Dear Dr. Snyder:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
System Description for the Solid Waste Staging Facility

Attached for your information is the annual update to the System Description for the Solid Waste Staging Facility (SWSF) as requested by your letter dated February 4, 1982. This update reflects minor changes in the operation of the SWSF.

Sincerely,

F. R. Standerfer
Vice President/Director, TMI-2

Attachment

cc: Deputy Program Director - TMI Program Office, Dr. W. D. Travers

GPU Nuclear Corporation is a subsidiary of the General Public Utilities Corporation
DIVISION

SYSTEM DESCRIPTION

FOR

Solid Waste Staging Facility

COG ENG DATE 7/18/85
RTR DATE 7/18/85
COG ENG MGR. DATE 7/18/85
<table>
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<th>Rev.</th>
<th>SUMMARY OF CHANGE</th>
<th>Approval</th>
<th>Date</th>
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<td>Initial issue per letter 4400-82-L-0059</td>
<td>4/82</td>
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<td>1</td>
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<td>2</td>
<td>Annual Update</td>
<td>7/85</td>
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THREE MILE ISLAND NUCLEAR STATION UNIT 2
RECOVERY PROGRAM
SOLID WASTE STAGING FACILITY
SYSTEM DESCRIPTION
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FOR
SOLID WASTE STAGING FACILITY

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Attachment 1 Shielding Analysis - Types of Waste 14

Figure 1 Plot Plan - Location of SWSF

Figure 2 Typical Layout - SWSF

Figure 3 SWSF Sump Flow Diagram
SYSTEM DESCRIPTION

OF

SOLID WASTE STAGING FACILITY (SWSF)

1.0 INTRODUCTION

The Solid Waste Staging Facility (SWSF) performs no active function. The facility is a passive system for temporary staging of nuclear radioactive waste prior to preparation for shipment and disposal to approved offsite burial grounds. The SWSF has been designed and will be operated in such a manner as to provide assurance that:

A. The health and safety of the public will be protected.

B. Occupational exposures will be as low as reasonably achievable (ALARA)

C. There will be no significant adverse impact on the environment.

2.0 DESIGN DESCRIPTION

2.1 Facility Function

2.1.1 The SWSF is used for the collection and temporary staging of the radioactive waste (i.e., Solidified/Dewatered Resins, Filters, Sludges, etc.) generated during the Recovery cleanup operations at TMI Unit 2, and operations in Unit 1.

2.1.2 The SWSF is located as shown on Figure 1, South and East of Unit 2 Natural Draft Cooling Towers within the area protected by the Flood Control Dikes.

Space was allocated to accommodate six (6) modular structures; two (2) modules "A" and "B" are completed, the remaining space is available for additional modules as, or if, required.
2.1.3 Figure 2 shows the typical layout of the SWSF system.

2.1.3.1 Each Module is designed with Sixty (60) Cells forming the compartments for storing the radioactive waste generated during processing.

2.1.3.2 Each Cell is designed to stage the radioactive waste contained in either One (1) 6 ft. diameter by 6 ft. high liner, or Two (2) 4 ft. diameter by 4 ft. high liners, or Eighteen (18) 55 gallon, type DOT.17H Drums.

2.1.3.3 Each Module is designed to accommodate any combination of the radioactive waste containers as follows:

<table>
<thead>
<tr>
<th>Container</th>
<th>Total Quantity</th>
<th>Wt of One Filled Container lb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 ft. dia. x 6 ft. H Liners</td>
<td>60 (1 per cell)</td>
<td>7,000 - 22,000 max.</td>
</tr>
<tr>
<td>55 gallon drums</td>
<td>1080 (18 per cell)</td>
<td>840</td>
</tr>
<tr>
<td>4 ft. dia. x 4 ft. H Liners</td>
<td>120 (2 per cell)</td>
<td>4,500 - 5,000 max.</td>
</tr>
</tbody>
</table>

2.1.3.4 A floor drainage system is incorporated into the module design which discharges into a common sump located between Modules "A" and "B". The total capacity of the sump is approximately 2750 gallons.

2.2 References


2.2.2 Design Criteria/Input Record. GAI W.O. #04-4283-070

2.2.3 Gilbert Associates, Inc. (GAI) Drawings:
2.2.3.1 Excavation and Grading Plan. E-774-151.

2.2.3.2 Plant Layout
E-012-006
E-014-004.

2.2.3.3 Structural.
E-430-005
E-430-007
E-430-008
E-430-011
E-430-012
E-430-013
E-430-014
E-430-015

2.2.3.4 Building Services—Piping
E-311-873
E-311-874

2.2.3.5 Electrical
SS-308-417
B-256-031
E-266-011

2.3 Design Basis

2.3.1 The SWSF is designed to comply with the requirements of RG.1.143, July, 1978. The facility is designed to provide a controlled, but ready access for material handling operations and to ensure that the operator exposures are as low as reasonably achievable (ALARA).

2.3.2 The facility is designed to maintain the dose rates in accordance with 10 CFR Part 20 and to meet the requirements of 40 CFR Part 190 at the site boundary and beyond.

2.3.3 The shielding thickness was calculated to limit the contact dose rates at the outer surfaces of the module walls and the top of the cell covers to within 0.5 mr/hr and 2.5 mr/hr, respectively. The analysis was based on the types of waste defined in Attachment 1. No credit was taken for the structure being partially underground.

2.3.4 Quality Assurance requirements for the design, operation and construction of the SWSF are consistent with those specified in Regulatory Guide 1.143.
2.4 Summary System Description

2.4.1 The concrete structure and individual cell covers provide the necessary shielding from the radioactive waste housed in the SWSF Module Storage Cells.

The cell covers with gaskets protect the waste containers from the elements and the ingress of precipitation. Slots and weep holes in the upper module structure are provided to direct rainwater to external drainage ditches. A drainage piping system prevents any spillage/leakage of fluids from accumulating in the cells (i.e., floor drain hub in each cell), the system manifold discharges into a common sump.

2.4.2 The sump compartment, a radwaste seismic concrete structure, houses the pump, valves, piping, instrumentation, etc., necessary to perform the functions and control the disposal of any effluent which may collect in the sump. The compartment is divided into two levels, with the upper operator level shielded by a thick concrete floor from the sump. Access to the upper compartment is via a manhole in the concrete slab roof. Access to the sump is via a removable ladder at the sump plug opening and a permanently installed ladder into the sump.

2.4.3 The flow diagram (Figure 3) shows the pumping system for the sump effluent. All operations are local/manual. The local alarms and sump level indication are housed in a weatherproof instrumentation panel mounted outside the Module "A" structure adjacent to the sump compartment.
The sump pump, Solenoid Valve #WS-5 and three-way valve #WS-1 (extension spindle) are located in the lower sump while the electrical distribution and control panels, valves, etc. are mounted in the operators compartment.

Sump level is measured by a variable capacitance sensor (SWS-LE-01) which transmits the signal to local and remote (Unit-2 Control Room) alarms.

Sump influent flow alarms are provided. The sensing elements (conductivity) Nos. SWS-CE-07 and SWS-CE-08 are mounted in the Module "A" and "B" drain system manifolds.

2.4.3.1 Sump Pumping Operations (See Figure 3)

The SWSF sump is controlled and disposal of the effluent will be in accordance with Unit-2 Chemistry Procedure 4212-CHM-3011.99 and Operating Procedure 4212-OPS-3232.14. The sump compartment is posted as a radiological controlled area and surveillance is required prior to entry to ensure operator exposure will be as low as reasonably achievable (ALARA).

On receipt of the alarm signal (approximately 50% sump level) in Unit-2 Control Room, the above procedures are put into effect and the sequence of operations is as follows:

2.4.3.1.1 Recirculation Mode (Sump effluent mixing to obtain representative sample for analysis).

A. All valves to be checked closed.

B. Operate three-way Valve WS-1 to route pump discharge returned to sump.

C. Start pump.
2.4.3.1.2 Sampling Mode (during Recirculation Mode)

NOTE: Radiologically monitor the collection of the sample with the appropriate instrument.

A. Solenoid Valve WS-5 open.
B. Valve WS-7 open.
C. Collect sample.
D. WS-5 and WS-7 closed.
E. Stop pump.

2.4.3.1.3 Discharge Mode (Only after sample analysis is completed).

A. All valves to be checked closed.
B. Connect hose to the tank truck (or portable vehicle) connection for effluent disposal.
C. Operate three-way Valve WS-1 to route pump discharge to truck discharge manifold.
D. Valve WS-4 (WS-3) open.
E. Start pump.
F. Stop pump, disconnect tank truck (or portable vehicle) connection, and allow contents of hose to drain back into sump.
G. Valve WS-4 (or WS-3) closed.
H. Operate three-way Valve WS-1 for recirculation mode and secure.

2.4.4 Major Equipment

A. Sump Pump (1.): Gould Model 3171 1 x 1-1/2 -6

| Capacity   | 50 gpm |
| TDH        | 100 ft. |
| Fluid      | Radioactive waste water/resin slurry pH approx. 7. |
| Materials  | Cast iron/bronze fittings |
| Impeller   | Open type |
| Discharge Conn. | Flanged above mtg. plate |
| Service    | Intermittent 5 yr. life |

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B. Solenoid Valve (1):
   1/2" nom. bore. 120 volt AC

C. Instrumentation: See Table 1.

2.4.5 Facility General Arrangement: See typical layout Figure 2. The general arrangement, layout and details of the SWSF systems are shown in the drawings referenced in Section 2.2.3.

2.4.6 Instrumentation and Controls

2.4.6.1 The SWSF has three (3) instrument loops as follows:

A. A level instrument string provides the alarm and level indication both local and remote. In addition, this loop provides a sump pump permissive at greater than 10 percent level.

B. The other two (2) instrument strings are conductivity flow loops providing local alarms. One loop senses input from the drain discharge manifolds from Module "A" and the other from Module "B".

2.4.6.2 Instrument Setpoint Index. See Table 2.

2.4.7 System Interfaces

There are five interfaces associated with this facility:

1. Processing Systems: Access road to and from waste and fluid processing facilities for transportation of materials and equipment.

2. Material Handling System: Facility will accept radioactive waste containers from the processing systems and are compatible with the transportation and lifting equipment, i.e., transfer shield and site cranage (Manitowoc 4000 W mobile crane or equivalent).
3. Cooling Water Pump (CWP) House: 480 V, 3Ø 200 A feeder
cable from Bus 2-61 shall provide power for the following:
A. 460 volts to the sump pump.
B. 480 volt welding receptacle.
C. 25 KVA, 240-120V power center to energize lighting,
   convenience receptacles, instrumentation, and control
devices.

   NOTE: No permanent heat tracing required for sump com-
   partments.

4. Control Room: Sump level alarm.

5. Chemistry Laboratories: Sump effluent samples for chemistry
   and radiological analysis prior to disposition.

   NOTE: The sump pump discharge is not directly connected to
   any plant systems, a local hose station is provided.

2.4.8 Operations-Radwaste Handling

The major operations performed at the SHSF is handling the radio-
active waste containers while loading/unloading the individual cells
in accordance with the types of containers like those specified in
Section 2.1.3.

Unit 2 procedures, like those listed in Table 3 but not limited to
those specifically written for these operations, are strictly
adhered to, using the Manitowoc Mobile Crane or equivalent and
appropriately shielded equipment.
Each cell has an individual concrete cover 8'3" square x 3'0" deep. (Dwg. #B-430-015) weighing approximately Fourteen (14) tons. Normally only one (1) cover will be removed at any time from the cells containing radioactive waste containers within a module system. If more than one (1) cover is to be removed at any one time, additional safety precautions will have to be exercised.

2.4.9 Maintenance

Most operations including Maintenance requires a RWP. Inner surfaces of the cells and the sump are epoxy coated to ease decontamination of the facility.

2.4.10 Acceptance Testing.

2.4.10.1 Mechanical. Dwgs. #E-311-873 and E-311-874

A. Module "A" and "B" Drain Piping Systems.

(i) Leak Test in accordance with ANSI B31.1.1977.

Criteria: Static Head. (Fill System, water level top of drain hubs)

Holding Period. 10 minutes minimum.

Acceptance. No visual leakage.

(ii) Flow verification, allow leak test water to drain to sump.

Criteria: No visible fluid in system.

B. Sump Pump "A" and associated piping.

Initial Service Leak Test in accordance with ANSI B31.1, 1977.

Criteria: Pump discharge pressure

Acceptance. No visual leakage, all welded joints leaktight.
2.4.10.2 Electrical/Instrumentation: Dwgs. #B-256-031, B-248-011 and SS-261-011

A. Continuity and Megger tests were performed for all circuits.
B. Instrument and Control were tested and calibrated in accordance with MTX 507.
C. Sump Pump "A", tested in accordance with Electrical Preoperational Test Procedure WG-E01.
D. Solenoid Valve #WS-V05, tested in accordance with Electrical Preoperational Test Procedure WG-E02.
### Solid Waste Staging Facility Instrumentation

<table>
<thead>
<tr>
<th>Instrument Designator</th>
<th>Model or Type</th>
<th>Locations</th>
<th>Functions</th>
</tr>
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<tbody>
<tr>
<td>SWS-LE-01</td>
<td>Drexelbrook 700-2-57</td>
<td>Mod A Sump</td>
<td>Sump Level Sensor</td>
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<tr>
<td>SWS-LT-11</td>
<td>Drexelbrook 408-6230</td>
<td>Mod A Opr. Floor</td>
<td>Sump Level Transmitter</td>
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<tr>
<td>SWS-LI-01</td>
<td>370-1104-401</td>
<td>Mod A Opr. Floor</td>
<td>Sump Level Indication</td>
</tr>
<tr>
<td>SWS-LI-01A</td>
<td>International Instr. 1151</td>
<td>Mod A Top Panel</td>
<td>Sump Level Indication</td>
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<tr>
<td>SWS-LSL-01</td>
<td>SETCON 401-100x</td>
<td>Mod A Top Panel</td>
<td>Sump Level Switch Low (Pump Permissive)</td>
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<tr>
<td>SWS-LSH-01</td>
<td>SETCON 401-100x</td>
<td>Mod A Top Panel</td>
<td>Sump Level Switch High</td>
</tr>
<tr>
<td>SWS-LAH-01</td>
<td>PANALARM</td>
<td>Mod A Top Panel</td>
<td>Sump Level Alarm High</td>
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<td>SWS-LAH-01A</td>
<td>PANALARM</td>
<td>CR Panel 17E-24</td>
<td>Sump Level Alarm High</td>
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<td>SWS-CE-07</td>
<td>Level Lance 14-115V</td>
<td>Sump</td>
<td>Influent Flow</td>
</tr>
<tr>
<td>SWS-CAH-07</td>
<td>PANALARM</td>
<td>Mod A Top Panel</td>
<td>Conductivity Element</td>
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<tr>
<td>SWS-CE-08</td>
<td>Level Lance 14-115V</td>
<td>Sump</td>
<td>Influent Flow Alarm</td>
</tr>
<tr>
<td>SWS-CAH-08</td>
<td>PANALARM</td>
<td>Mod A Top Panel</td>
<td>Conductivity Element</td>
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</tbody>
</table>

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### Table 2

**Instrument Setpoint Index**

<table>
<thead>
<tr>
<th>Instrument Tag No.</th>
<th>Instrument Description</th>
<th>Component Type</th>
<th>Setpoint Description</th>
<th>Action</th>
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<tr>
<td>SWS-LSL-01 (GAI: LB-S-4)</td>
<td>Solid Waste Staging Facility Sump Level Switch Low (Sump Pump Permissive)</td>
<td>Current Switch</td>
<td>10% level (5.6 ma) Increasing</td>
<td>Contact Closure</td>
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<tr>
<td>SWS-LSH-01 (GAI: LB-S-3)</td>
<td>Solid Waste Staging Facility Sump Level Switch High</td>
<td>Current Switch</td>
<td>42% level (11.2 ma) Increasing</td>
<td>Contact Closure</td>
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## OPERATING PROCEDURES

<table>
<thead>
<tr>
<th>Proc. No.</th>
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<tr>
<td>4215-OPS-3232.14</td>
<td>SWSF sump pumping operation.</td>
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<tr>
<td>2104.4.103</td>
<td>EPICOR II 4' x 4' liner transfer and shipping cask loading.</td>
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<td>4212-OPS-4450.08</td>
<td>On-site transfer of Radioactive liners to SWSF/Ship.</td>
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<tr>
<td>4214-OPS-4450.09</td>
<td>On-site transfer of Radioactive liners from SWSF.</td>
</tr>
<tr>
<td>4214-OPS-4440.01</td>
<td>Transfer of EPICOR 4' x 4' liners to SWSF/Ship.</td>
</tr>
</tbody>
</table>
NOTE: SDS vessels used in the SDS processing system may not be stored in this facility unless resin has been removed.

Types of waste considered are given below. A 3 month decay period was used in the analysis.

1) Natural Circulation Evaporator with Solidification
   Waste Form: 55 gallon drums (solidified)
   Design Basis for Cell: C-D waste at VR* = 4.5, \( \eta^{**} = 0.6 \)
   18 drums per storage cell
   C-D waste analysis is given below

or 2) Forced Circulation Evaporator/Crystallizer with Solidification
   Waste Form: 55 gallon drum (solidified)
   Design Basis for Cell: C-D waste at VR = 22, \( \eta = 0.6 \)
   18 drums per storage cell

or 3) Epicor II Charcoal Filter
   Waste Form: Activated Charcoal in 4 ft. diameter x 4 ft. high liner
   Design Basis for Cell: 2500 R/hr on contact
   Two liners per cell

or 4) Epicor II Demineralizer Resins
   Waste Form: Dewatered Resins in 4 ft. diameter x 4 ft. high liner
   Design Basis for Cell: B-C waste at VR = 543
   B-C waste analysis is given below
VR - volume reduction

** n - Packaging efficiency: ratio of volume of waste to total container volume.

A) Quantities: C-D Waste

83,000 gallon - Reactor Coolant Bleed Tank - A
83,000 gallon - Reactor Coolant Bleed Tank - B
250,000 gallon - Reactor Building Sump

B) Isotopic Analysis (μCi/ml) - Design Basis: C-D Waste

<table>
<thead>
<tr>
<th>Isotope</th>
<th>μCi/ml</th>
</tr>
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<tbody>
<tr>
<td>Mo 99</td>
<td>180</td>
</tr>
<tr>
<td>I 131</td>
<td>-8200</td>
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<tr>
<td>I 132</td>
<td>-20</td>
</tr>
<tr>
<td>Cs 134</td>
<td>-82</td>
</tr>
<tr>
<td>Cs 137</td>
<td>-330</td>
</tr>
</tbody>
</table>

Ce 144 - 100
H 3-1.2
La 140 - 160
Sr 89 - 1400
Sr 90 - 120

C) Isotopic Analysis (μCi/ml) - Design Basis: B-C Waste

<table>
<thead>
<tr>
<th>Isotope</th>
<th>μCi/ml</th>
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<tbody>
<tr>
<td>Ba 133</td>
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<tr>
<td>Co 60</td>
<td>1.4E-4</td>
</tr>
<tr>
<td>Cs 134</td>
<td>1.6E-1</td>
</tr>
<tr>
<td>Mo 99</td>
<td>2.7E-1</td>
</tr>
<tr>
<td>I 131</td>
<td>2.3E+1</td>
</tr>
<tr>
<td>Bi 207</td>
<td>2.2E-2</td>
</tr>
<tr>
<td>Co 58</td>
<td>1.2E-3</td>
</tr>
<tr>
<td>Cs 137</td>
<td>7E-1</td>
</tr>
</tbody>
</table>

Ba 140 | 7.5E-1
La 140 | 2.4E+0

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