hot leg, through seal injection lines to each cold leg, and to the normal cold leg return for alternate flow paths based on RCS parameter trends.

Lowering the CC heat exchanger temperature controller setpoint will increase RHR heat exchanger heat removal capability. Any added heat removal capability will provide the same core decay heat removal with lower RHR flow rates.

Attachment 1 Background Information for F3-17.2, Long Term Core Cooling (Continued)

Table 1 and Table 2 provide mitigation strategies for the identified flow blockage locations.

Table 1

Table 1 provides strategies for use during high head recirculation operation. The most susceptible blockage locations are the RHR heat exchangers, SI throttle valves or orifices and the fuel assembly bottom nozzles. The indications and trends provided are those primary indications expected to show degrading conditions. Other parameters are also being monitored and may provide valuable trend information when making decisions about recirculation performance.

- SI Pump Suction Blockage (e.g., RHR Heat Exchanger) strategies can be broken down as follows:

    1. Switch to the other train if both trains are available. Since one train of ECCS pumps is idle, that train may not have sustained any significant debris blockage. Stopping the operating train may allow accumulated debris to settle. Operation of the train following a period of time for settling could later be attempted if necessary or desired.

    2. Stopping one train of pumps, if both trains are running, may allow debris to settle. Operation of the secured train following a period of time for settling could later be attempted if necessary or desired.

    3. If only one train is available then stopping the running pumps and restarting the pumps may clear the debris by allowing it to settle or pushing it through the opening with the flow/pressure surge when the pumps are started. To avoid excessive core heat-up flow to the core should not be stopped for more than six minutes. (EOP Setpoint calculation J.5 provides the basis for the six minutes maximum flow interruption time).

    4. Open the RHR heat exchanger bypass line. Establishing this flow path will provide sump water to the SI pump with limited or no cooling in the RHR heat exchanger. Flow is provided to maintain the core covered and sump liquid temperature would increase to saturation. Decay heat is then removed by the containment fan coil units. Analysis has demonstrated that no unacceptable conditions would result from this scenario. (NMC Internal Correspondence, dated 1/17/03, "Containment Response to LOCA with loss of CC at 24 hours," also see NAD File#OC.PX.2003.06).

Attachment 1 Background Information for F3-17.2, Long Term Core Cooling (Continued)

5. Align the SI pump to the reactor vessel. Changing the SI pump discharge flow path to the hot legs and closing the cold leg injection line reduces the recirculation flow rate. The reduction in flow rate may minimize the affects of debris blockage sufficiently to provide adequate SI pump NPSH and maintain core cooling.

6. Expedite post-LOCA cooldown and depressurization. Post-LOCA cooldown and depressurization cools down the RCS, which permits RCS depressurization by sequentially stopping the SI pumps. The procedure may also place one or both trains of RHR in a shutdown cooling alignment. IF RHR can be placed in shutdown cooling alignment, then the need for recirculation is eliminated. This eliminates the potential for debris ingestion to further degrade post-LOCA recirculation operation.

7. Stop any train RHR and SI pump with inadequate suction, align pump suction to the RWST, and refer to guidance of ECA-1-1: Damage to ECCS pumps can occur within a matter of minutes if operated with inadequate suction. Although this action may stop recirculation flow, it is necessary to preserve the pumps for future use. Loss of emergency sump recirculation procedure provides guidance for operation of ECCS pumps to preserve RWST inventory while providing sufficient injection for core cooling. Providing injection from the RWST will only be possible when inventory has been added to raise RWST level.

- SI Pump Discharge Blockage (e.g., SI Pump Throttle Valves or Orifices) - These strategies can be broken down as follows:

  1. Align the SI pump to the reactor vessel in lieu of the cold legs provides an alternate flow path to the RCS. If flow blockage is occurring in the cold leg injection throttle valves, then changing the flow path may allow the debris to settle or be forced through the system if flow is re-established to the cold legs in the future.

  2. Re-initiating cold leg injection may clear the debris by allowing it to settle or pushing it through with the flow/pressure surge when the flow is re-initiated.

  3. Expedite post-LOCA cooldown and depressurization. Post-LOCA cooldown and depressurization cools down the RCS, which permits RCS depressurization by sequentially stopping the SI pumps. The procedure may also place one or both trains of RHR in a shutdown cooling alignment. IF RHR can be placed in shutdown cooling alignment, then the need for recirculation is eliminated. This eliminates the potential for debris ingestion to further degrade post-LOCA recirculation operation.

Attachment 1 Background Information for F3-17.2, Long Term Core Cooling (Continued)

4. Stop any train RHR and SI pump with inadequate flow and refer to guidance of ECA-1-1. Damage to ECCS pumps can occur within a matter of minutes if operated with inadequate flow. For flow blockage in the SI pump discharge, the RHR pumps should have adequate recirculation flow, however the SI pump mini-flow path is isolated. Although this action may stop recirculation flow, it is necessary to preserve the pumps for future use. Loss of emergency sump recirculation procedure provides guidance for RCS cooldown to establish RHR recirculation flow to the core.

- Fuel Assembly Blockage (Bottom) - These strategies can be broken down as follows:

1. Aligning SI flow to the reactor vessel rather than the cold legs provides an alternate flow path to the core. If fuel assembly bottom nozzles are sufficiently blocked, then flow may be backing up into the cold legs and spilling to the floor rather than making it into the core region. Opening the SI vessel injection path and closing the cold leg injection path will provide flow directly on the top of the fuel assemblies and may reverse the flow path through the fuel assemblies helping to push debris off the bottom of the fuel assembly nozzles.

2. Re-initiating cold leg injection flow after a settling period: Actions taken to direct flow to the core outlet may have allowed debris to settle or flow reversal may have cleared the bottom nozzles of debris. Re-establishing the normal SI cold leg flow path allows staff to determine if bottom nozzle debris has been removed.

3. Expedite post-LOCA cooldown and depressurization. Post-LOCA cooldown and depressurization cools down the RCS, which permits RCS depressurization by sequentially stopping the SI pumps. Core cooling is supplied by the RHR pumps and/or charging pumps when SI pumps are stopped. RHR flow is directed to the vessel outlet and thus provides a different flow path for core cooling and allows settling of any debris on the bottom nozzles. The procedure may also place one or both trains of RHR in a shutdown cooling alignment. IF RHR can be placed in shutdown cooling alignment, then the need for recirculation is eliminated. This eliminates the potential for debris ingestion to further degrade post-LOCA recirculation operation.

Attachment 1 Background Information for F3-17.2, Long Term Core Cooling (Continued)

Table 2

Table 2 provides strategies for use during low head recirculation operation. The most susceptible blockage locations are the RHR heat exchangers and the fuel assembly top nozzles. Indications of and strategies for sump screen blockage are also provided. Sump screen blockage is not expected to occur due to the significant amount of screen blockage needed to result in any degradation of RHR suction and the size of screen openings. The indications and trends provided are those primary indications expected to show degrading conditions. Other parameters are also being monitored and may provide valuable trend information when making decisions about recirculation performance.

- RHR Heat Exchanger Blockage – These strategies can be broken down as follows:

    1. Switch to the other train if both trains are available. Since one RHR pump is idle, that pump may not have sustained any significant debris blockage. Stopping the operating train may allow accumulated debris to settle. Operation of the train following a period of time for settling could later be attempted if necessary or desired.

    2. Stopping one pump, if both pumps are running, may allow debris to settle. Operation of the secured pump following a period of time for settling could later be attempted if necessary or desired.

    3. If only one pump is available then stopping the running pump and restarting the pump may clear the debris by allowing it to settle or pushing it through the opening with the flow/pressure surge when the pump is started. To avoid excessive core heat-up, flow to the core should not be stopped for more than six minutes. (EOP Setpoint calculation J.5 provides the basis for the six minutes maximum flow interruption time).

    4. Throttling RHR flow as low a possible will reduce debris ingestion and may result in maintaining adequate core cooling flow while limiting further degradation of flow capability.

    5. Open the RHR heat exchanger bypass line. Establishing this flow path will provide sump water to the vessel with limited or no cooling in the RHR heat exchanger. Flow is provided to maintain the core covered and sump liquid temperature would increase to saturation. Decay heat is then removed by the containment fan coil units. Analysis has demonstrated that no unacceptable conditions would result from this scenario. (NMC Internal Correspondence, dated 1/17/03, "Containment Response to LOCA with loss of CC at 24 hours," also see NAD File#OC.PX.2003.06.

Attachment 1 Background Information for F3-17.2, Long Term Core Cooling (Continued)

- Fuel Assembly Blockage (Top) - These strategies can be broken down as follows:

  Blockage at the top of the fuel assemblies is one of the most difficult scenarios to detect based on existing indications. Depending on the break location, recirculation system parameters can appear to be normal, but the flow would not be reaching the core. As top nozzle plugging occurs and flow to the core is hindered, RCS hot leg level may rise. Level could rise such that RHR flow spills to the floor rather than finding an alternate route to the core via the cold legs. Due to thermocouple location, the thermocouples may not show elevated temperatures indicative of fuel heat-up. However, if the core is covered and adequate cooling is provided, then the thermocouples are expected to be indicating a relatively uniform core exit temperature. If the core exit thermocouples start to diverge or show unexpected indications or trends, then blockage at the fuel assembly top nozzle should be suspected.

  1. Aligning for high head recirculation provides an alternate flow path to the core by directing flow through the vessel via the cold legs to the bottom of the fuel assemblies. The change in flow path should provide core cooling and help to push the debris from the top of the fuel assemblies.

  2. Aligning RHR to the Loop B cold leg return line directs the flow through the vessel via the cold leg. The alternate flow path may provide core cooling and help to push the debris from the top of the fuel assemblies.

- Sump B Screen Blockage - These strategies can be broken down as follows:

  Blockage of the sump B screen is not expected due to the relative large size opening. Analysis (ENG-ME-005, Rev. 3) has demonstrated that a substantial portion of the screen would need to be completely blocked to adversely affect recirculation operation. Blockage of the sump B screen is evidenced by loss of adequate NPSH to the RHR pump(s) or erratic RHR pump/motor indications. Since the sump screens are common to both trains, both trains are expected to show the same symptoms and alternating trains provides no benefit.

  1. Stopping one RHR pump if both are running reduces the total flow through the sump screens. The reduction in total flow may be sufficient to restore NPSH for the remaining pump. One train of RHR on recirculation is also sufficient to provide adequate core cooling flow.

Attachment 1 Background Information for F3-17.2, Long Term Core Cooling (Continued)

2. Reducing RHR pump flow reduces the required NPSH and may restore adequate NPSH margin for the pumps and provide sufficient flow for core cooling. Flow reduction below the value needed for stable core temperature may be necessary and in that case vessel inventory should be maintained above the fuel. This flow reduction may be sufficient to maintain RHR pump NPSH and decay heat removal by phase change and subsequent heat removal by the containment fan coil units.

3. If only one pump is available then stopping the running pump and restarting the pump may clear the debris by allowing it to settle. To avoid excessive core heat-up, flow to the core should not be stopped for more than six minutes. (EOP Setpoint calculation J.5 provides the basis for the six minutes maximum flow interruption time).

4. Aligning RHR suction to the RWST provides a source of injection flow to the core and raises containment level to improve RHR pump NPSH. This action is only possible if RWST level has been raised following transfer to recirculation. ECA-1.1 provides guidance for required flow to maintain core cooling. RHR pumps should be stopped if a suction source is not available (RWST not available and NPSH lost regardless of RHR flow).

Step 7.2

Step 7.2 provides guidance to adjust/reduce RHR flow rate during long-term recirculation operation. Full RHR flow rate is not required for long-term recirculation operation. Evaluations have demonstrated that adequate core cooling can be provided with much lower flow rates within the first few hours following the reactor trip. Reducing RHR flow rate during long term recirculation has several benefits:

1. Better control of plant parameters such as RCS temperature and temperature trends, RCS inventory, etc.
2. Reduces the flow velocities at the basement of containment. This increases the likelihood that potential debris sources can settle to the containment floor prior to reaching the containment sump B.
3. Reduces the head loss across the sump B screen, which increases the available NPSH to the RHR pumps.
4. Decreases adverse affects of debris that has been ingested into the recirculation system.
5. May establish conditions that allow aligning for RHR shutdown cooling; which would alleviate the need to draw liquid from the containment sump.

Attachment 1 Background Information for F3-17.2, Long Term Core Cooling (Continued)

Note at beginning of Step 7.2

Minimum RHR pump flow rate for continuous operation is 600 gpm. Specifying a minimum RHR flow rate of 750 gpm is consistent with other plant procedures (such as reduced inventory operation and ensures that continuous operation of the pump is at greater than 600 gpm.

Steps 7.2.1 and 7.2.2

These steps reduce RHR flow based on the number of RHR trains operating and system conditions. In lieu of specifying a minimum flow rate vs. time as provided in other procedures, RHR flow rate is reduced based on maintaining specific system conditions such as RCS temperature and RCS inventory. Stopping one RHR pump and reducing RHR flow are routine activities performed with RHR in a shutdown cooling alignment. As decay heat load reduces, the requirement for RHR flow also reduces. The actions of throttling flow or stopping one pump account for the reduced decay heat removal requirements. Performance of these steps is only performed after both SI pumps are stopped to ensure an RHR pump supplying SI is not stopped.

Step 7.2.3

Establishment of RHR shutdown cooling is performed based on operating equipment and system conditions. Based on the break elevation, it may be possible to maintain RCS elevation at the break location with one train and align the other RHR train for shutdown cooling. If shutdown cooling is established, it may be subsequently possible, based on break location, to stop recirculation flow and have RCS inventory maintain at the break location. The combination of listed conditions and use of ES-1.1 provide the necessary plant conditions and instructions to complete the shutdown cooling alignment, if plant staff decide this should be attempted.

Attachment 1 Background Information for F3-17.2, Long Term Core Cooling (Continued)

Step 7.3

This step provides guidance for refilling the RWST after recirculation has been initiated. Refilling the RWST provides an alternate water source to re-establish injection in the event that recirculation flow is degraded or lost. Refilling the RWST also provides a source of water to the charging pumps. Evaluations have shown that the liquid contents equivalent to two complete RWSTs can be injected into containment without flooding required equipment. In addition to providing an injection water source to maintain core cooling, re-establishing injection can also provide the following benefits:

1. Increases the liquid level inside of containment, which (for a given recirculation flow rate) results in a reduced flow velocity. The reduced flow velocity increases the likelihood that potential debris sources can settle to the containment floor prior to reaching sump B.
2. Increases the liquid level inside of containment, which increases the available NPSH to the RHR pumps.

Note at beginning of Step 7.3

See above discussion.

1st Caution at beginning of Step 7.3

Radiation levels following a LOCA are dependent upon the amount of fuel damage that has occurred. If significant fuel damage has occurred, then refilling the RWST may involve personnel entry into areas with potentially very high radiation fields. Based on analysis the areas near SI–17-1 and 2SI-17-1 are anticipated to be very high radiation fields. Strategies to minimize exposure such as minimizing time, knowing the high radiation field locations through surveys, or the use of multiple people.

2nd Caution at beginning of Step 7.3

In order to maintain long-term sub-criticality of the core, a minimum boron concentration of the sump liquid is required. To ensure that this minimum boron concentration is maintained, with some margin, a minimum boron concentration of 2000 ppm should be established in the RWST during refill. This minimum boron concentration can be established by knowing the boron concentrations and volumes in the water sources used to refill the RWST; that is, it is not necessary to sample the RWST unless there is uncertainty that the 2000 ppm minimum concentration is satisfied. The upper limit of 3500 ppm is to be consistent with the sump pH evaluation.

Attachment 1 Background Information for F3-17.2, Long Term Core Cooling (Continued)

Step 7.3

The RWST is refilled using current standing procedures. The first three methods (transfer from other unit RWST, CVCS Hold-Up Tanks or CVCS Monitor Tanks) require no actions from the Control Room. The fourth method (refill using the BA Blender) requires control room operator actions. Consideration that the control room operators may have other duties at this time should be factored into deciding which method(s) will be used. Transfer of water from the other unit RWST may require some justification, or LCO Condition entry, for opening cross tie valves on lines without adequate seismic evaluation.

Step 7.4

This step provides guidance for adjusting the pH of the liquid in the containment sump. Containment spray may have been secured during the injection phase, or may not have started for break conditions that did not result in containment pressure reaching 23 psig. To reduce the potential for stress corrosion cracking of stainless steel and to retain Iodine in the sump liquid solution, it is necessary to establish a pH > 7.0.

1st Note at beginning of Step 7.4

See above discussion

2nd Note at beginning of step 7.4

Caustic standpipe level indication < 45% indicates that adequate NaOH has been injected to assure a pH > 7.0 if the entire liquid contents of one RWST have been injected. If liquid from a second RWST are to be injected (or has been injected) it will be necessary to inject additional NaOH to assure the sump liquid pH is maintained greater than 7.0.

Step 7.4

The combination of caustic standpipe level and RWST level provides NPSH for the containment spray pumps and adequate caustic for containment sump pH adjustment. Initiation of flow is by manually actuating containment spray. The containment spray pump discharge valves open when containment spray is actuated and are maintained open while the associated spray pump is running. An option is provided to stop one train of containment spray. This may be desirable to lengthen the time for RWST inventory depletion for the case when the RWST is also being used to re-supply ECCS pumps with an injection source.