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August 10, 1981
NRC/TMI-81-045

MEMORANDUM FOR: Harold R. Denton, Director
Office of Nuclear Reactor Regulation

Bernard J. Snyder, Program Director
TMI Program Office

FROM: Lake H. Barrett, Deputy Program Director
TMI Program Office

SUBJECT: NRC TMI PROGRAM OFFICE WEEKLY STATUS REPORT

Enclosed is the status report for the period of August 2 - 8, 1981.

ORIGINAL SIGNED BY:

Lake H. Barrett
Deputy Program Director
TMI Program Office

Enclosure: As stated

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SURNAME	GKalman/lmp	RConte	MShanbaky	AFasano	RBellamy	LBarrett	
DATE	8/10/81	8/10/81	8/10/81	8/10/81	8/10/81	8/[illegible]/81	

NRC TMI PROGRAM OFFICE WEEKLY STATUS REPORT

Week of August 2 - 8, 1981

Plant Status

Core Cooling Mode: Heat transfer from the reactor coolant system (RCS) loops to Reactor Building ambient.

Available Core Cooling Modes: Decay heat removal systems. Long term cooling "B" (once through steam generator-B)

RCS Pressure Control Mode: Standby Pressure Control (SPC) System.

Backup Pressure Control Modes: Mini Decay Heat Removal (MDHR) System. Decay Heat Removal (DHR) System.

Major Parameters (as of 0500, August 7, 1981) (approximate values)
Average Incore Thermocouples: 119°F
Maximum Incore Thermocouple: 142°F

RCS Loop Temperatures:

		A	B
Hot Leg		118°F	121°F
Cold Leg	(1)	73°F	75°F
	(2)	75°F	75°F

RCS Pressure: 93 psig

Reactor Building: Temperature: 74°F
Water level: Elevation 290.9 ft. (8.4 ft. from floor) via penetration 401 manometer
Pressure: -0.2 psig
Concentration: 2.3×10^{-5} uCi/ml Kr-85 (Sample taken 7/30/81)

Effluent and Environmental (Radiological) Information

1. Liquid effluents from the TMI site released to the Susquehanna River after processing, were made within the regulatory limits and in accordance with NRC requirements and City of Lancaster Agreement dated February 27, 1980.

   During the period July 31, 1981, through August 6, 1981, the effluents contained no detectable radioactivity at the discharge point although individual effluent sources which originated within Unit 2 contained minute amounts of radioactivity. Calculations indicate that less than 1 millionth (0.000001) of a curie of Cs-137 was discharged. This represents less than 0.00001% of the permissable total liquid activity as specified in Technical Specifications for operational commercial reactors.

2. Airborne effluents from the TMI site released to the environment, after processing, were made within the regulatory limits and in accordance with NRC requirements.

During the reporting period June 1-30, 1981, the licensee reported the following gaseous releases:

	Curies
Noble Gases	58.7
Particulates	0.00000237
Tritium	3.8

The above releases represent a small fraction of the allowable regulatory limits. The noble gas (Kr-85) release for the month of June, although well within limits and insignificant for environmental considerations, was higher than anticipated. A portion of the release can be attributed to Reactor Building purges, and the licensee is currently examining the potential origin of the remainder. Preliminary indications are that the increase may be the result of summer time temperatures affecting the lower sensitivity levels of the effluent monitors. Airborne effluent information will continue to be provided on a monthly basis.

3. Environmental Protection Agency (EPA) Environmental Data. The EPA announced on July 6, 1981 that, due to a new shipping procedure for Kr-85 samples to the laboratory, the results for the Kr-85 environmental monitoring stations around TMI will not always be available on a weekly basis. The NRC will report these results as they become available.

-- No radiation above normally occurring background levels was detected in any of the samples collected from the EPA's air and gamma rate networks during the period from July 30, 1981, through August 6, 1981.

4. NRC Environmental Data. Results from NRC monitoring of the environment around the TMI site were as follows:

-- The following are the NRC air sample analytical results for the onsite continuous air sampler:

Sample	Period	I-131 (uCi/cc)	Cs-137 (uCi/cc)
HP-279	July 30, 1981 - August 5, 1981	<10.0 E-14	<10.0 E-14

5. Licensee Radioactive Material and Radwaste Shipments.

-- On Monday, August 3, 1981, a 40 ml Unit 2 reactor coolant sample was sent to Babcock and Wilcox (B&W), Lynchburg, Virginia.

-- On Tuesday, August 4, 1981, one 6' x 6' EPICOR-I dewatered resin liner (liner P-16) from Unit 1 was shipped to Chem-Nuclear Systems Incorporated, Barnwell, South Carolina.

-- On Friday, August 7, 1981, two Hittman steel liners containing Unit 1 solidified evaporator bottoms were shipped to U.S. Ecology, Richland, Washington.

Major Activities

1. Submerged Demineralizer System (SDS). Processing of the third batch (approximately 50,000 gallons) of Reactor Coolant Bleed Tank (RCBT) water continued. As of 7:00 a.m., August 7, 1981, approximately 34,000 gallons had been processed. Preliminary results indicated that the loading on the first zeolite ion-exchange vessel as of August 7, 1981 is 740 curies of Cs-137 and 360 curies of Sr-90. This loading represents greater than 99% removal of these radioactive materials from the process stream.

The licensee completed processing the third batch on August 9, 1981. Prior to staging and processing reactor building sump water the licensee plans an outage period to incorporate minor system modifications. Staging and processing of reactor building sump water is expected to start the first part of September 1981.

2. TMI Occupational Exposures. Attachment 1 shows the data for Units 1 and 2 for 1979 - 1981. The higher exposures for both units in 1979 relative to 1980 reflect both reactors being operational early in 1979, the higher level of worker activity immediately after the March 28, 1979 accident, and the effects of radioactive decay and subsequent dose reduction.

Attachment 2 provides a comparison of PWR average exposures for the years 1979 and 1980. The two basic conclusions are (1) TMI occupation doses during 1979 (accident year) are comparable to those of other PWR sites, and (2) the difference in occupational exposure between TMI-2 and TMI-1 is not significant.

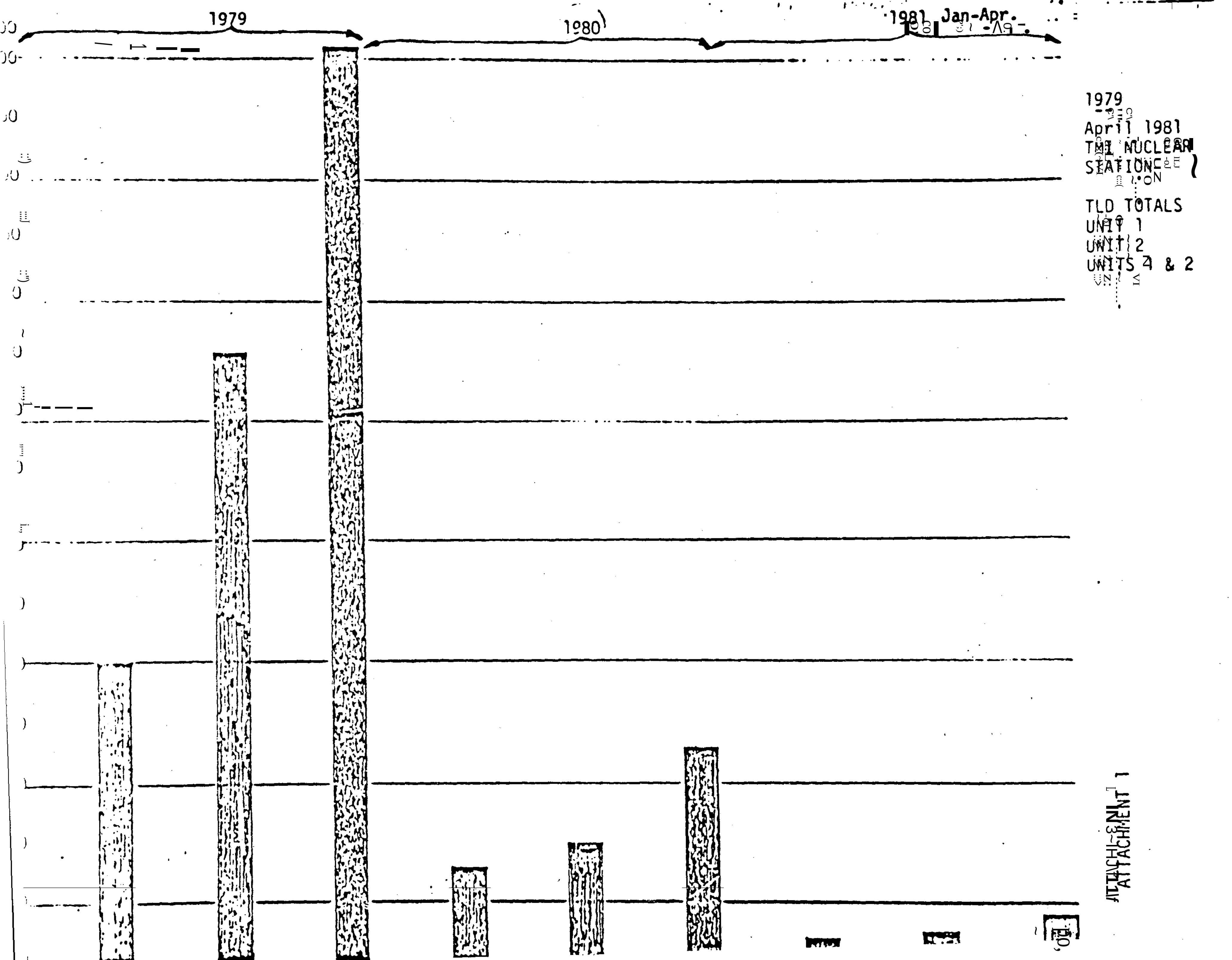
Attachments 3A, 3B, and 3C present a breakdown of occupational exposure for the TMI station. These data indicate the number of personnel monitored for each indicated time period, and number of personnel in each exposure range. As an example, attachment 3A indicates that in 1979, 10,824 people were monitored at the TMI station, with no measured exposure for 6,869, and 249 received between 0.5 to 0.75 Rem exposure (for instance). The total occupational exposure for the station was 1508 Rem in 1979. The 1979 exposure data directly related to the accident were evaluated in great depth by the USNRC Special Inquiry Group, with the evaluation published in "Three Mile Island, A Report to the Commissioners and to the Public", by M. Rogovin, Director (Attachments 4A, 4B, and 4C).

Meeting Attended

On Thursday, August 6, 1981, Lake Barrett met with a delegation of area mothers to discuss various issues related to TMI. Topics discussed included the safety of transportation of radioactive materials, NRC's investigation of Unit 1 operator licensee examination cheating, and Unit 2 funding.

Future Meeting

On Tuesday, September 1, 1981, the Citizens Advisory Panel for the Decontamination of TMI Unit 2, will meet from 7:00 p.m. to 10:00 p.m. at the Holiday Inn, 23 South Second Street in Harrisburg, to discuss current activities at TMI. This meeting will be open for public observation.



ATTACHMENT 1

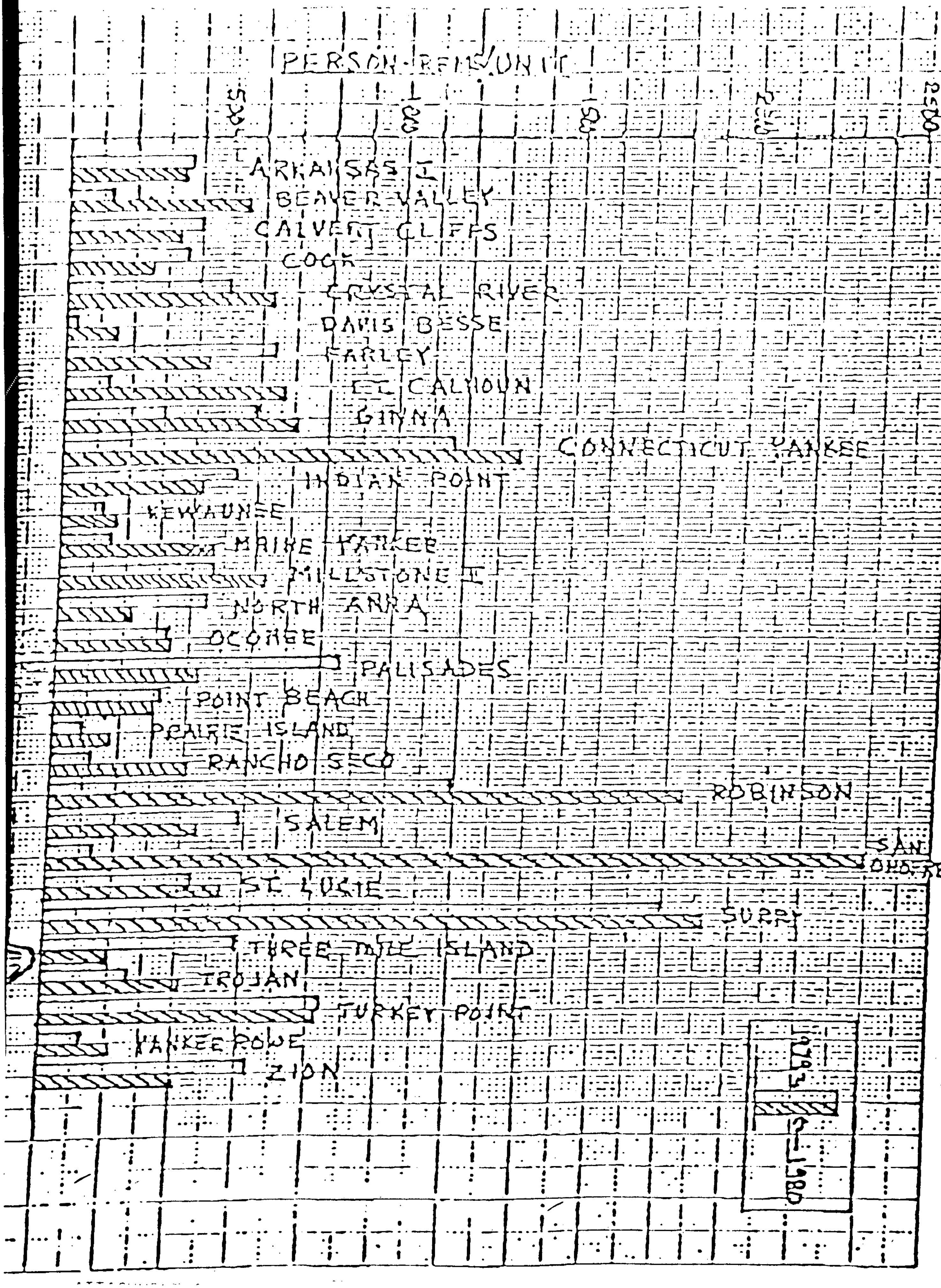


FIGURE 3b
PWRs - PERSON-REMS/UNIT 1979-1980

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1979 SUMMARY REPORT
TMI STATION-UNITS I & II
CURRENT OCCUPATIONAL EXTERNAL RADIATION EXPOSURE

Report period	1/01/79 - 12/31/79
Personnel monitored	10,824
No measurable exposure	6,869
Rem Exposure less than 0.1	2,053
0.1 to 0.25	715
0.25 to 0.5	521
0.5 to 0.75	249
0.75 to 1.0	153
1.0 to 2.0	222
2.0 to 3.0	31
3.0 to 4.0	6
4.0 to 5.0	5
Greater than 5.0	0
Yearly total for Units I & II	1508 REM

ATTACHMENT 3A

SUMMARY REPORT
TMI STATION-UNITS I & II
CURRENT OCCUPATIONAL EXTERNAL RADIATION EXPOSURE

Report period	01/01/80-12/31/80
Personnel monitored	10,761
No measurable exposure	8,433
Exposure less than 0.1 Rem	1,356
0.1 to 0.25	539
0.25 to 0.5	304
0.5 to 0.75	62
0.75 to 1.0	35
1.0 to 2.0	31
2.0 to 3.0	1
3.0 to 4.0	
Greater than 3.0	0
Yearly total for Units 1 & 2	360

SUMMARY REPORT
TMI STATION-UNITS I & II
CURRENT OCCUPATIONAL EXTERNAL RADIATION EXPOSURE

Report period	01/01/81-04/30/81
Personnel monitored	3920
No measurable exposure	2717
Rem Exposure less than 0.1	974
0.1 to 0.25	163
0.25 to 0.5	38
0.5 to 0.75	22
0.75 to 1.0	6
Greater than 1.0	0

Plant total this period 92

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CHELL ROGOVIN
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RGE T. FRAMPTON, JR.
uty director

EAR REGULATORY COMMISSION
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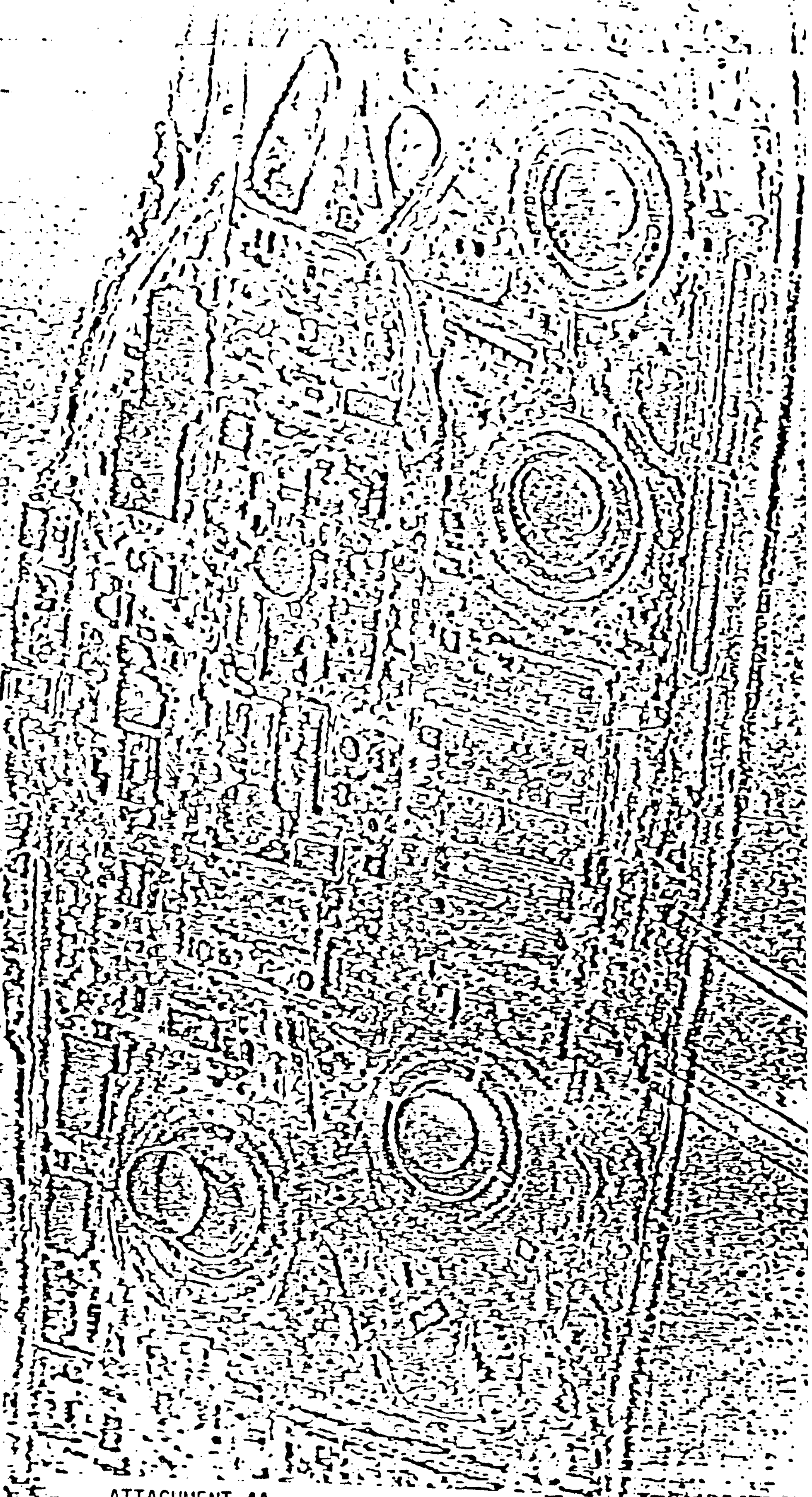

ATTACHMENT 4A

not have any discernible effect. The Ad Hoc Group reached similar conclusions.[170]

e. Occupational Exposure

Met Ed reported three accident-related whole-body exposures in excess of the NRC quarterly limit of 3 rem. These doses were 3.9, 4.1, and 4.2 rem. In addition, two workers received overexposures to their hands. These doses have been calculated by the NRC at about 50 rem to skin of the forearm of one worker and about 150 rem to the fingers of the other[171]. The worker who received 150 rem to his fingers is the same individual who received a whole-body exposure of 4.2 rem. (On August 27, 1979, six workers received overexposures to the skin and extremities. The doses, as measured by TLDs, were up to 50 rads to the skin and between 40 and 150 rads to the extremities.)[172]

The potential for severe, additional overexposures existed during the first few days of the accident. Extremely high radiation fields, in excess of 1000 R/h, existed in the auxiliary building.[173] Moreover, unauthorized entries to the building were made in violation of station health physics procedures. Although a person could have been severely overexposed, there is no evidence that anyone was.

The total estimated occupational collective dose through June 30 was about 1000 person-rem.[174] Table II-25 shows the number of individuals monitored and the collective occupational doses received for the period March through September 1979.

Table II-26 shows the number of individuals who received whole-body doses in excess of 100 mrem during the period from March through September 1979. The data in this table were extracted from Met Ed's TLD personnel dosimetry report.

The collective dose received by the 1596 individuals receiving doses in excess of 100 mrem is approximately 800 person-rem. These data show that no individual has received a dose in excess of the allowable annual limit of 5000 mrem.[172] The average dose received by these 1596 individuals was 10% of that limit.

Table II-27 contains the dose accumulation rate for the seven individuals receiving more than 3000 mrem during that 7-month period. The table shows that most of the relatively high individual exposure occurred during the first month after the accident.

The collective occupational dose is smaller than that received by the surrounding population, although it will continue to rise during recovery operations. Moreover, the Health Physics and Dosimetry Task Group of the President's Commission concluded, after its review of the procedures and data regarding the occupational exposures resulting from the accident, that "the available data on occupational exposure at Three Mile Island must be treated with caution. It may be incomplete."[174] We agree with this conclusion.

We find that the accident at TMI-2 resulted in several exposures in excess of regulatory limits to plant personnel in the first few days following the accident. We find further that the collective occupational dose and the extent of overexposure is not large in relation to the radiation fields and contamination levels encountered during the accident, although the actual collective occupational dose is not precisely known.

f. Health Effects of Low Level Ionizing Radiation

The human health effects of ionizing radiation may be classified as: (1) acute somatic effects, (2) developmental or teratogenic effects, (3) late somatic effects, and (4) genetic effects.

Acute somatic effects involve various forms of radiation sickness occurring shortly (a few days or weeks) after whole-body doses of about 100 rad or more. Teratogenic effects involve various kinds of developmental abnormalities following irradiation *in utero*. Such effects have been observed in animals following doses as low as 5 rad[176] and in humans following doses exceeding 50 rad.[177] There is no evidence associating much smaller doses of radiation to developmental effects.[178,179]

The radiation exposures caused by the accident resulted in individual doses considerably smaller than those associated with acute and teratogenic effects. The most important effects of radiation on man which may be caused by low level radiation are those which may appear, or continue to appear, at long intervals of time after exposure in the individual irradiated (late somatic effects) or in his or her progeny (genetic effects). (As used in this report, "low level" or "low dose" refers to doses below individual occupational dose standards of 5000 mrem per year).

Late Somatic Effects — The most important late somatic effect of low doses of radiation is the increase of incidence of cancer. Most human studies on populations exposed to radiation (e.g., atomic bomb survivors in Hiroshima and Nagasaki, radium dial painters) indicate that radiation-induced life

TABLE II-25. Occupational dose March 1 to September 30, 1979[175]

Month	Number of Dosimeters Distributed	Collective Dose (person-rem)
March	1131	334
April	4504	140
May	5282	350
June	2973	159
July	2500 (approx.)	63
August	2500 (approx.)	63
September	2472	36

TABLE II-26. Occupational doses in excess of 100 mrem March 1, 1979 to September 30, 1979

Dose Range (mrem)	100-250	251-500	501-750	751-1000	1001-2000	2001-3000	3001-4000	4001-5000	More than 5000
Number of Individuals	648	465	213	118	129	16	4	3	0

TABLE II-27. Dose accumulation rate for individuals receiving more than 3000 mrem from March 1, 1979 to September 30, 1979[175]

	Dose (mrem)						
Period	Indiv. A	Indiv. B	Indiv. C	Indiv. D	Indiv. E	Indiv. F	Indiv. G
03/01-03/31	4100	4120	1785	3575	2230	1785	2360
04/01-04/30	160	10	915	40	990	915	1335
05/01-06/30	15	30	45	220	100	45	180
07/01-09/30	30	15	395	70	345	395	210

shortening is largely due to increased cancer mortality.[180,181]

Radiation-induced cancer is detectable only in a statistical sense. A particular case cannot be attributed to radiation[182]. Human evidence for radiogenic cancer comes from epidemiological studies conducted on relatively large population groups exposed to doses much larger than those experienced by the population in the vicinity of the Three Mile Island Station. Numerous animal studies confirm the carcinogenic properties of radiation, but those studies also necessarily involved exposure to relatively large doses. Cancers induced by radiation are indistinguishable from those occurring from other causes. Radiogenic cancer thus can only be inferred on the basis of an excess above the expected natural incidence.

Theoretical considerations suggest that at any level of radiation, no matter how small, some carcinogenic potential exists. Thus far, nearly all human data rely on observations at high dose levels and high dose rates (doses generally greater than 50

ATTACHMENT 4C