79-038

Met-Ed / GPU

Metropolitan Edison Company
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Writer's Direct Dial Number

June 18, 1979
GQL 0780

Mr. B. H. Grier, Director
Office of Inspection & Enforcement
Region 1
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, Pennsylvania 19406

Dear Sir:

Three Mile Island Nuclear Station Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320

Enclosed is the second in a series of followup reports on the March 28, 1979 incident at TMI-2. This submittal is being made in accordance with Met-Ed's commitment in the letter dated April 11, 1979 (GQL 0490). It provides information compiled subsequent to that contained in the May 15th report together with updates to that report. In a phone conversation between Mr. L. W. Harding of my staff and the Chief, I & E Resident Office - TMI-2 an extension was granted to June 18, 1979.

Sincerely,

J. G. Herbein
Vice President-Generation

JGH:JRS:tas

Enclosure: TMI-2 Incident Report dated June 15, 1979

cc: Director of Nuclear Reactor Regulation
Attn: S. A. Varga
Light Water Reactors Branch No. 4
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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SECOND INTERIM REPORT ON THE

THREE MILE ISLAND NUCLEAR STATION

UNIT - 2 (TMI-2)

ACCIDENT

June 15, 1979

Metropolitan Edison Company

CONTENTS

I. Sequence of Events

The document filed with the May 15, 1979 report is currently under revision. The next revision is scheduled for completion on June 22, and we will forward a copy as soon as it is available.

II. RECOVERY ORGANIZATION

Included in this section are changes identified by change bars and Rev. 1 at the bottom right hand corner of each page. There is also updated information for the period of May 1, 1979 through June 1, 1979 concerning the Industry Advisory Group (I.A.G.), and Waste Management Group.

255 036

II. RECOVERY ORGANIZATION

On Wednesday, April 4, 1979, the TMI Unit 2 Recovery Organization was initiated. Due to the constraints of the crisis, it was recognized then that the organization would be continually evaluated in light of the conditions that would exist and the tasks at hand, and that refinements and modifications would take place as appropriate.

The Recovery Organization consists of an integration of GPU personnel with senior, experienced people from other utilities and nuclear industry organizations across the country.

The Recovery Organization focused on the following priorities:

A) Maintaining the current plant operations in the safest conditions.

B) Containing the release of radioactivity to minimize exposure to the public and onsite personnel.

C) Making a reliable safe transition to a benign and reliable long-term cooling mode for the plant.

D) Reinforcing the capability of the plant to assure long-term cooling.

Mr. Herman Dieckamp, President of General Public Utilities, established the Three Mile Island Unit 2 (TMI-2) Recovery Organization.

Mr. Robert C. Arnold, Vice President-Generation, GPU Service Corporation, was designated as the GPU Operations Manager with responsibility for the overall management of all onsite and near site capabilities and resources related to the recovery effort for TMI-2. The major near term objectives of the Recovery Organization were established as follows:

- Maintain the unit in a stable condition

- Control and manage the volumes of existing radioactivity

- Develop an overall waste management plan for liquid, gas, and solids

- Develop a strategy to reach cold shutdown safely and expeditiously

- Modify the necessary procedures, facilities, and equipment to accomplish the above; and

- Establish the plan for accomplishing a transition into the organization necessary to proceed with the longer term recovery efforts.

The Recovery Organization established is shown in Exhibit 1. The Organization was divided into the following major groups:

Industry Advisory Group, Technical Support, Met-Ed Plant Operations, Waste Management Group, Plant Modifications Group, Task Management/ Schedule Group, Administrative & Logistics, and Public & Government Affairs.

255 087

The functions for which each group has been responsible are as follows:

1. Technical Support Group - has provided engineering criteria and support, technical planning and analysis, procedure support, technical support to the control room, support to licensing requirements, and data reduction and management.

2. Plant Modification Group - has provided the engineering, design, materials and construction necessary to complete the plant modifications to equipment or structures.

3. Waste Management Group - was established to safely and effectively manage the quantities of radioactive gases, liquids and solids during the initial phases of the recovery operation. They are responsible for the development and implementation of short term plans to manage and process contaminated gases, liquids and solids; identification of the status of Auxiliary Building systems, establishment of processing priorities that are based on plant needs and decontamination of the Auxiliary Building.

4. Industry Advisory Group (I.A.G.) - was established as a "think tank" to function in parallel with all ongoing activities. The group was not to be part of the implementation structure. The group would of its own initiative look into potential problems of any kind, maintain a current awareness of the perceived status of the core, and provide assessments based on experience and judgement as opposed to detailed engineering review and calculations.

5. Plant Operations Group - consisted of the Met-Ed TMI Plant Staff with substantial augmentation from other organizations whose immediate objectives were:

   - Perform all plant operations and maintenance activities required
   - Limit personnel exposure
   - Stop off-site uncontrolled releases
   - Return the plant to a benign status
   - Ensure the plant's ability to respond to any future emergencies.

6. Task Management/Scheduling Group - was formed to coordinate and monitor the overall tasks and priorities, plans, schedules and work progress of all groups. They were aware of information that the groups required to perform their tasks and assisted them in obtaining the required information

7. Technical Working Group - is a group which includes the heads of each of the groups described in 1. through 6., and representatives from Babcock and Wilcox Co. and the Office of Nuclear Reactor Regulation.

8. Administration & Logistics - was formed to handle the necessary administrative logistics requirements such as communications, manpower, transportation, maintenance and commissary arrangements.

9. Public and Government Affairs - was established to coordinate the interface requirements needed with the public and governmental bodies.

Due to the nature of this section of the report, only changes to the Recovery Organization will be presented in subsequent reports.

May 1 - June 1, 1979

For the period of May 1, 1979, through June 1, 1979, the following changes have been incorporated within the TMI Unit 2 Recovery Organization in accordance with the recognized need for continual organizational evaluation and changing conditions that require different areas of expertise.

The effective utilization of the Industry Advisory Group (I.A.G.) with the course of natural circulation and plant stabilization diminished during the month of May. Its functions as described in last month's report were slowly absorbed within the remaining groups. If the need arises, members are still available to provide their experiance and expertise.

Since the reactor approached a stable condition after establishing natural circulation cooling and releases of radioactivity to the environment are being controlled at acceptably low levels, it was timely to mount a more vigorous effort to reduce accumulated liquid and solid wastes and restore the auxiliary building to near normal access and use.

Mr. Ben Rusche is the Director of the reorganized Waste Management Activity. The new organization will build on the nucleus of the existing waste management group augmented by separate operating and support groups.

The new organization has been assigned responsibility for evaluation, planning and execution of all TMI-2 liquid, gaseous, and solid waste operations not directly related to reactor operations. As a first approximation, these activities will encompass most of the Auxiliary Building operations.

Objectives of the Waste Management Activity are:

MAJOR OBJECTIVES

- Control (Contain) and manage radioactivity so as to minimize exposure to the public and onsite personnel.
- Develop and implement programs to manage and process contaminated water to:
  - minimize releases of radioactivity
  - optimize use of available storage capacity
  - increase freeboard for contingency storage

- Develop and implement programs to minimize radioactive gas releases

- Develop and implement programs to manage solid radioactive waste

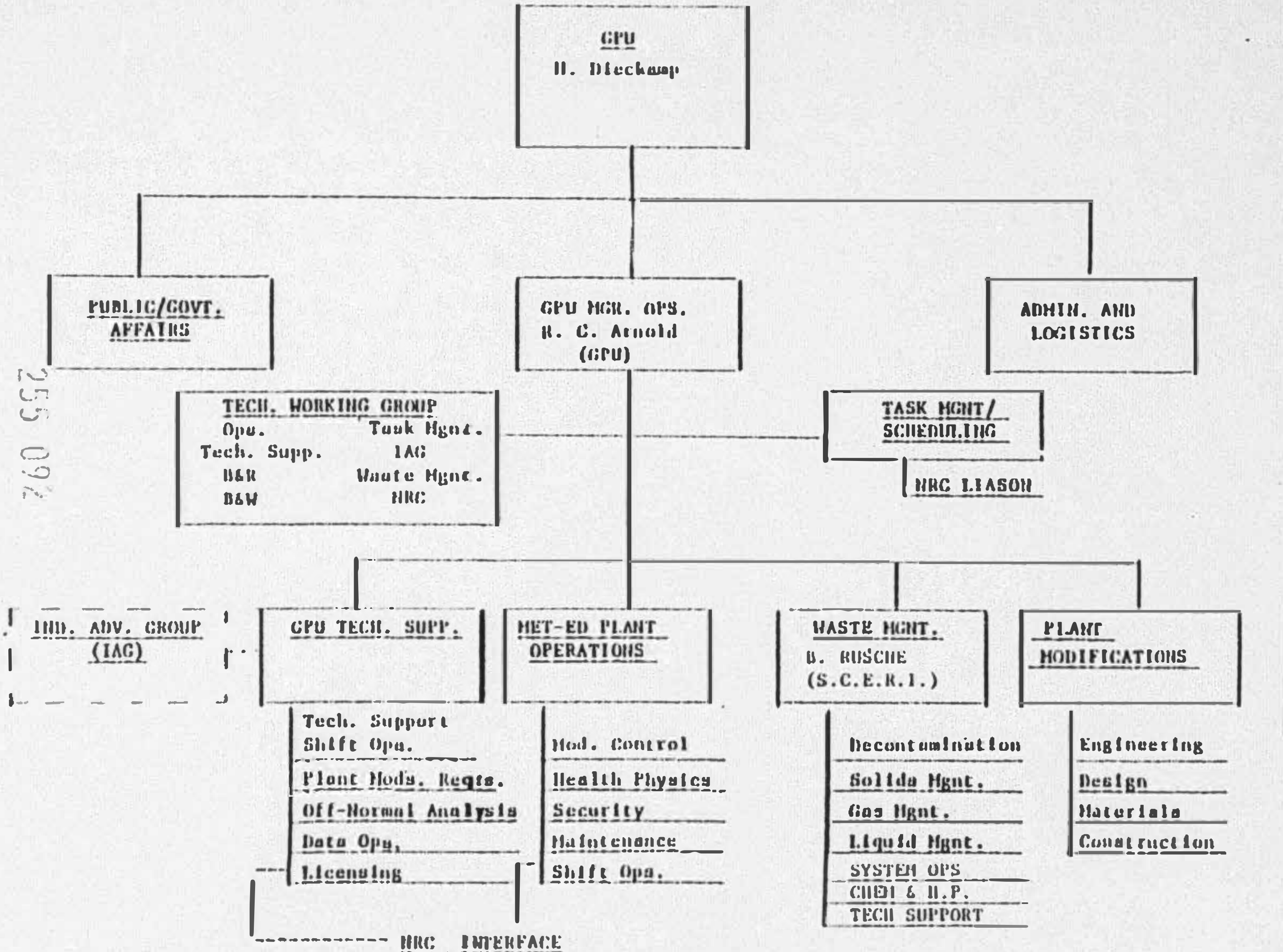
  - volume reduction
  - interim retention facility
  - disposition

- Develop and implement decontamination programs to restore the auxiliary building and equipment to near normal access and use.

  - minimize personnel exposure
  - decontamination techniques
  - strategies and programs
  - management and disposition of resulting wastes

The new organization is shown in Exhibit 2.

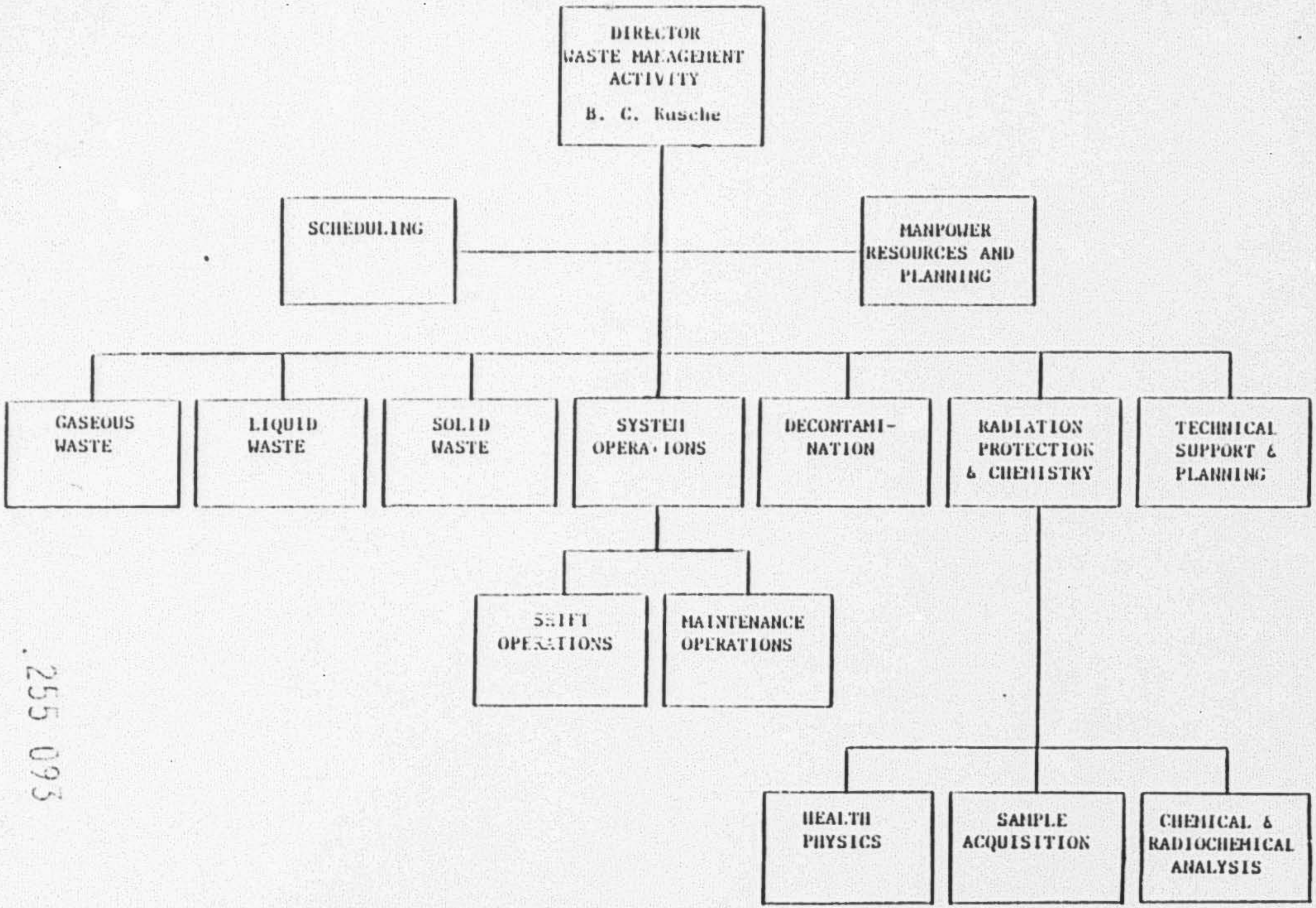
TMI UNIT II RECOVERY ORGANIZATION



255 092

EXHIBIT 1

EXHIBIT 2



WASTE MANAGEMENT ACTIVITIES

ORGANIZATION CHART

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III. PLANT MODIFICATIONS

Included in this section are updated and amended subsections from the May 15, 1979 Interim Report and a new subsection entitled "S" - Nuclear Sampling System. Changes from the previous report are denoted by change bars in the right hand margin and Rev. 1 on the bottom right hand corner of the page. Subsections from the May 15, Interim Report which have not had any changes are not included in this report.

255 094

B. Auxiliary and Fuel Handling Building Supplementary Air Filtration Systems

1.0 System Function and Design Objectives

Radioactive iodine, released from the Reactor Coolant System during the TMI Unit 2 accident, was transferred into the Unit 2 Auxiliary and Fuel Handling Buildings. Immediate change out of the Auxiliary and Fuel Handling Building charcoal filter trains was not feasible because of the high radiation and contamination levels in the filter areas. As a consequence of the I-131 release rate, it was decided to construct a supplementary air filtration system to reduce off-site releases.

The function of the system is to filter radioactive particles and absorb iodine which has passed through the normal filtration system in the building ventilation system.

2.0 System Description

The system interfaces with the Auxiliary Building HVAC system, Fuel Handling Building HVAC system, and the Service Building HVAC system.

Discharge monitoring for the supplementary system is provided at each discharge point.

3.0 System Operation

A final detailed description of the system's operation is not yet available. This description will be included in a subsequent report.

4.0 System Status

Engineering 95% Complete

Construction 90% Complete

System description, flow diagrams, operating procedures, are complete. An operating and failure modes analysis is being prepared.

All four (4) trains are operable. The stack is capped. Present operation is with three (3) trains.

D. Fuel Pool Waste Storage System

1.0 System Function and Design Objectives

This Fuel Pool Waste Storage System is to be used for temporary storage of liquid waste. These tanks will add approximately 110,000 gallons to the present storage capacity of the plant, and are located within the "A" spent fuel pool. These tanks will be filled with liquid waste from both the Reactor Building Sump and the Miscellaneous Waste Hold-Up Tank. This system enhances the capability of the plant to move and process radioactive waste.

2.0 System Description

The system consists basically of upper (4 at 15,000 gallons each) and lower (2 at 25,000 gallons each) tanks, forming two separate storage areas. Either storage area is capable of being filled from either the Reactor Building Sump or the Miscellaneous Waste Hold-Up Tank, and each has level indication. The tanks are protected from over-filling by automatically closing the feed valve when the storage area is nearly full. Provisions have been made to both flush the piping system after completion of the pumping operation, and to drain the piping system as required.

The vents from the tanks and the stand pipes are directed through a dryer and a charcoal filter to remove moisture and iodine before proceeding to the fuel pool ventilation system. The tanks and vent system is protected by a relief valve which vents through a parallel set of dryers and charcoal filters.

The tanks will be emptied as necessary by steam eductors. Two eductors are permanently installed in each stand pipe.

3.0 System Operation

Water is transferred from the Reactor Building Sump or the Miscellaneous Waste Storage Tank to the tank farm. After either the lower set of tanks or upper set of tanks is full the level controllers automatically close the air operated inlet valves.

Air forced from the tanks during the filling process is vented to a charcoal filter & dryer to remove moisture and iodine. This air is then piped to the Fuel Pool Ventilation System.

The steam eductors give the capability to transfer waste water from the tank farm to the Miscellaneous Waste Storage Tank or Epicor II Rad Waste System, from the upper tanks to the lower tanks in the tank farm (or vice versa) or to recirculate the water in the tanks.

A high temperature alarm and temperature switch to close the steam control valve, is installed in the tank vent line to prevent damage to the filter/dryer skids during use of the eductors.

255 096

4.0 System Status

Auxiliary Building - Tie-ins are complete. Shielding is being installed.

pH Building - The shielding on the supply line and insulation for the steam line are being installed. The lower tanks have been hydrostatically tested with the fluorescein solution and accepted. Upper tanks still to be tested with fluorscein solution.

255 097

E. Upgraded Decay Heat Removal System

1.0 System Function and Design Objectives

Future operation of the existing decay heat removal (DHR) system may result in radiation levels possibly ranging up to 500 Rads per hour in the vicinity of the system fluid components. This condition would severely limit personnel access for routine surveillance, operation, and maintenance. The upgraded DHR system consists of a program intended to identify, evaluate, and implement modifications necessary to ensure the integrity and reliability of the system in a radiation environment, substantially exceeding the original design basis, for up to one year of operation.

2.0 System Description

Proposed DHR system modifications include a remote TV monitoring system, modified DHR pump and motor bearing oilers, a vibration monitoring system, and associated operating and testing procedures.

The TV monitoring system will provide remote surveillance capability for DHR operation and maintenance. Two independent systems are provided, one for each vault. Each system includes a radiation-tolerant, closed-circuit television with remote controls. Specific operations to be monitored include pump and motor bearing oil level, pump packing leak-off, remote oil fill, and pump venting.

DHR pump and motor bearing oiler modifications will provide for increased oil storage capacity, a means for remotely reading oil levels, and to permit feeding of oil to the bearings.

Provisions for remote venting of the pumps is also provided.

Provisions will be made for monitoring pump vibration and loose parts in the system. This is intended to provide early indication of pump and motor degradation, loose parts in the system (particularly at the heat exchanger tube inlet), and changes in flow patterns due to partial line blockages.

Monitoring and control for these modifications will be provided from the fan room at elevation 322 in the service building.

3.0 System Operation

These modifications to the DHR will not appreciably alter system operation.

4.0 Status

The TV montiroing system, the bearing oil tanks and piping, and pump venting arrangements are installed and operational. An opening test plan for the DHR system has been developed.

255 098

F. Steam Generator "B" Closed Loop Cooling System

1.0 System Function and Design Objectives

In order to provide a high pressure, closed cooling loop for water-solid steam generator "B", a system utilizing new equipment must be installed. The closed loop must remove the decay heat from the core plus the added heat load from one reactor coolant pump. To minimize the possibility for contamination of the closed loop, the system must be operated at a higher pressure than the reactor coolant system. The heat transferred to the closed loop will ultimately be rejected to the river. The system is intended to provide backup decay heat removal capability should the present steaming from steam generator "A" be discontinued.

2.0 System Description

The system consists of a new heat exchanger, pump, surge tank, piping and valves. The hot water leaving the steam generator will pass through the tube side of the new heat exchanger and return to the steam generator via the new pump. A pressurizer surge tank will maintain the steam generator secondary side pressure above the primary coolant system pressure.

The shell side of the heat exchanger is supplied with cooling water from the secondary services closed cooling water system which, in turn, will be cooled by water from the nuclear services river water pumps piped to the turbine building via the secondary services river water piping.

The new pump discharge piping is connected to the existing feedwater piping downstream of the main feedwater pumps, and the heat exchanger inlet piping is connected to the drain pot on the main steam line between the main steam isolation valve and main turbine stop valves.

3.0 System Operation

A detailed description of the system's operation is given in the operating procedure for Long Term OSTG "B" Cooling System. This description is available in draft form and is in the process of being revised to incorporate comments.

A procedure is currently being generated to fill the "B" steam generator using the condensate pump.

4.0 System Status

The system is installed and the preservice testing is 90% completed.

255 077

G. Portable Disposable Demineralizer

1.0 System Function and Design Objectives

Steam Generator "B" is presently contaminated with radioactive (fission) products. To minimize exposure to personnel and minimize the potential for contamination of the turbine building, this fluid must be cleaned up before the closed loop cooling system is placed into long term service. This cleanup capability will be provided by a portable disposable demineralizer (PDD) sub system. After the initial cleanup is completed, water quality can also be maintained by passing the closed loop cooling system flow through portable demineralizers.

2.0 System Description

The PDD sub system is located along the north wall of the turbine building basement. The system includes a disposable demineralizer approximately 18 inches in diameter, 30 inches in height, and having a 1.5 cubic foot resin capacity. The demineralizer will be connected to the steam generator "B" closed loop cooling system, and receives process water from the new closed loop pump discharge while returning the effluent to the pump suction. The number of demineralizer changes that will be required will depend on the water quality and activity.

The design pressure of the available demineralizers is 30 psig. Therefore, in order to protect the vessels, the PDD sub system also includes a pressure reduction valve, a pump, and safety relief facilities necessary to process the fluid while minimizing the potential for radioactive release to the environment.

The demineralizer is housed in a portable shielded cask. All operation, maintenance, and demineralizer removal and replacement will be performed in accordance with existing health physics requirements.

3.0 System Operation

A detailed description of the system's operation is given in the operating procedure for Long Term OSTG "B" Cooling System.

4.0 Status

The demineralizers and shield casks have been fabricated and installed.

The piping system and pump have been installed and are being tested.

255 100

H. Nuclear River Water System

1.0 System Function and Design Objectives

The river is the ultimate heat sink for the alternate decay heat removal (ADHR) system and the steam generator "B" closed loop cooling system.

To ensure system reliability, the nuclear services river water system was selected to supply the water.

The ADHR system requires approximately 3500 gpm, and the secondary services closed cooling water system that services the new steam generator "B" closed loop heat exchanger will require approximately 7000 gpm. These flow requirements will not be simultaneous.

2.0 System Description

Connections from the existing nuclear services river water supply and discharge headers are to be made. These connections will be made in the river water pump house and in the nuclear services river water piping between the river water pump house and fuel handling building. The former connection is for supply of river water to the "B" generator closed loop cooling scheme and the latter is to supply river water to the alternate decay heat removal system (ADHRS).

A jumper connection to supply nuclear services river water to the secondary services river water system was made in the river water pump house. The connection was made between valves NR-V3 and NR-V197 on the river water header and was fabricated in accordance with ASME Section III requirements up to and including the second isolation valve (two isolation valves are provided to segregate the safety class nuclear services river water system and the secondary services river water system). The jumper connection was made to the secondary services river water pump header downstream of valves SR-V2A, B, and C (see FSAR Figures 9.2-1 and 10.1-3).

3.0 System Operation

A detailed description of the system's operation is given in operating procedure 2104-3.1 and in the operating procedure for the Long Term OSTG "B" Cooling System for use with the Steam Generator "B" Cooling System. The description for the use of the system with the ADHR system will be included in a subsequent report.

4.0 Status

The connections for the alternate decay heat removal system to the nuclear services river water system have not been made and exact locations for the connections are not chosen.

The connection for the nuclear services river water system to the secondary services river water system have been installed and hydro tested.

255 101

I. Secondary Services Closed Cooling Water System

1.0 System Function and Design Objectives

An intermediate closed cooling system is required to transfer heat from the new heat exchanger, in the steam generator "B" closed loop cooling system, to the river water. This is necessary to prevent fouling which could result if river water were to pass through the shell side of the new DHR heat exchanger. The secondary services closed cooling water (SSCCW) system will be modified to satisfy this requirement.

2.0 System Description

No new major components have been added to the SSCCW system. Piping connections have been made between the closed cooling water supply and return headers and the new DHR heat exchanger. After modifications are completed, the SSCCW can be controlled and operated as originally intended during normal plant operations. However, during steam generator "B" closed loop cooling, the SSCCW system will only serve the new steam generator "B" closed cooling loop heat exchanger, and the service air compressors. All other components will be valved out. This operating mode will not exceed the performance limitations of the originally installed system.

3.0 System Operation

A detailed description of the system's operation is given in operating procedure 2104-3.5 and in the operating procedure for the Long Term OSTG "B" Cooling System. This description will be included in a subsequent report.

4.0 Status

The system modification is complete and the system has been operated satisfactorily.

J. Steam Generator "A" Closed Loop Cooling System

1.0 System Function and Design Objectives

In order to provide a high pressure, closed cooling loop for water-solid steam generator "A", a cooling system utilizing new equipment has been proposed. The closed loop would remove the decay heat from the core plus the added heat load from one reactor coolant pump. To minimize the possibility for contamination of the closed loop, the system would be operated at a higher pressure than the reactor coolant system. The heat transferred to the closed loop would be rejected to the river. The system would be intended to provide primary decay heat removal capability redundant to the steam generator "B" closed loop cooling system.

2.0 Description

The system will consist of a new heat exchanger, pump, surge tank, and piping and valves. The hot water leaving the steam generator would be cooled in the shell side of the heat exchanger and returned to the steam generator by a new pump. A pressurized surge tank would maintain the steam generator secondary side at a minimum pressure greater than the primary coolant system pressure.

The tube side of the heat exchanger would be supplied with cooling water from the nuclear services river water pumps piped to the turbine building via installed secondary services river water piping.

The new pump discharge piping would be connected to the existing feed-water piping downstream of the main feedwater pumps. The heat exchanger inlet process piping would be connected to the main steam turbine bypass line between the isolation valve and the control valve at the condenser.

3.0 System Operation

The system is not intended to be implemented, therefore, the operations description will not be provided.

4.0 System Status

Design is completed. The pump and heat exchanger have been purchased and are on site. No piping, except the two tie-in pieces, have been fabricated. The procurement, fabrication, and installation have been placed on hold, and no further construction will be done.

L. Alternate Decay Heat Removal System

1.0 System Function and Design Objectives

The proposed Alternate Decay Heat Removal (ADHR) system augments the two existing DHR systems and the proposed water solid secondary/ natural circulation system as backup to steam generator "A" steaming. An integral Decay Heat Closed Cooling Water (DHCCW) system is included to transport heat from the ADHR cooler and the ADHR pump seal coolers to the nuclear services river water system. Connection points are also provided outside the fuel handling building to connect other dedicated liquid waste processing systems.

The specific function of the ADHR system is to remove decay heat such that the reactor coolant system can be brought to and maintained at a cold shutdown condition. With the exception of gross core flow restrictions, this system is intended to provide sufficient core flow to maintain reactor coolant subcooled.

2.0 System Description

The two ADHR pumps and a new heat exchanger will be mounted on a skid located outside the west wall of the fuel handling building. Three pipe runs will be installed from the existing DHR system piping within the fuel handling building and penetrate the fuel handling building west wall of a valve vault. The pipe runs will terminate in the valve vault by capping each line. Hook-up to the ADHR skid will be made later if needed. In addition, three capped taps will be provided on the ADHR piping installed outside the fuel handling building. These taps may be used later to connect other dedicated liquid waste processing systems.

Motor control centers and I&C panels for operation of all ADHR system pumps and motor operated valves will be mounted in a control trailer located near the ADHR skid.

The DHCCW system provides cooling water to the ADHR system heat exchanger and pump seal coolers. It utilizes a closed loop system to provide a double barrier between the ADHR system and the river water to prevent the direct release of radioactivity to the environment. A radiation detector is provided to monitor the level of radioactivity in the DHCCW system at the outlet of the DHR cooler. A radiation level indicator with high radiation level alarm is located in the ADHR system remote control room. If radioactivity is detected, operation of the decay heat removal loop and its associated DHCCW loop can be halted and the affected decay heat removal cooler isolated. The DHCCW system is mounted on a second skid and consists of the DHCCW pump, heat exchanger, and surge tank. Both skids will be located outdoors at grade level near the west wall of the fuel handling building and adjacent to each other.

255 104

3.0 System Operation

A detailed description of this system is not yet available. Therefore, this description will be provided in a subsequent report.

4.0 System status

The piping for the ADHR system has been designed, fabricated, and received on site. The skid for the ADHR system with its components, two pumps, heat exchanger, valves and piping is near completion. Motor control centers are on site. The valve vault excavation is completed and the control trailer purchased and delivered and near completion.

Temporary ADHR system shield building, permanent building and provision of electrical power and service water support is on hold. Tie-in of ADHR system to existing plant DHR system is on hold.

Piping supports are being designed and fabricated on site, the control trailer is being wired, air conditioned and insulated on site. Vault design is complete. Piping construction is in progress in the Fuel Handling Building. Wall penetrations are 75% complete.

255 105

M. Standby Reactor Coolant Pressure Control System

1.0 Systems Function and Design Objectives

High radiation levels and flooding in the reactor building have or could potentially render much of the reactor coolant (RC) system electrical equipment and instrumentation inoperable. With much of the instrumentation inoperable, the RCS should be maintained water "solid". An alternate system of pressure control is required to ensure safe and reliable cooling of the reactor core, should control of the existing system become unmanageable. The standby reactor coolant pressure control (SRCPC) system will ensure reliable core cooling by performing the following function:

a. Maintain the RC system in a water-solid condition for natural circulation core cooling.

b. Maintain sufficient available NPSH should RC pump operation be required

c. Control the quality of the makeup fluid

d. Maintain pressure within control limits while accomodating thermal and volumetric contractions in RC system inventory.

2.0 System Description

The SRCPC system ties into the existing High Pressure Injection lines (see FSAR Figure 9.3-6). RC system pressure is maintained by three surge tanks arranged in series with a pressurized nitrogen blanket over the last tank. A fluid inventory of approximately two thirds of the total tank capacity is sufficient to maintain RC system pressure during sudden RC system inventory reduction transients. A level control valve at the tanks' discharge will prevent nitrogen from entering the RC system.

Long term makeup will be provided by the charging pump taking suction from an atmospheric storage tank. Makeup fluid conditions are adjusted by chemical addition and heating to meet RC system water quality requirements.

The RC system pressure will normally be maintained between 100 and 750 psig during the intended cooldown process. As of April 30, the RC system pressure must be maintained at 900 psig in order to provide letdown flow equal to th RC pump seal injection flow to the system so that the RC pumps can be operable.

The SRCPC makeup system will be operated manually from a local panel during initial operation and from the control room after system automation is complete. Makeup is provided in response to decreasing pressure in the RC system. An alarm will annunciate at the control station when the pressure differential between the RC and SRCPC makeup system reaches or exceeds 50 psi.

The SRCPC makeup system will prevent gross depressurization of the RC system when operating in a water-solid mode. Overpressurization protection can be provided by increased letdown resulting directly from RC system pressure increase, letdown with concurrent termination of RC pump seal injection or makeup, open ing the pressurizer vent valve, opening the pressurizer electromatic safety relief block valves, or lifting the pressurizer safety relief valves (the latter two methods are undersirable and will only be considered as a last resort).

3.0 System Operation

A preliminary description of this systems' operation is now available.

Title: Preliminary System Description Task TS-6B Standby Reactor Coolant Pressure Control System, Revision 1, dated 5/23/79

4.0 Status

Phase I of the SRCPC makeup system is in the final assembly stage. Phase I will allow local manual operation of the system. Phase II will ultimately convert the system to control room operation.

The system is nearly ready for hydrostatic testing. This will be followed by functional testing.

255 107

N. BOP Electrical Power System

1.0 System Function and Design Objectives

In the event of failure of normal off-site power sources to the BOP busses, the BOP Electrical Power (BOPEP) system provides an alternate source of power to serve existing components, which previously did not require loss-of-offsite power backup protection and new components that are planned to be used or may be used for decay heat removal from the primary system.

The BOPEP system should be completely independent of the existing Class IE busses.

The BOPEP busses should be loaded on a "manual only" basis in accordance with emergency operating procedures.

Modifications of power supplies associated with steam generator "A" cooling systems should be given priority of installation with respect to those for the steam generator "B" cooling systems.

The testing requirements for the BOPEP systems should be similar to those of the Class IE systems.

The BOPEP system shall supply power to the following components and associated auxiliaries at one time or another depending upon the specific situations:

a. Supplementary Air Compresser

b. Circulating Water Pumps

c. Condensate Pumps
   Steam Generator "A" Long Term Cooling Pumps*
   Steam Generator "B" Long Term Cooling Pump

d. New Decay Heat Removal Pump

e. Secondary System Closed Cooling Water Pumps

f. Alternate DHR System Pumps*
   Secondary Services River Water Strainer and pumps

g. Pressure and Volume Control System Charging Pumps

h. Chemical Cleaning Building Ventilation Equipment

i. Pressurizer Heaters

*Indicates components not currently planned to be put in service.

255 108

j. Alternate DHR System Closed Cooling Water Pump*
Temporary Auxiliary and Fuel Handling Building HVAC

k. Fuel Handling Building HVAC Fans, Filters and Heaters

l. Auxiliary Building HVAC Fans, Filters and Heaters

m. Condenser Vacuum Pumps

n. Instrument and control power for above systems.

2.0 System Description

The BCPEP system includes two independent power block busses (2-3 and 2-4), each fed by a 2500 kw rated diesel generator, and two circulating water pump busses (2-5 and 2-6) fed by one 13.2 kv line. The loads associated with cooling steam generator "A" are connected to odd numbered busses. Correspondingly, loads associated with cooling steam generator "B" are connected to even numbered busses. The odd and even busses are powered by the gray and white diesel generators respectively and are, therefore, designated as the "gray" and "white" busses.

The diesel generators and associated auxiliary systems are located outdoors just south of the turbine building. Each diesel is a skid-mounted package complete with starting system, fuel injection equipment, and associated instrumentation and controls. The permanently installed fuel oil storage and supply system provides sufficient reserve for one day of rated load operation. In addition, there will be sufficient on-site fuel oil reserve to operate both diesel generators at rated load for the normal time required to obtain fuel resupply plus a four-day margin.

Suitable fire protection will be provided for the diesel generators and auxiliary systems. This may include a fire wall separating the two fuel oil tanks and diesels or a fire suppression system.

Existing circuit breakers, previously used for condensate booster pumps 2A and 2B, have been modified to connect the 2-3 (gray) and 2-4 (white) busses to their respective switchgear. Relays are provided at the busses to shed all loads on loss-of-offsite power. The existing bus transfer schemes that provide continuity of power supply by fast-transfer to the other transformer, have been left intact. To accommodate this, the new undervoltage detection schemes include a 10 second delay.

* Indicates components not currently planned to be put in service.

The 13.2 kv line supplies power to the circulating water pumps and their associated auxiliaries. This line is powered by a 115 kv network which is backed by combustion turbines capable of being energized independently of the 230 kv network. The 13.2 kv line has sufficient capacity to start a second circulating water pump while one pump is still operating. However, only one pump is normally required.

Circulating water pump IE is disconnected so their breakers can be used to connect the new power supply to busses 2-5 and 2-6 respectively. Buss 2-5 serves pumps 1A and 1C which are associated with steam generator "A" cooling systems. Correspondingly, buss 2-6 serves pumps 1B and 1D which are associated with steam generator "B" cooling systems.

3.0 System Operation

The BOPEP system normally provides standby power capabilities and is not operating. On loss-of-offsite power, the offsite power supply breakers will open and the diesel generators will be started and connected to their respective busses automatically.

Loading on the diesel generators, connection of the 13.2 kv line, and startup of the circulating water pumps will be performed manually from the control room in accordance with established procedures for the various potential plant conditions. For the "gray" and "white" busses, return to normal power is accomplished manually by first opening the diesel breaker and then closing the offsite supply breaker. For the 13.2 kv line, a return to normal power will be controlled manually by closing the normal supply breaker before opening the new supply breaker (not transfer).

The primary control center for the BOPEP system is the control room control and monitoring capability exists locally for the diesel generators.

Initial startup testing will verify proper system and component operability, the adequacy of operating procedures, and ensure adequate performance capabilities of the BOPEP system. Periodic testing will be performed in accordance with procedural requirements and any additional testing and maintenance requirements by the component manufacturers. Periodic testing will verify proper breaker actuation, diesel starting and synchronizing, fuel oil quality, and breaker positions.

4.0 System Status

The following work has not yet been completed:

Detailing the provisions for the fire protection.

Detailing the provisions for the supplementary fuel oil reserve.

255 111

O. Liquid Radioactive Waste Processing System Title "EPICOR II"

1.0 System Function and Design Criteria

The system is designed to cleanup radioactive liquids so as to produce water capable of being released from Three Mile Island. Cleanup includes removal of radioisotopes and chemical constitutents to comply with Plant Technical Specifications for Water Releases to the Susquehanna River. The design is being optimized with respect to ALARA considerations.

Instrumentation and controls will be provided for monitoring of system performance. Water flows will be monitored where the values are critical to the process and or system safety. Inline monitoring and a comprehensive sampling system will be provided for thorough analyses of system water cleanup performance. Radiation and airborne monitoring equipment will be provided for analysis of activity levels.

Shielding is being provided to minimize exposure related to the operation of this system.

An HVAC subsystem is utilized to cleanup and monitor any gases that might be released from the liquid processing system. It is the goal to minimize gas releases from the system, however, should they occur, they will be cleaned to reduce any releases to the environment. Monitoring of the air exhaust will continue to detect any potential radioactive gas. A slight negative pressure is projected to ensure building inleakage will be established. The system is being optimized with respect to ALARA considerations.

2.0 System Description

Liquid Processing

The TMI StationChemical Cleaning Building is being used to house the system along with the existing tankage and sump existing in that building. Piping and pumps are provided for water movement through cleanup vessels. The system is composed of a prefilter, two demineralizers and an after filter. The prefilter and demineralizers will be designed for ease of hookup and disconnect to allow for quick installation and remote, reliable removal.

Gas Processing

The primary components are a fan, an air cleanup filter train, and necessary ducting. The main HVAC components located external to the Station Chemical Cleaning Building, but are enclosed in their own shelter.

255 112

3.0 SYSTEM OPERATION

The Auxiliary Building Emergency Liquid Cleanup System consists of a vendor supplied liquid radwaste process system which is located in the Chemical Cleaning Building. The system is designed to decontaminate by filtration and ion exchange between 150,000 and 200,000 gallons of radioactive waste water contained in the Auxiliary Building of TMI Unit 2. Contaminated water will be pumped from a connection located on the Miscellaneous Waste Holdup Tank (WDL-T-2) by a pump located in the Chemical Cleaning Building through the yeard and into the process system. Yard piping will be enclosed within a guard pipe, the end of which terminates inside the Chemical Cleaning Building.

Decontaminated water will be delivered to the Clean Water Receiving Tank (CC-T-2) for sampling and analysis and pumped to the Liquid Waste Disposal System of TMI Unit I or Unit II for discharge if within specs, or transferred to the Off Spec Water Receiving Batch Tank (CC-T-1) for recycling through the process system. Capability also exists to discharge to a tank truck.

The Chemical Cleaning Building (CCB) has been made into a low leakage confinement building and provided with an exhaust ventilation system to maintain the building at a negative pressure. HEPA and charcoal filtering is provided on the ventilation system which discharges to a local stack at the roof line of the CCB where all effluent air is monitored for radioactivity.

Normal operation of the processing system will be by remote means except for infrequent operations, such as sampling and chemical addition. All remote system operations are controlled from the TV Monitor Control Building located outside the northwest corner of the Chemical Cleaning Building.

Remote handling of spent resin containers from their position inside the Chemical Cleaning Building to the transport cask and truck are provided.

The system interface with the TMI Unit 2 Radwaste Disposal Miscellaneous Liquids System, the TMI Unit 1 Liquid Waste Disposal System, Demineralized Water System and the Service Air System.

4.0 Status

The design is complete and fabrication and construction is essentially complete. The system is being tested for integrity and operability. An extensive operator training and qualification program is being developed and implemented.

255 115

P. Trash Compactor

1.0 System Function and Design Criteria

Additional compaction facilities were required due to the amount of compactible waste being generated. Therefore, a system was needed to compact low level solid waste into 55 gallon drums for storage or shipment.

The system shall compact waste into 55 gallon Department of Transportation (DOT) drums meeting requirements for shipping LSA material.

2.0 System Description

A Stock Equipment Company Model 240T compactor was installed in the Unit 1 waste drumming area. A drawing of the unit is attached. The unit includes roughing and HEPA filters. The discharge of the unit is vented to the Aux. Building ventilation system which contains charcoal filters.

3.0 System Operation

Trash is compacted into 55 gallon DOT approved drums. Standard plant operating procedures have been revised to include the use of the new compactor. Use is limited to compactible dry waste only. No wood, metal or liquids are permitted. All bags of trash are surveyed prior to compaction; bags in excess of 500mr are not compacted.

4.0 Status

Compaction of trash for LSA shipments continues. Approximately 350 drums have been compacted and are in the compacted waste staging facility awaiting shipment.

755 114

Q. Staging Facilities for Dewatered Resins and Evaporator Bottoms

A. WG 21 - Interim Solid Waste Staging Facility

1.0 System Function and Design Criteria

Facilities are needed to stage dewatered radioactive resin generated by Epicor I and Epicor II until they can be shipped to a burial site. WG-21 will provide space for interim staging until WG-22, Solid Waste Staging Facility, is complete. Contact readings on the surface of the facility will be less than 5mr/hr.

2.0 System Description

The facility consists of 16-54" diameter cells and 12-84" diameter cells to receive 4' x 6' and 6' x 6' resin liners. The cells are to be installed in the Unit 2 cooling tower desilting basin, backfilled for shielding and capped with 3' thick concrete plugs.

3.0 System Operation

The facility has not been constructed as of this report.

4.0 System Status

The design criteria for WG-21 has been approved by the WMA, Met-Ed and the NRC. Design has been completed and issued for construction.

Concrete covers, drip pans and cell liners are on order and are promised for delivery on a schedule consistant with the startup of Epicor II. Most of the cell liners have been received as of May 31, 1979. Grading and backfilling under the cells began during the last week in May and was nearly completed by May 31, 1979. The facilities should be ready to receive cells in the basin by early July.

B. WG-22-Solid Waste Staging Facility

1.0 System Function and Design Criteria

Facilities are required to stage the following radioactive wastes until they can be shipped to a burial site:

1.1 Dewatered radioactive resins from Epicor I.
1.2 Dewatered radioactive resins from Epicor II.
1.3 Dewatered radioactive resins or solidified evaporator bottoms from systems used to process water more radioactive than that processed by Epicor I or Epicor II.

255 115

B. WG-22 - Solid Waste Staging Facility (continued)

The sump meets the seismic requirements of Reg. Guide 1.143. Contact readings on the sides of the facility will be less than 0.5 mr/hr and less than 2.5 mr/hr on the top.

2.0 System Description

The facility is designed as a modular one. Each module consists of 30" - 34" diameter cells imbedded in concrete and capped with 3' thick concrete plugs. Each cell has a drain line to a sump which will serve three modules. The sump is designed to collect any leakage from liners installed in the cells and meets the seismic requirements of Reg. Guide 1.143.

3.0 System Operation

The facility has not been constructed as of this report.

4.0 System Status

The design criteria for the facility has been submitted for approval. Detailed design is proceeding and is expected to be complete about mid-June. Cell liners, concrete covers and drain line material is on order. About half of the liners have been received on the site.

255 116

5. Nuclear Sampling System

1.0 System Function and Design Objectives

This nuclear sampling system is to be used as a temporary liquid waste sampling facility to allow TMI Unit II recovery operations to continue without interfering in the normal operations of Unit I when that unit is returned to service. It will provide a single controlled statio.. whereby fluid samples may be taken from tanks otherwise innaccessible for local sampling and/or from tanks that require frequent sampling for analyses of chemical and radiochemical content. Included in the sampling scope will be capability for representative samples of Unit II Reactor Coolant from the pressurizer steam or water space or upstream of letdown coolers, samples from the three Unit II Reactor Coolant Bleed Tanks, Unit II Miscellaneous Waste Hold-Up Tank, and the new Fuel Pool Waste Storage System containing liquid waste from both the Unit II Reactor Building Sump and Miscellaneous Waste Hold-Up Tank. Provisions shall also be provided in the system for continuous monitoring of boron concentration in the reactor coolant.

2.0 System Description

Unit II Sample Lines which presently run into Unit I sampling area shall be rerouted to a new sample sink to be located in the Fuel Handling Building 305' elevation of Unit II. In an adjacent room, the so-called "model room" a boronometer shall be installed.

The system shall provide for adequate recycle, purge and return of waste liquids. Purging of radioactive piping shall be performed prior to installation of new sample lines.

A shielded bottle shall be provided for drainage from the sample sink.

All piping, valves and components of the sampling system will meet the design conditions of the system with which they are associated or will meet 150 psig and 200°F. Primary coolant sampling points will have the design condition of 2500 psig and 670°F up to valve SNS-V-70.

Air exhausted from the sample hood will be filtered through charcoal and HEPA filters and discharged to the Auxiliary Building ventilation system exhaust ductwork.

3.0 System Operation

A detailed description of the systems operation is not yet available as design changes are still being made. This description shall be incorporated in a subsequent report.

255 117

4.0 System Status

The project is still in design phase. No materials have yet been procured although the purchasing of the boronometer is actively being pursued with the issuance of a purchase requisition.

IV. Radiological Monitoring

This section includes the results of information compiled for the period of March 28, 1979 through April 30, 1979, and provides greater amplification, explanation and analyses of the previous month's report. Because of the preliminary nature of the data for the month of May and insufficient time for thorough evaluation, results of the evaluation for May will be supplied in a later report.

255 118

EXECUTIVE SUMMARY
RADIOLOGICAL MONITORING

255 119

EXECUTIVE SUMMARY
RADIOLOGICAL MONITORING
MARCH 28 - APRIL 30, 1979

The results of an assessment of radiation doses to the public due to releases from March 28 through April 30, 1979 from the Three Mile Island Unit 2 accident, based on verified release data and verified radiological environmental data are summarized in the attached table. Doses from radioactivity released in liquid effluents were extremely low. No individual received more than a fraction of a millirem, and the population dose was much less than one person-rem. Doses from airborne effluents are due to noble gas isotopes which deliver whole body doses and iodine isotopes which deliver thyroid doses. Measurements indicate that the maximum individual whole body dose from noble gases was less than 83 millirem, and the noble gas whole body dose to the 50 mile population was calculated to be about 3300 person-rem. Doses from iodine isotopes in airborne effluents result from inhalation of iodine in air and ingestion of iodine in milk. Calculations and measurements show that no individual received more than about 10 millirem to the thyroid from inhalation, and the calculations indicate the thyroid inhalation dose to the 50 mile population was about 160 person-rem. Measurements indicate that the maximum individual thyroid dose from ingestion of ^{131}I in cow milk was 2.3 millirem. Calculations show that the population dose from ^{131}I in milk produced within 50 miles was about 900 person-rem. Average doses to individuals in the population from any isotope in any pathway were very low, less than 2 millirem. The maximum doses to any individual is higher (less than 83 millirem), comparable to the difference in natural background radiation dose between Harrisburg, PA and Denver, Colorado over the period of one year.

255 120

TABLE

Summary of Radiation Doses due to TMI Unit 2 Accident

March 28 - April 30, 1979

Release Mode	Pathway	Estimated Integrated Dose[a]: Maximum Individual (mrem)	Estimated Integrated Dose[a]: Maximum Individual Organ	Estimated Integrated Dose[a]: Population Dose (person-rem)	Estimated Integrated Dose[a]: Population Dose Organ
Liquid	b. Drinking Water (^{131}I)	<.04	Thyroid	< 1	Thyroid
	c. Fish Ingestion (^{131}I)	.01	Thyroid	<< 1	Thyroid
	b. Swimming, Boating & Shoreline	0	Thyroid	0	Thyroid
Airborne	Noble gases in plume	83	Whole Body	(3300)	Whole Body
	Iodine Inhalation	(6.3) 2.7	Thyroid	(160)	Thyroid
	Iodine uptake through cow milk ingestion	(1.2) 2.3	Thyroid	(900)	Thyroid

a. Doses in not parenthese are based on measured isotopic concentrations in environmental samples. Other doses are based on release data and transport models.

b. No Iodine 131 activity detected in 97.5% of water samples. Concentration assumed to be minimum detectable (366 water samples)

c. No Iodine 131 activity detected in any fish samples. Concentration assumed to be minimum detectable

255 121

IV. A. OFFSITE LIQUID RELEASES AND DOSES

1. Releases

The releases of radionuclides in liquid effluents to the Susquehanna River have been within expected values as a result of the refueling outage of Unit 1. From March 28, 1979 to April 30, 1979, 10.7 curies of tritium and about 0.3 curies of various activation and corrosion products have been released to the river from both units. (Table IV-1).

As a result of the accident on March 28, 1979, the only radionuclide released in significant concentrations and quantities has been Iodine-131. The total quantity of Iodine-131 released through April 30 is approximately 0.24 curies. Although the release of Iodine-131 in liquid effluents did exceed normal levels, the levels did not exceed either the Technical Specification release rate limits, or concentration limits in 10 CFR 20.106, averaged over one day.

A block diagram of the liquid release flow paths for the Three Mile Island Station is shown in Figure IV-1. The Industrial Waste Treatment System (IWTS) and the Industrial Waste Filter System (IWFS) are used to filter and, if necessary, neutralize floor drainage from areas having low potential for significant radioactive contamination. Following the accident, small quantities of radioactive iodine entered the stream which feeds the IWTS and IWFS.

The secondary neutralization tank receives non-radioactive liquid waste from a system in which raw river water is purified for use in the plant. Since the system does not process plant effluents, but only processes river water, no radioactive iodine would be expected to enter the tank. Analysis of tank contents at various times has confirmed that no radioactive iodine has entered this system.

The Waste Evaporator Condensate Storage Tanks (WECST) A and B are the normal operation hold up tanks for radioactive liquid waste. These tanks receive liquid waste which, if necessary to meet effluent limits, has been processed to remove radioactivity. These tanks are located in Unit 1, but receive liquid wastes from both units. Controlled batch releases of radioactive liquid wastes to the Susquehanna River has been made from these tanks in accordance with plant procedures and Technical Specifications after analysis of samples and dilution in the mechanical draft cooling tower blowdown to the river water. Discharges from these tanks are controlled so that calculated concentrations do not exceed 10 percent of 10 CFR 20 MPC_W after dilution in mechanical draft cooling tower effluent prior to discharge.

Prior to the accident, effluents from IWTS and IWFS were not routinely sampled and analyzed because the potential for any contamination of these systems was extremely low. As a result of the accident some Iodine-131 was introduced into streams feeding these systems, and most of the Iodine-131 released to the Susquehanna River through April 30 has come from the IWTS and IWFS, during the period March 31, 1979 through April 2, 1979.

255 122

Since March 28 at 0700, all but five releases from the IWTS and IWFS systems were sampled. Releases from these five discharges were estimated from discharges made later. All liquid releases are monitored continuously by a monitor at the point of discharge, to the river. Data from this monitor during these five discharges indicate that these estimates are reasonable.

Detailed ^{131}I data from each liquid release are included in Table IV-2. Daily ^{131}I release quantities are plotted in Figure IV-2 and 3.

2. Environmental Measurements

The Radiological Environmental Monitoring Program conducted by Metropolitan Edison Company includes analysis of river surface water, downstream drinking water from treatment plants and aquatic biota. Except for three samples collected March 31, April, and 2, at Station 7G1, the Columbia Water Plant intake, which showed levels of Iodine (0.4, 0.72 and 0.66 pCi/l) slightly above minimum detectable concentrations and one sample, collected April 27 at Station 7G2, the Wrightsville Water Treatment Plant (0.49 pCi/l), also only slightly above minimum detectable concentration, no gamma emitting isotopes other than low levels of naturally occurring potassium-40 and radium-226 were detected. Tritium and gross beta measureable at Station 7G1 and 7G2 are consistent with measured iodine release rates for the same period, shown in Figure IV-2 and 3, assuming liquid effluent has been fully mixed in the river prior to sampling downstream.

3. Estimated Offsite Exposures

Radiation doses estimated from the measurements described above are extremely low, a few hundredths of one millirem for a person drinking water or eating fish from the river or using the river for swimming, boating, or shoreline activities. The dose to the population from these liquid effluent pathways is only a few hundredths of a person-rem. Detailed results are included in Attachment 1.

TABLE IV-1

SUMMARY OF RADIONUCLIDES
RELEASED TO THE SUSQUEHANNA RIVER

(3/28/79 - 4/30/79)

Radionuclide	Activity (Ci)
^{3}H	10.670
^{51}Cr	3.5E-4
^{54}Mn	4.11E-4
^{58}Co	0.022
^{60}Co	6.9E-3
^{95}Zr	4.83E-5
^{95}Nb	1.82E-4
^{110m}Ag	1.25E-3
^{131}I	0.235*
^{132}I	3.44E-4
^{133}I	1.4E-4
^{133}Xe	0.012
^{134}Cs	2.11E-3
^{136}Cs	2.7E-4
^{137}Cs	5.61E-3
^{140}La	1.29E-3
^{140}Ba	5.99E-4

*^{131}I is the only radionuclide of significance released to the river from the Unit 2 accident of March 28, 1979. Other isotopes came primarily from Unit 1.

TABLE IV-2

LIQUID EFFLUENT RELEASES

(All data refers to I-131)

Start	Stop	Tank	[1] Concentration at Station Discharge (dilution calc.) (μCi/cc)	[2] Concentration at Station Discharge (grab samples) (μCi/cc)	μCi Discharged	Cumulative μCi Discharged
3/28 0400	3/28 0900	IWTS	$1.6x10^{-7}$	$4x10^{-8}$ at 1100 hrs.	6469	6,469
3/28 0320	3/28 0655	WECST-B	None		None[3]	6,469
3/29 0015	3/29 1215	WECST-B	None		None	6,469
3/29 1315	3/29 1410	IWTS	$7.5x10^{-10}$		7.5	6476.5
3/29 1610	3/29 1815	IWTS	$7.5x10^{-10}$	$5.4x10^{-10}$* at 1700 hrs.	17.0	6493.5
3/30 0020	3/30 0753	SEC. NEUT.	None		None[4]	6493.5
3/30 1200	3/30 1630	IWTS	$1.2x10^{-9}$		135.8	6629.3
3/30 0300	3/30 1600	IWTS	$6.7x10^{-10}$		153	6782.3
3/30 2020	3/30 2253	SEC. NEUT.	None		None	6782.3
3/31 0140	3/31 0430	IWTS	$2.5x10^{-8}$		241.3	7023.6
3/30 1600	3/30 2400	IWTS	$5.8x10^{-8}$		6,981	14004.6
3/31 0001	3/31 2400	IWTS	$2.7x10^{-7}$		92,112	106116.6
3/31 0240	3/31 0710	WECST-A	$3.9x10^{-9}$		140	106256.6
3/31 2230	4/1 1030	SEC. NEUT.	None		None	106256.6
4/1 0630	4/1 1304	WECST-B	None		None	106256.6

255 125

* Data from REMP performed by Porter-Gertz Consultants

TABLE IV-2

LIQUID EFFLUENT RELEASES (Cont'd)

(All data refers to I-131)

Start	Stop	Tank	(µCi/cc) [1]Concentration at Station Discharge (dilution calc.)	(µCi/cc) [2]Concentration at Station Discharge (grab samples)	µCi Discharged	Cumulative µCi Discharged
4/1 0001	4/1 2400	IWTS	1.49×10^{-7}	6.2×10^{-8}* 2020 hrs.	54678	160934.6
4/1 0130	4/1 0534	IWFS	2.5×10^{-8}		346.3	161280.9
4/1 1521	4/1 1915	IWFS	2.5×10^{-8}		396	161676.9
4/2 0001	4/2 1850	IWTS	1.08×10^{-7}	1.5×10^{-8}* 1130 hrs.	27354	189530.9
4/2 1650	4/2 1850	SEC. NEUT.	None		None	189530.9
4/2 0515	4/2 1110	IWFS	2.5×10^{-8}		394.6	189925.5
4/3 1025	4/3 1915	SEC. NEUT.	None	7.3×10^{-10}* 1540 hrs.	None	189925.5
4/4 4/5 1813	4/6 0750	WECST-A	1×10^{-8}	2×10^{-10}* 1815 hrs; 1.0×10^{-10} 4/5 at 1305 hrs.*	1010	190935.5
4/5 1300	4/6 0003	SEC. NEUT.	None		None	190935.5
4/6 0310	4/6 0400	IWTS	1.9×10^{-7}		480.1	191415.6
4/6 0615	4/7 2230	IWTS	7.9×10^{-8}	5.9×10^{-9}* 4/6 at 1640 hrs.	16668	208083.6
4/6 1930	4/7 0450	IWFS	5.1×10^{-8}		930.9	209014.5
4/7 0355	4/7 1430	SEC. NEUT.	None	$<6\times10^{-8}$; 5.3×10^{-9}* 4/7 at 1045 hrs.	None	209014.5

*Data from REMP performed by Porter-Gertz Consultants

255 126

Table IV-2
LIQUID EFFLUENT RELEASES (cont'd)

(All data refers to I-131)

[illegible]	Stop	Tank	($\mu Ci/cc$) [1] Concentration at Station Discharge (dilution calc.)	($\mu Ci/cc$) [2] Concentration at Station Discharge (grab samples)	μCi Discharged	Cumulative μCi Discharged
5 -	4/8 0130	WECST-B		$<4x10^{-8}$ $<3 \times 10^{-10}$* 4/8 at 1100 hrs.	1180	210194.5
3 -	4/9 0945	SEC. NEUT	None	$<4x10^{-8}$	None	210194.5
5 -	4/9 0945	WECST-B		$<4x10^{-8}$ $<2 \times 10^{-10}$* 4/9 at 1910 hrs.	443	210637.5
5 -	4/10 1410	IWFS	5.7×10^{-9}	$<6.5x10^{-8}$ 4.2×10^{-9}* 4/10 at 1710 hrs.	80.6	210718.1
5 -	4/10 1900	WECST-A		$<6.5x.0^{-8}$	129.0	210847.1
	4/11 1600	SEC. NEUT.	None	$<1.1x10^{-8}$ 1.4×10^{-9}* 4/11 at 1620 hrs.	None	210847.1
	4/12 1230	WECST-B		$<3.9x10^{-9}$ 1.5×10^{-9}* 4/12 at 2000 hrs.	200.0	211047.1
	4/13 2005	WECST-A	None	$<3.6x10^{-9}$	None	211047.1
	4/13 1130	SEC. NEUT.	None	$<3x10^{-9}$	None	211047.1
	4/13 0449	WECST-B		$<5.1x10^{-8}$	60.0	211107.1
	4/13 0535	IWTS	2.1×10^{-8}	$<2.3x10^{-8}$	6,208	217315.1
3	4/14 0117	IWFS	4.8×10^{-8}	$<1.6x10^{-8}$ 1.2×10^{-9}* 4/13 at 1230 hrs.	1,956	219271.1
	4/14 0440	WECST-A	None	$<5.1x10^{-8}$	None	219271.1
	4/15 0215	IWTS	7.8×10^{-9}	$<2.2x10^{-8}$ 1.9×10^{-9}* 4/14 at 1530 hrs.	1325	220596.1
	4/15 2015	WECST-A		$<3.6x10^{-8}$ 2.3×10^{-9} 4/15 at 1550 hrs.	1590.0	222186.1
	4/16 1915	IWFS	1.2×10^{-9}	$<3.0x10^{-8}$ $<3 \times 10^{-10}$ 4/16 at 1610 hrs.	102.6	222288.7

255 107

Table IV-2

LIQUID EFFLUENT RELEASES (Cont'd)

(All data refers to I-131)

rt	Stop	Tank	[1] (μCi/cc) Concentration at Station Discharge (dilution calc.)	[2] (μCi/cc) Concentration at Station Discharge (grab samples)	μCi Discharged	Cumulative μCi Discharged
7 5	4/17 1610	IWTS	9.5×10^{-9}	7.5×10^{-8} 7.8×10^{-9}* 4/17 at 1810	21.5	222310.2
 .3	4/18 1048	WECST-A		6.5×10^{-8}	2112	224422.2
18 22	4/18 1945	WECST-B	4.6×10^{-9}	7.78×10^{-8} 4.8×10^{-9}*	23	224445.2
18)	4/18 2400	IWTS	6.4×10^{-9}	5.1×10^{-8} 4.8×10^{-9}* 4/18 at 1930	4.5	224449.7
.9 0	4/23 0450	IWTS	3.5×10^{-8}	3.5×10^{-8}	2910.88	227360.58
9 5	4/19 2005	WECST-B		3.7×10^{-8} 3.65×10^{-9}* μCi/cc 4/19 at 2150 hrs.	315	227675.58
.0 .5	4/20 2125	IWFS	3.1×10^{-8}	3.1×10^{-8} 5.75×10^{-9}* μCi/cc 4/20 at 2010 hrs.	77	227752.58
0 0	4/21 0255	WECST-A		1.39×10^{-8} 1.65×10^{-9}* μCi/cc 4/21 at 1535 hrs.	862	228614.58
3 0	4/24 0230	WECST-A		6.9×10^{-10}	1520	230134.58
3 .0	4/23 1856	SEC. NEUT. TANKS	None	3.1×10^{-8} 4.2×10^{-9}*	None	230134.58
3 .0	4/24 0310	IWFS	3.1×10^{-8}	3.1×10^{-8} 2×10^{-10}*	108	230242.58
4 0	4/25 0630	WFCST-B		1.7×10^{-8} 3×10^{-10}*	1200	231442.58
4	4/25 0755	SEC. NEUT. TANKS	None	2×10^{-8}	None	231442.58
5 .2	4/26 1300	WECST-A		1.4×10^{-8} 9.8×10^{-10}	43.7	231486.28
5	4/27 1113	IWTS	2.5×10^{-9}	2.5×10^{-9}	261.67	231747.95
6 0	4/27 1515	WECST-B		1.4×10^{-8} 1.5×10^{-9}*	1480	233227.95
7 0	4/28 0015	IWFS	3.1×10^{-8}	3.1×10^{-8} 1.1×10^{-9}	7.9	233235.85

255 128

Table IV-2

LIQUID EFFLUENT RELEASES (Cont'd)

(All data refers to I-131)

[illegible]	Stop	Tank	[1] (μCi/cc) Concentration at Station Discharge (dilution calc.)	[2] (μCi/cc) Concentration at Station Discharge (grab samples)	μCi Discharged	Cumulative μCi Discharged
.7)5	4/28 0425	Sec Neut Tanks	None	3.1×10^{-8} 1.1×10^{-9}*	~~None~~	~~233235.35~~
.7 .5	4/28 1515	WECST-A		3.1×10^{-8}	592	233827.35
.8 0	4/29 0830	Sec Neut Tanks	None	3.1×10^{-8} 4.0×10^{-10}*	None	233327.85
0 5	4/30 1515	Sec Neut Tanks	None	3.1×10^{-8}	None	233827.35
.7 .0	4/30 2400	IWTS	1.9×10^{-9}	3.1×10^{-8} 1.7×10^{-9}*	588.3	234515.65

NOTES

1 Calculated based on average tank sample and known dilution factor (df) data during the period of time that the tank was being released. Discharges for IWTS are averaged over a 24 hour period.

2 Calculated by averaging the station discharge (RML-7) grab samples taken during the time the tank was being released If the number appearing in this column is a "less than" (<) number, all the numbers averaged were less than MDA numbers and the MDA's were used for the purpose of averaging. This calculation is conservative in that it overestimates the actual I-131 concentration at the station discharge.

3 WECST Tank releases are controlled by procedure HP 1621 which limits the release concentration to 0.1 MPC. The HP 1621 permit takes the specific activity of all the isotopes in the tank, assumes a dilution factor from MDCT flow and calculates a release rate so that 0.1 MPC is not exceeded while discharging.

<u>NOTES</u> (Continued)

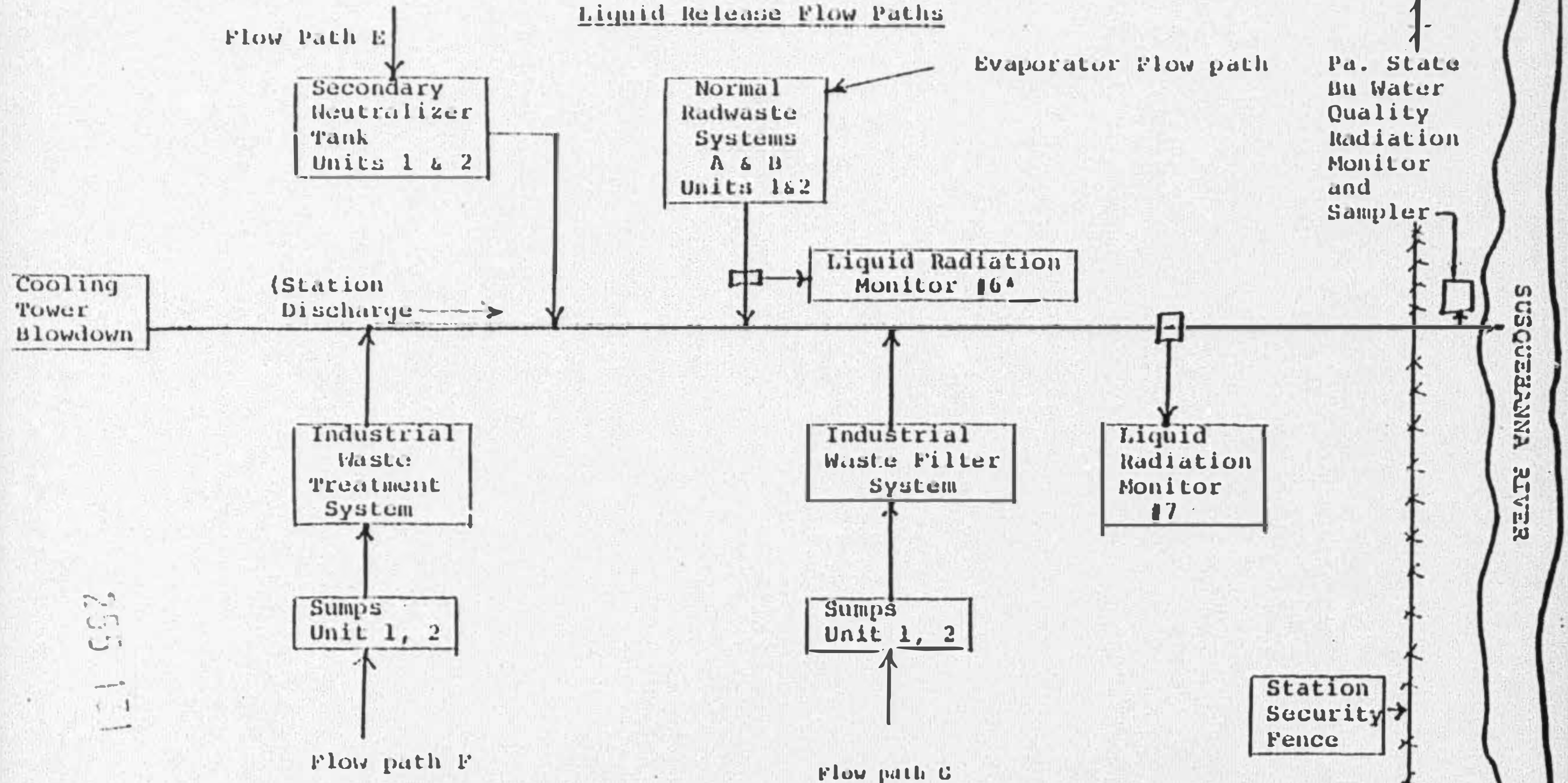
a The source of water into the Secondary Neutralizing Tank is from the regeneration of the Illinois Water Treatment System demineralizers. The Illinois Water Treatment System produces demin water by taking pretreated river water from upstream of the station discharge and sending it through demineralizers. The water from the regeneration of these demineralizers goes to the Secondary Neutralizing Tank. All isotopic samples on this tank showed no detectable I-131 or I-133.

Since the input to this tank is essentially river water from upstream of the station discharge, it is reasonable to assume that from 3/28 at 0400 to 4/2 at 1350, no I-131 was released from this tank.

Figure IV-1

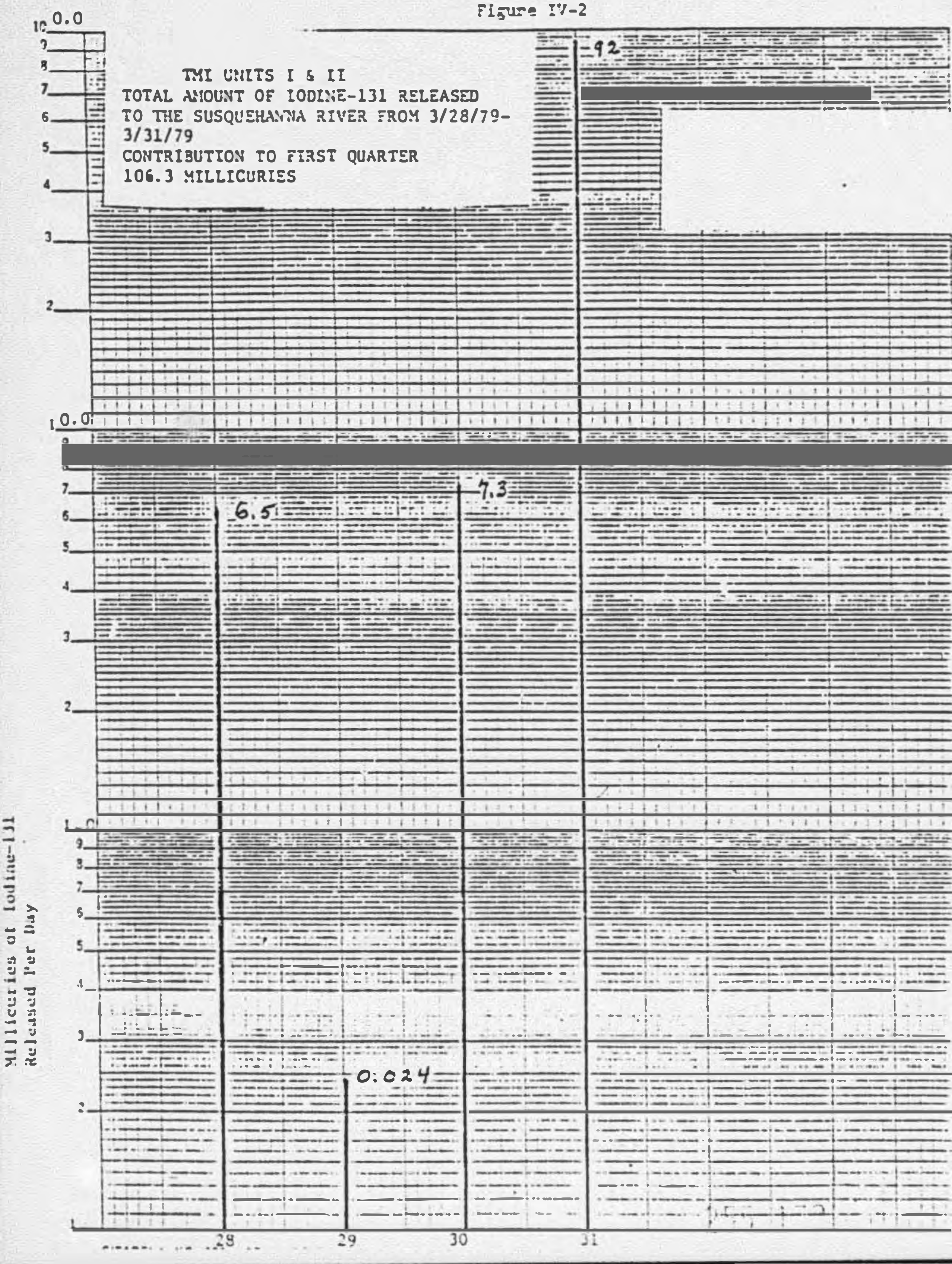
Three Mile Island

Liquid Release Flow Paths

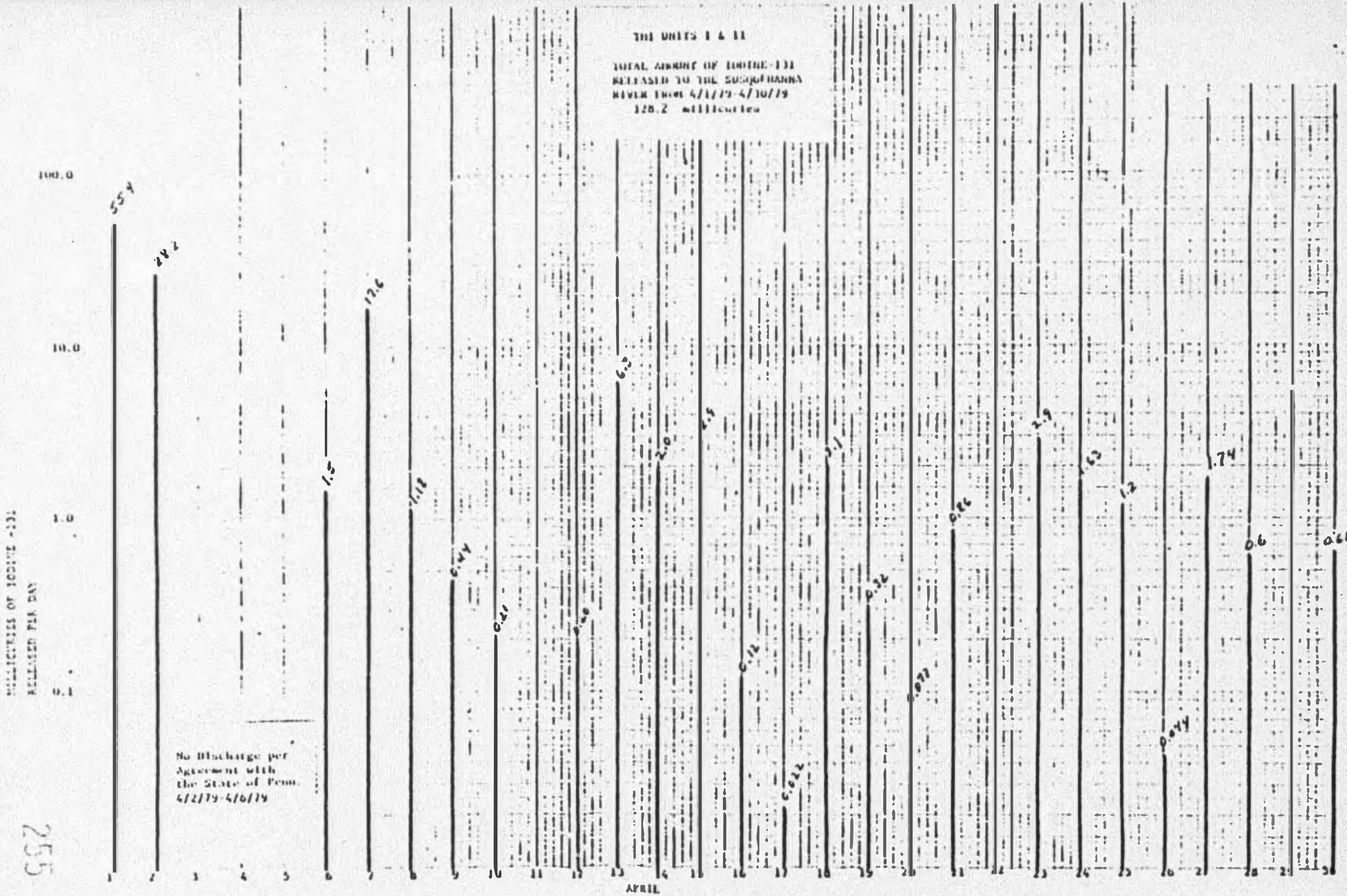


*Liquid radiation monitors consist of a shielded sodium iodide crystal, a single channel analyzer, a strip chart recorder in each control room and alarms in both control rooms. Monitor #6 automatically closes the discharge valve when it alarms. Cooling tower blowdown and the secondary neutralizer tank streams, flow path E, do not normally contain radioactivity and have not contained radioactivity throughout the course of the accident. The industrial waste treatment system, flow path F, and industrial waste filter system, flow path G, do not normally contain radioactivity but contained small amounts of iodine 131 after the accident.

Figure IV-2



TMI UNITS I & II
TOTAL AMOUNT OF IODINE-131 RELEASED
TO THE SUSQUEHANNA RIVER FROM 3/28/79-3/31/79
CONTRIBUTION TO FIRST QUARTER
106.3 MILLICURIES
[redacted]
92
[redacted]
6.5
7.3
0.024
Millicuries of Iodine-131
Released Per Day
28
29
30
31


THE UNITS I & II
TOTAL AMOUNT OF IODINE-131
RELEASED TO THE SUSQUEHANNA
RIVER FROM 4/1/79-4/30/79
128.2 millicuries
MILLICURIES OF IODINE -131
RELEASED PER DAY
100.0
10.0
1.0
0.1
No Discharge per
Agreement with
the State of Penn.
4/2/79-4/6/79
APRIL

255 133

IV. B. OFFSITE NOBLE GAS RELEASES AND DOSES

1. Estimated Releases

During the period March 28, 1979 through April 30, 1979, about 12 million curies of noble gases were released to the environment via the ventilation system of Units I and II. All of this release was a result of the Unit II accident of March 28, 1979.

A detailed evaluation of strip chart records for all noble gas radiation monitors located in effluent streams indicates that no significant releases of noble gases occurred for the first three hours following the reactor trip at 4 A.M. Shortly after 7 A.M., noble gas effluent monitors increased rapidly to full scale and remained at that level for days, probably due to high area radiation levels in the vicinity of the monitors. Therefore, these data can only be used to indicate when significant releases began.

Most area radiation monitors, however, remained on scale throughout the accident and were used to provide some insight as to when release rates may have been changing. In making these determinations, it is believed that these monitors were responding to airborne gases, and they may also have been influenced by radioactive liquids or gases in nearby tanks and pipes. The fact that almost all Auxiliary Building area monitors respond in parallel, periodically rising to a peak, then returning to an elevated baseline, suggests that the primary influence during fluctuations is airborne gases and not other local sources, because local sources would not affect all monitors the same way. It was noted that this behavior frequently corresponded to operations in which Makeup Tank gas was pumped to the Radwaste Gas Decay Tanks, after the third day of the accident. Brief periods when the Auxiliary Building ventilation system was not operating probably resulted in decreased releases to the environment and probably accounted for observed increased area monitor indications during these periods. Attempts were made to avoid using area monitor indications for estimating releases during periods when the ventilation system shutdown.

Figure IV-B-1 summarizes the approximate relative increases and decreases in these area monitor indications observed during the time that noble gas effluent monitors were not providing useable data. These data can only provide a relative indication of the rate of release and are not sufficient to establish the actual quantitities released.

A procedure was developed to scale the release trend (e.g. in Fig. IV-B-1) such that dose estimates based on assumed releases rates and measured meteorological conditions matched doses measured by TLD's. This procedure was used for the period during which noble gas effluent monitors were unavailable and environmental doses were measurable, starting on March 28 through March 31, 1979, when grab samples became readily available. This extra procedure utilizing TLD agrees with grab sample data. Because there was general agreement between doses calculated using this procedure and doses measured at different locations, it was concluded that the derived releases developed were appropriate. The TLD monitoring program is discussed below.

255 134

After April 22, 1979, effluent monitoring was reestablished. Figure IV-B-2 illustrates the estimated noble gas releases through April 30, 1979. Grab samples data were available, as shown on Figure IV-B-2 for certain periods before effluent monitoring was reestablished.

Using the estimated release rates and associated periods of time, the total number of curies of each isotope are computed as given in Table IV-B-1. Of the total 12 million curies of noble gases released during the period March 28, 1979 through April 30, 1979, about 76% was attributable to Xe-133. Most (63%) of the total activity was released during the first day and a half following the accident, with another 20% of the total occurring in the next two days. The release on Friday morning, March 30, 1979, which caused federal and state agencies to consider evacuation was not as significant as prior releases had been. See Figure IV-B-1.

2. Environmental Measurements

The highest measured exposure offsite for the period March 28, 1979 through April 30, 1979 was less than 83 mR at Station 4A1, 1200 meters north-northeast of the site.

Metropolitan Edison Company conducts a routine Radiological Environmental Monitoring Program (REMP) described in detail in Attachment 1. This program includes the use of stationary thermoluminescent dosimeters (TLD's) which measure integrated gamma dose. Theyare in place at all times at 20 locations as shown on the map in Attachment 1. These dosimeters were in place in the field at the time the accident occurred and have been a part of the REMP for more than five years. Eight of the TLD locations are on-site. The other twelve are offsite, including locations in Goldsboro and Middletown. Most are within several miles of the plant, but a few are located up to 15 miles away. Dosimeters in the field were replaced with fresh dosimeters every one to three days following the accident, and the collected dosimeters were evaluated to determine trends for dose rate as well as the dose accumulated since the beginning of the accident. These data represent a comprehensive measurement of doses due to noble gas releases at the locations monitored.

It was considered for purposes of this analysis that TLD data was the best available for the determination of cumulative doses and B-γ survey meters data were not used in this assessment except in attempts to determine when noble gas releases were significantly higher than baseline values.

3. Estimated Offsite Whole Body Doses

Mathematical models for estimating doses to individuals and populations normally use known isotope release rates and meteorological parameters. However, since noble gas releases were not monitored release rates estimated using the procedure described above were used to estimate doses to individuals at locations not monitored by TLD's and to the population within 50 miles of the plant. For these calculations, an atmospheric dispersion model which had been previously used only for estimates at TLD locations close to the plant was extended to a distance of 50 miles in each of 16 direction sectors.

255 175

Population dose estimates were computed using the straight line dispersion model and site meteorological data to compute the whole body dose each hour at 10 locations down wind in the sector in which the wind was blowing. There is some evidence that channeling of the plume within the river may have occurred, however, this is not expected to have a significant affect on population dose calculations. These hourly doses were added for all hours in the period after the accident extending to April 30, 1979 and multiplied by the population in each of these 10 distances. The estimated 1980 population given in the TMI-2 FSAR was used. Results of this analysis indicate that the aggregate whole body dose to the population within 50 miles (about two million people) was about 3300 person-rems from noble gases released through April 30, 1979. This estimate does not consider the effect of shielding due to housing or other structures which could reduce dose estimates by a factor of 2 to 3. The uncertainty in this calculation is estimated to be about a factor of two without consideration of structural shielding.

The highest offsite integrated exposure measurement at any TLD location through April 30, is about 43 millirems above background at a location about 1200m NNE from the plant.

It should be noted that the maximum measured noble gas exposure, about 83 millirem, is comparable to the increased exposure between Harrisburg, Pennsylvania and Denver, Colorado for one year because the natural background radiation levels in Denver are greater than those in Harrisburg. Based on calculations the average dose received by the population within 50 miles was about 1 millirem, one-third of the dose received in a round trip transcontinental subsonic plane flight.

TABLE IV-B-1

Estimated Quantities (Ci) of Each Isotope for Release Periods Corresponding to TLD Measurements

	Period of TLD Exposure (yr,mo,day,hr)					
Isotope	79032807-79032917	79032918-79033117	79033118-79040315	79040316-79040613	79040614*-79043024	TOTAL (Ci)
Xe-133	5.2E6	2.7E6	1.0E6	2.8E5	1.5E4	9.2E6
Xe-133m	7.6E5	3.0E5	6.8E4	8.3E3	0	1.1E6
Xe-135	1.4E6	6.5E4	0	0	0	1.5E6
Xe-135m	1.7E5	0	0	0	0	1.7E5
Kr-88	5.5E4	0	0	0	0	5.5E4
	7.6E6	3.1E6	1.1E6	2.8E5	1.5E4	1.2E7

* The last three weeks of the month are combined into one group since the contribution is less than 1% of the total.

255 137

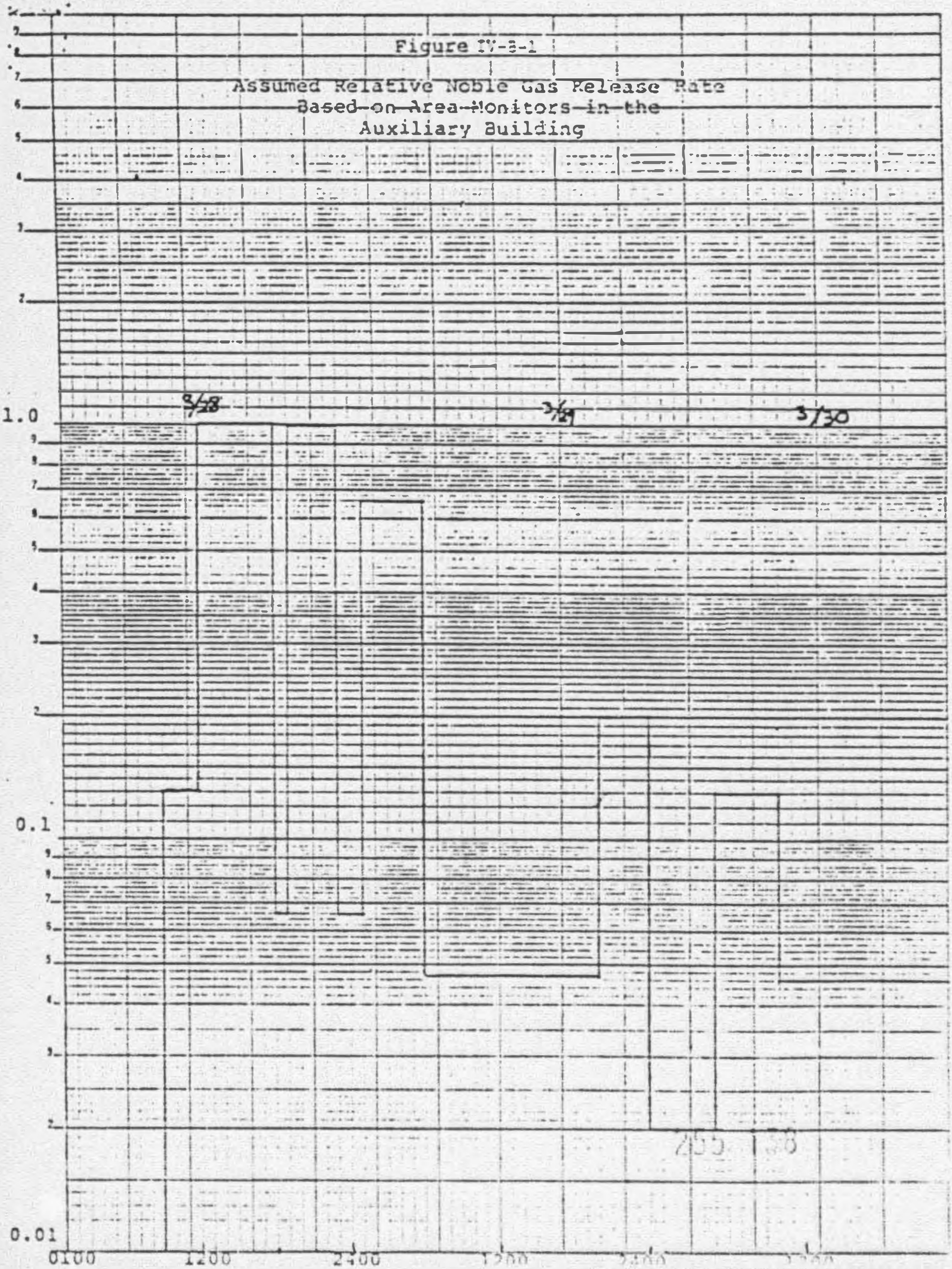
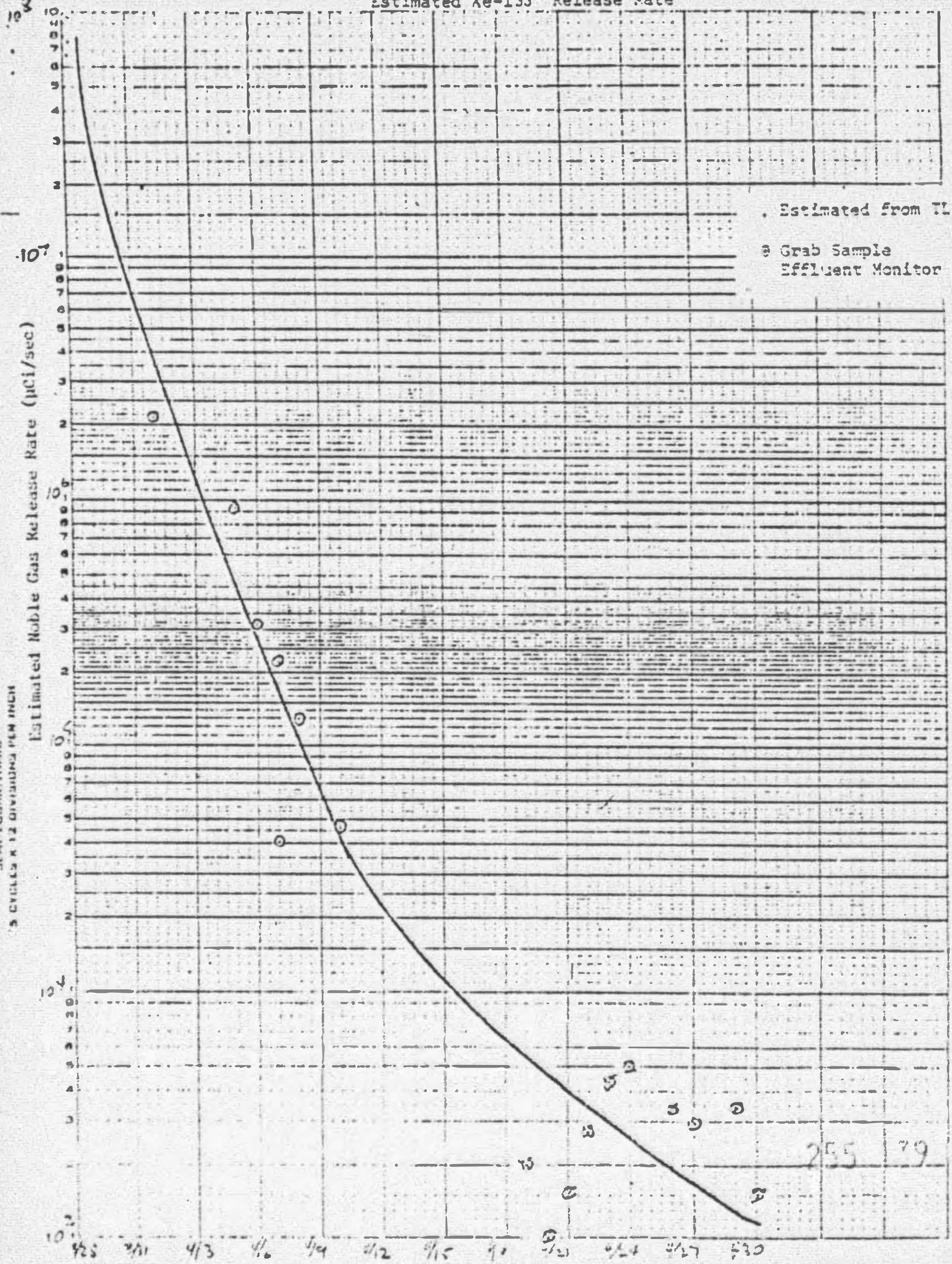


Figure IV-3-1

Assumed Relative Noble Gas Release Rate Based on Area Monitors in the Auxiliary Building

FIGURE IV 3-2
Estimated Xe-133 Release Rate



255 79

IV-C. OFF-SITE IODINE AND PARTICULATE RELEASES AND DOSES

1. Releases

During the period March 28, 1979 through April 30, 1979 about 14.1 curies of ^{131}I, and 2.6 curies of ^{133}I were released to the environment via the ventilation systems of Unit 1 and 2. All of this release was a result of the Unit 2 accident of March 28, 1979.

Preliminary evaluations of measured particulate concentrations and releases indicate these isotopes are not significant in off-site assessments. These evaluations are continuing and results will be presented in a later report.

Plant gaseous effluent streams are continuously sampled for particulate isotopes and iodines by drawing a small side stream through a filter which traps particulate isotopes and a treated charcoal cartridge which traps iodine. After removal, the filters and cartridges are analyzed in the laboratory to determine isotope concentrations in the effluent air.

Iodine samples from the Unit 2 vent (HPR-219) have been collected at frequent intervals since the beginning of the accident. Samples were collected and analyzed every other day. For a few short periods of time data are not available from HPR-219 and release rates are interpolated for these periods. The interpolations are supported by analyses of continuous air samples drawn from individual input streams covering the period of interpolation.

Table IV-C-1 and Figure IV-C-1 summarize the releases of iodine through April 30, 1979 from the plant vent. For purposes of the dose calculations release rates shown on Figure IV-C-1 have been grouped over periods of about 3 days as shown in Table IV-C-1. Shorter time periods are used during periods of changing release rates. All heating and ventilation system effluent passes through samplers before release to the plant vent.

2. Environmental Measurements

In support of routine plant operations, Metropolitan Edison Company conducts an Radiological Environmental Monitoring Program which includes continuous air samples. Included are continuous air samples of iodines and particulates, vegetation samples and milk samples. This program has continued with a higher sampling frequency since the accident. Attachment 1 includes a tabulation of these data and a brief discussion of the program. Results indicate that Iodine-131 was the only iodine or particulate isotope released in significant quantities. This isotope was detected in air and milk, as discussed below, and was also detected in some grass samples.

3. Estimated Off-Site Exposures

A summary of off-site doses from radioactive iodines is given in the Executive Summary Table.

Estimates of off-site doses from iodines are accomplished using a standard straight line atmospheric dispersion model (with onsite meteorological data). Of the particulate and iodine isotopes released, only ^{131}I is of significance in off-site dose calculations.

The dose from ^{131}I results from concentration of this isotope in the thyroid gland following intake from inhalation of air containing iodine and ingestion of milk containing iodine. The iodine in milk results from deposition on pasture grass after release.

An analysis using measured release rates and meteorological data has been made to estimate the average ^{131}I concentration at all offsite locations near the plant. The highest average concentration from March 28, 1979 to April 30, 1979 was estimated to be 6.3×10^{-12} uCi/cc in the SE direction. If an adult had resided there through the accident, the inhalation dose would have been about 6.3 mrem. No other age group would be more than 30% higher.

Population doses through ingestion of milk produced in the site region has been estimated using the atmospheric dispersion model in the computer routine out to 50 miles.

Detailed cow inventories were available out to a distance of 5 miles. However, beyond 5 miles, county milk production rates were relied upon to estimate cow populations assuming each cow produces 34 pounds of milk per day. The milk production rates for the 50-mile radius suggest a population of about 300,000 dairy cows with a population density in sectors to the ENE, E, ESE, and SE approximately 2.5 the density in other sectors about 75 cows per square mile versus 30. There is evidence from cow population surveys within five miles that stored feed is an important fraction of the dairy cattle diet. Furthermore, data on land use in three counties near the plant indicate that only 5 to 10 percent of the land is used to support dairy cows. At the yield specified in Regulatory Guide 1.109, that pasture land could only provide about 20 percent of the diet for 300,000 cows. In addition, warnings had been issued to keep cows in barns during the period following the accident. For these reasons, it has been assumed that pasture grass accounted for 30% of the average cow's diet. In addition, the portion of iodine that was released in organic form, which does not deposit on grass, was measured periodically and found to be less than 30 percent on the average, and has been taken into account for this analysis. Iodine concentrations in milk were determined using the models which serve as a basis for Regulatory Guide 1.109 relationships and parameter values given in the same guide. The population dose was estimated by calculating the average concentration in milk produced within 50 miles, accounting for dilution due to atmospheric dispersion. All milk produced was assumed to be consumed.

Results of the above calculations indicated the potential for population thyroid doses to be 900 person-rems.

The above dose estimates have been made independent of measured iodine concentrations in air and milk. Measurement results in Attachment 1 indicate peak iodine levels in milk to be less than 110 pCi/l with an average from March 28 through April 30 at any one sample location of 29 pCi/l. These figures apply to goat milk collected at location 1B1, about one mile north of the plant. The comparable values for cow milk are 21 pCi/l peak and 2.8 pCi/l average at location 7B1, 1.4 miles SE. If an infant had been consuming this milk through April 30, 1979, his dose is estimated to be 1.2 millirems from cow milk or 11 millirems from goat milk. However, as noted in Attachment 1, the goat milk is not now being used for human consumption. Airborne sample results (Attachment 1) indicate that average airborne iodine concentrations at any location through April 30, 1979 were 2.9 pCi/m^3, which would result in an inhalation dose of 2.7 millirems.

The doses from releases of radioactive iodine have been very low. As a matter of perspective, a round-trip transcontinental plane flight results in an incremental dose of 3 millirems and a resident of the area in the vicinity of the plant normally receives about 8 millirems each month from naturally-occurring radiation.

255 142

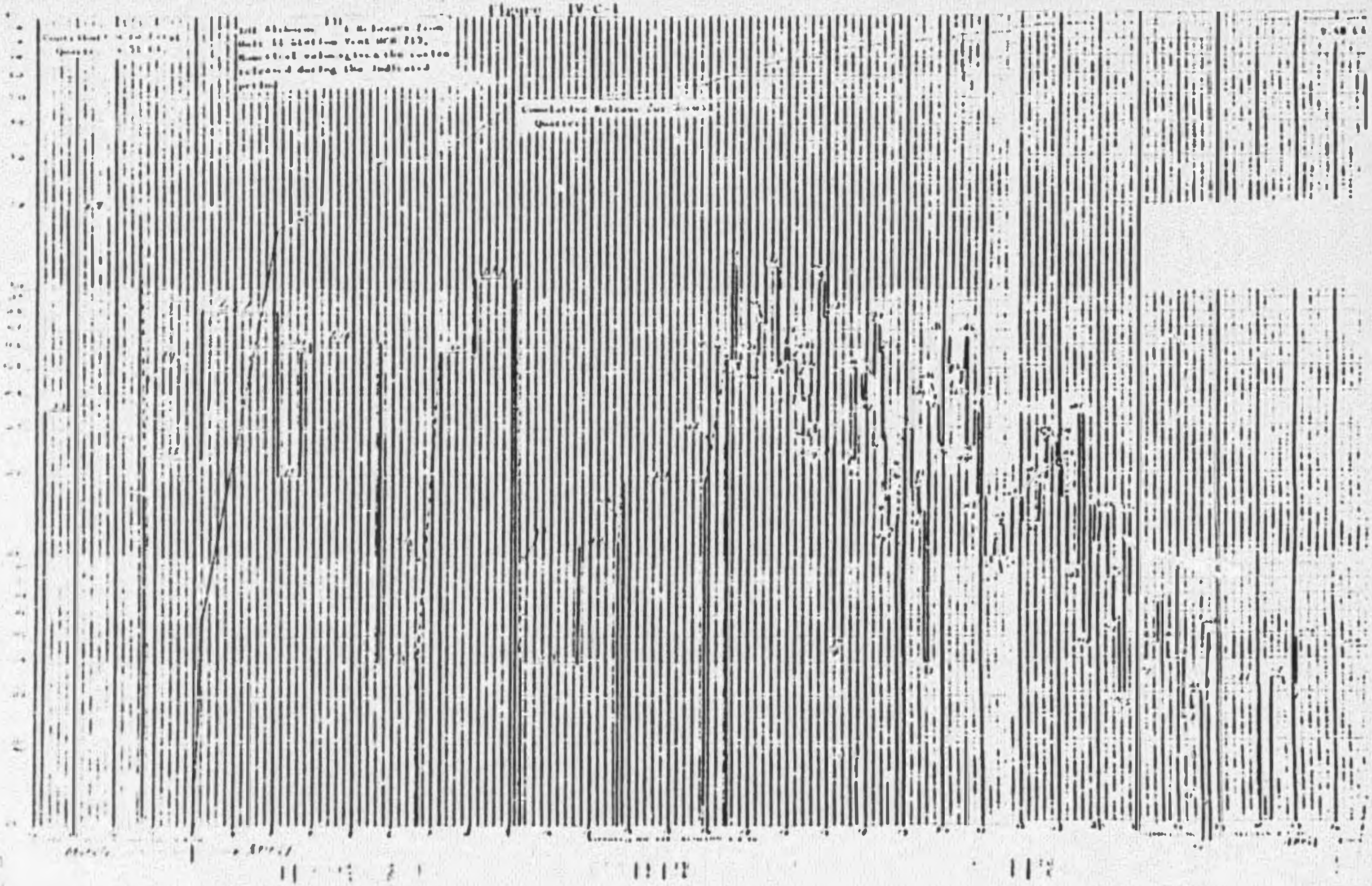
TABLE IV-C-1

Smoothed Iodine Release Rate Data Used in Dose Assessments

Start Date (Yr. Mo. Date Hr.)	^{131}I Release Rate µCi/sec
79032804	4.2[1]
79032819	22.7
79033022	2.7
79040106	9.7
79040303	2.3
79040319	7.0
79040519	0.43
79040615	3.7
79040706	6.9
79040803	12.7
79040909	0.46
79041016	1.3
79041119	2.2
79041323	4.1
79041410	6.6
79041505	3.5
79041508	14.0
79041513	6.0
79041516	11.0
79041524	3.0
79041716	5.5
79041804	7.5
79041809	2.0
79041914	5.5
79042022	1.5
79042213	2.5
79042304	1.0
79042312	3.6
79042316	1.5
79042406	0.30
79042516	0.50
79042600	0.46
79042700	0.37
79042808	0.39
79042900	0.56
79043000	0.48

[1] Iodine release rates are roughly constant over the period from one start time to the next.

Figure IV-C-1



255 144

ATTACHMENT I

RADIOLOGICAL ENVIRONMENTAL
MONITORING PROGRAM

ATTACHMENT 1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Introduction

A Radiological Environmental Monitoring Program (REMP) for Three Mile Island Nuclear Station (TMINS) has been conducted by Metropolitan Edison Company since June 1969. The REMP has a preoperational program and an operational program. Unit 1 achieved initial criticality on June 5, 1974, which marked the beginning of the operational phase of the REMP for Unit 1. The Operational REMP for Unit 2 began on March 28, 1978, when this unit achieved initial criticality.

In the operational phase of the REMP, radioanalytical data are collected for comparison to that generated in the preoperational phase. Differences between these two periods are compared to determine whether any station effects exist based on the magnitude and fluctuations of radioactivity levels determined in the preoperational phase.

The objectives of the operational radiological environmental program are:

1. To determine whether any statistically significant increases occur in the concentration of radionuclides in critical pathways;

2. To detect any buildup of long-lived radionuclides in the environment;

3. To detect any change in ambient gamma radiation levels;

4. To verify that radioactive releases are within allowable limits and that TMINS operation has no detrimental effects on the health and safety of the public or on the environment; and

5. To fulfill the obligations of the Radiological Environmental Surveillance sections of the Environmental Technical Specifications.

In order to meet the stated objectives, samples for the operational REMP are taken from the aquatic, atmospheric, and terrestrial environments. Samples of various media are selected to obtain data for the evaluation of the radiation dose to man and important organisms. Sample types are based on (1) established critical pathways for the transfer of radionuclides through the environment to man, and (2) experience gained during the preoperational and earlier operational phases. Sampling locations are determined from site meteorology, Susquehanna River hydrology, local demography and land uses.

Sampling locations are divided into two classes--indicator and control. Indicator stations are those which are expected to show station effects, if any exist; control samples are collected at locations which are believed to be unaffected by station operations. Fluctuations in the levels of radionuclides and direct radiation at indicator stations are evaluated with respect to analogous fluctuations at control stations, which are unrelated to station operations. Indicator station data are also evaluated relative to background characteristics established prior to station operation. Additional samples beyond those required by the Environmental Technical Specifications are collected, analysed and designated as management audit samples.

Table 1 summarizes information on the Three Mile Island Nuclear Station operational REMP. Appendix A explains the sample coding system which specifies sample type and relative locations at a glance. Table A-1 gives the pertinent information on individual sampling locations, prior to the TMI-2 accident, while Maps A-1, 2, and 3 show their geographic locations.

On March 29, 1979 an Emergency REMP was implemented. The Emergency REMP requires, in addition to all normal operational REMP procedures, an increased sampling and analysis frequency and the addition of new sampling stations (Table 2). On May 31, 1979, Met-Ed reduced the intensity of the emergency REMP monitoring to the levels set in Table 3.

Results

The radiological environmental monitoring program data for the time period March 28 through April 30, 1979 is presented in Appendix B.

Summary

Waterborne Pathways
Surface & Drinking Water

All water samples were analyzed for radioiodine, tritium, and gross beta activities, as well as by gamma spectroscopy. Seven samples, 1 upstream and 6 downstream, had very low positive results for radioiodine (all < 1pCi/l) while all other samples had no detectable radioiodine. Tritium and gross beta activities were at normal ambient levels for all samples and no reactor produced radionuclides were found. The dosimetric implications of these results are found in Appendix C to this report.

Effluent Water

Tritium levels ranged from 100 to 3690 pCi/l through April 21, 1979; Iodine-131 levels ranged from 0.1 to 62 pCi/l through April 30, 1979; no gamma emitters other than Iodine-131 and on two occasions Cobolt-58 were found. The levels of radioactivity found, based on the surface and drinking water results, had no discernible effect offsite.

Fishes - Aquatic Sediment - Aquatic Plants

Analyses of fishes found only naturally occurring Potassium-40 and occasional low levels of fallout Casium-137. Analysis of sediment samples found normal levels of naturally occurring radionuclides and on occasion low levels of Cobolt-58, Cesium-134, and Magnanese-54. No aquatic plants were found.

Airborne Pathways

Gross beta analyses of airborne particulates found typical background activities at all locations at all times. Radioiodine analyses found activities ranging from 0.02 to 23.9 pCi/m^3. The distribution of these values was such that locations closest to Three Mile Island had the highest activities. The dosimetric implications of these results are in Appendix C to this report.

Terrestrial Pathways

Milk

Analyses of cow's milk noted radioiodine levels ranging from 0.1 to 21 pCi/l and normal background levels of Cesium-137 and Potassium-40. The higher radioiodine results were found immediately post-incident and have been decreasing. The dosimetric implications of these results are in Appendix C to this report. Analyses of goats milk found radioiodine levels ranging from 1.1 to 110 pCi/l and normal background levels of Cesium-137 and Potassium-40. It should be noted that most of all goat's milk production was used to suckle newborn kids and thus there was little to no human exposure via this pathway.

Rainwater

Tritium, gross beta, and gamma spectrometric analyses found normal ambient activities and naturally occurring radionuclides only. Radioiodine analyses found detectable activities (2.1 and 1.2 pCi/l) in two indicator samples for the period March 31 through April 6, 1979; no other samples had detectable levels of radioiodine.

Other Samples

Two of six grass samples had low but detectable levels of radioiodine (0.033 and 0.063 pCi/g); no radioiodine or reactor produced radionuclides were found in soil, poultry, beef, eggs, or game.

255 149

SYNOPSIS OF THE OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM FOR TMINS

JANUARY 1 THROUGH DECEMBER 31, 1978

SAMPLE TYPE	COLLECTION FREQUENCY	SAMPLING LOCATIONS	NUMBER OF SAMPLES COLLECTED	TYPE	ANALYSIS FREQUENCY	NUMBER OF SAMPLES ANALYSED
Surface Water/ Drinking Water	MC	7	82	I-131	MC	47
				Beta	MC	81
				Gamma	MC	81
				H-3	MC	81
				Sr-89	QC	16
				Sr-90	QC	16
				H-3	QC	28
Fish	SA	2	8	Sr-89	SA	8
				Sr-90	SA	8
				Gamma	SA	8
Sediment	SA	3	6	Sr-89	SA	6
				Sr-90	SA	6
				Gamma	SA	6
Air Particulates	W	8	395	Beta	W	395
				Gamma	MC	24
				Gamma	QC	32
				Alpha	QC	8
				Sr-89	QC	8
				Sr-90	QC	8
Air Iodine	W	4	197	I-131	W	197
Precipitation	M	4	48	Beta	M	48
				Gamma	QC	16
				H-3	QC	16
				Sr-89	SA	8
				Sr-90	SA	8
Milk	M	6	94	I-131	M, bi-M	92
				Gamma	M, bi-M	94
				Sr-89	QC	23
				Sr-90	QC	23
Green Leafy Vegetables	A	5	6	Gamma	A	6
Dosimeters	Q	20	77	Gamma Dose	Q	77x4 = 308

TABLE 2

The Emergency REMP requires, in addition to all operational REMP procedures, an increased sampling and analysis frequency and the addition of new analyses and sampling locations. The table below describes the Emergency REMP which started on March 29, 1979.

edia	No. of Indicator Locations	No. of Background Locations	Sampling Frequency	Analyses[1]
ir Particulates	5	3	Every 3 days[2]	Gross beta, gamma s
ir Iodine	5	3	Every 3 days[2]	Radioiodine
urface/Drinking Water	5[3]	2	Daily[4]	Gross beta, radioio
ffluent Water	1	0	Daily[4]	Tritium, gamma spec
recipitation (rain water)	2	2	As Available[5]	Gamma spec.
ishes	1	1	Weekly	Gamma spec, stronti
quatic Plants	2	1	Weekly (if available)	Gamma spec.
quatic Sediment	2	1	Weekly	Gamma spec, stronti
ilk	4[6]	1	Daily	Radioiodine, gamma
egetation	4	1	Monthly	Radioiodine, gamma
oil	4	1	Monthly	Gamma spec.
isc. Foodstuffs[7]	1	1	As Available[2]	Gamma spec.
LD	15	5	Every 3 days[2]	Dose rate

The listed analyses are performed on each sample and are additional to those performed in the operational REMP.

Sampling periods were from 3/29-3/31, 3/31-4/3, and every three days thereafter until 4/24/79. As of 4/24/79 samples are collected weekly.

An indicator location was added on 4/22/79.

Sampling was done on 3/29, 3/31, and daily thereafter.

Precipitation was collected on 3/31, 4/5 and 4/27.

Milk is not always available from a goat farm due to its use by newborn goats.

Includes poultry, beef, eggs, pork, and game if available.

255 151

TABLE 3

Off-Site Emergency Radiological Environmental Monitoring Program
As of May 31, 1979*

Media	Collection Frequency[1]	Analyses	Analyses Frequency	Action Level[2]
ir Particulates	Weekly	Gross Beta	Each Sample	Indicator >10X Backgrou
ir Iodine	Weekly	Radioiodine	Each Sample	0.9 pCi/m^3.
urface/Drinking ater	Daily	Radioiodine	Each Sample	2 pCi/l
		Gross Beta	Weekly Composite	Indicator >10X Backgrou
		Tritium	Weekly Composite	20,000 pCi/l
		Gamma Spec	Weekly Composite	Indicator >10X Backgrou
ffluent Water	Daily	Radioiodine	Each Sample	-
		Gross Beta		-
		Tritium		-
		Gamma Spec		-
recipitation	Monthly	Radioiodine	Monthly	2 pCi/l
		Gross Beta		Indicator >10X Backgrou
		Tritium		20,000 pCi/l
		Gamma Spec		Indicator >10X Backgrou
ishes	Semi-Annually (July & October)	Strontium	Each Sample	Indicator >10X Backgrou
		Gamma Spec		Indicator >10X Backgrou
quatic Plants	Semi-Annually (July & October)	Gamma Spec	Each Sample	Indicator >10X Backgrou
quatic Sediment	Semi-Annually (July & October)	Gamma Spec	Each Sample	Indicator >10X Backgrou
ilk[3]	Weekly	Radioiodine	Each Sample	5 pCi/l
		Gamma Spec	Each Sample	Indicator >10X Backgrou
isc. Food Stuffs	As Available	Gamma Spec	Each Sample	
LD	Monthly	Dose Rate	Each Sample	Indicator >10X Backgrou

1 Samples are collected only if available.

2 This level, if exceeded, by confirmed analyses, results in the implementation of the more intense surveillance program for that media and location as described in Table 2, until the radioactivity levels are below the action level for three successive samples.

3 One milk location (goat farm at 1B1) is in excess of the action level and will be sampled daily if sufficient milk is available.

* The normal operational Radiological Environmental Monitoring Program required by the ETS continues to be maintained per Table 1.

APPENDIX A

TABLE A-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

SAMPLE MEDIUM	LOCATION CODE	MAP NO.	DESCRIPTION*
AI,AP,ID	1S2	2	0.4 mile N of site, N. Weather Station
ID	2S2	3	0.7 mile NNE of site on light pole in middle of North Bridge
ID	4S2	5	0.3 mile ENE of site on top of dike, East Fence
ID	5S2	6	0.2 mile E of site on top of dike, East Fence
ID	9S2	8	0.4 mile S of site at South Beach of Three Mile Island
ID	11S1	9	0.1 mile SW of site, west of Mechanical Draft Towers on dike
ID	14S1	10	0.4 mile WNW of site at Shelly's Island picnic area
ID	16S1	11	0.2 mile NNW of site at gate in fence on west side of Three Mile Island
AQP,AQS	1A2	12	0.7 mile N of site at north tip of Three Mile Island
ID	4A1	13	0.5 mile ENE of site on Laurel Rd., Met. Ed. pole #668-OL
AI,AP,ID,RW	5A1	14	0.4 mile E of site on north side of Observation Center Building
AQP,SW	9A2	15	0.5 mile S of site below Discharge Pipe
ID	16A1	17	0.4 mile NNW of site on Kohr Island
M	4B1	18	1.1 miles ENE of site, west of Gingrich Road
FPL,M	5B1	19	1.0 mile E of site on Peck Road
FBL,M	7B3	20	1.6 miles SE of on east side of Conewago Creek
AQF,AQP,AQS,SW	9B1	21	1.5 miles S of site, above York Haven Dam
ID	10B1	23	1.1 miles SSW of site on south beach of Shelly's Island
AP,ID	12B1	24	1.6 miles WSW of site adjacent to Fishing Creek
AQF	16B1	25	1.1 miles NNW of site below Hill Island
AI,AP,ID	1C1	26	2.6 miles N of site at Middletown Substation
SW	1C3	27	2.3 miles N of site at Swatara Creek
AI,AP,ID,RW	8C1	28	2.3 miles SSE of site
FPL,M	14C1	29	2.7 miles WNW of site near intersection of Routes 262 and 392
SW	8E1	30	4.1 miles SSE of site at Brunner Island
AI,AP,ID,RW	7F1	34	9 miles SE of site at Drager Farm off Engle's Tollgate Road
SW	15F1	35	8.7 miles NW of site at Steelton Municipal Water Works
FPL,M	2G1	36	2 miles NNE of Hershey on Rt. 39 Hummelstown
ID	4G1	37	10 miles ENE of site at Lawn - Met. Ed. Pole #J1813
ID,SW	7G1	38	15 miles SE of site at Columbia Water Treatment Plant
AP,ID	9G1	39	13 miles S of site in Met. Ed. York Load Dispatch Station
AI,AP,ID,RW	15G1	40	15 miles NW of site at West Fairview Substation
SW	8C2	43	2.3 miles SSE of site - York Haven Hydro
AQS	10A1	44	0.8 mile SSW of site
M	1B1	45	1.2 miles N of site - along Rt. 441

* All distances are measured from a point that is midway between the Reactor Buildings of Units One and Two

APPENDIX

Sampling Locations

Sample Identification

Metropolitan Edison identifies samples by a three-part code. The first two letters are the power station identification code, in this case TM. The next one to three letters are for the media sampled.

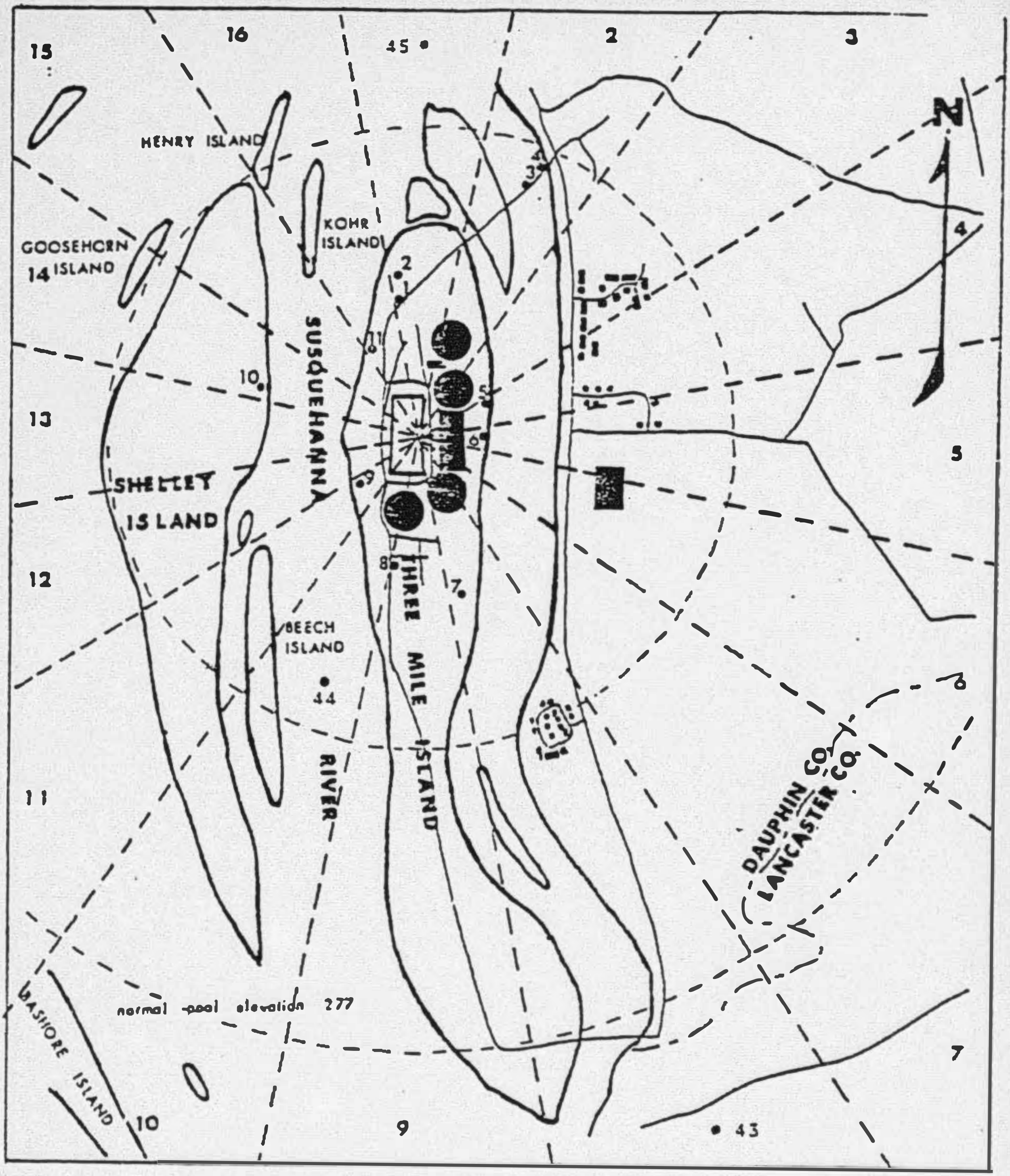
AI	=	Air Iodine	FPL	=	Green Leafy Vegetables
AP	=	Air Particulates	ID	=	Immersion Dose (TLD)
AQF	=	Fish	M	=	Milk
AQP	=	Aquatic Plants	RW	=	Precipitation
AQS	=	Sediment	SW	=	Surface Water
E	=	Soil	V	=	Fodder Crops
FPF	=	Fruit	MG	=	Milk (Goats)

The last four symbols are a location code based on direction and distance from the site. Of the last four symbols, the first two represent each of the sixteen angular sectors of 22½ degrees centered about the reactor site. Sector one is divided evenly by the north axis and the other sectors are numbered in a clockwise direction; i.e., 2 = NNE, 3 = NE, 4 = ENE, 5 = E, etc. The next digit is a letter which represents the radial distance from the plant:

S	=	On-site location	E	=	4-5 miles off-site
A	=	0-1 miles off-site	F	=	5-10 miles off-site
B	=	1-2 miles off-site	G	=	10-20 miles off-site
D	=	3-4 miles off-site	H	=	L.T. 20 miles off-site

The last number is the station numerical designation within each sector and zone; e.g., 1, 2, ...

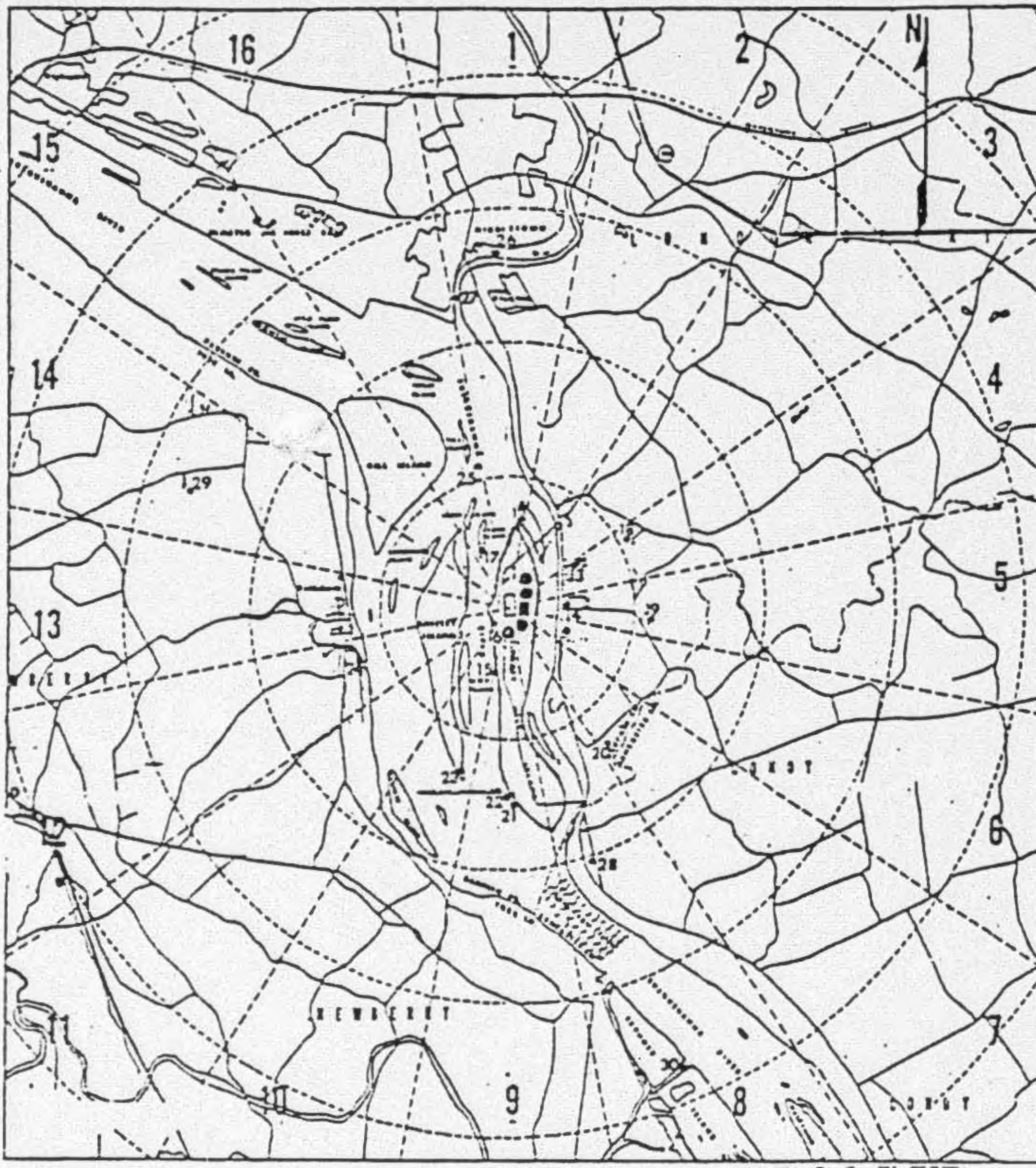
The location portions of these codes (i.e. 1S1, 3A1, etc.) are shown in the attached table along with more detailed information and a map coordinate number used to designate the individual samples in the analytical results tables, Appendix B.



Map A-1

THREE MILE ISLAND NUCLEAR STATION
Location of Operational
Radiological Environmental
Monitoring Stations within
the Site Boundaries

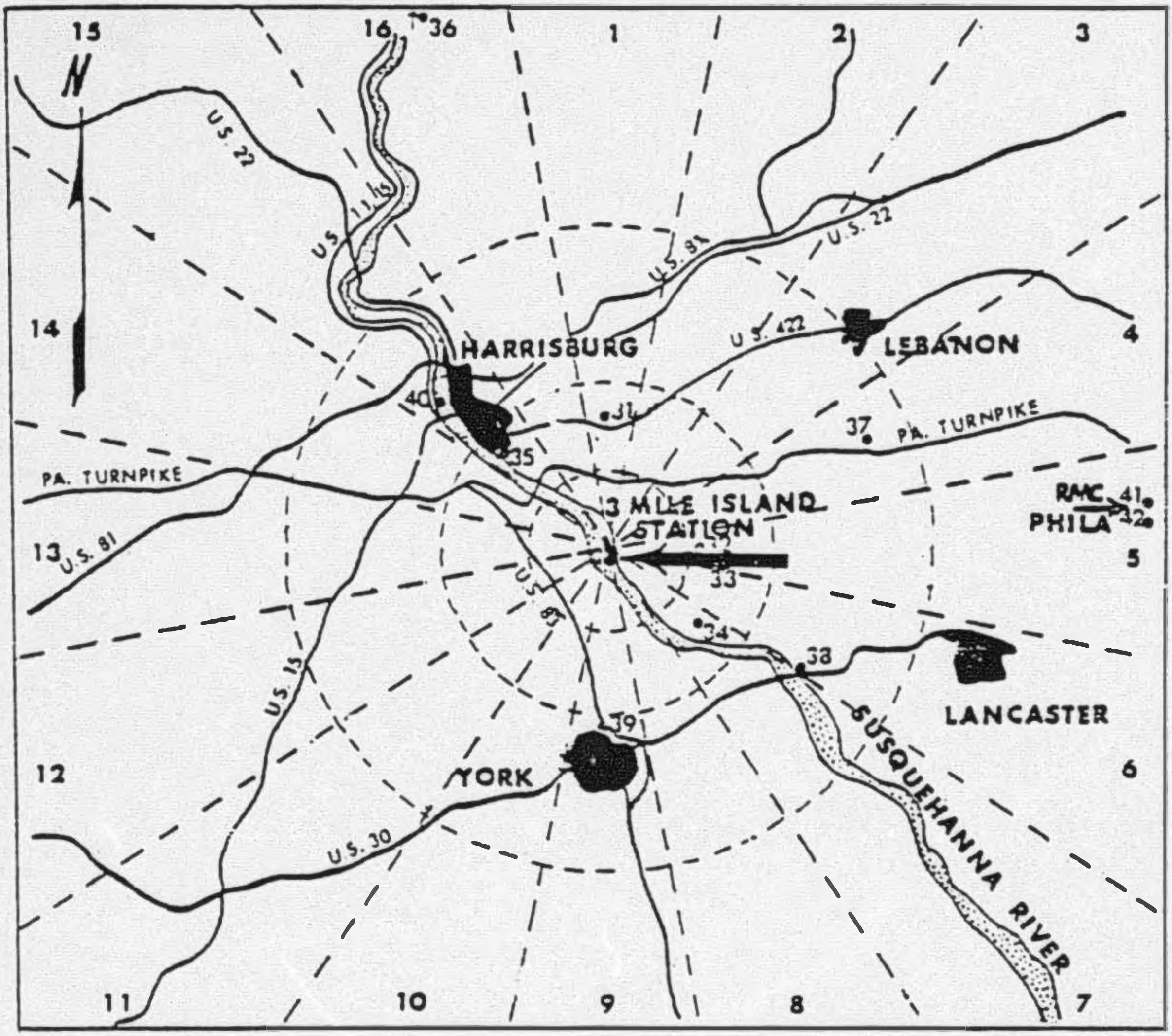
255 156



Map A-2

THREE MILE ISLAND NUCLEAR STATION
Location of Operational
Radiological Environmental
Monitoring Stations within
5 Miles of the Site

255 157



Map A-3

THREE MILE ISLAND NUCLEAR STATION
Location of Operational
Radiological Environmental
Monitoring Stations Greater
than 5 Miles from the Site

255 158

APPENDIX B

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM RESULTS

(March 28 - April 30, 1979)

TLD BACKGROUNDS

AVE 1978

mR/30.4 Days ± 2σ

CONTROL TLD'S

LOCATION	mR/mo.
7F1	8.32 ± 4.84
4G1	6.38 ± 2.92
9G1	6.76 ± 3.64
15G1	6.27 ± 3.32
7G1	10.1 ± 3.2

INDICATOR TLD'S

1S2	5.61 ± 2.42
2S2	4.76 ± 1.80
4S2	5.59 ± 3.38
5S2	5.39 ± 3.56
8C1	4.17 ± 1.96
9S2	6.11 ± 3.34
11S2	8.54 ± 10.3
14S2	6.71 ± 10 ± 2
16S1	9.58 ± 12.2
4A1	5.58 ± 2.68
5A1	5.32 ± 2.88
16A1	5.0 ± 5.8
10B1	5.99 ± 7.52
12B1	4.53 ± 2.54
1C1	4.75 ± 2.26

255 160

Regular Stations - Results in Milli-roentgens/hour
Q " - " " Milli-rads/hour
(Milli-roentgens)(.955) = milli-rads

TLD'S
mr/hr
INCLUDES BACKGROUND

x(x) = Duplicates

Map #	page 1 of 2	Sample	9/30-12/27	12/27-3/29	3/29-3/31	3/31-4/3	4/3-4/6	4/6-4/9	4/9-4/12	4/12-4/15	4/15-4/18	4/18-4/21	4/21-4/24	4/24-4/28
2	N. Weather Station	1S2	0.007	0.065	0.444	0.099	0.009	0.018	0.004	0.004	0.004	0.023	0.009	0.008
2	N. Weather Station	1S2Q	0.008	0.013	0.341	0.017	0.011	0.011	0.011	0.011	0.010	0.011	0.008	0.009
3	N. Bridge	2S2	0.006	0.020	0.722	0.046	0.011	0.009	0.004	0.002	0.002	0.006	0.005	0.007
5	Top of Dike	4S2	0.006	0.016	2.757	0.381	0.108	0.022	0.009	0.002	0.004	0.006	0.008	0.006
5	Top of Dike	4S2Q	0.007	0.014	1.587	0.288	0.064	0.014	0.013	0.010	0.012	0.010	0.008	0.009
6	Top of Dike	5S2	0.006	0.014	1.098	0.363	0.211	0.081	0.037	0.002	0.004	0.006	0.008	0.008
6	Top of Dike	5S2Q	0.007	0.013	0.817	0.287	0.158	0.064	0.030	0.013	0.010	0.012	0.007	0.010
28	Falmouth-Collins Sub	8C1	0.005	0.006	0.233	0.024	0.018	0.013	0.007	0.002	0.002	0.006	0.010	0.005
28	Falmouth-Collins Sub	8C1Q	0.006	0.006	0.184	0.036	0.015	0.008	0.010	0.008	0.008	0.007	0.007	0.008
8	S. TMI	9S2	0.008	0.011	0.581	0.062	0.024	0.018	0.004	0.004	0.004	0.007	0.008	0.007
9	MDCT	11S1	0.008	0.100	2.431	0.614	0.297	0.114	0.015	0.009	0.009	0.010	0.011	0.009
9	MDCT	11S1Q	0.008	0.080	1.720	0.479	0.194	0.073	0.014	0.014	0.014	0.012	0.011	0.014
11	N. Boat Dock	16S1	0.008	0.477	1.903	0.095	0.022	0.013	0.009	0.009	0.009	0.009	0.010	0.011
11	N. Boat Dock	16S1Q	0.008	0.421	1.400	0.076	0.017	0.012	0.011	0.013	0.012	0.011	0.012	0.011
10	Shelley	14S2	←.030(.034)→		1.047	0.132	0.022	0.011	0.007	0.002	0.002	0.006	0.007	0.005
13	Laurel Rd	4A1	0.007	0.009	0.757	0.574	0.031	0.009	0.009	0.007	0.004	0.008	0.007	0.006
14	Observ. Center	5A1	0.006	0.009	0.180	0.108	0.042	0.018	0.031	0.002	0.004	0.006	0.007	0.006
14	Observ. Center	5A1Q	0.008	0.007	0.120	0.073	0.028	0.018	0.024	0.008	0.010	0.009	0.009	0.009
17	Kohr Island	16A1	←.207(.103)→		0.909	0.024	0.011	0.009	0.007	0.002	0.004	0.005	0.010	0.005
23	S. End Shelley	10B1	←.009(.008)→		0.319	0.004	0.015	0.011	0.007	0.007	0.004	0.008	0.013	0.007
24	Goldsboro Air Station	12B1	0.006	0.007	0.205	0.002	0.018	0.018	0.004	0.002	0.002	0.005	0.010	0.005
26	Middletown Sub	1C1	0.006	0.009	0.068	0.020	0.007	0.009	0.007	0.004	0.004	0.005	0.007	0.007
34	Drager Farm	7F1	0.010	0.011	0.024	0.007	0.011	0.013	0.009	0.009	0.011	0.009	0.011	0.010
34	Drager Farm	7F1Q	0.011	0.011	0.018	0.021	0.012	0.013	0.012	0.014	0.013	0.013	0.013	0.014
37	RTE 241	4G1	0.008	0.008	0.026	0.009	0.009	0.011	0.004	0.004	0.004	0.007	0.013	0.006
37	RTE 241	4G1Q	0.009	0.008	0.014	0.020	0.009	0.011	0.010	0.010	0.010	0.013	0.008	0.010
39	N. York Sub	9G1	0.008	0.010	0.031	0.000	0.002	0.011	0.009	0.007	0.007	0.008	0.008	0.007
40	W. Fairview	15G1	0.008	0.008	0.042	0.600	0.007	0.011	0.007	0.007	0.009	0.007	0.008	0.007
40	W. Fairview	15G1Q	0.009	0.008	0.024	0.011	0.009	0.008	0.009	0.010	0.010	0.012	0.009	0.009
38	Columbia	7G1	0.010	0.012	0.022	0.499	0.011	0.132	0.009	0.007	0.011	0.011	0.014	0.010

(milli-roentgens) (0.955) = mill-rads

255 162

TLD'S

mr/hr

INCLUDES BACKGROUND

Regular Stations - Results in mill-roentgens/hour
Q Stations - Results in milli-rads/hour

Map #				4/28-5/5
2	1	N. Weather Station	1S2	0.005
2	2	N. Weather Station	1S2Q	0.009
3	3	N. Bridge	2S2	0.002
5	4	Top of Dike	4S2	0.003
5	5	Top of Dike	4S2Q	0.009
6	6	Top of Dike	5S2	0.003
6	7	Top of Dike	5S2Q	0.008
28	8	Falmouth-Collins Sub	8C1	0.002
28	9	Falmouth-Collins Sub	8C1Q	0.005
8	10	S. TMI	9S2	0.003
9	11	MDCT	11S1	0.006
9	12	MDCT	11S1Q	0.011
11	13	N. Boat Dock	16S1	0.007
11	14	N. Boat Dock	16S1Q	0.011
10	15	Shelley	14S2	0.002
13	16	Laurel Rd	4A1	0.004
14	17	Observ. Center	5A1	0.004
14	18	Observ. Center	5A1Q	0.008
17	19	Kohr Island	16A1	0.003
23	20	S. End Shelley	10B1	0.005
24	21	Goldsboro Air Station	12B1	0.002
26	22	Middletown Sub	1C1	0.004
34	23	Drager Farm	7F1	0.008
34	24	Drager Farm	7F1Q	0.013
37	25	RTE 241	4G1	0.004
37	26	RTE 241	4G1Q	0.009
39	27	N. York Sub	9G1	0.005
40	28	W. Fairview	15G1	0.006
40	29	W. Fairview	15G1Q	0.008
38	30	Columbia	7G1	0.007
	31			

X (X) = Duplicate
Teledyne results in milli-roentgens
RMC (Q) Results in milli-rads
The Total Error is 1 sigma

TLD'S
NET EXPOSURES
INCLUDES BACKGROUND

Page 1 of 3   255 [illegible]

Map #	Location		9/27/78 - 12/27/78	12/27/78 - 3/29/79	3/29 - 3/31	3/31 - 4/3	4/3 - 4/6	4/6 - 4/9
2	N. Weather Station	1S2		97.9 ± 1.9	20.0 ± 3.4	-0.1 ± 0.1	0.6 ± 0.1	1.4 ± 1.0
2	N. Weather Station	1S2Q		95.7 ± 5.0	15.25 ± 2.63	1.28 ± 0.14	0.81 ± 0.14	0.85 ± 0.05
3	N. Bridge	2S2		43.7 ± [illegible]	32.5 ± 5.6	3.4 ± 0.6	0.9 ± 0.2	0.6 ± 0.1
5	Top of Dike	4S2		35.5 ± 4.3	124.3 ± 32.7	28.0 ± 9.1	7.9 ± 2.3	1.6 ± 0.2
5	Top of Dike	4S2Q		31.4 ± 1.6	71.35 ± 13.0	21.27 ± 6.60	4.68 ± 0.36	1.04 ± 0.07
6	Top of Dike	5S2		30.5 ± 1.3	49.3 ± 11.2	26.7 ± 5.3	15.5 ± 5.0	6.0 ± 1.6
6	Top of Dike	5S2Q		27.7 ± 4.0	36.65 ± 0.8	21.16 ± 3.11	11.54 ± 2.37	4.74 ± 0.94
28	Falmouth-Collins Sub	8C1		13.0 ± 0.3	10.7 ± 1.6	1.7 ± 1.1	1.3 ± 0.4	1.0 ± 0.8
28	Falmouth-Collins Sub	8C1Q		12.6 ± 0.6	8.36 ± 0.97	2.63 ± 0.17	1.11 ± 0.08	0.65 ± 0.11
8	S. TMI	9S2		25.0 ± 3.0	25.3 ± 2.6	4.6 ± 1.0	1.8 ± 0.3	1.3 ± 0.2
9	MDCT	11S1		216.0 ± 24.1	107.1 ± 12.7	45.0 ± 15.2	21.8 ± 7.3	8.5 ± 2.6
9	MDCT	11S1Q		168.5 ± 15.6	75.71 ± 12.7	35.22 ± 3.32	14.2 ± 1.1	5.47 ± 0.58
11	N. Boat Dock	16S1		1044.2 ± 128.2	83.7 ± 17.5	7.0 ± 0.7	1.5 ± 0.3	1.0 ± 0.1
11	N. Boat Dock	16S1Q		929.4 ± 90.5	61.6 ± 12.2	5.59 ± 0.96	1.26 ± 0.25	0.88 ± 0.10
10	Shelley	14S2	← 131.2±20.6(148.3±9.7) →		48.8 ± 8.6	9.5 ± 4.3	1.5 ± 0.4	0.8 ± 0.3
13	Laurel Rd	4A1		20.2 ± 1.3	34.3 ± 8.6	41.4 ± 8.5	2.2 ± 0.4	0.7 ± 0.0
14	Observ. Center	5A1		18.6 ± 1.0	8.3 ± 2.8	7.7 ± 2.5	3.0 ± 1.2	1.2 ± 0.2
14	Observ. Center	5A1Q		16.1 ± 1.3	5.45 ± 1.0	5.24 ± 0.90	2.0 ± 0.61	1.28 ± 0.10
17	Kohr Island	16A1	← 907.7±49.4(453.4±12.2) →		45.1 ± 2.1	1.7 ± 1.1	0.9 ± 0.1	0.7 ± 0.1
23	S. End Shelley	10B1	← 40.6± 3.5(36.6±1.3) →		14.9 ± 0.9	0.4 ± 0.3	1.1 ± 0.2	0.8 ± 0.1
24	Goldsboro Air Station	12B1		16.3 ± 0.9	9.4 ± 1.6	0.2 ± 0.3	1.2 ± 0.2	1.3 ± 0.2
26	Middletown Sub	1C1		20.1 ± 1.3	3.2 ± 0.7	1.4 ± 0.4	0.5 ± 0.1	0.5 ± 0.1
34	Drager Farm	7F1		24.1 ± 1.8	1.1 ± 0.1	0.5 ± 0.5	0.9 ± 0.1	1.0 ± 0.1
34	Drager Farm	7F1Q		23.3 ± 0.5	0.80 ± 0.15	1.52 ± 0.20	0.90 ± 0.04	0.97 ± 0.11
37	RTE 241	4G1		17.2 ± 2.1	1.2 ± 0.2	0.6 ± 0.2	0.6 ± 0.1	0.7 ± 0.0
37	RTE 241	4G1Q		17.7 ± 0.1	0.64 ± 0.11	1.43 ± 0.09	0.69 ± 0.07	0.75 ± 0.08
39	N. York Sub	9G1		21.3 ± 1.4	1.4 ± 0.1	0.1 ± 0.2	0.6 ± 0.1	0.9 ± 0.2
40	W. Fairview	15G1		18.4 ± 2.0	1.9 ± 0.3	-0.7 ± 0.1	0.5 ± 0.0	0.8 ± 0.1
40	W. Fairview	15G1Q		17.6 ± 0.6	1.14 ± 0.13	0.77 ± 0.07	0.68 ± 0.16	0.61 ± 0.09
38	Columbia	7G1		25.8 ± 0.6	1.0 ± 0.1	-0.5 ± 0.0	0.8 ± 0.0	1.1 ± 0.2

Teledyne Results in milli-roentgens
RMC (Q) Results in milli-rads
The Total Error is 1 sigma

TLD'S

NET EXPOSURES
INCLUDES BACKGROUND

Map #		Page 2 of 3		4/9-4/12	4/12-4/15	4/15-4/18	4/18-21	4/21-4/24	4/24-4/28
2	1	N. Weather Station	1S2	0.4 ± 0.2	0.2 ± 0.6	0.3 ± 0.1	1.6 ± 0.4	0.7 ± 0.2	0.7 ± 0.2
2	2	N. Weather Station	1S2Q	0.81 ± 0.18	0.72±0.08	0.78±0.11	0.77±0.11	0.61±0.13	0.83±0.14
3	3	N. Bridge	2S2	0.3 ± 0.3	0.2 ± 0.5	0.2 ± 0.2	0.4 ± 0.4	0.4 ± 0.1	0.6 ± 0.2
5	4	Top of Dike	4S2	0.6 ± 0.2	0.2 ± 0.5	0.3 ± 0.1	0.4 ± 0.4	0.6 ± 0.2	0.5 ± 0.2
5	5	Top of Dike	4S2Q	0.96±0.03	0.65±0.13	0.88±0.09	0.69±0.12	0.63±0.08	0.83±0.07
6	6	Top of Dike	5S2	2.7 ± 0.9	0.2 ± 0.5	0.4 ± 0.1	0.4 ± 0.4	0.6 ± 0.1	0.7 ± 0.2
6	7	Top of Dike	5S2Q	2.2 ± 0.17	0.87±0.5	0.76±0.06	0.79±0.14	0.55±0.15	0.89±0.10
28	8	Falmouth-Collins Sub	8C1	0.4 ± 0.2	0.1 ±0.5	0.2 ± 0.2	0.4 ± 0.4	0.7 ± 0.2	0.5 ± 0.2
28	9	Falmouth-Collins Sub	8C1Q	0.65±0.14	0.57±0.08	0.60±0.04	0.47±0.02	0.47±0.12	0.80±0.05
8	10	S. TMI	9S2	0.4 ± 0.1	0.3 ± 0.5	0.3 ±0.1	0.5 ± 0.4	0.6 ± 0.2	0.6 ± 0.2
9	11	MDCT	11S1	1.1 ± 0.1	0.6 ± 0.5	0.6 ± 0.2	0.7 ± 0.4	0.9 ± 0.2	0.8 ± 0.2
9	12	MDCT	11S1Q	0.99±0.22	0.93±0.06	1.04±0.07	0.83±0.11	0.86±0.20	1.27±0.13
11	13	N. Boat Dock	16S1	0.6 ± 0.3	0.6 ± 0.5	0.6 ± 0.2	0.6 ± 0.4	0.8 ± 0.2	1.0 ± 0.3
11	14	N. Boat Dock	16S1Q	0.80±0.19	0.91 ±0.10	0.88±0.06	0.72±0.06	0.92±0.03	0.99±0.15
10	15	Shelley	14S2	0.3 ± 0.2	0.1 ± 0.5	0.2 ± 0.1	0.4 ± 0.4	0.5 ± 0.2	0.5 ± 0.2
13	16	Laurel Rd	4A1	0.6 ± 0.2	0.4 ± 0.7	0.3 ± 0.1	0.5 ± 0.4	0.5 ± 0.2	0.6 ± 0.2
14	17	Observ. Center	5A1	2.2 ± 1.0	0.2 ±0.5	0.4 ± 0.2	0.4 ± 0.4	0.5 ± 0.1	0.6 ± 0.2
14	18	Observ. Center	5A1Q	1.76±0.16	0.57±0.03	0.75±0.03	0.62±0.06	0.67±0.16	0.91±0.5
17	19	Kohr Island	16A1	0.4 ± 0.4	0.2 ± 0.5	0.4 ± 0.3	0.3 ± 0.4	0.7 ± 0.2	0.5 ± 0.2
23	20	S. End Shelley	10B1	0.6 ± 0.3	0.4 ± 0.5	0.4 ± 0.1	0.5 ± 0.4	0.9 ± 0.2	0.7 ± 0.2
24	21	Goldsboro Air Station	12B1	0.3 ± 0.3	0.1 ± 0.5	0.2 ± 0.1	0.3 ± 0.4	0.7 ± 0.4	0.5 ± 0.2
26	22	Middletown Sub	1C1	0.6 ± 0.3	0.3 ± 0.5	0.3 ± 0.1	0.4 ± 0.4	0.6 ± 0.2	0.6 ± 0.2
34	23	Drager Farm	7F1	0.7 ± 0.2	0.5 ± 0.5	0.8 ± 0.2	0.6 ± 0.4	0.8 ± 0.1	1.0 ± 0.2
34	24	Drager Farm	7F1Q	0.96±0.03	0.87±0.13	1.04±0.10	0.87±0.04	0.90±0.10	1.32±0.03
37	25	RTE 241	4G1	0.4 ± 0.2	0.3 ± 0.5	0.4 ± 0.2	0.5 ± 0.4	0.9 ± 0.2	0.6 ± 0.2
37	26	RTE 241	4G1Q	0.81 ± 0.11	0.70±0.12	0.80±0.06	0.90±0.16	0.54±0.09	0.94±0.11
39	27	N. York Sub	9G1	0.6 ± 0.3	0.5 ± 0.6	0.5 ± 0.2	0.5 ± 0.4	0.6 ± 0.1	0.7 ± 0.2
40	28	W. Fairview	15G1	0.4 ± 0.3	0.5 ± 0.7	0.6 ± 0.3	0.5 ± 0.4	0.6 ± 0.2	0.7 ± 0.2
40	29	W. Fairview	15G1Q	0.62±0.08	0.71±0.10	0.81 ± 0.11	0.79±0.20	0.64±0.11	0.82±0.09
38	30	Columbia	7G1	0.7 ± 0.2	0.4 ± 0.5	0.8 ± 0.2	0.7 ± 0.4	1.0 ± 0.2	1.0 ± 0.2
	31								

Teledyne Results in milli-roentgens
RMC (Q) Results in milli-rads
The Total Error is 1 sigma

TLD'S
NET EXPOSURES
INCLUDES BACKGROUND

Map #				4/28-5/5
2	1	N. Weather Station	1S2	0.8 ± 0.9
2	2	N. Weather Station	1S2Q	1.40±0.12
3	3	N. Bridge	2S2	0.4 ±0.7
5	4	Top of Dike	4S2	0.5 ± 0.7
5	5	Top of Dike	4S2Q	1.49±0.20
6	6	Top of Dike	5S2	0.6 ± 0.7
6	7	Top of Dike	5S2Q	1.46±0.11
28	8	Falmouth-Collins Sub	8C1	0.3 ± 0.7
28	9	Falmouth-Collins Sub	8C1Q	0.96±0.18
8	10	S. TMI	9S2	0.6 ± 0.7
9	11	MDCT	11S1	1.1 ± 0.7
9	12	MDCT	11S1Q	1.85±0.16
11	13	N. Boat Dock	16S1	1.2 ± 0.7
11	14	N. Boat Dock	16S1Q	1.86±0.16
10	15	Shelley	14S2	0.4 ± 0.7
13	16	Laurel Rd	4A1	0.6 ± 0.7
14	17	Observ. Center	5A1	0.6 ± 0.7
14	18	Observ. Center	5A1Q	1.40±0.18
17	19	Kohr Island	16A1	0.5 ± 0.1
23	20	S. End Shelley	10B1	0.8 ± 0.7
24	21	Goldsboro Air Station	12B1	0.4 ± 0.7
26	22	Middletown Sub	1C1	0.6 ± 0.7
34	23	Drager Farm	7F1	1.3 ± 0.7
34	24	Drager Farm	7F1Q	2.06±0.08
37	25	RTE 241	4G1	0.7 ± 0.7
37	26	RTE 241	4G1Q	1.60±0.16
39	27	N. York Sub	9G1	0.9 ± 0.7
40	28	W. Fairview	15G1	0.9 ± 0.7
40	29	W. Fairview	15G1Q	1.38±0.14
38	30	Columbia	7G1	1.3 ± 0.7
	31			

TLD'S
EXPOSURE TIMES

Map #		Sampling Location	Loca. Code	Time Col 3/29	Elpd. Hrs.	Time Col. 3/31	Elpd. Hrs.	Time Col. 4/3	Elpd. Hrs.	Time Col. 4/6	Elpd. Hrs.	Time Col. 4/9	Elpd. Hrs.	Time Col. 4/12	
2	1	N. Weather Station	1S2	1640	44.92	1335	73.63	1513	73.00	1613	74.53	1845	72.83	1935	
2	2	N. Weather Station	1S2Q												
3	3	N. Bridge	2S2	1715	45.00	1415	73.62	1552	73.13	1700	74.55	1933	72.73	2017	
5	4	Top of Dike	4S2	1705	45.00	1405	73.75	1550	73.00	1650	74.58	1925	72.63	2003	
5	5	Top of Dike	4S2Q												
6	6	Top of Dike	5S2	1705	44.92	1400	73.75	1545	73.13	1653	74.58	1928	72.65	2007	
6	7	Top of Dike	5S2Q												
28	8	Falmouth-Collins Sub	8C1	0930	45.75	0715	72.08	0720	72.33	0740	76.25	1155	67.42	0720	
28	9	Falmouth-Collins Sub	8C1Q												
8	10	S. TMI	9S2	1655	44.00	1355	73.58	1530	73.00	1630	74.55	1903	72.78	1950	
9	11	MDCT	11S1	1650	44.00	1350	73.53	1522	73.05	1625	74.52	1856	72.82	1945	
9	12	MDCT	11S1Q												
11	13	N. Boat Dock	16S1	1645	44.00	1345	73.58	1520	73.00	1620	74.55	1853	72.78	1940	
11	14	N. Boat Dock	16S1Q												
10	15	Shelley	14S2	1215	46.58	1050	72.17	1100	72.83	1150	76.42	1615	67.17	1125	
13	16	Laurel Rd	4A1	0920	45.33	0640	72.17	0650	72.42	0715	71.80	0703	71.87	0655	
14	17	Observ. Center	5A1	0900	45.92	0655	72.08	0700	72.50	0730	71.42	0655	72.25	0710	
14	18	Observ. Center	5A1Q												
17	19	Kohr Island	16A1	1210	46.58	1045	72.17	1055	72.50	1125	76.67	1605	67.17	1115	
23	20	S. End Shelley	10B1	1225	46.58	1100	72.12	1107	73.38	1230	75.88	1623	67.20	1135	
24	21	Goldsboro Air Station	12B1	1150	45.92	0945	72.75	1030	72.50	1100	76.67	1540	67.25	1055	
26	22	Middletown Sub	1C1	1445	46.08	1250	72.58	1325	74.33	1545	64.83	0835	80.17	1645	
34	23	Drager Farm	7F1	0955	45.67	0735	72.00	0735	72.42	0800	77.00	1300	77.00	1800	
34	24	Drager Farm	7F1Q												
37	25	RTE 241	4G1	1810	45.42	1535	73.08	1640	73.42	1805	66.42	1230	78.83	1920	
37	26	RTE 241	4G1Q												
39	27	N. York Sub	9G1	1050	46.08	0855	72.42	0920	72.25	0935	77.00	1435	69.42	1200	
40	28	W. Fairview	15G1	1330	46.08	1135	72.50	1205	74.25	1420	75.17	1730	63.50	0900	
40	29	W. Fairview	15G1Q												
38	30	Columbia	7G1	1020	33.67	0800	72.13	0808	71.87	0800	77.30	1318	76.95	1815	
	31														

TLD'S

EXPOSURE TIMES

Map #	Sampling Location	Loca. Code	Time Col. 4/12	Elpd. Hrs.	Time Col. 4/15	Elpd. Hrs.	Time Col. 4/18	Elpd. Hrs.	Time Col. 4/21	Elpd. Hrs.	Time Col. 4/24	Elpd. Hrs.	Time Col. 4/28
2	N. Weather Station	1S2	1935	67.92	1530	75.50	1900	68.17	1510	79.33	2230	88.17	1440
2	N. Weather Station	1S2Q											
3	N. Bridge	2S2	2017	67.88	1610	75.67	1950	67.08	1455	80.62	2332	88.42	1557
5	Top of Dike	4S2	2003	67.95	1600	75.67	1940	68.17	1550	79.63	2328	88.37	1550
5	Top of Dike	4S2Q											
6	Top of Dike	5S2	2007	67.97	1605	75.67	1945	68.13	1553	79.53	2325	88.47	1553
6	Top of Dike	5S2Q											
28	Falmouth-Collins Sub	8C1	0720	72.00	0720	77.50	1250	66.42	0715	71.92	0710	96.83	0800
28	Falmouth-Collins Sub	8C1Q											
8	S. TMI	9S2	1950	67.92	1545	75.50	1915	68.08	1520	79.42	2245	88.20	1457
9	MDCT	11S1	1945	67.92	1540	75.47	1908	68.12	1515	79.42	2240	88.12	1447
9	MDCT	11S1Q											
11	N. Boat Dock	16S1	1940	67.92	1535	75.50	1905	67.92	1500	79.62	2237	88.12	1444
11	N. Boat Dock	16S1Q											
10	Shelley	14S2	1125	71.20	1037	77.47	1605	66.58	1040	71.95	1037	96.30	1055
13	Laurel Rd	4A1	0655	72.00	0655	77.42	1220	66.58	0655	71.92	0650	96.92	07[illegible]5
14	Observ. Center	5A1	0710	71.92	0705	77.50	1235	66.50	0705	71.83	0655	97.00	0755
14	Observ. Center	5A1Q											
17	Kohr Island	16A1	1115	71.28	1032	77.47	1600	66.58	1035	71.95	1032	96.30	1050
23	S. End Shelley	10B1	1135	71.15	1044	77.43	1610	66.58	1045	72.00	1045	96.33	1105
24	Goldsboro Air Station	12B1	1055	71.25	1010	77.58	1545	66.42	1010	71.92	1005	96.42	1030
26	Middletown Sub	1C1	1645	68.17	1255	71.08	1200	72.92	1255	81.00	2155	87.17	1305
34	Drager Farm	7F1	1800	61.58	0735	77.50	1305	66.50	0735	71.83	0725	96.78	0812
34	Drager Farm	7F1Q											
37	RTE 241	4G1	1920	66.75	1405	78.42	2030	67.83	1620	70.50	1450	95.42	1415
37	RTE 241	4G1Q											
39	N. York Sub	9G1	1200	69.17	0910	77.33	1430	66.08	0835	72.00	0835	96.50	0905
40	W. Fairview	15G1	0900	74.67	1140	77.42	1705	66.67	1145	72.00	1145	96.17	1155
40	W. Fairview	15G1Q											
38	Columbia	7G1	1815	61.70	0757	77.55	1330	66.42	0755	71.97	0753	96.53	0825

TLD'S

EXPOSURE TIMES

Map #	Sampling Location		Time Collect 4/28	Elpsed Hours	Time Collect 5/5
2	N. Weather Station	1S2	1440	172.53	1912
2	N. Weather Station	1S2Q			
3	N. Bridge	2S2	1557	171.88	1950
5	Top of Dike	4S2	1550	171.83	1940
5	Top of Dike	4S2Q			
6	Top of Dike	5S2	1553	171.83	1943
6	Top of Dike	5S2Q			
28	Falmouth-Collins Sub	8C1	0800	174.83	1450
28	Falmouth-Collins Sub	8C1Q			
8	S. TMI	9S2	1457	171.97	1855
9	MDCT	11S1	1447	172.52	1918
9	MDCT	11S1Q			
11	N. Boat Dock	16S1	1444	172.52	1915
11	N. Boat Dock	16S1Q			
10	Shelley	14S2	1055	165.22	0808
13	Laurel Rd	4A1	0745	166.83	0635
14	Observ. Center	5A1	0755	166.58	0630
14	Observ. Center	5A1Q			
17	Kohr Island	16A1	1050	165.22	0803
23	S. 2nd Shelley	10B1	1105	165.67	0845
24	Goldsboro Air Station	12B1	1030	165.33	0750
26	Middletown Sub	1C1	1305	170.92	1600
34	Drager Farm	7F1	1812	164.38	1435
34	Drager Farm	7F1Q			
37	RTE 241	4G1	1415	171.17	1725
37	RTE 241	4G1Q			
39	N. York Sub	9G1	0905	168.42	0930
40	W. Fairview	15G1	1155	163.17	0705
40	W. Fairview	15G1Q			
38	Columbia	7G1	0825	173.58	1400

X = result by radiochemistry
(X)= result by gamma spec.

Milk
Iodine - 131 (pCi/ℓ)

Map Loc	Page 1 of 3	Sample	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6	4/7	4/8	4/9
18	Alwine Farm	4B1	<0.2	-	8.5 (14.4)	4.6	2.6	1.0	<0.4	<0.3	0.64	0.47	<0.2	<0.2
20	Becker Farm	7B3	<0.2	-	21.0 (18.6)	-	3.8	2.1	0.87	0.72	0.25	<0.2	1.2	0.78
20	Becker Farm	7B3Q	<0.1	-	10		3.2	2.7	1.26	0.65		<0.4	1.34	1.28
29	Conley Farm	14C1	2.7	-	4.4	2.9	-	-	-	-	-	-	-	-
-	Fisher Farm	14D1	-	-	-	2.5	-	2.0	1.9	0.54	0.49	.32,<.2	-	< 0.3
36	Oellig Farm	2G1	<0.2	-	< 0.3	< 0.3	< 0.3	< 0.3	<0.4	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
45	Hardison Farm	1B1	1.1	41.0 (59.0)	-	27.0 (48.8)	12.0 (26.5)	19.0 (39.4)	-	12.0,11.0 (36.6)(<40)	-	3.4	-	-

X = result by radiochemistry
(X) = result by gamma spec.

Milk
Iodine - 131 (pCi/ℓ)

Effective 4/18 - 40 gm/gal $NaHSO_3$ to each sample

Map Loc	Page 2 of 3	Sample	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21
18	Alwine Farm	4B1	<0.3	<0.2	<0.3	0.24	<0.1	<0.2	0.39	0.34	0.59	0.54	0.35	0.27
20	Becker Farm	7B3	0.58	1.3	1.1	1.8	0.94	0.57	3.4	3.7	5.6	6.6	3.1	2.1
20	Becker Farm	7B3Q	2.4	1.6	1.4	1.8	1.3	1.1	5.2	4.4	11.5	7.8	4.4	2.8
-	Fisher Farm	14D1	-	<0.3	<.3,0.84	-	0.73	0.26	0.27	<0.2	< 0.1	<0.2	<0.1	<0.3
36	Oellig Farm	2G1	<0.3	<0.2	<0.3	<0.3	<0.2	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.3
45	Hardison Farm	1B1	4.2	6.0	34.0 (47.1)	10.0	4.1	8.0	3.3	13.0 (28.4)	-	-	-	-

X = result by radiochemistry
(X) = result by gamma spec.
40 gm/gal NaHSO$_3$ to each sample

Milk
Iodine - 131 (pCi/ℓ)

Map Loc	Page 3 of 3	Sample	4/22	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30
18	Alwine Farm	4B1	<0.2	0.19	<0.2	<0.4	<0.2	<0.2	<0.4	<0.4	<0.3
20	Becker Farm	7B3	0.57	0.72	<0.4	0.42	0.86	0.49	<0.5	3.6	4.7.
20	Becker Farm	7B3Q	1.7	<0.8	<2.2	0.5	<0.5	<0.7	<0.4	4.5	5.2
-	Fisher Farm	14D1	0.31	0.40	1.0	0.77	2.1	-	.89 <.5	<0.3	-
36	Oellig Farm	2G1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.3	<0.5	<0.5	<0.3
45	Hardison Farm	1B1	-	-	-	110.	57.	39.	22.	37.	26.
						(97.6)	(60.8)	(46.8)	(28.9)	(50.8)	(21.6)

Note: Composite samples are taken at 8E1 and 8C2
*Indicates Finished (Treated) Water
— Indicates Composite

Water pCi/l TRITIUM

Page 1 of 3

		Sample	2/28	3/7	3/21	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6
27	Swatara Creek	1C3						110			<120	110	<100	100
27	Swatara Creek	1C3Q									<268	181	<274	<263
30	Brunner Island	8E1						350	<120	220	810	160	330	150
30	Brunner Island	8E1*				130					<130	100	<120	170
30	Brunner Island	8E1Q							<211		<268		175	
30	Brunner Island	8E1Q*											234	
38	Columbia Water Plant	7G1				130		<200	320	190	<130	100	<120	100
38	Columbia Water Plant	7G1Q							<211	180	<268	175	<307	<286
35	Steelton Water Works	15F1*						170,140	<110	<150	110	110	160	210
35	Steelton Water Works	15F1Q*							<211	<217	<268	349	<274	298
48	YNGS	8C2				260		110	180	290	590	<110	240	100
48	YNGS	8C2Q			<265	<265			<273	<217	<268	<274	<274	428
	Discharge Pit	10S1			19,300	500			500	100	120	150	100	<130
	Discharge Pit	10S1Q			16,900	<265			218	<307	<203	<274	<307	<292
	York	9G2*							440	180	<130	130	420	140
	York	9G2Q*				<281		<281	<211	<217	570	<274	<307	223
	Holtwood/Safe Habor	-											150	

Map Locat.

Note: Composite samples are taken at 8E1 and 8C2
*Indicates Finished (Treated) Water

Water TRITIUM
pCi/l

Map Locat.	Page 2 of 3	Sample	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18
27	Swatara Creek	1C3	<100	100	100	180	100	220	270	110	100	220	200	310
27	Swatara Creek	1C3Q	<286	<292	<216	205	<273	<262	<283	<268	<268	<256	<207	440
30	Brunner Island	8E1	110	150	150	<120	100	320	170	100	130	280	210	160 / 150
30	Brunner Island	8E1*	100	100	100	120	<110	110	<100	100	130	270	190	
38	Columbia Water Plant	7G1	270	160	100	110	100	120	100	100	<120	200	190	160
38	Columbia Water Plant	7G1Q	<286	190	<216	<264	<273	<262	<283	<268	<309	<256	139	<305
35	Steelton Water Works	15F1*	180	120	100	110	110	150	<100	150	160	190	140	120
35	Steelton Water Works	15F1Q*	<286	<292	<216	<273	<273	<283	<283	<268	<309	<256	<207	<305
48	YHGS	8C2	110	110	110	140	190	210	150	160	120	260	110	
48	YHGS	8C2Q	<286	<292	<216	<273	<262	<283	<244	<268	<309	<256	<207	<305
	Discharge Pit	10S1	<130	270	140	510	100	120	2920	220	3690			
	Discharge Pit	10S1Q	<292	<264	181	506	183	<244	2880	<309	3990	<256	2440	<250
	York	9G2*	<130	<110	120	<110	140	160	240	150	<110	130	<110	
	York	9G2Q*	<286	142	<216	<273	<262	<283	<283	<268	<309	<256	<207	<305

Note: Composite samples are taken at 8E1 and 8C2
*Indicates Finished (Treated) Water

Water TRITIUM
pCi/l

Map Location	Page 3 of 3	Sample	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30
27	Swatara Creek	1C3	220	140	280									
27	Swatara Creek	1C3Q	<305	<287	<287	<312	<270	<220	<220	<279	<226	<272	<235	<262
30	Brunner Island	8E1	300	270										
30	Brunner Island	8E1*	270	390										
38	Columbia Water Plant	7G1	100	270	200									
38	Columbia Water Plant	7G1Q	<250	<287	<250	<312	<270	<220	<220	<279	<226	<272	244	<262
35	Steelton Water Works	15F1*	210	210	240									
35	Steelton Water Works	15F1Q*	<250	<287	<250	<312	180	<220	<252	<279	<226	<272	<235	<262
48	YNGS	8C2		200	190									
48	YNGS	8C2Q	<250	<287	<250	<312	233	<220	<252	<279	<226	<272	<235	<262
	Discharge Pit	10S1	370	2240	450									
	Discharge Pit	10S1Q	<250	2440	<262	235	1980	1920	<252	<279	1280	1400	<243	1130
	York	9G2*		180	110									
	York	9G2Q*	<250	<287	<250	<312	<270	<243	<252	<279	<226	<272	166	<262
	Wrightsville	7G2												
	Wrightsville	7G2*												

Note: Composite samples are taken at 8E1 and 8C2
*Indicates Finished (Treated) Water
— Indicates Composite

Water
pCi/l

GROSS BETA

Page 1 of 3	Sample	2/28	3/7	3/21	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6
Swatara Creek	1C3						2.5			3.0	2.6	5.8	4.7
Swatara Creek	1C3Q									<2.95	<3.21	4.59	3.26
Brunner Island	8E1						2.7	3.8	4.5	3.3	5.7	<5.5	5.7
Brunner Island	8E1*				2.7					2.4	<1.0	<1.0	<1.0
Brunner Island	8E1Q							<3.3		3.00		5.35	
Brunner Island	8E1Q*											<3.55	
Columbia Water Plant	7G1				2.8		2.3	3.8	3.8	2.5	3.4	3.3	4.7
Columbia Water Plant	7G1Q							2.6	<3.3	2.13	<3.21	<3.21	3.09
Steelton Water Works	15F1*						2.1,1.4	3.2	3.9	1.7	28.0	4.5	1.9
Steelton Water Works	15F1Q*							<3.3	<3.3	<2.95	<3.21	2.42	<3.55
YNGS	8C2				3.7		3.3	3.1		<1.0	1.7	3.3	2.0
YNGS	8C2Q			5.17	<2.89			3.0	<3.3	2.05	<3.21	<3.21	<3.55
Discharge Pit	10S1				4.3			6.2	4.7	2.1	1.7	3.1	3.2
Discharge Pit	10S1Q			18.1	<2.89			33.0	23.8	<2.95	<3.21	2.67	7.86
York	9G2*							2.0	1.8	2.1	3.3	2.7	2.3
York	9G2Q*				<2.89		2.05	<3.3	<3.3	<2.95	<3.21	<3.21	<3.55
Holtwood/Safe Harbor	-											2.0	

Note: Composite samples are taken at 8E1 and 8C2
*Indicates Finished (Treated) Water

Water
pCi/l

GROSS BETA

Map Locat.	Page 2 of 3	Sample	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18
27	Swatara Creek	1C3	3.9	3.0	1.8	4.1	3.1	3.8	3.2	1.9	2.6	4.3	3.3	2.7
27	Swatara Creek	1C3Q	<3.55	4.2	3.1	2.8	3.6	<3.0	<3.0	<3.0	2.1	<3.3	<3.3	3.3
30	Brunner Island	8E1	3.9	4.4	4.0	3.0	4.3	7.8	4.2	3.5	6.1	4.1	2.4	3.4 2.9
30	Brunner Island	8E1*	5.9	<1.0	<1.0	1.9	1.4	-	1.9	1.3	2.2	<1.0	2.3	1.3 <1.0
38	Columbia Water Plant	7G1	4.8	2.8	3.1	2.4	3.1	2.5	4.9	4.7	3.0	1.7	2.8	2.9
38	Columbia Water Plant	7G1Q	5.10	2.5	3.1	2.6	<3.1	<3.0	2.3	2.1	<3.0	<3.3	7.8	2.64
35	Steelton Water Works	15F1*	1.9	<0.9	2.4	<1.0	1.9	2.6	2.5	2.7	2.2	2.1	<1.0	2.8
35	Steelton Water Works	15F1Q*	7.78	2.2	2.5	<3.1	3.5	8.0	<3.0	<3.0	<3.0	<3.3	<3.3	2.2
48	YHGS	8C2	2.5	3.6	2.0	2.3	1.6	2.6	4.9	2.7	2.9	2.0	<1.0	2.6
48	YHGS	8C2Q	<3.55	3.4	4.9	2.3	<3.0	<3.0	<3.0	<3.0	< 3.0	<3.3	<3.3	<2.9
	Discharge Pit	10S1	3.0	5.0	3.0	2.7	2.4	3.4	8.1	3.5	7.3	1.9	17.0	3.2
	Discharge Pit	10S1Q	8.78	6.5	5.2	5.4	7.8	<3.0	5.1	2.5	8.5	<3.3	12.5	2.5
	York	9G2*	2.3	2.0	1.5	2.2	1.4	2.4	2.3	3.2	2.9	3.5	2.6	2.1
	York	9G2Q*	<3.55	3.0	2.5	<3.1	3.6	<3.0	<3.0	<3.0	<3.0	<3.3	<3.3	2.2

Note: Composite samples are taken at 8E1 and 8C2
*Indicates Finished (Treated) Water

Water
pCi/ℓ

GROSS BETA

Map Local	Page 3 of 3	Sample	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30
27	Swatara Creek	1C3	2.7	2.4	3.5	3.3	3.8	3.1	2.6	2.4	2.4	2.7	3.5	4.3
27	Swatara Creek	1C3Q	<2.9	<3.3	<3.3	<3.1	2.4	7.9	2.4	4.4	8.1	<3.3	2.9	<3.1
30	Brunner Island	8E1	2.7	3.9	2.2	3.1	2.6	3.4		3.6 3.5	2.2	2.0	3.8	2.9
30	Brunner Island	8E1*	1.9	<1.0	<1.0	3.9	<1.0	<1.0	1.8	<0.9 1.4	<1.0	4.8	1.4	<0.9
	TMI W. shore 0.5 mi.S.	9A1(2)										5.0		
	TMI W. shore 1.5 mi.S.	9B1										2.0		
38	Columbia Water Plant	7G1	2.9	3.1	2.4	2.1	2.9	1.8	5.3	3.8	3.0	3.1	1.4	1.7
38	Columbia Water Plant	7G1Q	2.4	2.96	<3.3	<3.1	2.8	<3.3	2.4	4.6	4.4	2.9	<3.3	<3.1
35	Steelton Water Works	15F1*	2.3	4.2	1.9	2.5	1.7	1.9	4.5	<1.0	2.0	3.8	2.4	1.4
35	Steelton Water Works	15F1Q*	<2.9	2.71	<3.3	<3.1	2.7	<3.2	<3.3	2.6	3.9	3.2	<3.3	<3.1
48	YHGS	8C2	2.1	1.9	2.1	1.7	2.4	1.5	<1.0	1.9	2.1	1.7	2.0	1.6
48	YHGS	8C2Q	2.8	<3.3	<3.3	2.6	3.1	<3.3	<3.3	2.7	<3.0	4.5	<3.3	<3.1
	Discharge Pit	10S1	2.0	16.	2.5	2.8	7.8	7.9	2.9	3.3	1.1	4.6	3.7	3.8
	Discharge Pit	10S1Q	4.99	10.9	2.45	<3.1	7.7	9.0	2.2	6.7	3.6	6.4	2.5	<3.1
	York	9G2*	1.8	2.2	2.1	1.7	2.2	2.2	1.2	1.7	2.8	2.2	3.3	2.0
	York	9G2Q*	<2.9	<3.3	<3.3	<3.1	<3.1	2.2	2.3	<3.0	3.4	<3.3	<3.3	<3.1
	Wrightsville	7G2				3.0	2.2	2.8	2.4	2.7	2.8	4.3	3.5	3.1
	Wrightsville	7G2*				2.0	2.4	3.8	2.5	2.2	2.4	3.3	1.8	2.8

255 177

Note: Composite samples are taken at 8E1 and 8C2
*Indicates Finished (Treated) Water
—Indicates Composite

Water
pCi/ℓ

IODINE-131

X = Result by radiochemistry
(X) = Result by gamma spec.
Y, Y = Normal sample, Sodium Bisulfite added.

Page 1 of 3

		Sample	2/28	3/7	3/21	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6
27	Swatara Creek	1C3						<0.3			<0.2	<0.2	<0.2	<0.2
27	Swatara Creek	1C3Q									<0.3	<0.4	<0.4	<0.3
30	Brunner Island	8E1						<0.2	<0.2	<0.5	<0.1	<0.2	<0.2	<0.2
30	Brunner Island	8E1*				<0.2					<0.2	<0.1	<0.3	<0.2
30	Brunner Island	8E1Q							<0.2		<0.2		<0.3	
30	Brunner Island	8E1Q*											<0.6	
38	Columbia Water Plant	7G1				<0.3		0.4	0.72	0.66	<0.2	<0.3	<0.2	<0.3
38	Columbia Water Plant	7G1Q							0.88	0.63	<0.3	<0.4	<0.3	<0.4
35	Steelton Water Works	15F1*						.1, .2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.3
35	Steelton Water Works	15F1Q*							<0.2	<0.2	<0.2	<0.4	<0.4	<0.3
48	YHGS	8C2				<0.1		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.3
48	YHGS	8C2Q			<0.7	<0.3			<1.4	<0.2	<0.3	<0.5	<0.4	<0.4
	Discharge Pit	10S1			<0.5	0.54			62.0 (73.)	43.0 (67.)	0.73	<0.2	<0.1	5.9
	Discharge Pit	10S1Q			<0.7	0.62			52.7 (71.)	48.6 (54.)	1.13	<0.6	<0.6	7.3 (18.)
	York	9G2*							<0.3	<0.2	<0.2	<0.1	<0.2	<0.4
	York	9G2Q*				<0.3		<0.2	<0.2	<0.2	<0.3	<0.4	<0.4	<0.2
	Holtwood/Safe Harbor	-											<0.4	

Note: Composite samples are taken at 8E1 and 8C2
*Indicates Finished (Treated) Water

Water
µCi/ℓ

IODINE-131

X - Result by radiochemistry
(X) - Result by gamma spec.
Y,Y = Normal sample, Sodium Bisulfite added.

Map Locati[on]	Page 2 of 3	Sample	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18
27	Swatara Creek	1C3	<0.2	<0.2	<0.2	<0.5	<0.3	<0.3	<0.2	<0.3	<0.3	<0.3	<0.2	<0.3
27	Swatara Creek	1C3Q	<0.2	<0.3	<0.4	<0.2	<0.4	<0.4	<0.3	<0.2	<0.2	<0.5	<0.3	<0.4
30	Brunner Island	8E1	<0.2	<0.3	<0.3	<0.3	<0.2	<0.2	<0.2	<0.3	<0.4	<0.2	<0.3	<0.3 / <0.
30	Brunner Island	8E1*	<0.2	<0.3	<0.3	<0.2	<0.1	<0.2	<0.3	<0.3	<0.2	<0.5	<0.4	<0.2 / <0.
38	Columbia Water Plant	7G1	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.2	<0.4	<0.2	<0.4	<0.3	<0.3
38	Columbia Water Plant	7G1Q	<0.2	<0.5	<0.4	<0.3	<0.4	<0.5	<0.3	<0.2	<0.2	<0.4	<0.3	<0.3
35	Steelton Water Works	15F1*	<0.2	<0.3	<0.2	<0.3	<0.3	<0.3	<0.2	<0.4	<0.2	<0.4	<0.3	<0.3
35	Steelton Water Works	15F1Q*	<0.2	<0.4	<0.6	<0.3	<0.5	<0.3	<0.3	<0.2	<0.2	<0.3	<0.3	<0.3
48	YHGS	8C2	<0.2	<0.4	<0.2	<0.2	<0.5	<0.2	<0.2	<0.5	<0.4	<0.3	<0.4	<0.5
48	YHGS	8C2Q	<0.3	<0.5	<0.3	<0.5	<0.4	<0.4	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3
	Discharge Pit	10S1	6.3	<0.3	<0.2	4.2	4.1	1.5	1.2	1.9	2.3	<0.3	6.6,8.9	4.7,4.9
	Discharge Pit	10S1Q	7.3 (11.)	0.8	<0.6	4.5 (5.8)	4.6	1.6	2.4	1.9 (3.4)	3.6 (3.3)	1.7	10.0 (11.)	5.1 (7.8)
	York	9G2*	<0.3	<0.5	<0.4	<0.2	<0.2	<0.2	<0.3	<0.2	<0.2	<0.3	<0.5	<0.3
	York	9G2Q*	<0.3	<0.4	<0.4	<0.4	<0.4	<0.5	<0.2	<0.3	<0.3	<0.4	<0.3	<0.4
	Holtwood/Safe Habor	-												

Note: Composite samples are taken at 8E1 and 8C2
*Indicates Finished (Treated) Water

Water
pCi/ℓ

IODINE-131

X = Result by radiochemistry
(X) = Result by gamma spec.
Y,Y = Normal sample, Sodium Bisulfite added.

Map Location		Sample	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30
27	Swatara Creek	1C3	<0.3	0.41	<0.2	<0.3	<0.3	<0.2	<0.1	<0.3	<0.2	<0.4	<0.3	<0.3
27	Swatara Creek	1C3Q	0.57	<0.4	<0.3	<0.3	<0.3	<0.2	<0.3	<0.3	<0.2	0.7	<0.4	<0.4
30	Brunner Island	8E1	<0.2	<0.2	<0.4	<0.3	<0.2	<0.2	<0.5	<.2 <.2	0.37	<0.3	<0.2	<0.4
30	Brunner Island	8E1*	<0.4	<0.3	<0.4	<0.3	<0.3	<0.2	<0.4	<.5 <.3	<0.2	<0.2	<0.2	<0.3
38	Columbia Water Plant	7G1	<0.2	<0.2	<0.1	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.3	<0.3	<0.4
38	Columbia Water Plant	7G1Q	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.2	<0.3	<0.3	<0.3
35	Steelton Water Works	15F1*	<0.2	<0.2	<0.2	<0.5	<0.4	<0.2	<0.1	<0.5	<0.4	<0.3	<0.2	<0.3
35	Steelton Water Works	15F1Q*	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3	<0.2	<0.3	<0.4
48	YHGS	8C2	<0.4	<0.3	<0.3	<0.3	<0.3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5
48	YHGS	8C2Q	<0.3	<0.3	<0.2	<0.3	<0.3	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3
	Discharge Pit	10S1	4.7,3.6	5.6,5.9	1.5,1.8	-, 1.4	-, 4.2	-,<.2	-,<.3	-, .98	-, 1.5	-, 1.1	-,< .4	-,1.7
	Discharge Pit	10S1Q	4.1 (3.6)	5.8 (7.7)	1.5	2.0	4.3 (6.9)	3.7 (4.3)	1.2	1.3	2.2	2.2	0.9	2.5
	York	9G2*	<0.2	<0.2	<0.3	<0.3	<0.4	<0.3	<0.2	<0.2	<0.3	<0.2	<0.4	<0.2
	York	9G2Q*	<0.2	<0.2	<0.3	<0.3	<0.3	<0.5	<0.2	<0.3	<0.4	<0.3	<0.3	<0.3
	Holtwood/Safe Habor	-												
	Wrightsville	7G2				<0.4	<0.4	<0.2	<0.3	<0.3	0.55	<0.2	<0.4	<0.3
	Wrightsville	7G2*				<0.4	<0.3	<0.5	<0.3	<0.3	0.49	<0.3	<0.2	<0.3

pCi/gm (DRY)

Para.	Stat.	Collect. Date	I-131	Cs-137	K-40	Th-228	Sr-89	Sr-90	Co-58	Cs-134	Ra-226	Mn-54	Be-7	All Other
AQS	1A2	4/10	*	0.085	7.49	0.81			*	*	*	*	*	*
AQS	10B1	4/10	*	0.066	4.88	0.61			*	*	*	*	*	*
AQS	11A1	4/10	*	0.44	7.35	1.29			0.54	0.21	*	*	*	*
AQS	7A1	4/10	*	0.28	10.9	1.15			*	*	2.25	*	*	*
AQS	9B1	4/10	*	0.18	9.47	1.00			0.19	*	*	*	*	*
AQS	1A2	4/5	*	0.13	7.22	0.98			*	*	*	*	*	*
AQS	10B1	4/5	*	0.19	6.32	1.27			*	*	*	*	*	*
AQS	11A1	4/5	*	0.24	9.08	1.05			0.57	*	1.56	0.12	*	*
AQS	7A1	4/5	*	0.52	10.4	1.47			*	*	3.08	*	*	*
AQS	9B1	4/5	*	0.43	12.7	1.52			0.37	*	*	*	*	*
AQS	10B1	4/12	*	0.12	5.82	0.72			*	*	1.39	*	*	*
AQS	1A2	4/12												
AQS	7A1	4/12												
AQS	9B1	4/12												
AQS	11A1	4/12												
AQS	1A2	4/16	*	0.284	9.51	1.16			*	*	*	*	1.08	*
AQS	9B1	4/16												
AQS	10A1	4/16	*	0.295	8.96	0.825			0.531	*	*	*	*	*
AQS	7A1	4/16												
AQS	10B1	4/16												
AQS	11A1	4/16												
AQS	1A2	4/23	*	0.222	7.35	0.745			*	*	1.15	*	*	*
AQS	7A1	4/23	*	0.245	9.59	1.16			*	*	1.79	*	*	*
AQS	9B1	4/23	*	0.457	14.7	1.63			0.200	*	2.39	*	*	*
AQS	10B1	4/23	*	0.109	6.63	0.709			*	*	*	*	*	*
AQS	11A1	4/23	*	0.206	7.13	0.926			0.580	*	*	0.072	*	*

Misc. Results
pCi/g

Note: Blank indicates result is less than MDL.

Parameter	Station	Collect Date	Wet/Dry	Item	I-131	Cs-137	K-40	Ra-226	Th-232	Be-7	Th-228
FPP	1B1Q	4/3	W	Chicken	<0.05		3.0				
SOL	1B1Q	4/5	W	Soil	<0.1	1.0	110	0.72	1.0		
VGT	1B1Q	4/5	W	Grass	<0.14	0.32	2.9			3.4	
SOL	4B1Q	4/5	W	Soil	<0.1	0.58	8.7	0.69	0.92		
VGT	4B1Q	4/5	W	Grass	<0.11		3.6			2.3	
SOL	7B3Q	4/5	W	Soil	<0.01	0.72	110	1.0	1.1		
VGT	7B3Q	4/5	W	Grass	<0.2	0.18	3.5			4.0	
FPG	1B1Q	4/5	W	Kid	<0.05		1.5				
FPP	6B1Q	4/8	W	Chicken	<0.13		4.0				
MET	14C3Q	4/9	W	Pig	<0.09		1.9				
FPE	6B1Q	4/8	W	Eggs	<0.13						
FPB	5G1Q	4/6	W	Beef	<0.15		2.9				
FPP	5G2Q	4/16	W	Chicken	<0.06		3.4				
FPE	5G2Q	4/16	W	Eggs	<0.09						
FPP	14D1	4/5	W	Duck	<0.05		3.09				
FPB	4E1	3/30	W	Beef	<0.09		2.27				
FPP	6B1	4/8	W	Chicken	<0.1						
E	2G1	4/5	D	Soil	<0.2	0.456	19.9	2.49			1.59
E	14D1	4/5	D	Soil	<0.3	0.677	110				1.57
E	14C1	4/5	D	Soil	<0.3	1.38	14.3	1.95			1.36
E	2G1	4/5	W	Grass	<0.01						
E	14D1	4/5	W	Grass	0.033						
E	14C1	4/5	W	Grass	0.063						

pCi/gm (WET)

Station	Item	Collec Date	I-131	Cs-137	K-40	Th-228	Sr-89	Sr-90	Cs-134	All Others
13A1	Rock Bass	4/10	<MDL	<MDL	4.29	<MDL			<MDL	<MDL
16A2	Sm. M. Bass	4/10	<MDL	<MDL	9.21	0.29			<MDL	<MDL
16B8	ChCt& Br Bh	4/11	<MDL	<MDL	2.57	<MDL			<MDL	<MDL
16B8	Sm. M. Bass	4/11	<MDL	<MDL	2.70	<MDL			<MDL	<MDL
10A3	Rock Bass	4/10	<MDL	<MDL	3.54	<MDL			<MDL	<MDL
10A3	Sm. M. Bass	4/11	<MDL	0.145	3.21	<MDL			<MDL	<MDL
9A2	Ch. Ct.	4/12	<MDL	<MDL	2.63	<MDL			<MDL	<MDL
9D2	Ch. Ct.	4/12	<MDL	0.11	2.55	<MDL			<MDL	<MDL
9B1	Predators	4/17-19	<MDL	0.125	2.86	<MDL			<MDL	<MDL
9B1	Bottom Feeders	4/17	<MDL	0.129	3.74	<MDL			0.057	<MDL
16B1	Predators	4/17-19	<MDL	0.438	2.66	<MDL			<MDL	<MDL
16B1	Bottom Feeders	4/17	<MDL	<MDL	3.31	<MDL			<MDL	<MDL
9B1	Predators	4/24-26	<MDL	<MDL	2.69	<MDL			<MDL	<MDL
9B1	Bottom Feeders	4/24-26	<MDL	0.743	2.69	<MDL			<MDL	<MDL
16B1	Predators	4/23-24	<MDL	<MDL	2.89	<MDL			<MDL	<MDL
16B1	Bottom Feeders	4/23	<MDL	0.778	3.49	<MDL			<MDL	<MDL

pCi/l
GROSS BETA, IODINE 131, TRITIUM

	LOCATION		STATION	2/28-3/29	2/28-3/31	3/31-4/5	4/5-4/27
40	W. Fairview	GROSS BETA	15G1		10.0	93.0	5.2
40	W. Fairview	GROSS BETA	15G1Q	20.9		3.3	<3.3
28	Falmouth-CollinsSub	GROSS BETA	8C1		19.0	5.4	6.2
28	Falmouth-CollinsSub	GROSS BETA	8C1Q	15.5		2.8	<3.3
14	Obs Cntr.	GROSS BETA	5A1		2.9	3.7	3.1
34	Drager Farm	GROSS BETA	7F1		14.0	8.1	4.1
40	W. Fairview	IODINE 131	15G1		<0.2	<0.2	
40	W. Fairview	IODINE 131	15G1Q	<0.4		<0.6	
28	Falmouth-CollinsSub	IODINE 131	8C1		<0.2	2.1	
28	Falmouth-CollinsSub	IODINE 131	8C1Q	<0.3		<0.7	
14	Obs. Cntr.	IODINE 131	5A1		<0.4	1.2	
34	Drager Farm	IODINE 131	7F1		<0.4	<0.2	
40	W. Fairview	TRITIUM	15G1		<150	<110	
40	W. Fairview	TRITIUM	15G1Q	201		<307	
28	Falmouth-CollinsSub	TRITIUM	8C1		160	160	
28	Falmouth-CollinsSub	TRITIUM	8C1Q	<248		<307	
14	Obs. Cntr.	TRITIUM	5A1		160	<120	
34	Drager Farm	TRITIUM	7F1		140	100	

+Composite began 4/10
*Composite began 2/28

Air Particulates - Air Iodine
(Gross Beta) (Iodine-131)
pCi/m³

	page 1 of 1		Station	3/21-3/29	3/29-3/31	3/31-4/3	4/3-4/6	4/6-4/9	4/9-4/12	4/12-4/15	4/15-4/18	4/18-4/21	4/21-4/24	4/24-4/27	2/27-4/30
	North Weather Station	AP-GROSS BETA	1S2	0.033	0.17	0.035	0.043	0.058	0.057	0.058	0.030	0.091	0.10	0.067	0.031
S	Falmouth Sub.		8C1	<0.002	0.038	0.013	4.17	-	0.220+	0.071	0.028	0.069	0.076	0.034	0.034
3	Observation Cntr.		5A1	0.025	0.21	0.026	0.073	0.047	0.040	0.028	0.160	0.040	0.040	0.039	0.053
0	West Fairview		15G1	0.035	0.12	0.032	0.039	0.047	0.041	0.047	0.042	0.074	0.074	0.060	0.035
4	Drager Farm		7F1	0.065*	0.19	0.084	0.074	0.110	0.096	0.070	0.069	0.140	0.140	0.092	0.073
4	Drager Farm		7F1Q	0.124*	0.155	0.202	0.04	0.06	0.04	0.05	0.04	0.09	0.08	0.051	0.033
6	Middletown		1C1	0.039*	0.24	0.035	0.044	0.06	0.065	0.047	0.041	0.110	0.060	0.053	0.039
6	Middletown		1C1Q	0.124*	0.212	0.184	0.04	0.06	0.03	0.05	0.03	0.09	0.05	0.044	0.030
4	Goldsboro Air Station		12B1	0.049*	0.22	0.038	0.045	0.038	0.061	0.053	0.027	0.089	0.073	0.053	0.051
9	North York Sub.		9G1	0.034*	0.10	0.045	0.038	0.048	0.046	0.038	0.029	0.069	0.058	0.052	0.042
2	North Weather Station	AI-IODINE 131	1S2	0.468	22.6	0.110	0.317	0.364	0.412	0.346	< 0.07	0.611	0.963	0.253	<0.046
8	Falmouth Sub.		8C1	< 0.02	20.1	1.39	< 5.27	-	0.152+	0.449	0.057	0.172	0.086	<0.050	<0.17
4	Observation Cntr.		5A1	< 0.02	20.3	0.279	3.87	0.666	0.627	0.197	8.39	0.082	0.105	<0.027	0.647
40	West Fairview		15G1	< 0.03	1.83	<0.024	<0.047	<0.052	<0.01	0.065	< 0.04	< 0.07	<0.065	<0.078	<0.14
34	Drager Farm		7F1	< 0.04*	0.266	0.155	0.090	0.039	0.205	<0.03	0.39	0.233	<0.061	<0.065	<0.23
34	Drager Farm		7F1Q	< 0.02*	0.09	<0.09	0.08	<0.07	0.09	<0.07	0.17	0.09	<0.078	<0.051	<0.076
26	Middletown		1C1	0.082*	12.7	0.051	0.167	0.202	0.098	0.381	< 0.06	0.069	0.184	<0.035	<0.042
26	Middletown		1C1Q	0.05*	9.8	< 0.05	0.1	0.15	<0.07	0.15	<0.06	0.12	0.049	<0.068	<0.058
24	Goldsboro Air Station		12B1	0.295*	23.9	0.068	0.368	0.687	0.675	0.462	<0.06	0.168	0.130	<0.046	<0.16
39	North York Sub.		9G1	< 0.02*	0.143	0.355	< 0.037	0.048	< 0.04	0.061	<0.04	< 0.06	<0.051	<0.037	<0.062

APPENDIX C

Appendix C

Information On Potential Radiological Doses For The Noted Pathways And Periods

Waterborne Pathways

Location	Period	Nuclide and Average Concentration*
TM-SW-8E1	3/29-4/21	H-3 = 168 pCi/l
	3/29-4/30	I-131 = None detected
	3/29-4/12	γ = None detected
TM-SW-7G1	3/29-4/21	H-3 = 150 pCi/l
	3/29-4/30	I-131 = 0.28 pCi/l
	3/29-4/10	γ = None detected
TM-SW-7G2	Not available	H-3 =
	4/22-4/30	I-131 = 0.34 pCi/l
	Not available	γ =
TM-SW-9G2	4/1-4/21	H-3 = 170 pCi/l
	4/1-4/30	I-131 = None detected
	4/1-4/9	γ =
Susquehanna River South of TMI	3/29-4/21	H-3 = 165 pCi/l
	3/29-4/30	I-131 = 0.25 pCi/l
	3/29-4/12	γ = None detected

*For purposes of averaging values at or below the detection limit were considered to be the value of the detection limit.

Waterborne Pathways (continued)

Pathway	Location	Radionuclide	Organ	Dose: mrem/period Maximum Individual	Average Individual	Man-rem
Drinking Water	TM-SW-8E1	H-3	Whole body	8.5E-4	5.1E-4	1.3E-5
	TM-SW-7G1	H-3	Whole body	8.1E-4	4.8E-4	4.8E-3
	TM-SW-7G1	I-131	Thyroid	3.6E-2	2.2E-2	-
	TM-SW-7G2	I-131	Thyroid	4.4E-2	2.6E-2	-
	TM-SW-9G2	H-3	Whole body	7.5E-4	4.5E-4	5.6E-2
Eating Fish	River	H-3	Whole body	1.9E-5	2.1E-6	-
	River	I-131	Thyroid	1.3E-2	1.4E-3	-
Swimming	River	H-3	Whole body	0	0	-
	River	I-131	Whole body	1.6E-6	6.7E-8	-
Boating	River	H-3	Whole body	0	0	-
	River	I-131	Whole body	7.9E-7	3.3E-8	-
Shoreline	River	H-3	Whole body	0	0	-
	River	I-131	Whole body	5.3E-6	2.2E-8	-

Milk Pathway (cow's milk only)

Location	Radionuclide and Average Concentration	Period	Organ	Dose: mrem/period
TM-M-7B3	I-131 = 2.4 pCi/l	3/29-4/30	Infant Thyroid	1.1
All locations	I-131 = 1.1 pCi/l	3/29-4/30	Infant Thyroid	0.5

Inhalation of Radioiodine

Location	Average Concentration	Period	Organ	Dose: mrem/period
TM-AI-5A1	2.93 pCi/m³	3/22-4/30	Adult Thyroid	3.7
TM-AI-1C1	1.21 pCi/m³	3/22-4/30	Adult Thyroid	1.5
TM-AI-IB1	2.25 pCi/m³	3/22-4/30	Adult Thyroid	2.9

255 189