MISSISSIPPI POWER & LIGHT COMPANY
Helping Build Mississippi
P. O. BOX 1640, JACKSON, MISSISSIPPI 39205

NUCLEAR PRODUCTION DEPARTMENT

August 9, 1982

U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Attention: Mr. Harold R. Denton, Director

Dear Mr. Denton:

SUBJECT: Grand Gulf Nuclear Station
Units 1 and 2
Docket Nos. 50-416 and 50-417
License No. NPF-13
File 0260/0272/L-860.0
Reference: AECM-82/263
PMP Water Level Analysis,
Operating License Condition
2.C (5); SSER-2 1.11 (46)
AECM-82/440

Please find attached Mississippi Power & Light's (MP&L) evaluation on the effects of high water levels in the Grand Gulf Nuclear Station (GGNS) power block area due to the probable maximum precipitation (PMP) event. This submittal addresses the PMP analysis and the optional plans for permanent modifications in accordance with part (b) of Operating License Condition 2.C (5).

The results of this analysis indicate that permanent modifications are necessary for the control building, diesel generator building, and the standby service water basin building to assure that safety-related equipment located in these buildings are fully protected from the site PMP event. The auxiliary building, turbine building, radwaste building, and water treatment building require no additional modifications for PMP protection. The effects from Unit 2 water contributions into Unit 1 were also considered as part of this analysis, but did not change the overall results for any permanent protection measures.

Various modifications for permanent protection on the affected buildings, as discussed in the attached report, are being evaluated by MP&L and will be considered in conjunction with your review of this submittal. Based on our commitment to provide permanent modifications on these structures, this submittal should be adequate to allow NRC approval until the detailed plans for such modifications are available. These plans will be submitted for your review four months prior to the commencement of the first regularly scheduled refueling outage and no later than January 1, 1984. All modifications will be implemented prior to the startup from that outage.

B001

AE2C1

The temporary PMP protection measures of Operating License 2.C (5)(a) will be adhered to for the Unit 1 control, diesel generator and standby service water basin buildings until implementation of the permanent modifications are complete. Please advise if you require any additional information.

Yours truly,

L. F. Dale
Manager of Nuclear Services

SAB/JGC/JDR:lm

cc: Mr. N. L. Stampley
Mr. R. B. McGehee
Mr. T. B. Conner
Mr. G. B. Taylor

Mr. Richard C. DeYoung, Director
Office of Inspection & Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. J. P. O'Reilly, Regional Administrator
Office of Inspection & Enforcement
Region II
101 Marietta Street, N.W., Suite 3100
Atlanta, Georgia 30303

EFFECTS OF PMP WATER LEVEL ON GGNS

INTRODUCTION

Due to the presently existing obstructions to overland flow that were not considered or evident at the time the original site drainage scheme was developed, the calculated probable maximum precipitation (PMP) flood level has been raised to elevations that are higher than the El. 133'-0" door sills for Unit 1 of the Grand Gulf Nuclear Station. This report examines the effects on the safe operation of the power plant due to the leakage flow of water through gaps at doors leading into power block structures and the standby service water basin buildings. Since water can enter a non-Category I structure and flow into a Category I structure through common doorways or openings, all power block structures were reviewed. This study determines the quantity of water that can leak through each door, the anticipated flow paths within the structures, and the effects this water will have on the safe operation of the plant.

DISCUSSION

In assessing the impact of floodwater leakage on Category I structures, all exterior doors on Unit 1 buildings are assumed to remain closed during the duration of a PMP event. This is considered reasonable, since security requirements dictate that all doors remain closed when unattended and are alarmed closed.

With all doors in a closed position, water leakage rates were calculated using a time-step function in which floodwater heights against the doors varied with time. These time functions are shown in Figures A and B and are based on inflow from the 6-hour PMP design storm and outflow over the roads and railroad. Calculations show that water surface elevations above 133'-0" would exist for 7 hours.

Figure A (Drainage Area G) was used for the radwaste building and doors on the East side of the Turbine Building. Figure B (Drainage Area L) was used for the control, auxiliary, standby service water basin building, diesel generator, and water treatment buildings and door 1T326 in the turbine building. Drainage areas for GGNS are shown in FSAR Figure 2.4-7a.

Flow rates for individual doors were determined using a head loss formula considering inlet, bend, and outlet losses on all contributing door gaps. Gaps between a door and frame were determined from field measurements on each of the doors being analyzed. The affected doors are listed in Table I.

Each building review utilized appropriate design drawings for locating safety-related equipment. In addition, a field walkdown was performed to identify arrangements not shown on design drawings that could affect the review conclusions. This included identification of field located items and as-built details not yet shown on design drawings.

The control, auxiliary, turbine, and radwaste building's floor drains are connected to the liquid radwaste system. Any water entering these buildings will flow across sloped floors and enter the floor drain system to be collected in sumps at the bottom floor elevation. From the sumps, the collected water is pumped into the liquid radwaste system located in the radwaste building. The diesel generator and water treatment buildings have floor drains that also empty into sumps. These sumps are connected to the plant s main storm drain system. The standby service water basin buildings do not have a floor drain system.

The FSAR specifies the use of a runoff coefficient of 1.0 when calculating the overland rates of flow. This would mean that there would be no percolation of rainwater into the soil. This is a conservative approach in determining the surface flow rates. Actually, some percolation would occur even with the required clay seal in place.

The following is a building-by-building description of the various means of entry of PMP floodwater and its impact on safety-related equipment.

Control Building

The control building has tow doors in the west wall that could allow water to enter the building. These doors are OCT5 and OC313 (see Figure C). The combined maximum flow rate entering these doors is 81.2 gpm, and the total amount of water entering the building over the projected seven hours that water will be above Elevation 133'-0", is approximately 27,000 gallons.

Water entering through these doors could flow down the center hallway to HVAC equipment rooms OC302 and/or OC303, flow down the stairwell OC01, or flow down the elevator shaft.

Since all floor penetration seals in the Elevation 133'-0" floor are not leak tight, water entering the HVAC equipment rooms would leak through the penetrations to the Elevation 111'-0" floor where electrical switchgear necessary for safe plant operation are located. Water flowing down stairwell OC01 could flow out onto the Elevation 111'-0" floor, further exposing the same switchgear to an unsafe condition. For these reasons, floodwater must be prevented from flowing onto the floor areas at Elevations 133'-0" and 111'-0". This can be accomplished by such modifications as installing concrete curbs near doors OC313 and OCT5 entrances to prevent water from entering the building, by installing grout ridges across the floor at doorways or hallways which pass through the concrete wall opening, or by providing doors with a watertight design.

The grout ridge option would confine water to the stairwell areas and channel the flow to floor elevation 93'-0" where safety-related equipment would not be affected. The maximum floodwater depth passing from door OC313 through doors OC312 and OC311 and down the stairwell is approximately 3/8-inch. A one-inch ridge height would be sufficient to divert such a flow, while leaving a margin to accommodate flow effects such as sloshing or rippling.

Water entering the control building will ultimately reach the Elevation 93'-0" floor. The floor drain sump pit at this elevation contains two pumps capable of a combined pump rate of 100 gpm. If the pumps are operable, the total leakage rate of 81.2 gpm would be controlled by pumping to the liquid radwaste system. If the pumps are inoperable, the Elevation 93'-0" floor would be flooded to a maximum water depth of five inches. Since all safety-related equipment is located above Elevation 110'-0", safe operation would not be affected.

Doors OC301 and OCT3 at Elevation 133'-0", OCT1 at Elevation 111'-0" and OC101, OC102, OC103 and OC104 at Elevation 93'-0" which are located on the east wall of the control building are all pressure doors. The doors have a spring loaded neoprene strip along the bottom edge which is pressed against the concrete floor. Flood water entering the turbine building and reaching the doors would be diverted by this seal mechanism, precluding any further leakage into the control building.

Auxiliary Building

The auxiliary building has only one door where water could leak into the building. This is the railroad door 1A319 shown on Figure D. The door sill has a compressible rubber weather strip attached to it. When the door is mechanically locked closed, a seal against the smooth concrete floor is formed, and negligible amounts of water will enter the building through this gap. However, there are channels in the concrete slab underneath the door for the railroad tracks. The calculated flow rate from leakage through the sides of the door frame and through the track channels is a maximum of 55.6 gpm, and the total accumulation is approximately 19,400 gallons. If the track channels are plugged, the maximum leakage rate is 3.3 gpm, and the total accumulation is 861 gallons. All rolling doors are constructed of interlocking flat steel slats. Negligible amounts of water will leak through these slats from windblown rain or water standing against the rolling door.

Water leaking through door 1A319 will be confined to the railroad bay. This is because all other openings are at or above Elevation 139'-0", and the equipment hatch in the railroad bay floor slab has a water proofed seal around it. All drains in the floor slab are plugged, except for four 2-inch-diameter drains. These four drains would eventually drain the bay area, but the rate would not be sufficient to prevent water from ponding the a maximum depth of five inches.

The auxiliary building drain sump has a capacity of 2,750 gallons and has two pumps with a capacity of 100 gpm each. If the pumps are operable, the sump would not overflow, and all accumulated water would enter the liquid radwaste system. If the pumps are not operable, the sump would overflow, and floodwater would reach an elevation no greater than 94'-0". Overflow of the sump to this elevation would affect no safety-related equipment. If the track channels underneath the rolling door sill are plugged, the leaked water would collect in the sump and no overflow of the sump would occur, whether the pumps operate or not.

Turbine Building

The turbine building has five doors that could allow water to leak into the building. These doors are numbered 1T301, 1T302, 1T303, 1T304, and 1T326 and are shown on Figures C and E. Door 1T301 is a rolling door located at the railroad bay opening, and the same assumptions used in calculating the leakage flows for auxiliary building door 1A319 were used for 1T301. Assuming that the track channels are not plugged, then the maximum leakage rate through

1T301 is 43.2 gpm, and the total amount of water that will enter through this door is approximately 13,400 gallons. Due to the numerous drains in the railroad bay area, all with capacities of at least 221.0 gpm, it is postulated that any water leaking through 1T301 will be confined to the railroad bay area and can be adequately drained by the floor drain system. This eliminates the possibility that any substantial amount of water leaking though 1T301 could flow across the railroad bay and reach the control building doors 0C301 or 0CT3. If the track channels are plugged, the maximum leakage rate is 1.5 gpm, and the total accumulation would be 231 gallons.

At door 1T302, it is calculated that the maximum leakage rate will be 17.6 gpm, and the total accumulation will be approximately 4,450 gallons. Water leaking though this door will either flow down stairwell 1T01 to lower elevations or will flow to rooms with floor drains which have the capacity to handle the maximum flow rate. Water flowing down the stairwell or flowing down to lower elevations through floor penetrations will not be a concern, since no safety-related equipment in the turbine building is affected.

Door 1T303 has a maximum leakage rate of 19.0 gpm, which allows approximately 4,770 gallons to enter the turbine building. Door 1T304 has a maximum leakage rate of 17.3 gpm and allows approximately 4,360 gallons to enter the building. Door 1T326 has a maximum leakage rate of 25.5 gpm and allows approximately 8,470 gallons to leak into the turbine building. Water leaking through these three doors will flow down stairwells to lower elevations, flow down floor penetrations to lower elevations, or enter the floor drain system. There is no safety-related equipment that can be affected by water which leaks through these doors have the capacity to handle the maximum leakage rates which would minimize water damage to equipment in these areas.

All water leaking into the turbine building eventually flows to the sumps located at Elevation 93'-0". Water entering doors 1T301, 1T302, 1T303, and 1T304 will enter the East floor drain sump. If the pumps are operable in the East sump, the sump will not overflow, since it contains two pumps rated at 200 gpm and one standby pump rated at 850 gpm. The maximum combined leakage rate for these four doors equals 97.1 gpm, which is much less than the combined pumping capacity of 1,250 gpm. If the pumps are inoperable, the 5,755-gallon-capacity sump will overflow. This overflow would not affect any safety-related equipment in the turbine building. Similarly, if this water flows through doorways and the radwaste tunnel into the control and radwaste buildings, safety-related equipment would not be affected. The overflow water could not enter the auxiliary building since the bottom of the only door opening is at Elevation 99'-3" and the elevation of the overflow would not be greater than 93'-2".

Water leaking into turbine building door 1T326 will eventually flow to the turbine building West floor drain sump. The maximum leakage rate for door 1T326 is 25.5 gpm. If the pumps are operable, the two pumps and the standby pump have a combined rating of 1,250 gpm, and the sump would not overflow. If the pumps are inoperable, the sump will overflow; however, no safety-related equipment would be affected if this occurred. It should not noted that sumps overflowing in the turbine building could cause water to leak into the control building at Elevation 93'-0", or vice versa. This water would not reach elevations greater than 93'-3" when distributed through these buildings, and is not a concern.

Radwaste Building

The radwaste building has two doors in the East wall that could allow water to leak through them. These doors are numbered OR301 and OR302 and are shown on Figure F. Door OR301 is a rolling door railroad entrance. The same assumptions used to determine flows through auxiliary building door 1A319 were used for door OR301. Assuming the track channels are not plugged, the maximum leakage rate for door OR301 is 43.2 gpm, and the total volume of water that would enter through the door is approximately 13,422 gallons. If the track channels are plugged, these quantities would be reduced to 1.5 gpm and 231 gallons. Door OR302 would allow a maximum leakage rate of 18.5 gpm and a total volume of 4.665 gallons to leak through the door.

Water entering these doors would either be confined to the railroad bay and would enter the floor drain system or would flow to lower elevations by entering stairwell OR01, the elevator shaft, or floor penetrations. No safety-related equipment is located in the radwaste building; thus, water leakage is of no concern. All drains in the radwaste building have sufficient capacity to handle the maximum leakage rates calculated for the two doors with or without plugging the track channels, thereby minimizing water damage to equipment.

All water entering the radwaste building will eventually flow to the floor drain sump at Elevation 93'-0". If the two pumps in this sump are operable, their combined rating of 200 gpm is sufficient to handle the maximum leakage rate. If the pumps are inoperable, the 2,236-gallon sump will overflow, but overflow will not affect any safety-related equipment.

As previously stated, all water leaking into the control, auxiliary, turbine, and radwaste buildings will eventually flow to the sumps in each building located at Elevation 93'-0". If the sump pumps are operable, water collected in these sumps will be pumped to the liquid radwaste system. The part of the liquid radwaste system that would be affected is the floor drain collector system. This system consists of all the floor drain sumps and their pumps, located in each building, along with one 30,000-gallon floor drain collector tank and two 50,000-gallon waste surge tanks located at Elevation 93'-0" in the radwaste building. This system operates through a batch process. The intervals depending on the quality of waste flowing through the system. The system has a maximum capacity of 300 gpm; but during the PMP, a rate greater than 50 gpm would be difficult to achieve, due to the quality of the flow entering the system (i.e., muddy water). Therefore, this study will assume that the system is inoperable.

If the liquid radwaste system is inoperable and all tanks are assumed initially full, then approximately 100,000 gallons of water would spill on Elevation 93'-0" of the radwaste building. This spillage would not reach an elevation greater than 93'-10", and the safety of the plant would not be affected. Some of this spillage could enter the turbine building and then the control building by entering the radwaste building tunnel. In this case, water would not reach elevations greater than 93'-3" in any building, and no safety-related equipment would be affected.

Diesel Generator Building

The diesel generator building has five doors that would allow water to leak inside the building. These doors are 1D301, 1D308, 1D309, 1D310, and 1D312 and are shown in Figure D. These five doors have a combined maximum leakage rate of 118.4 gpm, and a total volume of approximately 38,700 gallons would enter the building. All floor drains have sufficient capacity to handle the maximum leakage rate. All water entering the building would be confined to enter the Elevation 133'-0" floor drain system, since there are no lower elevations in the diesel generator building. The floor drain system empties into three sumps, each with a capacity of 2,025 gallons. Each sump has a pump rated at 75 gpm to pump the collected water into the plant's main storm drainage system. If the pumps are inoperable, or in the likely event during the PMP the main storm drainage system is flooded, then the sumps will overflow and water will pond as high as Elevation 133'-5". Since there is safety-related electrical equipment located near the floor, an unsafe condition would exist.

Permanent modifications to the diesel generator building will be limited to those considerations which prevent water from entering the building itself. Such modifications could include providing curbs at or near the entrances, water tight doors, door seals, waterproofing for individual components, or a combination of these options.

Water Treatment Building

The water treatment building has four doors that could allow water to leak inside the building. These doors are numbered 0M114, 0M115, 0M116, and 0M117 and are shown on Figure F. 0M116 and 0M117 are rolling doors, and the same assumptions used to calculate the flows for auxiliary building door 1A319 were used for 0M116 and 0M117. However, these two doors are not railroad entrances, and thus no track channels exist. The combined maximum leakage rate for the four doors is 61.8 gpm, and the total volume of water that would enter the building is approximately 19,800 gallons. Water entering the floor drain system at the base slab Elevation 133'-0" empties into either the chemical drain sump or the oily water drain sump. Assuming the sump pumps are inoperable or that the main storm drainage system is full, the sumps will overflow. Assuming that this overflow enters the turbine or radwaste buildings through doors 0R316 and 0R317, the additional amount of water will not cause any safety-related equipment to be affected, and an additional 75 gpm to the liquid radwaste system will not change any of the postulated effects previously mentioned.

Standby Service Water Basin

The standby service water basin has six doors which allow water to enter the pump house and the valve rooms. These doors are numbered 1M110, 1M111, 1M112, 2M110, 2M111, and 2M112 and are shown on Figures G and H. These doors permit a maximum leakage rate of 80.9 gpm for Basin A (Unit 1) and 81.9 gpm for Basin B (Unit 2), and the total volume of water entering the basin structure is approximately 27,000 gallons for each basin.

The flow calculations are all conservative, since the 133'-5" height of floodwater was assumed. The basin is not located in Drainage Area L, and the floodwater is not expected to reach this elevation, due to more favorable drainage conditions around the basin. There is no floor drain system for these buildings, and water entering these building would flow down blockouts and unsleeved penetrations in the floor slab to the water basin below.

Additional water from direct rainfall would enter the basins through the cooling fan towers and through backflow from the overflow drains. The cumulative effect of these three flows would cause the basins to overflow and water in the pump houses and valve rooms to reach elevations of 133'-6". This would affect electrical safety-related equipment, creating unsafe conditions.

Therefore, to protect safety-related equipment, modifications such as an 8-inch waterproofed toeplate or curb to be placed around all safety-related equipment is being considered. A toeplate would be an angle anchored to the concrete slab an caulked to provide a watertight seal. Both options would provide unobstructed access to all doors and could easily be removed if temporary access to the affected equipment was required.

CONCLUSION

Water leaking into the auxiliary, turbine, radwaste, and water treatment buildings would not affect the safe operation of the plant, and no modifications would be required to protect these buildings. Water leaking into the control building could affect safety-related equipment, and therefore, modifications such as water tight doors, door seals, or curbs at the exterior doorways or flow diverting ridges in selected areas of the Elevation 133'-0" and Elevation 111'-0" floors would be required to assure safe plant operation.

Water leaking into the diesel generator building could affect safety-related equipment; and, therefore, modifications such as curbs or watertight doors would be required at all entrances to this building to assure safe plant operation. A total of five door entrances would require modifications to stop water leakage. The standby service water basin building would require modifications such as watertight toeplates or curbs surrounding all safety-related, floor mounted electric equipment to assure safe plant operation.

UNIT 2 CONSIDERATIONS

Unit 1 and Unit 2 buildings are interconnected at several locations at or below grade by doorways which are not watertight. Floodwater entering Unit 2 buildings could, therefore, flow into Unit 1 buildings and ultimately affect safe plant operation. An analysis, using presently existing Unit 2 building conditions and Unit 2 site conditions similar to present Unit 1 conditions (July, 1982), revealed that water would flood the Unit 1 and Unit 2 powerblocks to a height no greater than Elevation 99'-0". Major factors contributing to this accumulation were:

1. Accumulation from Unit 1 door leakage in the control, turbine, auxiliary, radwaste, and water treatment buildings.

2. Accumulation from Unit 2 doors and blockout penetrations at grade (existing at the time of this report). All doors were assumed open, and site drainage characteristics were assumed to duplicate those of Unit 1.

3. Accumulation from the circulating water pump house excavation, including rainfall on the excavation and tributary flow from turbine building roof scuppers over the excavation.

4. Accumulation from windblown rain through open areas in the Unit 2 turbine building walls.

5. Accumulation from full PMP rainfall on the entire Unit 2 auxiliary building.

The resulting total accumulation was distributed throughout the Unit 1 and Unit 2 turbine buildings, the Unit 2 auxiliary building, the control building, and the radwaste building. Water accumulation in the unfinished Unit 2 containment building would be confined to the building. Since no Unit 1 safety-related equipment exists below Elevation 110'-0" in these buildings, safe plant operation could be assured with no additional protective measures.

The effects of water flows within Unit 2 buildings as related to the safe operation of Unit 2 was not investigated and therefore, will need be addressed prior to Unit 2 operation.

TABLE I

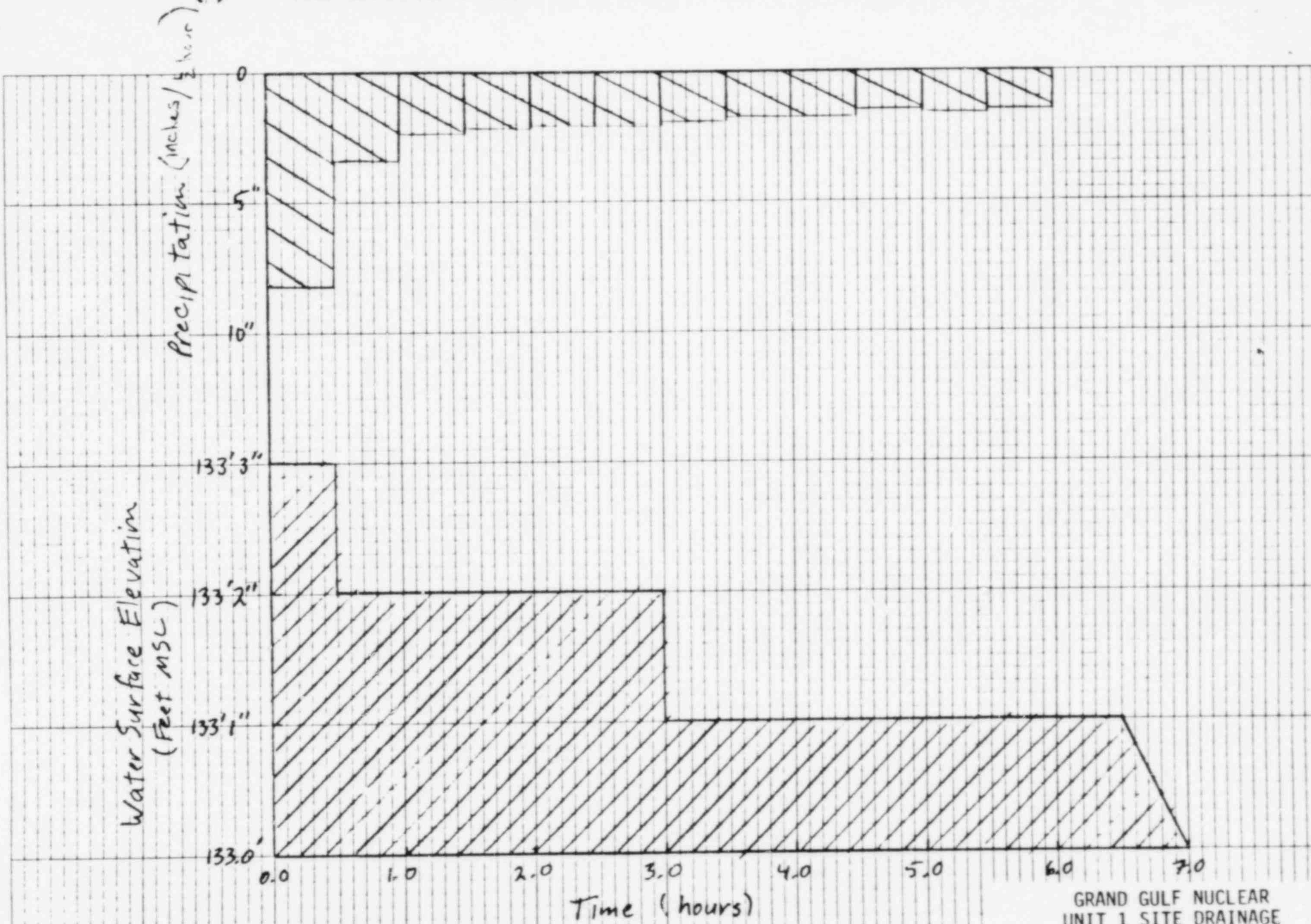
ARCHITECTURAL DOOR LISTING OF EVALUATED DOORWAYS

Doorways to Category I Structures

0C313	Control Building - Lobby
OCT5	Control Building - West Side
1D309	Diesel Generator Building - East Side
1D301	Diesel Generator Building - East Side
1D308	Diesel Generator Building - West Side
1D310	Diesel Generator Building - West Side
1D312	Diesel Generator Building - West Side
1M110	SSW Pump House
2M110	SSW Pump House
1M111	SSW Pump House
2M111	SSW Pump House
1M112	SSW Valve Room
2M112	SSW Valve Room
1A319	Auxiliary Building - Railroad Door- West Side

Doorways to Non-Category I Structures With Pathways to Category I Structures

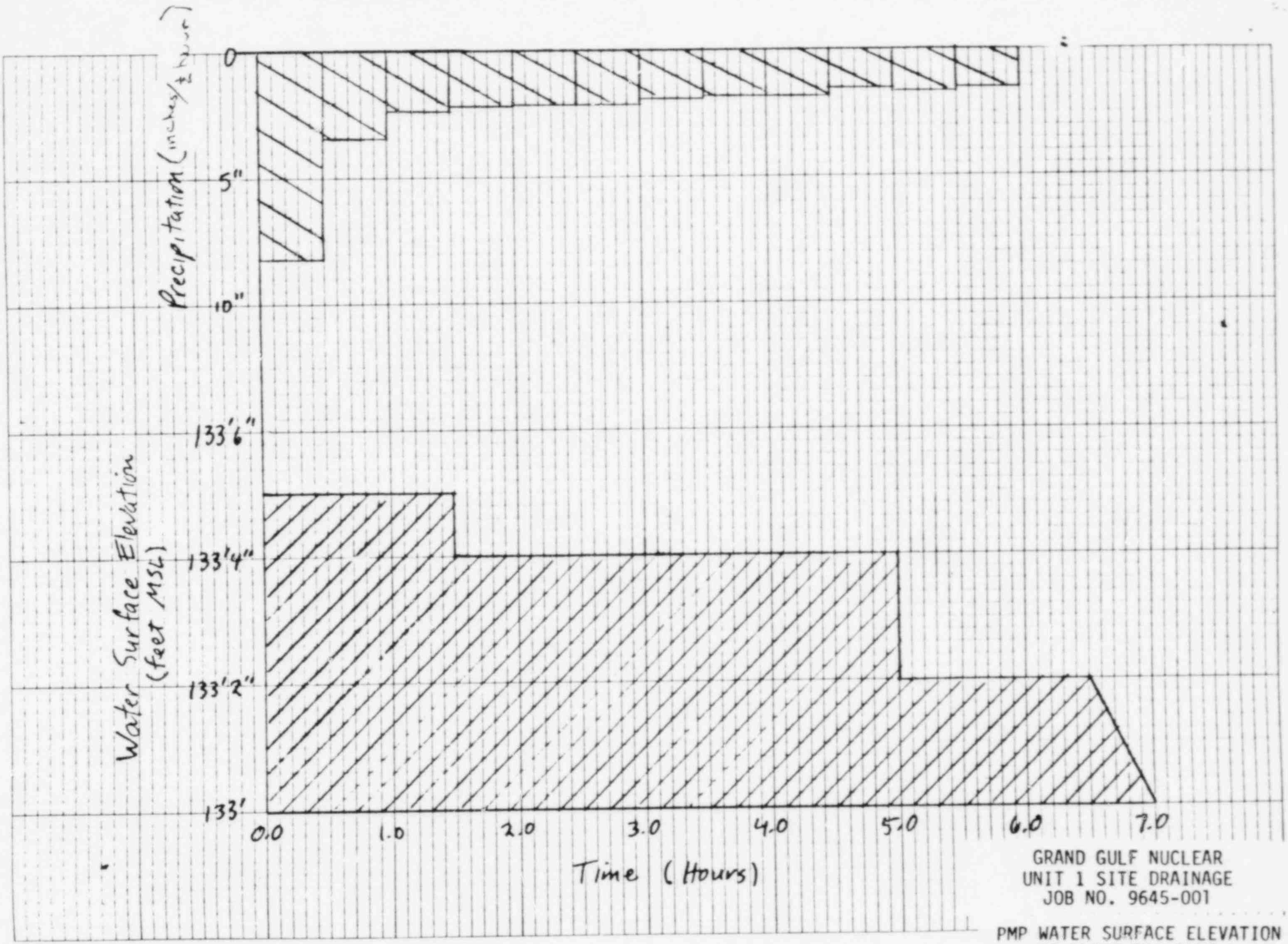
1T303	Turbine Building - East Side
1T302	Turbine Building - East Side
1T301	Turbine Building - Railroad Door - East Side
1T326	Turbine Building - West Side
1304	Turbine Building - East Side
0R301	Radwaste Building - Railroad Door
0R302	Radwaste Building - East Side
0M117	Water Treatment Building - Truck Door - North Side
0M115	Water Treatment Building - North Side
0M116	Water Treatment Building - Truck Door - South Side
0M114	Water Treatment Building - South Side



GRAND GULF NUCLEAR
UNIT 1 SITE DRAINAGE
JOB NO. 9645-001

PMP WATER SURFACE ELEVATION
AT PLANT FOR AREA G
(EAST AREA)

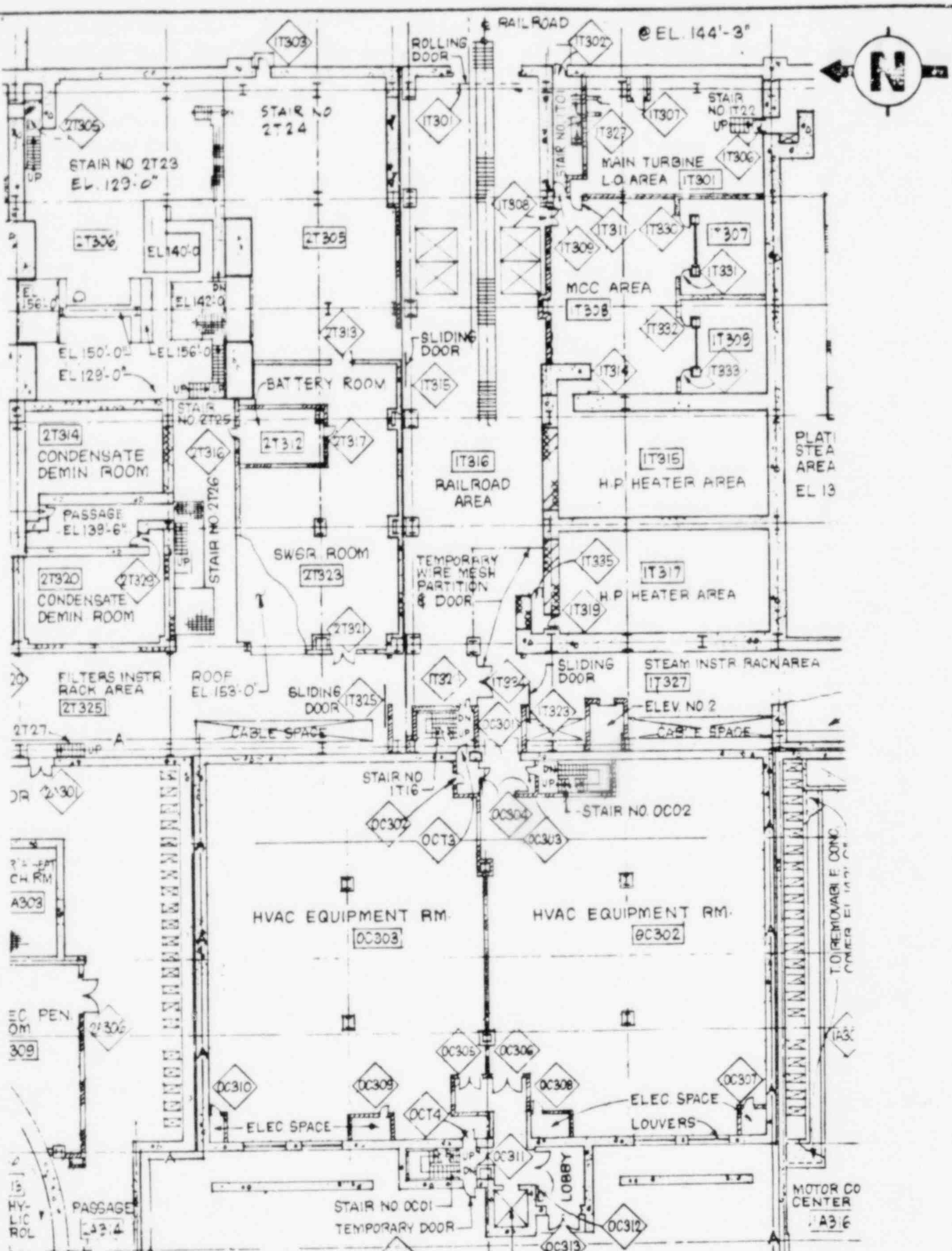
FIGURE A



GRAND GULF NUCLEAR
UNIT 1 SITE DRAINAGE
JOB NO. 9645-001

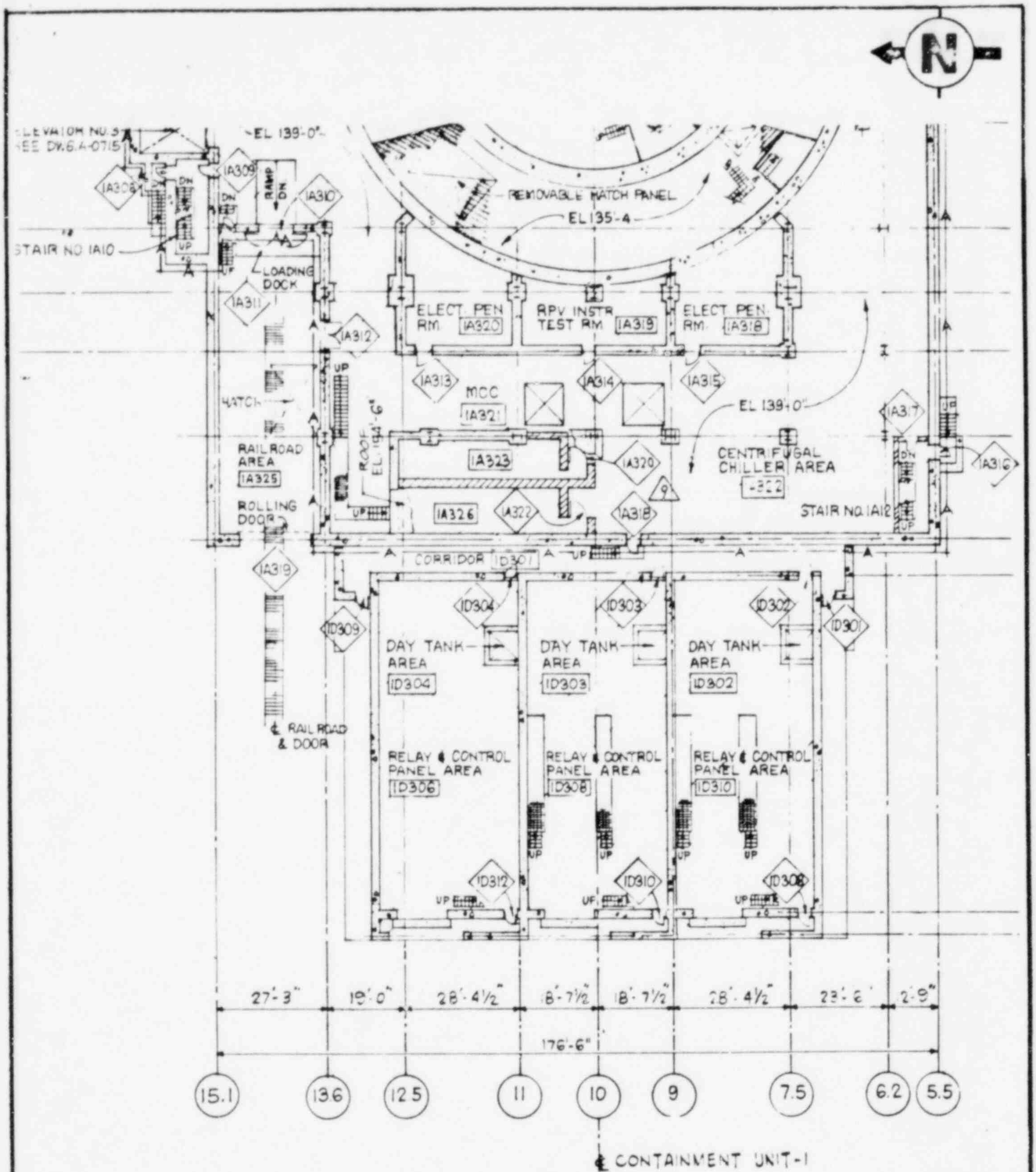
PMP WATER SURFACE ELEVATION
AT PLANT FOR AREA L
(AREA WEST)

FIGURE B



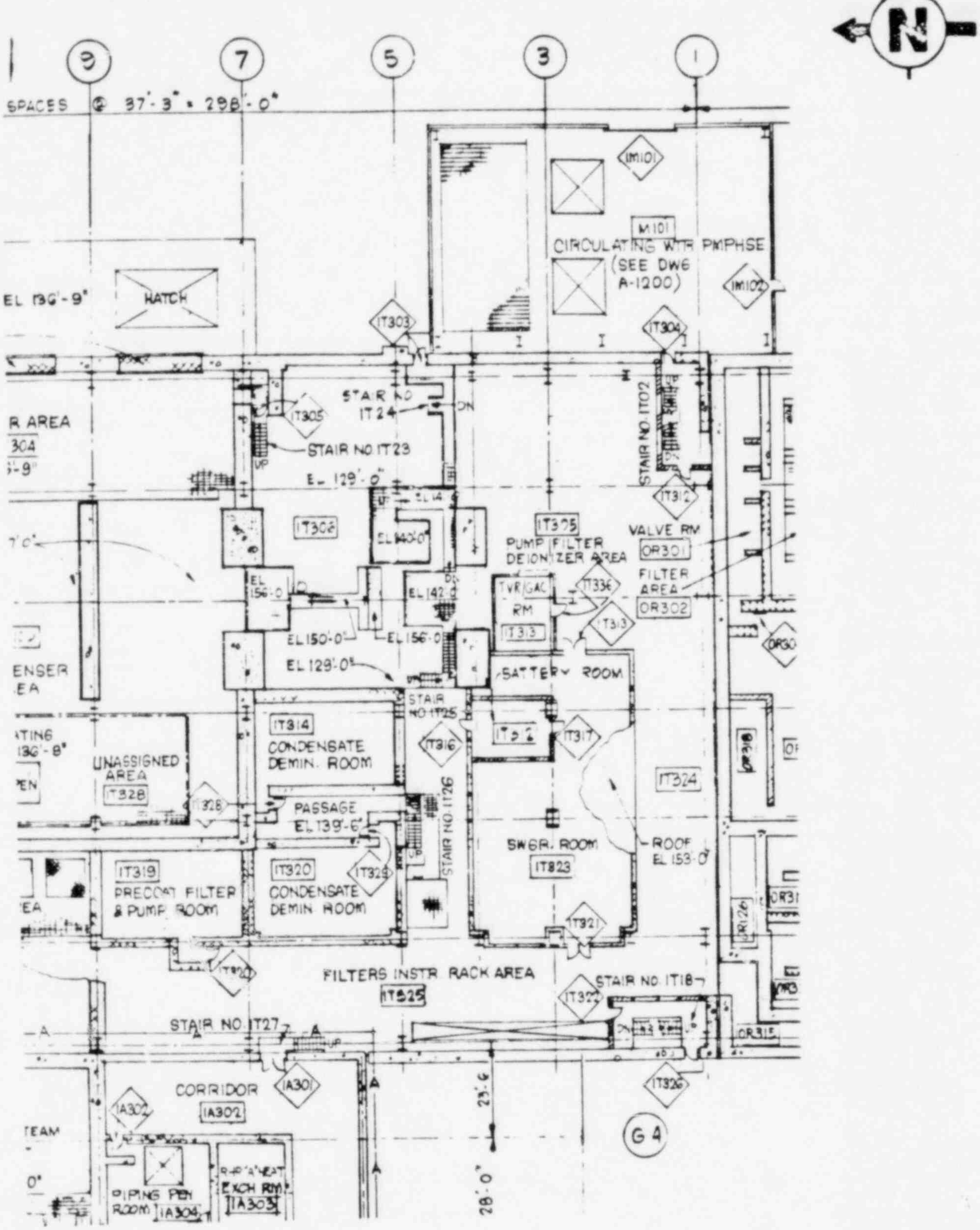
CONTROL BUILDING
TURBINE BUILDING - RAILROAD AREA

FIG. C



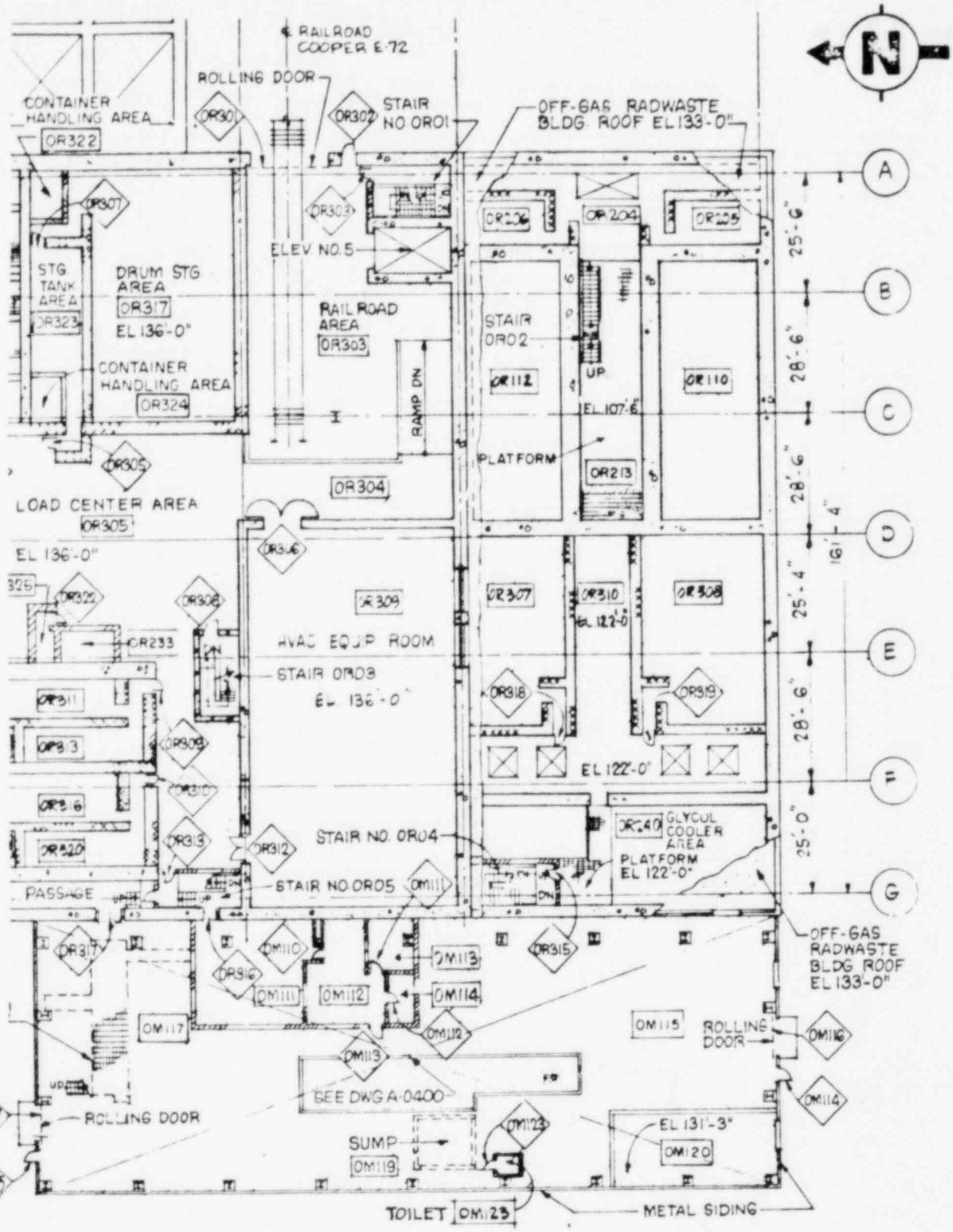
DIESEL GENERATOR BUILDING
AUXILIARY BUILDING - RAILROAD AREA

FIG. D



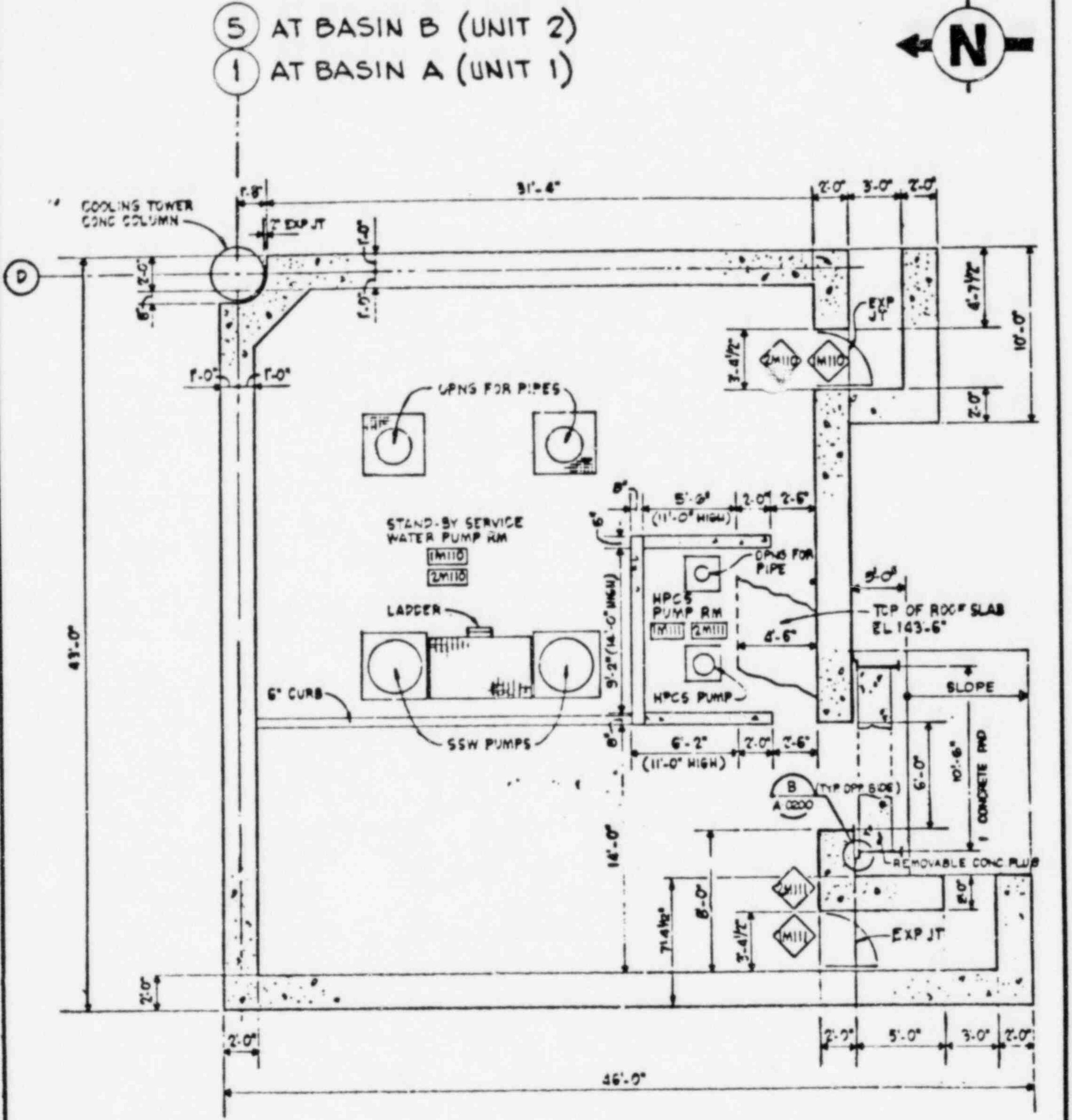
TURBINE BUILDING - SOUTH

FIG. E



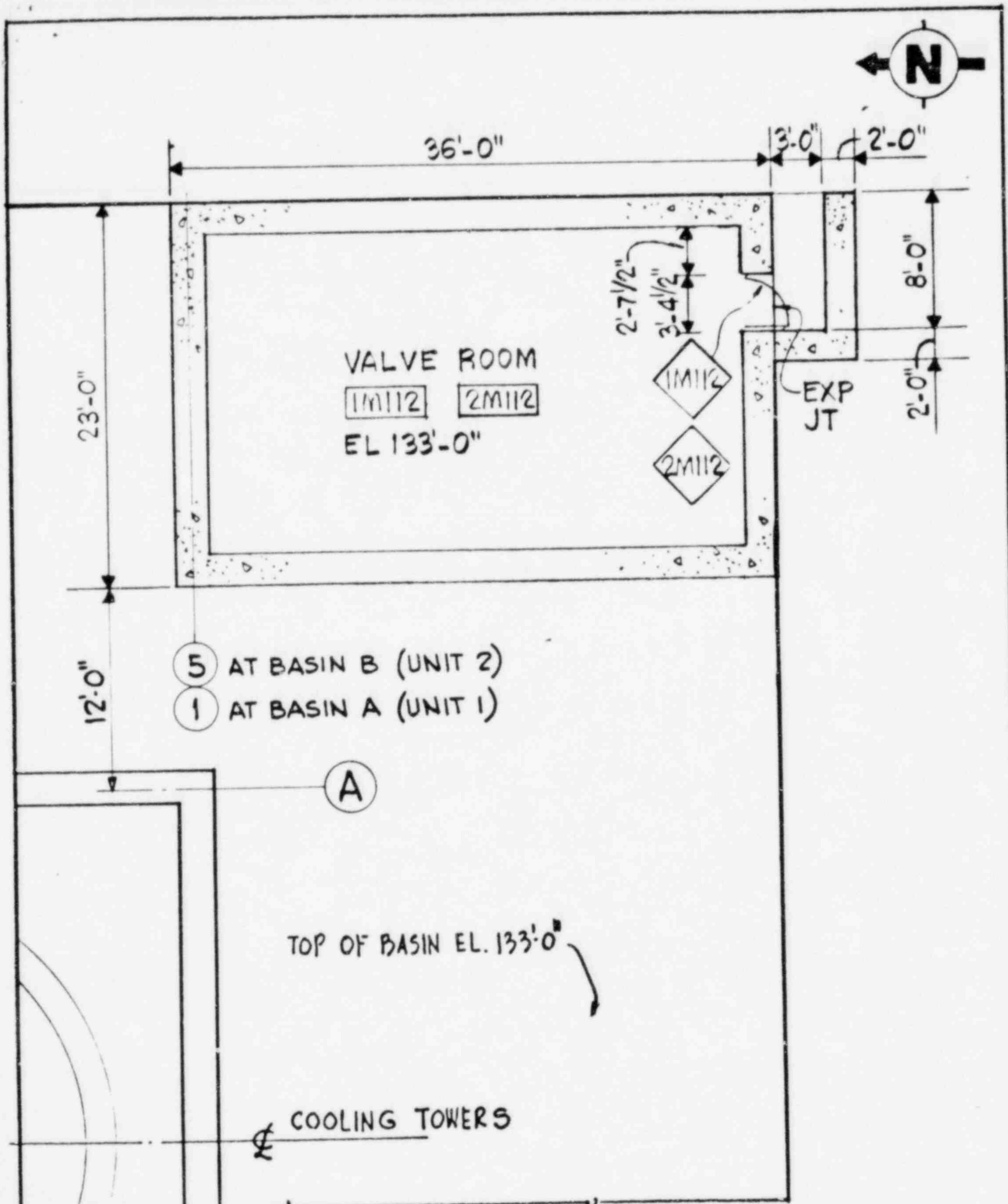
WATER TREATMENT BUILDING
RADWASTE BUILDING - RAILROAD AREA

FIG. F



STAND BY SERVICE WATER
PUMP HOUSE

FIG. G



PART PLAN SSW COOLING TOWER & BASIN SHOWING VALVE ROOM.

FIG. H