D. Rivenbark

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

December 30, 1986

MEMORANDUM FOR: Gary Holahan, Director, Operating Reactor Assessment Staff, Office of Nuclear Reactor Regulation

FROM: Albert F. Gibson, Director, Division of Reactor Safety

SUBJECT: TRANSFER OF LEAD RESPONSIBILITY FOR EVALUATING THE ADEQUACY OF THE TRANSFER CANAL SEAL BETWEEN HATCH UNIT 1 AND UNIT 2 REACTOR BUILDINGS

As the result of the loss of air pressure to the inflatable seals in the transfer canal at the three-inch gap between the Unit 1 and Unit 2 building, on December 3, 1986, approximately 141,000 gallons of water were lost from the spent fuel pools and the transfer canal. Eighty thousand gallons may have been released to the environs on Georgia Power Company property. It does not appear that this inflatable seal in the transfer canal was adequately described in the FSAR or evaluated by the NRC for its intended use. Figure 9.1-6 in the FSAR shows double redundant inflatable seals, but does not show that all six seals were inflated by a single air line. None of the seals were instrumented to alarm on loss of air pressure. The same sketch shows the leak detection alarm system for these seals. A critical review of this sketch and other prints at the site indicates a high probability that the leak detection alarm system would not alert the operators to a common mode failure of all seals such as the loss of all air pressure; leakage would preferentially flow to the three-inch gap between the building rather than into the leak detection system.

Secondary containment is provided to reduce the potential for a ground level release of gases and particulate matter. Technical Specifications require periodic testing to assure that secondary containment meets specific criteria. It is Region II's position that containment is also required for the radioactive liquid in secondary containment.

FSAR 9.1.2.2.1 states that in order to limit the possibility of pool leakage around pool penetrations, each pool is lined with stainless steel and that interconnected drainage paths are provided behind the liner to prevent uncontrolled loss of containment pool water to other relatively cleaner areas within the secondary containment. The Hatch 2 Safety Evaluation Report dated June 1978 concluded that the design of the spent fuel storage facility was in conformance with the requirements of GDC 61 of 10 CFR 50 Appendix A. We believe if the FSAR had adequately addressed the as-installed transfer canal and the transfer canal seals, the NRC would not have concluded that the intent of GDC 61 was met.

CONTACT:
F. Cantrell
FTS: 242-5534

A subsequent evaluation by Georgia Power Company indicated that irradiated control blades are stored on short hanger rods clipped over the side of the spent fuel pool. Some of these control blades would be completely uncovered if the water level dropped to the top of the transfer canal. Because of cobalt in the rollers on the control blades, the rollers have a contact reading of 8,000 to 10,000 R/hr, which would result in a field of about 100 R/hr at the edge of the spent fuel pool and 1 R/hr 6 feet from the edge of the pool. Georgia Power Company provided the Senior Resident Inspector with preliminary information that shows that with both condensate pumps in operation supplying 1,000 gpm, the pool level would stabilize at 6'3" above the bottom of the transfer canal with a complete failure of the inflatable seals. Under these conditions, part of the control blades would still be uncovered with a possible 1,000 gpm unmonitored release. (Region II has not verified these figures.)

Georgia Power Company has separated the air supply to the transfer canal seals and the air supply to the inner and outer gates between the transfer canal and the spent fuel pools, and is studying other changes to assure greater reliability.

We request that you:

1. Evaluate the adequacy of the description of the transfer canal and sealing arrangement in the FSAR.

2. Evaluate proposed changes to the seals in the transfer canal to determine if inflatable seals can be upgraded to meet NRC requirements or if a different solution is required.

3. Evaluate the leak detection alarm system to determine if the current configuration is an acceptable method to identify leakage past the transfer canal seal. Consider the possibility of unmonitored releases of spent fuel pool water to the environment upon gross seal failure.

4. Determine if these inflatable seals should have a low air pressure alarm to indicate potential seal failures, rather than waiting for a leak to provide an alarm.

Please provide a response by March 1, 1987.

Albert F. Gibson

cc: G. Rivenbark, NRR

FACSIMILE TRANSMITTAL

DATE 1/29/87 U.S. NRC RII

APPROVAL JR ATLANTA. GA.

PRIORITY
IMMEDIATELY
1 HOUR ✓
2-4 HOURS
COB

TO: GARY HOLAHAN (NAME) 24410

OPERATING REACTOR ASSESSMENT STAFF - NRR (LOCATION) Phillips

TO NRR I

FROM: F.S. CANTRELL

PAGES: 25 + TRANSMITTAL SHEET

George Pinkerton X27764

PURPOSE:

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(VERIFICATION)

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OTHER

9.1.2.1.2 Power Generation Design Bases

The spent-fuel pool has a fuel storage capacity of more than five full-core loads of fuel assemblies.

The spent-fuel storage racks are designed and arranged so that the fuel assemblies can be efficiently handled during refueling operations.

9.1.2.2 Description

The spent-fuel storage facility is located inside the Hatch Nuclear Plant-Unit 2 (HNP-2) secondary containment on the refueling floor (figure 9.1-3). Redundant radiation sensors are provided in the ventilation ducts servicing the refueling floor to detect any airborne radiation that might accidently be released during the refueling process. These sensors activate the standby gas treatment system (SGTS) and isolate the refueling floor upon sensing high radiation. Additionally, the area radiation monitors on the refueling floor will alarm in the main control room (MCR) and locally if the refueling floor activity exceeds the normal background activity during refueling.

9.1.2.2.1 Fuel Storage Pool

The fuel storage pool is designed to Seismic Category I criteria. The spent-fuel pool structure is designed for the following applied loads:

- The deadweight of the structural elements
- The live loads acting on the structural elements
- The hydrostatic load due to the water in the pool
- A three-component operating basis earthquake (OBE) seismic load
- A three-component safe shutdown earthquake (SSE) seismic load
- A thermal loading based on normal operating conditions (pool water temperature of 150°F and ambient air temperature of 90°F)
- A thermal loading based on accident conditions--pool water temperature of 212°F and ambient air temperature of 90°F

- A thermal loading based on normal operating conditions--pool water temperature of 150°F and ambient air temperature of 110°F
- A thermal loading based on accident conditions--pool water temperature of 212°F and ambient air temperature of 110°F

Loading combinations that produce the most severe loading to the structure were incorporated to verify that the structure would carry the mechanical and thermal loads for the design basis conditions.

The loads that may be carried over the spent-fuel pool and possibly be dropped are listed in table 9.1-1. A free fall of these loads onto the fuel pool liner plate and storage racks was evaluated resulting in a concensus that a fuel assembly drop causes the most damaging effect because of its weight and geometrical configuration. Also, none of the other loads can be lifted to a position higher than that of a fuel assembly above the liner plate and storage racks. Furthermore, it was determined that a fuel assembly dropped from the maximum possible height above the spent-fuel pool will not perforate the pool liner.

In order to limit the possibility of pool leakage around pool penetrations, each pool is lined with stainless steel. Interconnected drainage paths are provided behind the liner. These paths are designed:

- To prevent pressure buildup behind the plate
- To prevent the uncontrolled loss of contaminated pool water to other relatively cleaner locations within the secondary containment
- To provide expedient liner leak detection and measurement

No outlets or drains are provided that might permit the pool to be drained below 14 ft 9 in. above the bottom of the fuel pool. This level provides a cover for the active fuel. The two inlet lines from the spent-fuel pool cooling system penetrate the liner near the top of the pool and extend to near the bottom of the pool. Both of these lines are equipped with two check valves in series to prevent syphoning.

Low water level alarms are provided locally and in the MCR in the unlikely event of water loss. As a backup, flow alarms are provided in the drain lines of the reactor vessel to drywell

seal, drywell to concrete seal, fuel pool liner leak detection channels, and fuel pool to reactor well gates to detect

under strictly controlled administrative procedures. The HNP-2 reactor building crane, which is not single-failure proof and does not have the interlocks described above, is only used under strict administrative control.

If unanticipated load handling should occur, the size of the load that can be handled over stored spent-fuel, by any means, is limited to 1600 lb by the HNP-1 and the HNP-2 Technical Specifications.

9.1.2.3 Safety Evaluation

The design of the spent-fuel storage facility meets the requirements of Regulatory Guide 1.13 (March 1971).

9.1.2.3.1 Fuel Storage Pool

The spent-fuel pool concrete structure, as well as each spent-fuel storage rack and fixture, are designed to Seismic Category I criteria.

Provisions are made for level detection to ensure that the fuel in the spent-fuel storage is covered with sufficient water for radiation shielding.

Leakage detection instrumentation is also provided to ensure an adequate fuel pool water level is maintained. The design of the spent-fuel pool structure is such as to prevent inadvertent draining of the pool.

In the unlikely event that the fuel pool water level dropped to the level of the fuel transfer canal, the fuel pool water level will be 14 ft 9 in., and the active section of the spent fuel stored in the pool will remain covered with water. Rapid boiling of the remaining water in the spent-fuel pool will not occur. It would take 4.1 and 3.5 h for the HNP-1 and HNP-2 pool water, respectively, to reach boiling based on the following data:

Initial water temperature (°F)	133
Minimum water height (ft/in.)	14 ft 9 in.
Fuel pool cross section (plan) (ft)	40 x 33
Heat load (Btu/h)	11.57×10^6

During this time period the following corrective actions can be taken to prevent boiling:

TRANSFER CANAL SEAL

DESIGN

I. PURPOSE OF TRANSFER CANAL SEALS

The transfer canal seal system has several functions:

A. To prevent loss of inventory of water from the transfer canal and the HNP-1 and HNP-2 fuel pools. This water is needed for shielding and cooling of the spent fuel rods in the fuel pool.

B. To prevent the release of radioactive contaminants.

C. To allow the transfer of fuel bundles between the HNP-1 and the HNP-2 spent fuel pools. This allows better flexibility in fuel arrangement in the reactor core of both units.

II. DESIGN OF SEALS

A. Description of Transfer Canal

The U-shaped transfer canal, located on the refueling floor between the HNP-1 and HNP-2 spent fuel pools, is removable and as such requires inflatable bellows type seals for watertightness. The seals are located at either end of the canal (horizontal seals), and in the 9-inch space adjacent to the 3-inch seismic gap between the HNP-1 and HNP-2 reactor buildings (vertical seals).

B. Description of Seals

The transfer canal seals are located in pairs to provide an additional safety margin, i.e. if one of the seals fails, the other seal in the pair maintains integrity and water does not leak out. If both horizontal seals in a pair fails, water is prevented from leaking out by the vertical seal on that side.

C. Air Supply

1. In the original design, the transfer canal seals were pressurized by a single feed line from a unit 2 service air system service box which branched into six separate feeds to the individual seals. These lines were equipped with local pressure indicators and check valves. A manual cross tie to the unit 1 air supply is available.

2. Subsequent to the fuel pool leak down, several changes were made to improve reliability of the air supply. A second supply from HNP-1 service air was incorporated such that in each horizontal seal pair, one is fed from HNP-1 service air, and one is fed from HNP-2 service air. In this arrangement, loss of, say, the whole unit 2 air system will not affect but one of the seals in the pair and system integrity is maintained (transfer canal seal system). A common line was incorporated to supply the vertical seals with both HNP-1 and HNP-2 service air. Check valves placed in the feed piping to this common header prevent back flow upon loss of air from one unit or the other. Other changes included the addition of pressure switches that would alarm in both control rooms upon a drop in pressure in either supply.

D. Leak Detection System

1. The transfer canal seal system is equipped with a level switch which would detect leakage if the horizontal seals on the Unit 2 side of the transfer canal fail (both seals in the pair).

2. One proposed design change is the placement of two holes in the vertical divider plate separating the HNP-1 side from the HNP-2 side of the canal. This would allow a leak on the HNP-1 side of the transfer canal to be detected by the Unit 2 level switch since no such level switch exists on the Unit 1 side. (The transfer canal was added with the completion of HNP-2)

III. SAFETY QUESTIONS

A. Consequences of Seal Failure

If three seals on one side of the transfer canal or all six seals fail simultaneously, the water inventory in the transfer canal will drain out through the three inch seismic gap between the HNP-1 and HNP-2 reactor buildings to the yard drainage system. If the transfer canal gates are closed then only water in the canal will escape. If the gates are open, then water will also be lost from the spent fuel pools. The consequences of this loss are three fold.

1. Loss of fuel pool inventory reduces the shielding and cooling capacity of the pool. The fuel pool is designed to maintain a level of the bottom of the transfer canal which would leave 14 ft.-9 in. of water in the pool. The active section of the pool would remain covered with water and boiling would not occur for 4.1 hours and 3.5 hours for the HNP-1 and HNP-2 pool water respectively. (See paragraph 9.1.2.3.1 in the HNP-2 FSAR) Corrective actions can be taken during this time to restore the fuel pool level. These actions include repositioning the gates over the canal entrance, initiating make-up from condensate storage from the main control room, manually align the plant service water system to provide make-up if condensate is not available, and continue to refill the fuel pool to normal level.

2. Any release of radioactive materials must fall within the limits of 10 CFR 100. Since the water in the spent fuel pool is slightly radioactive, this release has been considered. The limits of 10 CFR 100 will not be exceeded by a release of water from both the HNP-1 and HNP-2 fuel pools, even if they are drained down to the bottom of the transfer canal.

B. Summary of Results and Conclusions Drawn

The spent fuel pool is designed so that no single failure of structures or equipment will cause inability to maintain irradiated fuel submerged in water, to re-establish normal fuel pool water level, or to safely move fuel. Failure of the transfer canal seal system will not disable the fuel pool. The redundant air supply eliminates any single failure mode, except loss of off-site power. This loss of power would cause a loss of both HNP-1 and HNP-2 air compressors. Compressed air is not required for safe shutdown of the plant; therefore, the compressors do not switch automatically to diesel generator power upon loss of normal power. They may be switched manually to diesel generated power if required after shutdown.

GPC/NRC MEETING
FUEL TRANSFER CANAL
JANUARY 22, 1987

AGENDA

I.	OPENING REMARKS	J. P. O`REILLY
II.	EVENT SUMMARY	J. T. BECKHAM, JR.
III.	GPC RESPONSE TO EVENT	J. T. BECKHAM, JR.
IV.	RAD/ENVIRONMENTAL SIGNIFICANCE	S. C. EWALD
V.	SAFETY/REGULATORY DESIGN BASIS	L. T. GUCWA
VI.	SYSTEM DESIGN	P. R. BEMIS
VII.	INCIDENT REVIEW	D. S. READ
VIII.	CONCLUSION	J. P. O'REILLY

ftc1

EVENT DESCRIPTION

- STATUS OF UNITS
- AIR PRESSURE REGULATOR FAILS
  - valve to transfer canal seals partially closed
- AIR SUPPLY VALVE CLOSED
- PERIODIC REPLENISHMENT OF FUEL POOL WATER
- CAUSE OF LEVEL DECREASE INVESTIGATED AND IDENTIFIED
- AIR SUPPLY VALVE OPENED- REESTABLISHING AIR TO SEALS
- INCIDENT MITIGATION ACTIVITIES UNDERTAKEN
  - management notified and involved
  - NRC/government agencies notified
  - spill contained
  - cleanup activities undertaken

EVENT RESPONSE EXCELLENT

fle2-1

EVENT NOTIFICATIONS

- PROMPT NOTIFICATIONS TO NRC
- STATE AND LOCAL AGENCIES NOTIFIED AND PERIODICALLY UPDATED
- CLOSE COOPERATION BETWEEN GPC AND AGENCIES
- FIELD EVALUATIONS COORDINATED

TIMELY NOTIFICATION
AND
UPDATES PROVIDED

ftc2-2

EVENT MANAGEMENT

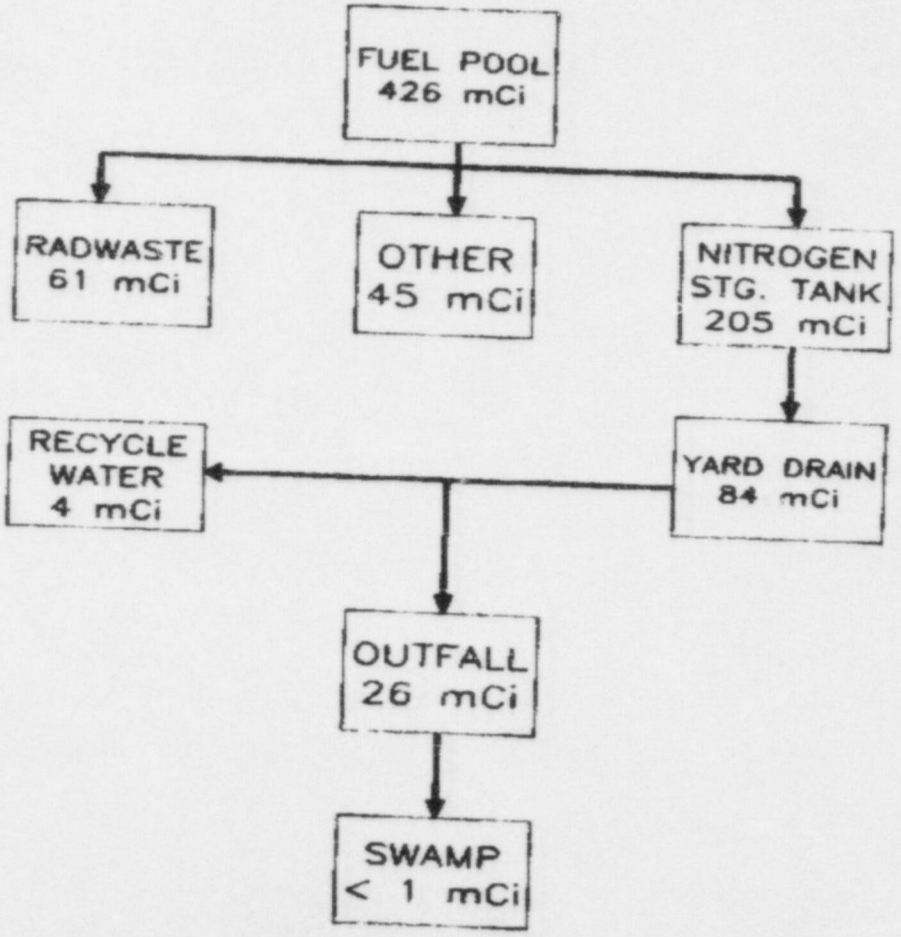
- EXECUTIVE MANAGEMENT INVOLVEMENT EARLY IN EVENT
  - President
  - Executive Vice President
  - Senior Vice President
  - Vice President Plant Hatch
- CORPORATE COMMITMENT TO MITIGATE WITH FULL AUTHORITY GIVEN TO SITE VICE PRESIDENT
- PLANT/CORPORATE EMERGENCY CENTERS ACTIVATED EARLY AND MANNED AROUND THE CLOCK
- CONSULTANTS BROUGHT IN EARLY IN EVENT

CORPORATE INVOLVEMENT
AT HIGHEST LEVELS

FUEL TRANSFER CANAL SAMPLING

- INVESTIGATIVE
  - Flowpath
  - Concentrations
- FOOTPRINT
  - Perimeter
  - Cleanup Scope
- CLEANUP
  - Migration
  - Results
- ROUTINE / AUGMENTED
  - Composite Water
  - Sediment

FUEL TRANSFER CANAL FLOWPATH



FUEL TRANSFER CANAL
Radiological Conclusions

*** NO RELEASE ***

* No Offsite Impact
* No Swamp Impact
* Routine / Augmented Sampling

SAFETY/REGULATORY DESIGN BASIS

- DESIGNED IN CONFORMANCE WITH REGULATORY REQUIREMENTS
- DESIGNED APPROPRIATELY FOR ITS FUNCTION AND SAFETY SIGNIFICANCE
- MEETS NRC SAFETY GUIDE 13 WHICH IMPLEMENTS GDC 61
- MEETS FSAR COMMITMENTS

DESIGN MEETS NRC AND FSAR REQUIREMENTS

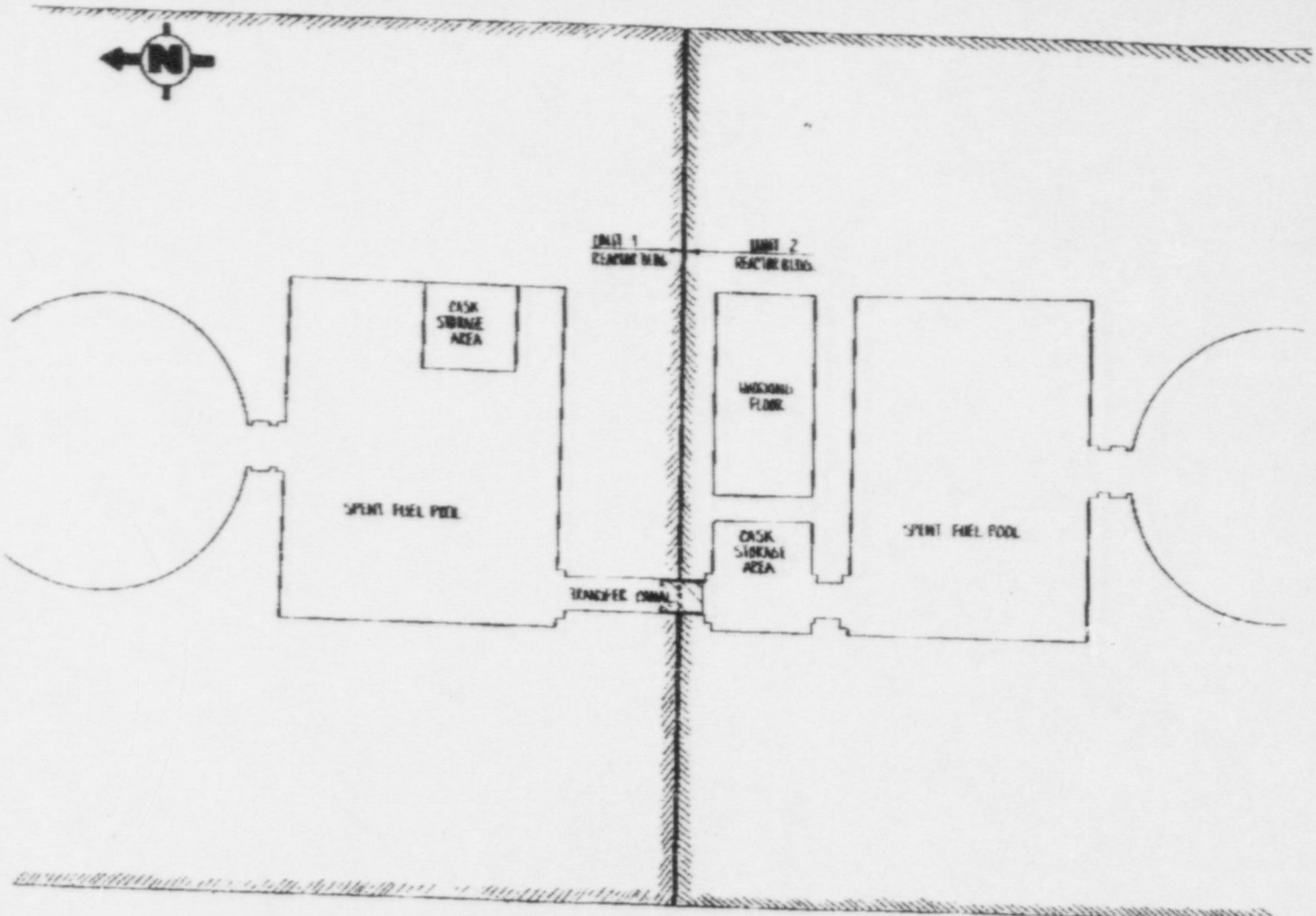
LTG1

SAFETY/REGULATORY DESIGN BASIS

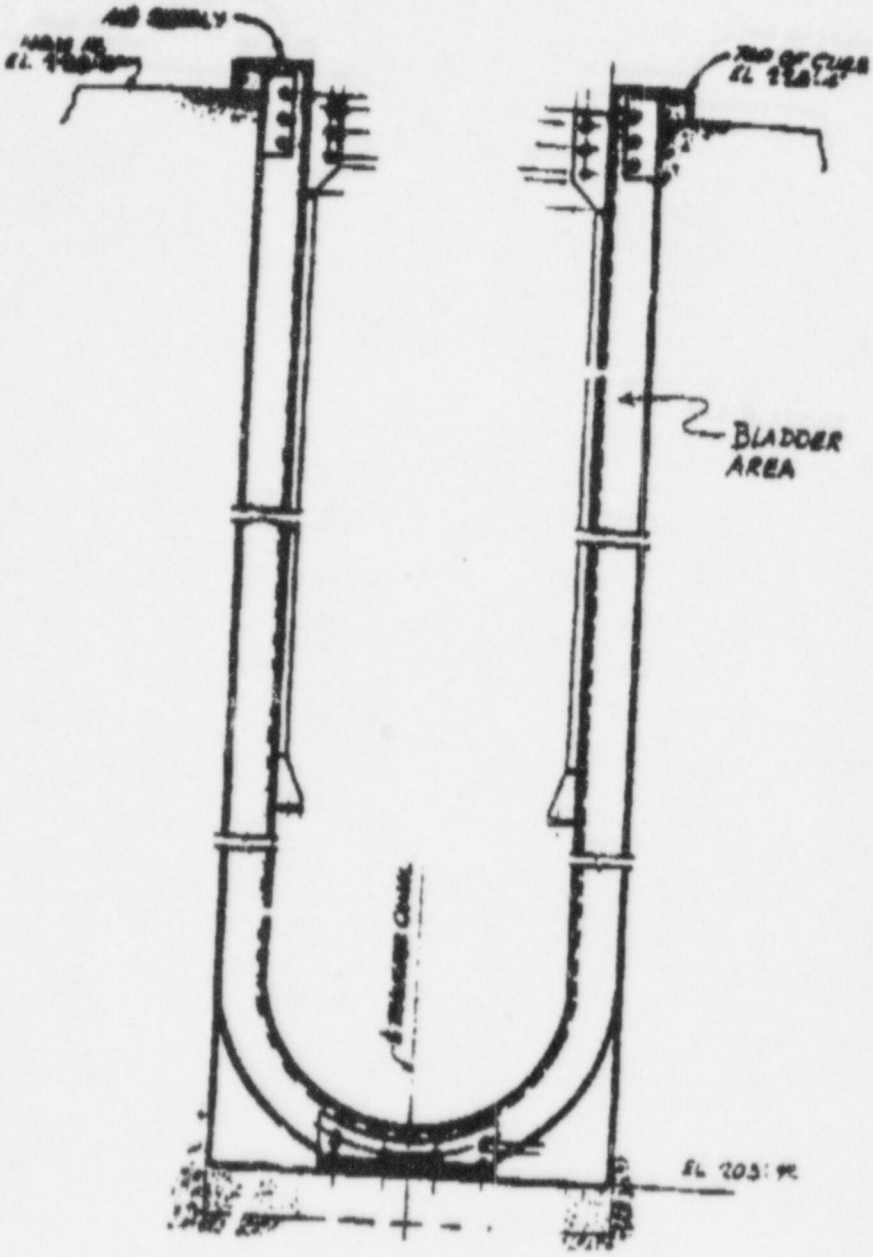
- REVIEWED THE SAFETY CLASSIFICATION
  - Appendix A to 10 CFR Part 100
  - Regulatory Guide 1.26
- REVIEWED THE ACTUAL DESIGN AND INDUSTRY PRACTICES
- SEALS ARE NOT SAFETY-RELATED
- THOSE PORTIONS OF SAFETY-RELATED STRUCTURES, SYSTEMS, AND COMPONENTS FUNCTIONED PROPERLY AND AS DESIGNED

PROPER SAFETY CLASSIFICATIONS

LT02

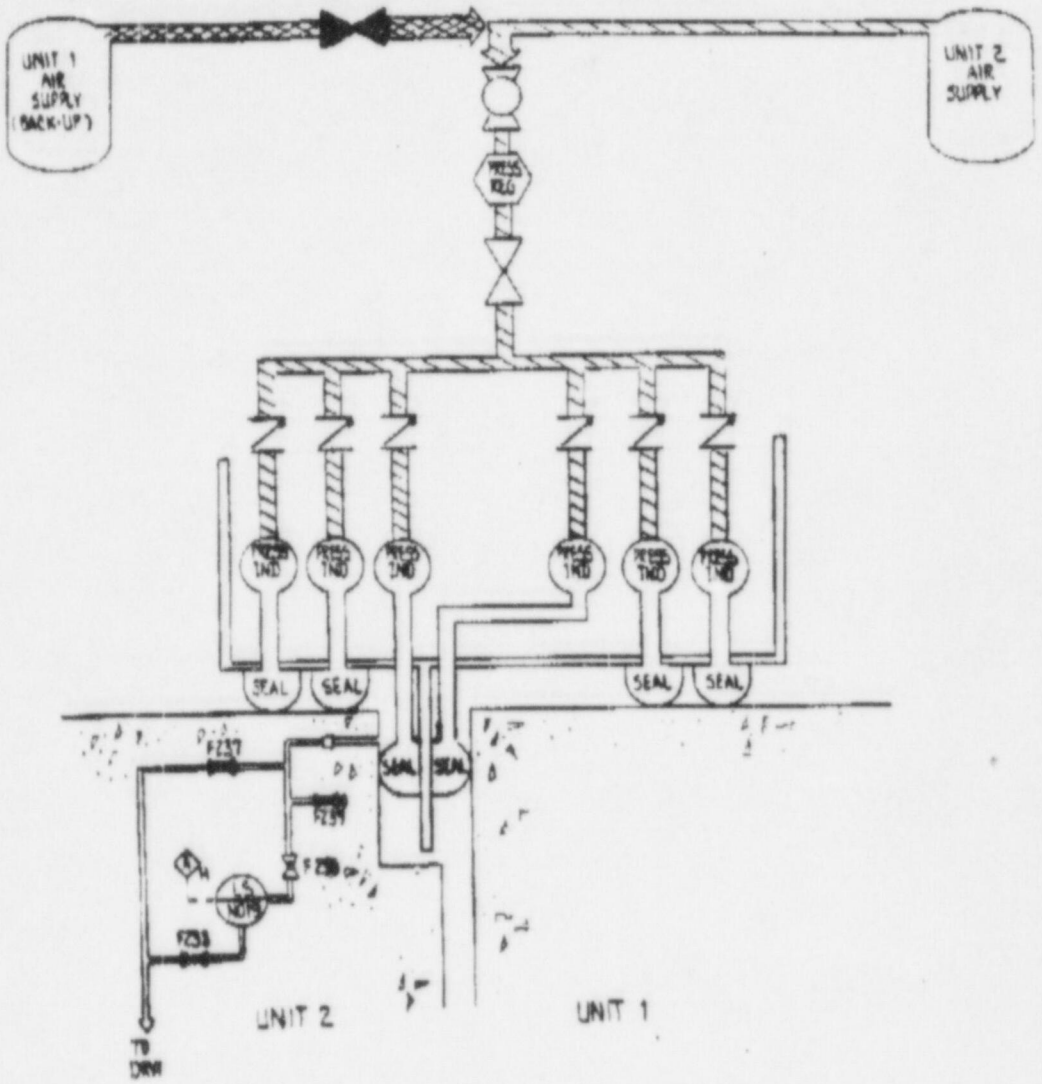


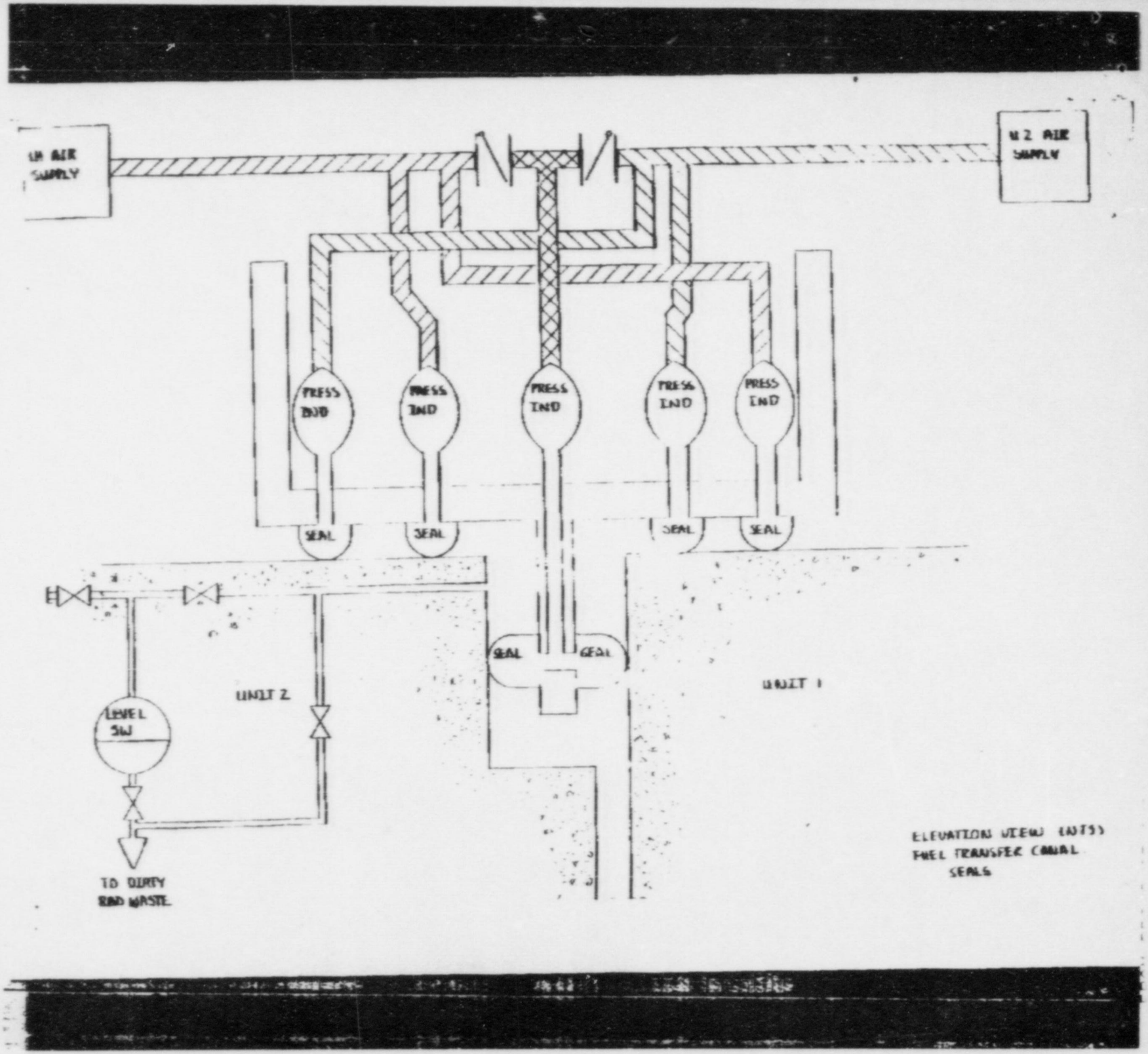
PARTIAL PLAN VIEW OF REFUELING FLOOR



END VIEW

ORIGINAL CONFIGURATION OF AIR SUPPLY




UNIT AIR SUPPLY
N2 AIR SUPPLY
PRESS IND
PRESS IND
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PRESS IND
SEAL
SEAL
SEAL
SEAL
SEAL
SEAL
UNIT 2
UNIT 1
LEVEL SW
TO DIRTY RAD WASTE
ELEVATION VIEW (UNIT 1)
FUEL TRANSFER CANAL
SEALS

INCIDENT REVIEW BOARD

- ESTABLISHED BY GPC
- SENIOR MANAGERS
- REVIEW
  - ISEG investigation
  - environmental protection
  - engineering efforts
  - recovery plans
- COMPREHENSIVE FORMAL REPORT

dw1

CORRECTIVE ACTIONS

FOR

IDENTIFIED PROBLEMS

- AIR SUPPLY OPERATION (regulator & ball valve)
  - revised DR procedure
  - in PEO inspection procedures
  - operator discipline
  - valves tagged

- LEAK DETECTOR OPERATION
  - revised procedures
  - engineering review during replacement

dw2

CORRECTIVE ACTIONS FOR IDENTIFIED PROBLEMS

- TRANSFER CANAL SEAL OPERATION
  - redundant air to seal system
  - normal seal replacement
  - further engineering evaluation

- ADMINISTRATIVE CONTROLS
  - DR procedure
  - procedure upgrade (calibration, annunciators)
  - shift turn-over
  - discipline
  - fuel pool level

APPROPRIATE MANAGEMENT CONTROLS IN PLACE

December 4, 1986

PRELIMINARY NOTIFICATION OF EVENT OR UNUSUAL OCCURRENCE PNO-II-86-90

This preliminary notification constitutes EARLY notice of events of POSSIBLE safety or public interest significance. The information is as initially received without verification or evaluation, and is basically all that is known by the Region II staff on this date.

FACILITY: Georgia Power Company
Hatch Units 1 and 2
Docket Nos. 50-321/366
Baxley, Georgia

Licensee Emergency Classification:
____Notification of Unusual Event
____Alert
____Site Area Emergency
____General Emergency
__X__Not Applicable

SUBJECT: AIT DISPATCHED TO INVESTIGATE LEAK FROM SPENT FUEL POOLS

Region II has dispatched an Augmented Inspection Team (AIT) to the Hatch site to investigate the leak of about 50,000 gallons of water from the Hatch Units 1 and 2 spent fuel pools.

Georgia Power discovered the leak at 10:02 p.m. (EST) yesterday, when it was found that water had spilled into an outside area between the Unit 1 and Unit 2 reactor buildings. Hatch Unit 1 is operating at 100 percent power; Hatch Unit 2 has completed a refueling outage, but is in cold shutdown.

An immediate investigation by Georgia Power disclosed that the leak detection annunciator failed to alarm and that the spent fuel pool levels had dropped about five feet. The pools are built so that they cannot be completely drained and the fuel uncovered. Although the pool levels dropped by five feet, the levels did not go below the technical specification limits.

Of the approximately 50,000 gallons of water which leaked, between 5,000 and 10,000 gallons were released through the storm drain system to a swampy area within the owner-controlled property. Plant personnel are building dikes and taking other steps to contain this water. Georgia Power believes no contaminated water has entered the nearby Altamaha River.

Georgia Power also believes that leak may have been caused by a loss of air to inflatable seals in the transfer canal flexible-joint seismic area. A valve which regulates air supply to these seals was found shut. Georgia Power is still investigating why the valve was shut and why the leak detection annunciator failed to alarm.

Coolant sample analysis by Georgia Power indicates that 1.26 times the maximum permissible concentrations of the following isotopes were released: cesium-134, cesium-137, zinc-65 and manganese-54.

The AIT is composed of a section chief from the Division of Reactor Projects, resident inspectors, and a specialist in both radiological effluents and chemistry, and environmental effects.

Media interest has occurred. Georgia Power has issued a press release, and Region II is responding to inquiries.

The State of Georgia has been informed and has dispatched a person to take environmental samples.

Georgia Power informed the NRC incident response center of this occurrence by telephone at 1:35 a.m. today. This information is current as of 2:30 p.m.

Contact: R. Croteau, 242-4668 V. L. Brownlee, 242-5563

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