

U. S. NUCLEAR REGULATORY COMMISSION

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Region I

Report No. 50-320/82-08

Docket No. 50-320

License No. DPR-73 Priority -- Category C

Licensee: GPU Nuclear Corporation

P.O. Box 480

Middletown, Pennsylvania 17057

Facility Name: Three Mile Island Nuclear Station, Unit 2

Inspection At: Middletown, Pennsylvania

Inspection Conducted: July 6 - August 7, 1982

Inspectors: Joel S. Wiebe 9/7/82
 J. Wiebe, Senior Resident Inspector (TMI-2) date signed

L. H. Thonus 7/7/82
 L. Thonus, Resident Inspector (TMI-2) date signed

T. Moslak 9/7/82
 T. Moslak, Radiation Specialist date signed

B. O'Neill 9/8/82
 B. O'Neill, Radiation Specialist date signed

Approved by: A. Fasano 9/8/82
 A. Fasano, Chief, Three Mile Island Section
 Projects Branch No. 2 date signed

Inspection Summary:

Inspection conducted on July 6 - August 7, 1982 (Inspection Report Number 50-320/82-08)

Areas Inspected: Routine safety inspection conducted by site inspectors of routine plant operations; routine health physics and environmental areas; reactor building entries; demineralizer inspection; radioactive material shipments; followup on radiological investigative report; licensee event reports; and respiratory protection. The inspection involved 135 inspector-hours.

Results: Of the eight areas inspected, two violations were identified in two areas (failure to follow radiological control procedures - paragraph 7; inadequate dosimetry calibration procedure - paragraph 8).

DETAILS

1. Persons Contacted

General Public Utilities (GPU) Nuclear Corporation

- *J. Chwastyk, Manager, Plant Operations
- *J. Cooke, Quality Assurance (QA) Trainee
- *W. Craft, Radiological Assessor
- J. Flanigan, Radiological Engineering Manager
- *E. Gee, Supervisor, Respiratory Protection
- *J. Hildebrand, Manager, Radiological Controls
- *D. LeQuia, Operations QA Monitor
- P. Newkirk, Deputy Manager Radiological Field Operations
- *P. Ruhter, Manager, Radiological Engineering
- *R. Swartzwelder, Licensing Engineer

Other licensee personnel were also interviewed.

*denotes those present at the exit interview.

2. Routine Plant Operations

Inspections of the facility were conducted to assess compliance with general operating requirements of TS 6.8.1 in the following areas: licensee review of selected plant parameters for abnormal trends; plant status from a maintenance/modification viewpoint including plant cleanliness; licensee control of ongoing and special evolutions including control room personnel awareness of these evolutions; control of documents including log keeping practices; and, area radiological controls.

Unannounced inspections of the control room during regular and back shift hours were conducted at least three times per week. Selected sections of the shift foreman's log and control room operator's log were reviewed for the period July 6 - August 7, 1982. Selected sections of other control room daily logs were reviewed for the period from midnight to the time of review. Inspections of areas outside the control room occurred on July 6, 14, 20, and August 6, 1982. Selected licensee planning meetings were also observed.

No violations were identified.

3. Routine Health Physics and Environmental Review

a. Plant Tours

The NRC site radiation specialists completed routine plant inspection tours. These inspections included all control points and selected radiologically controlled areas. Observations included:

- Access control to radiologically controlled areas
- Adherence to Radiation Work Permit (RWP) requirements

- Proper use of respiratory protection equipment
- Adherence to radiation protection procedures
- Use of survey meters including personnel frisking techniques
- Cleanliness and housekeeping conditions
- Fire protection measures.

No violations were identified.

b. Measurement Verification

Measurements were independently made by the inspector to verify the quality of licensee performance in the following areas.

- Radioactive material shipping
- Radiological control, radiation and contamination surveys
- Onsite environmental air and water sampling and analyses

A further summary of the pertinent samples and analytical results for the Independent Measurement Verification Program is included as an Attachment to this report.

No violations were identified.

4. Reactor Building Entries

- a. The site staff monitored reactor building (RB) entries conducted during the inspection period to verify the following on a sampling basis:
- The RB entry was properly planned and coordinated for effective task implementation including adequate as low as is reasonably achievable (ALARA) review, personnel training, and equipment testing.
 - Proper radiological precautions were planned and implemented including the use of a Radiation Work Permit (RWP).
 - Specific procedures were developed for unique tasks and properly implemented.
- b. The site staff attended RB entry status meetings, reviewed selected documents, applicable procedures, and RWPs concerning these entries.

Entries 70 through 79 were conducted during this inspection period.

Entry 70 conducted Friday, July 9, 1982
Entry 71 conducted Monday, July 12, 1982
Entry 72 conducted Wednesday, July 14, 1982

Entry 73 conducted Thursday, July 16, 1982
Entry 74 conducted Monday, July 19, 1982
Entry 75 (first Quick Look) conducted Wednesday,
July 21, 1982
Entry 76 conducted Wednesday, July 28, 1982
Entry 77 conducted Wednesday, August 4, 1982
Entry 78 conducted Thursday, August 5, 1982
Entry 79 (second Quick Look) conducted Friday,
August 6, 1982

During these entries, the licensee technicians successfully completed closed circuit television camera inspections of the reactor internals through three control rod drive mechanisms. In preparation for the television inspection, the reactor coolant system was vented and depressurized.

The following leadscrews were uncoupled from control rods and removed.

(core location) 8-H (center)
8-B (near edge)
9-E (between edge and center)

No violations were identified.

5. Purification Demineralizer Inspection

On August 3 and 6, 1982, the remotely operated System In-Service Inspection (SISI) robot successfully entered the auxiliary building purification demineralizer cubicles ("A" and "B") to televise conditions and retrieve information on dose fields, loose surface contamination, temperatures on vessel walls, etc. The dose fields ranged from a general area of 2-5 R/hr at the doorway entering the "B" cubicle to readings 12 inches from the bottom of the vessel of 1,150 R/hr. Both cubicles were generally clean of debris, however, high levels of loose surface contamination were identified. The temperatures on the external walls of the demineralizers were at ambient conditions (approximately 84°F). The inspectors observed selected portions of the licensee's control of the remote evolutions.

No violations were identified.

6. Radioactive Material Shipments

The NRC site radiation specialists inspected all radioactive material shipments during the inspection period to verify the items listed below.

- Licensee had complied with approved packaging and shipping procedures.
- Licensee had prepared shipping papers, which certified that the radioactive materials were properly classified, described, packaged, and marked for transport.

- Licensee had applied warning labels to all packages and placarded vehicles.
- Licensee controlled the radioactive contamination and dose rates below the regulatory limits.

Inspector review of this area consisted of: examination of shipping papers, procedures, packages, and vehicles; and performance of radiation and contamination surveys of each shipment.

During this period, six radioactive material shipments were made by the licensee.

No violations were identified.

7. Inspector Review of Licensee's Radiological Investigative Report 82-052; Unauthorized Entry into a Radiation Area

a. Description of Event

On July 15, 1982, a licensee Environmental Licensing Engineer and a Commonwealth of Pennsylvania Construction Inspector made an entry into a newly constructed Dosimetry Calibration Building in which a Cs-137 source was exposed. The Commonwealth Inspector was being escorted by the licensee Environmental Licensing Engineer and entered the building with the concurrence of the Instrument Shop Supervisor. A rope barricade and sign were present at the entrance to the Dosimetry Calibration Building. The sign read "Radiation Area: RWP Required for Entry - Personnel Monitoring Required." The individuals were not wearing personnel monitoring devices nor were they logged in on the Radiation Work Permit (RWP). Doses to the two individuals who entered the area were estimated to be less than 3 mrem.

The licensee notified the Unit 1 Senior Resident Inspector on July 15, 1982, of this incident.

b. Inspector Findings

The inspector interviewed licensee personnel who were involved in the incident, examined licensee investigative reports and procedures, and conducted a "walk-through" of the incident. The inspector identified the cause of the incident as an apparent failure to follow Radiological Control Procedures (RCP). Specific examples follow.

- RCP 4200, Thermoluminescent Dosimeter (TLD) Assignment, Issue, and Data Handling, Revision 5, effective June 5, 1982, requires that TLDs be worn by personnel in site radiation areas which are posted as "personnel monitoring required" areas.

Contrary to this requirement, personnel entered an area posted as "Personnel Monitoring Required," without obtaining the required TLDs.

- RCP 4122, Radiation Work Permit, Revision 3, effective June 22, 1982, states that an RWP is required of all personnel whose work involves entering any area posted "RWP Required for Entry."

Contrary to this requirement, personnel entered an area posted as "RWP Required for Entry," without obtaining the required RWP. The inspector stated that failure to follow RCP 4200 and RCP 4122 requirements is an apparent violation of Technical Specifications 6.8.1 (320/82-08-01).

The inspector has reviewed the licensee's immediate corrective actions that included counselling of the Licensing Engineer and Instrument Shop Supervisor, performing dose assessments on the involved individuals, and terminating usage of all radiation sources in the Calibration Facility until calibration personnel had received additional training on source handling and posting procedures. The inspector has no questions about the immediate corrective action. Further, the licensee is initiating action that will establish generic radiological controls for the instrument shop.

8. Self-Reader Dosimeter Calibration Procedures

The inspector reviewed selected RCPs for conformance with Regulatory Guide 1.33, Revision 2, February 1978. Regulatory Guide 1.33 states in paragraph 8, Procedures for Control of Measuring and Test Equipment and for Surveillance Tests, Procedures and Calibration, that "...procedures...be provided to ensure that...measuring devices...are properly controlled, calibrated, and adjusted at specific periods to maintain accuracy."

Contrary to this requirement, RCP 1772, Dosimeter Calibration and Leak Test, Revision 6, effective January 12, 1982, was inadequate in that it did not state the frequency of recalibration nor describe the recall system for self-reading dosimeters. This is an apparent violation of Technical Specification 6.8.1 (320/82-08-02). The inspector discussed with licensee representatives this procedural violation and the licensee committed to take subsequent corrective action by specifying the recalibration frequency and the method of recall in the appropriate procedure.

9. Licensee Event Reports

The inspector reviewed Licensee Event Reports (LER's) required to be submitted in accordance with Technical Specifications (TS) 6.9.1.8 and 6.9.1.9 (and NUREG 0161) to verify the following: Event and cause description clearly reported event information; the required LER form was properly completed; and adequate corrective action was specified.

Initial screening of these events was completed to determine generic applicability, need for additional site verification, and the necessity for additional NRC management review.

The below listed LER's were reviewed.

- LER 82-22/03L-0, dated July 12, 1982, Air intake tunnel chlorine monitor inoperable
- LER 82-23/03L-0, dated July 29, 1982, Actuation of air intake tunnel halon system which tripped auxiliary and fuel handling building ventilation systems

No violations were identified.

10. Respiratory Protection

On August 3, 1982, a respiratory protection specialist from the NRC's Office of Research (RES) contacted the inspector regarding preliminary results of recent respirator testing. The testing was performed by Los Alamos National Laboratory (LANL), under contract to RES, of a powered air purifying helmet in use at TMI-2. The test results indicated marginally acceptable airflow and lower than expected protection factors (PF). The PF's obtained in the test were as low as 200. The licensee had been using a PF of 1,000 to evaluate personnel protection in accordance with tabulated values in 10 CFR 20.

The inspector relayed the test result information to the licensee's respiratory protection supervisor. The respiratory protection supervisor took three actions:

- issued revised PF's of 200 for future use of these respirators
- restricted their use to case-by-case evaluation
- revised intake estimates from previous usage to reflect the revised PF of 200

These actions were confirmed at the exit interview.

No violations were identified.

11. Exit Interview

On August 9, 1982, a meeting was held with licensee representatives (denoted in paragraph 1) to discuss the inspection scope and findings. The licensee actions taken regarding respirators (described in paragraph 10) were confirmed.

ATTACHMENT

SUMMARY OF INDEPENDENT MEASUREMENT VERIFICATION

1. Groundwater Monitoring Program. The licensee samples onsite groundwater by means of test borings (see Figure 1). Weekly water samples are taken from borings 1, 2, 3, 10, 16, and 17. The other test borings are sampled monthly except test boring 9 which is clogged. During April, 1982, the licensee reported analytical results for groundwater samples taken from onsite test borings in February and March of 1982. Changes in tritium concentrations were noted for test borings 2, 3, and 17. A sample taken from test boring 17 on March 23, 1982, contained a tritium concentration of 1,100,000 pCi/l. The previous highest reading for test boring 17 was 678,000 pCi/l, for a sample taken February 25, 1982. Test boring 2, was reported as 954,000 pCi/l, for a sample taken February 12, 1982. More recent samples from test boring 2 showed reduced levels of tritium, down to 30,900 pCi/l for a sample taken March 23, 1982. The tritium levels for test boring 3 went from about 2,400 pCi/l on March 9, 1982, to 24,700 pCi/l on March 23, 1982. The licensee instituted a systematic program to identify the source of the tritium. The NRC independently analyzed water samples taken from these test borings on April 8, 1982.

The maximum permissible concentration (MPC) of tritium in unrestricted areas, as required by 10 CFR Part 20, is 3,000,000 pCi/l. The increased concentrations have remained below MPC. The increased tritium concentrations were only noted in the test borings near the Borated Water Storage Tank. The samples from aquatic environment in the TMI area did not indicate any apparent increase in tritium concentrations.

<u>Location</u>	<u>Licensee Result during February and March 1982 (Tritium Concentration)</u>	<u>NRC Results (Region I) for Samples taken April 8, 1982 (Tritium Concentration)</u>
*TB-2	30,900 pCi/l	40,100 pCi/l
TB-3	24,700 pCi/l	22,000 pCi/l
TB-17	1,100,000 pCi/l	800,000 pCi/l

*TB - Test Boring

2. Borated Water Storage Tank Leak. On Wednesday, January 13, 1982, a leak was discovered from a 3/8 inch instrument line connected to the Borated Water Storage Tank (BWST). The tank contained a mixture of pre-accident Unit 2 water, water transferred from the Unit 1 BWST in March 1979, and some processed auxiliary building water from EPICOR II. The predominant radionuclides in the water include:

Cs-137	3.7×10^{-4} uCi/ml
Cs-134	1.1×10^{-4} uCi/ml
Co-60	1.3×10^{-5} uCi/ml
H-3	9.02×10^{-2} uCi/ml

Since January 1982, groundwater near the borated water storage tank (BWST) had apparently leaked into underground structures in the vicinity of the BWST (Air Intake Tunnel and BWST Pipe Chase). As part of the monitoring program, a detailed characterization of the isotopic makeup of the contaminated water in the air intake tunnel and the borated water storage tank (BWST) was conducted. The additional analytical results indicated minute concentrations (6×10^{-8} uCi/ml) of Sb-125 in the BWST pipe chase and the air intake tunnel. A more sensitive analysis of water from the BWST indicated an Sb-125 concentration of 6.5×10^{-6} uCi/ml. Preliminary evaluation of the analytical results indicated that the Sb-125 to tritium ratios in the air intake tunnel were consistent with those in the BWST. This ratio indicated that the probable source of radioactivity in the groundwater was from the BWST. Although difficult to quantify, it appeared that the leakage of BWST water was approximately 3,000 gallons. The following is the analytical results of the BWST pipe chase water.

Environmental Protection Agency, Middletown Laboratory Results
(sample taken 4/16/82)

<u>Location</u>	<u>Concentrations</u>	
BWST Pipe Chase	2.6 E-7 uCi/ml (Sb-125)	8.7 E-3 uCi/ml (^3H)

3. Reactor Building Integrity Assessment Program. The licensee monitoring of the onsite groundwater is part of a program which began in early 1980 to assess reactor building integrity.

Besides the reported tritium levels (see above) the licensee detected minute quantities of cesium in some of the test borings during 1981.

<u>Date</u>	<u>Location</u>	<u>Cesium-137</u>	<u>Cesium-134</u>
Feb. 1981	TB-2	370 pCi/l	135 pCi/l
Nov. 1981	TB-2	35 pCi/l	Not Detected

Samples taken by the NRC from TB-2 on February 8, 1981, were tested by the EPA (Middletown Laboratory)

<u>Location</u>	<u>Cesium-137</u>	<u>Cesium-134</u>
TB-2	170 ± 18 pCi/l	68 ± 13 pCi/l

Another onsite location sampled was the East Dike Catch Basin (EDCB). Tritium concentrations at this location remain above background.

Composite samples from each of the test borings and the EDCB are being analyzed quarterly for radioactive strontium by the licensee. An analysis of samples collected from April 1, 1981 to June 24, 1982, indicated that strontium was below detectable limits in all monitoring locations except the EDCB. The composite sample from the EDCB indicated a strontium 90 concentration of approximately 1 pCi/l (slightly above the lower limit of detection).

<u>Date</u>	<u>Reporting Group</u>	<u>Result</u>
4/24/81	DOE (Idaho)	$2 \pm 2 \text{ E-7 uCi/ml (H-3)}$ $1.0 \pm 0.8 \text{ E-9 uCi/ml (Sr-90)}$

More recent sample results follow:

2/82	GPU	$520 \pm 80 \text{ pCi/l (H-3)}$
2/82	GPU	$840 \pm 120 \text{ pCi/l (H-3)}$
2/82	EPA (Middletown)	Average $600 \text{ pCi/l} \pm 250 \text{ (H-3)}$

No cesium or strontium radionuclides have been detected in the EDCB to-date during 1982.

4. Special NRC Sample Program. During March and April 1982, the NRC sampled various onsite locations (Figure 2) to assess BWST leakage/cleanup, and the licensee monitoring program. Soil and liquid samples were tested by the Analytical Chemistry Laboratory, Idaho Operations Office, DOE. The results of these analyses are reported in the following table.

TABLE 1

Sample #	Type and Location	^3H uCi/gm	Gross Beta uCi/gm	^{90}Sr uCi/gm	Gamma Scan uCi/gm
1	Soil; East of PWST Pump House	$(-9 \pm 9) \text{ E-7}$	$(1.7 \pm 0.4) \text{ E-5}$	$(-7 \pm 7) \text{ E-8}$	1.40 E-7 Cs-137 2.21 E-8 Cs-134
3	Soil; SW of PWST #2	$(0 \pm 9) \text{ E-7}$	$(1.8 \pm 0.4) \text{ E-5}$	$(1 \pm 8) \text{ E-8}$	-1.32 E-8 Cs-137 1.95 E-8 Cs-134
4	Soil; North of PWST #1	$(-9 \pm 9) \text{ E-7}$	$(1.5 \pm 0.4) \text{ E-5}$	$(-2 \pm 8) \text{ E-8}$	1.27 E-7 Cs-137 1.93 E-8 Cs-134
5	Soil; NE of Unit 2 BWST	$(0 \pm 9) \text{ E-7}$	$(1.7 \pm 0.4) \text{ E-5}$	$(1.7 \pm 0.9) \text{ E-7}$	1.76 E-7 Cs-137 2.41 E-8 Cs-134
6	Soil; West of Unit 2 BWST	$(5.77 \pm 0.17) \text{ E-5}^*$	$(1.7 \pm 0.4) \text{ E-5}$	$(-4 \pm 8) \text{ E-8}$	1.45 E-6 Cs-137 4.44 E-7 Cs-134
7	Soil; South of Unit 2 BWST	$(-9 \pm 9) \text{ E-7}$	$(1.5 \pm 0.4) \text{ E-5}$	$(9 \pm 8) \text{ E-8}$	1.43 E-6 Cs-137 4.04 E-7 Cs-134
8	Soil; <u>Control</u> - Hbg. Int. Apt.	$(-18 \pm 9) \text{ E-7}$	$(2.8 \pm 0.4) \text{ E-5}$	$(1 \pm 8) \text{ E-8}$	3.38 E-7 Cs-137 -8.50 E-9 Cs-134
9	Soil; <u>Control</u> - 1 mi. North of TMI	$(0 \pm 9) \text{ E-7}$	$(1.8 \pm 0.4) \text{ E-5}$	$(1.9 \pm 0.8) \text{ E-7}$	2.28 E-7 Cs-137 1.72 E-8 Cs-134

*Indicates Positive Result

TABLE 1 (continued)

Sample #	Type and Location	^3H uCi/gm	Gross Beta uCi/gm	^{90}Sr uCi/gm	Gamma Scan uCi/gm
2	Liquid; Standing Water E of PWST	$(5.2 \pm 0.2) \text{ E-6}^*$	$(3 \pm 1) \text{ E-8}$	$(1.5 \pm 0.2) \text{ E-8}$	-4.74 E-8 Cs-137 1.51 E-9 Cs-134
10	Liquid; Air Intake Tunnel Sump	$(1.70 \pm 0.02) \text{ E-3}^*$	$(3 \pm 1) \text{ E-8}$	$(2 \pm 2) \text{ E-9}$	9.15 E-9 Cs-137 -4.46 E-9 Cs-134
11	Liquid; BWST Pipe Chase	$(1.12 \pm 0.02) \text{ E-3}^*$	$(1.1 \pm 0.1) \text{ E-7}$	$(1.9 \pm 0.3) \text{ E-8}$	-6.78 E-10 Cs-137
12	Liquid; Control-River N of TMI	$(0 \pm 2) \text{ E-7}$	$(7 \pm 9) \text{ E-9}$	$(2 \pm 2) \text{ E-9}$	1.35 E-8 Cs-137 3.79 E-8 Cs-134
TB-2	Liquid; Test Bore #2	$(4.23 \pm 0.06) \text{ E-5}^*$	$(1.0 \pm 0.5) \text{ E-8}$	$(1 \pm 2) \text{ E-9}$	-1.88 E-9 Cs-137 -3.86 E-10 Cs-134
TB-3	Liquid; Test Bore #3	$(2.18 \pm 0.06) \text{ E-7}$	$(1.0 \pm 0.5) \text{ E-8}$	$(2 \pm 2) \text{ E-8}$	5.29 E-9 Cs-137 -5.19 E-9 Cs-134
TB-17	Liquid; Test Bore # 17	$(8.64 \pm 0.03) \text{ E-4}^*$	$(2.7 \pm 0.7) \text{ E-8}$	$(1 \pm 2) \text{ E-9}$	3.47 E-9 Cs-137 6.72 E-10 Cs-134
Control	Island TAP H_2O	$(0 \pm 2) \text{ E-7}$	$(1.1 \pm 0.5) \text{ E-8}$	$(2 \pm 2) \text{ E-9}$	1.43 E-9 Cs-137 1.51 E-10 Cs-134

*Indicates Positive Result

TEST BORING H³ CONCENTRATIONS

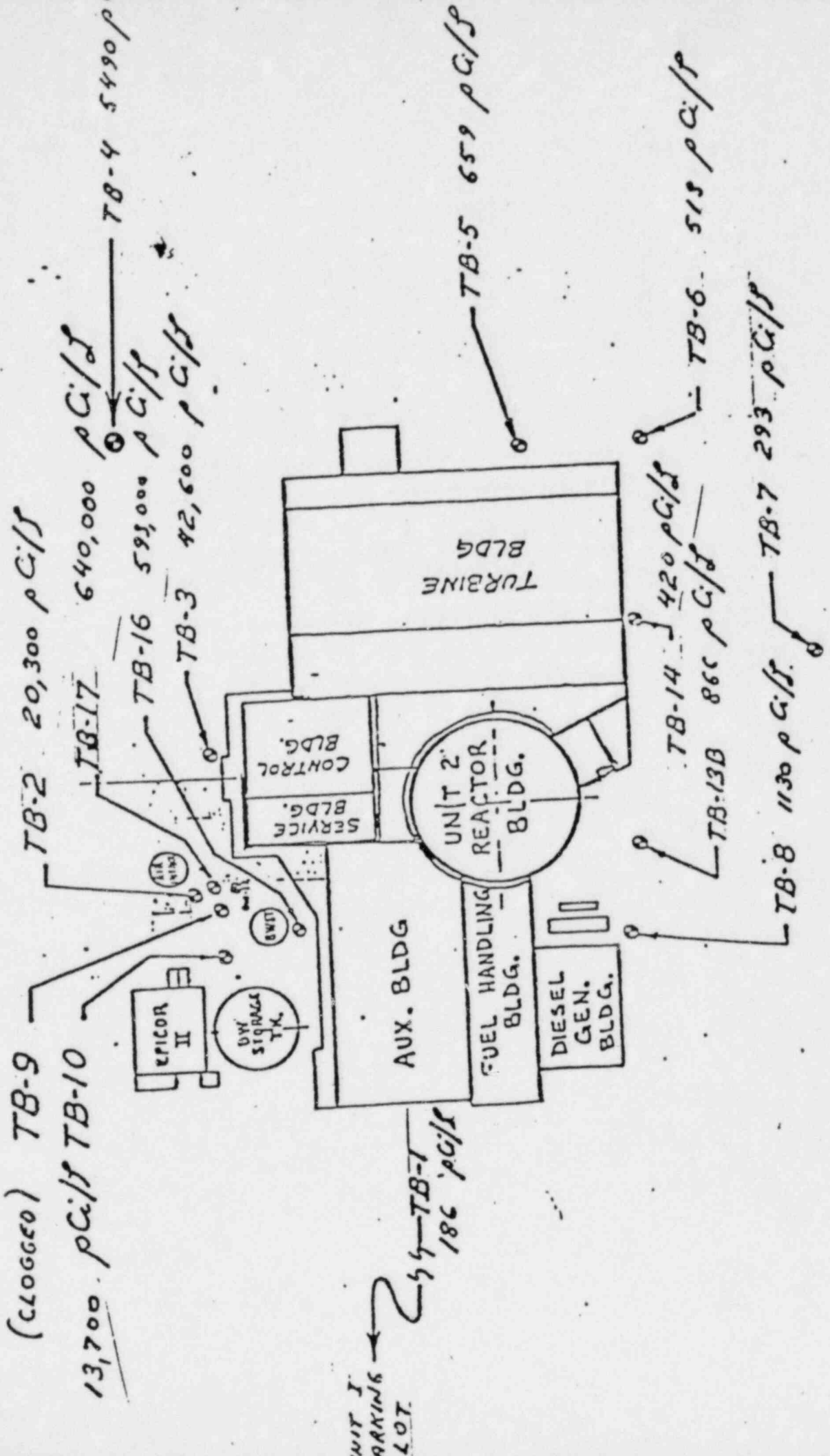
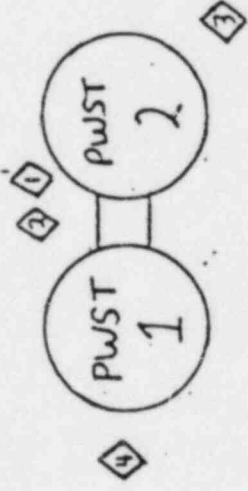
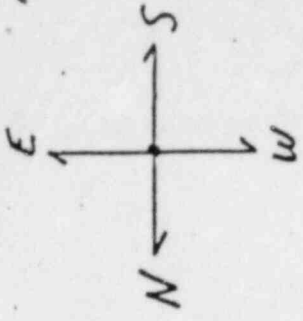


FIGURE 2 -7-



Controlled Area Boundary (Security Fence)

◇ - Sample Location

Air Intake

TB-2

TB-17

TB-3

