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CHAPTER 9.0

AUXILIARY SYSTEMS

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9.2 WATER SYSTEMS

9.2.1 STATION SERVICE WATER SYSTEM

The station service water system consists of the Service Water System (SW) and the Essential Service Water System (ESW). The SW system is used during normal operating and normal shutdown conditions in conjunction with portions of ESW system piping and valves. The ESW system is used during normal shutdown conditions when the SW system is not available and abnormal conditions, such as loss of off-site power or a LOCA.

9.2.1.1 Service Water System

9.2.1.1.1 Design Bases

9.2.1.1.1.1 Safety Design Basis

The SW system serves no safety-related function.

9.2.1.1.1.2 Power Generation Design Bases

POWER GENERATION DESIGN BASIS ONE - The SW system provides sufficient cooling water to nonessential auxiliary plant equipment and to the ESW system over the full range of normal reactor operation and normal shutdown.

9.2.1.1.2 System Description

9.2.1.1.2.1 General Description

The SW system outside the Power Block is shown in Figure 9.2-1. It consists of pumps, piping, valves, and associated instrumentation.

The SW system of each unit provides pumped circulation of approximately 38,000 gpm of cooling water from the cooling tower basin through various main plant auxiliary heat exchange equipment and returns it to the circulating water system return line inside the plant. This flow is sufficient to remove heat at a rate of 189.9 million BTU/hr during full load operation with water at 95°F entering the system and 105°F leaving the system. Heat dissipation of water returned to the cooling tower is described in Section 10.4.5.

Standard Plant FSAR Table 9.2-1 lists the components within the power block which are cooled by the SW system. Respective SW system flow rates and heat loads are also given.

SW system components are not designed to seismic Category I criteria. Failure of the SW system components will not prohibit use of the ESW system for safe shutdown of the plant.

9.2.1.1.2.2 Component Description

SW pumps - The three 50 percent system capacity service water pumps are single-stage, double-suction, vertical, constant-speed dual-volute centrifugal type. Each pump is equipped with a hydraulically operated butterfly valve on the discharge for isolation of the pump from the system. The valve is also programmed for quick closure to prevent reverse flow of water and pressure surge in the event of a pump trip. Refer to Table 9.2-1 for SW system component data.

Controls are provided to automatically start the remaining pump if a protective relay trips any one of the running pumps.

Design data for the SW components outside the Power Block are provided in Table 9.2-1.

9.2.1.1.3 Safety Evaluation

The SW system performs no safety-related function. The SW system is not required for safe shutdown of the plant.

9.2.1.1.4 Tests and Inspection

Refer to Section 9.2.1.1.4 of the Standard Plant FSAR.

9.2.1.1.5 Instrumentation Applications

Starting and stopping the service water pumps is a manual operation from the main control room. Upon loss of a service water pump, a backup pump automatically starts.

9.2.1.2 <u>Essential Service Water System</u>

9.2.1.2.1 Design Bases

9.2.1.2.1.1 Safety Design Bases

Section 9.2.1.2 of the Standard Plant FSAR provides the general safety design bases met by this system.

SAFETY DESIGN BASIS ONE - The components of the ESW system are sized to deliver, as a minimum, the required flow rates of water for safe shutdown of the plant. Continuation of the minimum required cooling water flows to the engineered safety features equipment served by the system and continuation of the availability of water supplies for the Auxiliary Feedwater System, for the spent fuel pool standby makeup, and for makeup to the Component Cooling Water System are essential to ensure safe operation and safe shutdown of the plant.

The components of the system are designed to meet seismic Category I requirements and the single failure criterion, as discussed in Section 9.2.1.2 of the Standard Plant FSAR.

SAFETY DESIGN BASIS TWO - The ESW system is designed so that postulated environmental occurrences cannot impair the system's ability to meet its functional requirements. Failure of any adjacent nonseismic Category I structure will not constitute a hazard to the ESW system.

9.2.1.2.1.2 Power Generation Design Basis

The components of the ESW system located outside the Power Block have no power generation design basis.

9.2.1.2.2 System Description

9.2.1.2.2.1 General Description

The ESW system outside the Power Block, shown in Standard Plant FSAR Fig. 9.2-2 Sht. 3, consists of pumps, pump prelube storage tanks, piping, self-cleaning strainers, valves, and associated instrumentation.

The system consists of two 100-percent redundant flow paths with one pump supplying cooling water to each flow path. Each flow path is fed from the ultimate heat sink retention pond (refer to Site Addendum Sections 9.2.5 and 3.8.4.1.5).

The ESW pumps are located in a seismic Category I pumphouse (refer to Site Addendum Section 3.8.4.1.1). Each flow path is protected from internally generated missiles, jet impingement, and flooding that may result from cracks in adjacent flow path piping by interior walls. Equipment protection from high winds and floods is discussed in Site Addendum Sections 3.3 and 3.4, respectively. Tornado missile protection is discussed in Section 3.5.2.

The ESWS pumphouse forebay inlet openings are intrinsically protected from blockage by credible tornado missiles or debris. Each individual opening is 8 feet wide by 7 feet 6 inches high. As designed, the ESWS is capable of withstanding the blockage of a single pumphouse forebay inlet opening. System redundancy provides assurance that the remaining unblocked train will provide the necessary flow for safe shutdown. This is based on the single failure criterion listed in Standard Plant Section 3.1.2.

Therefore, tornado debris must completely block both forebay openings to affect the system. However, as shown on Figures 3.8-1 and 3.8-2 for the ESWS pumphouse, a concrete stop log guide is located between each opening. These guides project 3 feet, 3 inches into the forebay. The total width across two adjacent forebay openings is 31 feet. The design UHS retention pond water level is 26 feet above the forebay floor. Therefore,

no credible tornado debris can completely cover both forebay inlet openings blocking all flow to the ESW pump suction.

9.2.1.2.2.2 Component Description

ESW PUMPS - Each of the two ESW pumps has a capacity of 100 percent of the flow rate required during accident conditions. The pumps are of the vertical centrifugal type. Pumps are sized to include an additional one percent margin on the flow at the design head to accommodate degradation of performance due to impeller wear.

ESW PUMP PRELUBE STORAGE TANKS - Each ESW pump is provided with a prelube storage tank. The tank supplies the pump lineshaft bearings with water to prevent the bearings above the pit water level from running dry during startup. Tank size is based on supplying a minimum of a 5-minute supply of water, at 6 gpm, with no makeup from the pump discharge line. When the pump is operating, the bearings are lubricated by the pumped fluid.

ESW SELF-CLEANING STRAINERS - One self-cleaning strainer is provided for each ESW flow path. One hundred percent of the ESW flow is filtered through the strainer element. On high differential pressure, the strainer element is automatically backwashed to eject the accumulated debris.

PIPING AND VALVES - Yard piping outside the Power Block is carbon steel, stainless steel, or polyethylene. Two entirely separate and redundant lines are provided.

Design data for the ESW pumps, prelube storage tanks, self-cleaning strainers, and piping and valves is provided in Table 9.2-2. Codes and standards applicable to the ESW system are listed in Table 3.2-1 of the Standard Plant FSAR. The ESW system outside the Power Block is quality group C and is seismic Category I.

9.2.1.2.3 System Operation

Following an accident which results in generation of an SIS and/or loss of offsite power, the ESW system is automatically isolated from the SW system by motor-operated valves. Both ESW pumps are automatically started by the emergency diesel load sequencer. Pump A starts 32 seconds and pump B starts 37 seconds after receipt of the SIS or loss of offsite power signal. The pumps supply cooling water from the ultimate heat sink to the Power Block components. After cooling the equipment, the heated water is returned to the ultimate heat sink cooling tower. Refer to Standard Plant FSAR Section 9.2.1.2.2.3 for a description of the system operation in the event of loss of only one Class-1E 4160-V bus.

The ESW system provides emergency suction supply to the Auxiliary Feedwater System (AFS) upon failure of the condensate storage tank. In addition to the SIS and loss of offsite power signals, the ESW pump start logic includes the open signal to the ESW supply valves to AFS (auxiliary feedwater low suction pressure, LSP). The auxiliary

feedwater LSP signal also closes the ESW/SW system isolation valves. This assures ESW supply to the AFS following an SSE without an accompanying accident or loss of offsite power (refer to Standard Plant FSAR Section 10.4.9). Following an SSE, operator action lines the discharge of the ESW system to the ultimate heat sink.

The ESW pump discharge piping includes a vent line with a normally open, motor-operated valve. This valve remains open until 15 seconds after pump start. This vents the air in the pump column and discharge piping to prevent system water hammer.

The prelube storage tank is continuously supplied with water by a connection on the ESW pump discharge, downstream of the check valve and self-cleaning strainer. Tank level can be automatically maintained by action of the supply line to the pump lineshaft bearings and stuffing box, and the open tank overflow, and by the manual setting of the globe valve in the tank supply line. The tank provides water to the lineshaft bearings and stuffing box continuously (provided that the discharge line is pressurized) even during periods when the ESW pumps are idle. The discharge lines are normally pressurized by the SW pumps. When the ESW pump is running, flow in the supply line from the tank reverses and discharges through the overflow. If an undetected failure of the SW pumps is assumed, this could result in loss of prelube supply prior to operator action to start the ESW pump. However, the pump will start and continue to run satisfactorily in an emergency situation with dry bearings. Bronze lineshaft bearings are provided in the ESW pumps because of this possibility. The alternate bearing material (cutless rubber) would have a greater tendency to seize during this transient.

The self-cleaning strainers filter the supply water to the Power Block. High differential pressure caused by accumulated debris on the strainer element is corrected automatically by backwashing the element to the ultimate heat sink.

9.2.1.2.4 Safety Evaluation

Safety evaluations are numbered to correspond to the safety design bases in Section 9.2.1.2.1. Safety evaluations for the general safety design bases are provided in Standard Plant Section 9.2.1.2.4.

SAFETY EVALUATION ONE - The ESW system services two identical trains of engineered safety features equipment which are required for safe shutdown of the reactor. Only one train of the redundant plant components is required for the safe shutdown of the plant after any postulated accident condition. Water is supplied to each train of components by a separate pump and header.

Both essential service water trains are capable of individually supplying the required cooling water flows to meet the single failure criterion.

The single active failure analysis is presented in Table 9.2-5 of the Standard Plant FSAR. This provides the basis for the technical specifications with regard to limiting conditions for operation and surveillance.

SAFETY EVALUATION TWO - The ESW pumps, prelube storage tanks and self-cleaning strainers are located in a seismic Category I pumphouse which is designed to protect the pumps against adverse environmental occurrences of tornado, missiles, and safe shutdown earthquake. Other parts of the system located outside the Power Block are either buried underground or located in seismic Category I structures. All structures and components of the system are located so that the failure of any nonseismic Category I structure would not constitute a hazard to the ESW system. The location of the ESW system structures and components is such that:

a. It is adequately separated from all non-seismic Category I structures.

b. The essential service water lines and seismic Category I electrical duct banks are placed below non-seismic lines at points of intersection, or are otherwise analyzed to be acceptable considering failure of the nonseismic lines.

c. It precludes any hazard to the system from the failure of man-made structures, such as the failure of slopes or the postulated rupture of storage tanks.

The seismic Category I essential service water pumphouse, designed as a unitized redundant facility, is located approximately 575 feet south-southeast of the centerline of the reactor as shown in Figure 1.2-44. The routing of the essential service water pipe lines, as shown in Figure 1.2-45, is designed to avoid interferences with the circulating water lines which approach the Power Block from the northeast direction. The ESW system lines are located to minimize the number cross-overs with the SW lines and with the pipes within the ESW system itself. The ESW lines are buried at such a depth to preclude any hazard from a postulated failure of any nonseismic Category I pipes located above.

9.2.1.2.5 Tests and Inspections

Refer to Section 9.2.1.2.4 of the Standard Plant FSAR.

9.2.1.2.6 Instrumentation Applications

Redundant controls are provided to initiate the start of the essential service water pumps following an accident and/or loss of offsite power.

Redundant and independent power supplies for controls and instrumentation are provided from Class 1E busses. Refer to Standard Plant Chapter 8.0. Indicating and alarm devices for the system are provided in Standard Plant FSAR Table 9.2-6.

9.2.3 DEMINERALIZED WATER MAKEUP SYSTEM

The demineralized water system consists of the Demineralized Water Makeup System (DWM) and the Demineralized Water Storage and Transfer System (DWST). This section provides information on the demineralized water makeup system to be constructed external to the Power Block unit.

9.2.3.1 Design Bases

9.2.3.1.1 Safety Design Bases

The DWM system serves no safety function and has no safety design basis.

9.2.3.1.2 Power Generation Design Bases

POWER GENERATION DESIGN BASIS ONE - The DWM system provides water to the demineralized water storage tank at the Power Block to support power generation.

POWER GENERATION DESIGN BASIS TWO - The DWM system provides water meeting the specifications noted in Section 9.2.3 of the Standard Plant FSAR.

9.2.3.1.3 Codes and Standards

The DWM system is designed and fabricated to conform to applicable codes and standards.

9.2.3.2 System Description

9.2.3.2.1 General Description

The DWM system is shown on Figure 9.2-3. It consists of filtration pretreatment equipment, two demineralizer trains in parallel, local demineralized water holding tanks, regeneration systems, bulk regenerant chemical storage tanks, a waste neutralization tank, a waste equalization basin, regeneration waste lagoon, and all associated pumps, piping, and controls.

The DWM system treats clarified river water or water from an on-site well to meet the water quality referenced above and transfers the treated water to the demineralized water storage tank near the Power Block. The system removes suspended solids, dissolved organic matter, residual chlorine, and dissolved ionic mineral impurities from the clarified water.

9.2.3.2.2 Component Description

9.2.3.2.2.1 Filtration Pretreatment Equipment

The filtration pretreatment equipment consists of a wet well, chlorinator, clarified water pumps, gravity sand filters, clearwell, service and backwash pumps, auxiliary service pumps, and activated carbon filters. The gravity sand filters remove suspended solids from the influent. Chlorine is periodically applied to prevent biological growth in the filters. The activated carbon filters remove residual chlorine and most dissolved organic matter in the water, and protect the demineralizer ion exchange resins from organic fouling. The effluent from the activated carbon filters feeds the demineralizer trains and also provides 8 gpm to the Potable Water System while the demineralizer trains are operating, and 15 gpm from auxiliary service pumps when the demineralizer trains are not operating.

9.2.3.2.2.2 Demineralizer Trains

Each demineralizer train consists of one weak acid cation exchanger, one strong acid cation exchanger, one degasifier and forced draft blower, one degasified water booster pump, one strong base anion exchanger, one mixed bed exchanger, piping, valves, instrumentation, and controls. Each demineralizer train is sized to provide 300,000 gallons per day of demineralized water to the Power Block and 8 gpm to the Potable Water System while either demineralizer train is operating. Each demineralizer train has its own monitoring and control system enclosed in a single demineralizer control panel. The ion exchanger vessels are equipped with access manholes, vents, drains, sight glasses, and flanged openings to permit sluicing of resin. The internals are of corrosion resistant material and are designed to adequately distribute and collect the flow without channeling or short-circuiting. Each mixed bed exchanger is provided with a flanged resin trap in its effluent line. The resin traps are designed to retain all particles larger than 50 mesh and to withstand a differential pressure of 150 psig.

9.2.3.2.2.3 Demineralizer Regeneration Equipment

The demineralizer regeneration equipment consists of acid pumps, caustic pumps, dilution water pumps, mixed bed blowers, demineralized water holding and hot water tanks, caustic dilution water heating equipment, regenerant in-line dilution piping, valves, instrumentation, and controls. Each demineralizer train has its own independent acid and caustic regeneration system. Concentrated sulfuric acid and sodium hydroxide are stored in tanks common to both trains. Instrumentation and controls automatically regulate the required amount of regeneration chemicals, concentration, and temperature. Conditions deviating from the specified ranges sound a local alarm and stop regeneration.

9.2.3.2.2.4 Neutralization Tank

The neutralization tank is an above-grade, open top, rubber-lined steel tank, located outside the demineralized water system building. It collects the waste streams produced during regeneration of the demineralizer trains. The tank is sized to hold the waste water from two regenerations. In addition, floor drainage from the demineralized water system building is collected in a sump and pumped to the neutralization tank. A mechanical agitator is used to mix the contents to a homogeneous pH. If necessary, dilute acid or caustic is automatically added to neutralize the waste. After the proper pH is attained, the tank outlet valve is automatically opened and the contents are discharged by gravity to the equalization basin.

9.2.3.2.2.5 Equalization Basin

The equalization basin is a below grade, open top, concrete basin located outside the demineralized water building. It collects the backwash from the filtration pretreatment equipment, and wet well overflow. The contents are discharged by gravity at a uniform flowrate to the Water Treatment Plant Sludge Disposal System.

9.2.3.2.2.6 Demineralizer Waste Pump Station

The Demineralizer Waste Pump Station is a below grade concrete pump station located outside the Demineralized Water System Building. It accepts overflow from the equalization basin and pumps the waste to the regeneration waste lagoon. After settlement, the supernatant flows by gravity to the Supernatant Pump Station, which recycles the water to the Water Treatment Plant.

9.2.3.2.2.7 System Operation

Flow of demineralized water to the Power Block is controlled by an open-close valve operated by level switches on the associated demineralized water tank. When the valve is open, the flow through each train is modulated by an auto/manual controller located in the main control room. In the auto mode, flow to the DWST is modulated proportionally to DWST level to minimize tank level fluctuations.

Effluent quality from each demineralizer train is monitored by instruments, and a service rinse is initiated automatically if conductivity levels increase above preset limits. A demineralizer train is taken out of service automatically if exhaustion is indicated by flow totalizer, silica level, or conductivity level. Exhaustion of the train is signaled on the main control panel located in the main control room.

Regeneration of a demineralizer is automatic after being initiated manually in the Unit 1 main control room or locally at the demineralizer control panel. After completion of regeneration, including filling of the local demineralized water holding tank and hot water tanks, the train remains on standby until manually returned to service.

9.2.3.3 Safety Evaluation

The DWM system serves no safety related function.

9.2.3.4 Tests and Inspections

The DWM system equipment is initially inspected and tested in accordance with preoperational test procedures as described in Chapter 14 to insure system integrity and completeness.

9.2.3.5 Instrumentation Applications

Local and remote indicators and alarms are provided to monitor the system and to protect the system components. Pressure differential, turbidity, pH, conductivity, silica, flow, and temperature monitors and alarms are provided for each applicable point in the system. High and low level alarms are installed on the tanks in the system and the degasifiers. The regeneration portion of the system is fully monitored and protected by pressure, flow, temperature, and conductivity alarms.

9.2.4 POTABLE WATER AND SANITARY WASTE WATER SYSTEM

The Potable Water (PW) and Sanitary Waste Water (SWW) system described herein is for the site-related portion of the system.

9.2.4.1 Design Bases

9.2.4.1.1 Safety Design Bases

The PW and SWW system serves no safety function and has no safety design basis.

9.2.4.1.2 Power Generation Design Basis

POWER GENERATION DESIGN BASIS ONE - The bacteriological and chemical quality of the potable water meets the requirements of the U.S. Environmental Protection Agency Interim Primary Drinking Water Regulations (1975) and the Missouri Public Drinking Water Regulations (1979).

POWER GENERATION DESIGN BASIS TWO - Deleted

POWER GENERATION DESIGN BASIS THREE - Deleted

POWER GENERATION DESIGN BASIS FOUR - Deleted

POWER GENERATION DESIGN BASIS FIVE - There are no physical connections between the potable water supply system and a sanitary sewer or process water line, or appurtenance thereto which would permit the passage of any sewage or process water

into the potable water supply. Instrumentation and positive control are provided to protect the PW system from contamination by demineralizer regenerant chemicals that may unintentionally enter the demineralizer effluent.

Where possible, sanitary and process water sewers are located at least 10 feet, horizontally, from any potable water distribution system piping. Where local conditions prevent a lateral separation of 10 feet, a sewer may be laid closer than 10 feet under either of the following conditions:

a. It is laid in a separate trench.

b. It is laid in the same trench with the water mains located at one side on a bench of undisturbed earth.

Wherever sewers cross under water mains, the sewer is laid at such an elevation that the crown of the sewer is at least 12 inches below the invert of the water main. No sewer crosses over a water main.

POWER GENERATION DESIGN BASIS SIX - The SWW system treats the waste from up to a flow of 40,000 gallons per day.

9.2.4.2 System Description

9.2.4.2.1 Potable Water System

The potable water system provides chlorinated water for the domestic water needs of the Power Block, and other permanent plant buildings.

9.2.4.2.1.1 Deleted

9.2.4.2.1.1.1 Deleted

The main supply to the storage tank is an on-site well. The tank has a usable volume of 23,000 gallons and is made of unpigmented fiberglass-reinforced plastic.

9.2.4.2.1.1.2 Deleted

9.2.4.2.1.1.3 Deleted

9.2.4.2.1.2 System Operation

The potable water system is predominantly automatic and requires periodic monitoring and sampling.

The potable water distribution system is kept under constant pressure. Pressure control valves maintain distribution pressure at approximately 62 psig for the proper operation of

fixtures and equipment throughout the site. The automatic control of the pumping system reacts to changes in system demand by monitoring the pressure in the distribution system, and starts or stops pumps as required to maintain the required pressure throughout the distribution system.

9.2.4.2.2 Sanitary Waste Water System

The SWW system provides for collection treatment and discharge of sanitary waste water generated during the operation of Callaway Plant. The SWW system consists of a gravity sewer collection system, force mains, a raw sewage wet well/dry well lift station, three flow through sewage treatment lagoons, and a wetlands.

9.2.4.2.2.1 Component Description

9.2.4.2.2.1.1 Raw Sewage Lift Station

The raw sewage lift station takes suction from the wet well and pumps the collected sanitary waste to the primary sewage treatment lagoon. It consists of a duplex pump system controlled by a liquid level sensor in the wet well.

9.2.4.2.2.1.2 Flow Through Sewage Treatment Lagoons

The flow through sewage treatment lagoons consist of three separate unaerated lagoons. The sewage treatment lagoon system is designed and constructed in accordance with the Missouri Code of State Regulations, 10 CSR 20 - Chapter 8. The effluent from the lagoons is discharged to the sewage treatment wetlands.

9.2.4.2.2.1.3 Sewage Treatment Wetlands

The sewage treatment wetlands is located at the former site of water treatment plant sludge lagoons #1 & #2. The sludge lagoons evolved into wetlands from silt deposited in the sludge lagoon as a result of the operation of the water treatment plant. Aquatic plants such as cattails, willows, duck weed, bulrush and others created a natural wetlands after the lagoon was no longer used as a settling pond for silt. The wetlands is now used as a polishing area for the SWW system to complete the treatment process.

9.2.4.2.2.2 System Operation

The sanitary sewer system collects sanitary waste water generated throughout the plant area and transports it to the raw sewage lift station. The lift station conveys the waste water to the sewage treatment lagoons.

The waste stream is discharged into the primary lagoon where it is processed by bacteria under natural conditions. Effluent from the primary lagoon will then gravity flow into the secondary pond where the waste water will continue to be processed by aerobic bacteria.

The effluent from the secondary lagoon will then gravity flow to the tertiary lagoon which is primarily a stilling chamber to allow any remaining solids to settle out. The resulting clear water will then gravity flow to the wetlands lift station where it is pumped to the wetlands for final treatment.

The wetlands polishes the water received from the lagoons by natural processes. Water in the wetlands is maintained at a depth which allows the natural process of plants, sunlight and bacteria to clean the water. Effluent from the wetlands is combined with supernatant from the Water Treatment Plant Sludge Lagoon system. This is then recycled to the Water Treatment Plant.

9.2.4.3 Safety Evaluation

The PW and SWW system serve no safety-related function.

9.2.4.4 Tests and Inspections

The PW system equipment is initially inspected and tested in accordance with applicable codes and preoperational test procedures to insure system integrity and completeness. The effluent of the sewage treatment system is monitored for flow, biochemical oxygen demand, suspended solids, and pH in accordance with the National Pollutant Discharge Elimination System Permit issued by the Missouri Department of Natural Resources.

9.2.4.5 Instrumentation Applications

Local and remote indicators and alarms are provided to monitor the systems and to protect system components. Pressure, flow, and level instruments and alarms are provided as necessary to adequately monitor the system.

9.2.5 ULTIMATE HEAT SINK

The ultimate heat sink (UHS) for the plant consists of a 4-cell seismic Category I mechanical draft cooling tower and a seismic Category I source of makeup water (retention pond) for the tower. Heat from the Essential Service Water Systems (ESW), as discussed in Standard Plant FSAR Section 9.2.5, is rejected to the UHS to permit a safe shutdown of the unit following an accident.

Using conservative analytical methods, the appropriate UHS water level for the plant is determined. This calculation results in a minimum initial UHS water level Technical Specification limit of 16.0 feet (this level includes 12% margin by volume).

9.2.5.1 Design Bases

9.2.5.1.1 Safety Design Bases

Standard Plant Section 9.2.5 provides the general design bases met by the UHS.

SAFETY DESIGN BASIS ONE - The UHS furnishes the cooling water source allowing the ESW system to supply approximately 15,000 gpm of cooling water per train to remove the heat loads of the components listed in Standard Plant FSAR Section 9.2.5. The maximum UHS retention pond and ESW supply water temperature reached due to post-LOCA heat load removal will not exceed 92.3°F.

SAFETY DESIGN BASIS TWO - The UHS is designed to meet the requirements of NRC Regulatory Guide 1.27, Ultimate Heat Sink.

SAFETY DESIGN BASIS THREE - The UHS retention pond capacity is sufficient to permit the safe shutdown of the reactor following a design basis large break LOCA as well as cooling the loads associated with a normal plant shutdown.

The design and operational parameters of the UHS provide the required 30 day supply of cooling water following a design basis large break LOCA.

9.2.5.1.2 Power Generation Design Basis

The UHS is not required for power generation.

9.2.5.2 System Description

9.2.5.2.1 General Description

The UHS consists of one seismic Category I mechanical draft cooling tower with redundant cells and a seismic Category I excavated retention pond.

Standard Plant FSAR Figure 1.2-48, Site Addendum FSAR Figure 3.8-12, and Site Addendum FSAR Figure 3.8-15 show the location and arrangement of the UHS cooling tower and the retention pond.

A piping and instrumentation diagram for the UHS is shown in Standard Plant FSAR Figure 9.2-2 Sht. 3.

9.2.5.2.2 Component Description

COOLING TOWER - The cooling tower is safety-related, seismic Category I, mechanical draft type, sized with 100-percent redundancy to provide heat dissipation for safe shutdown following an accident. The cooling tower is protected from horizontal and vertical tornado missiles. Details of the tower structural design and missile protection are

provided in Section 3.8.4.1.4. Tornado missile protection design criteria are provided in Section 3.5.3.1.

Design data for all cooling tower components is provided in Table 9.2-4. The cooling tower is divided into four cells with one fan assembly (fan, gear reducer and motor) per cell. Two of the four cells (one train of the ESW) are required for safe shutdown. Backup electric power to the fan motors is supplied from the emergency diesel generators located in the Power Blocks.

Supply headers and spray pipes for each train of ESW from the Power Block are separated by interior walls. A passive failure of the spray pipe for one train of the ESW will not affect the piping for the other train.

Figure 3.8-12 provides the arrangement for the cooling tower components. Refer to Standard Plant Section 9.4.8 for a description of the cooling tower electrical room ventilation equipment.

FREEZE PROTECTION - Freeze protection of the tower fill is provided by automatic bypass of the spray system. ESW from the power block is diverted directly into the cooling tower basin (refer to Section 9.2.5.5). Freeze protection of the spray system when the tower is idle is provided as follows:

a. Piping above El. 1998'-6" is provided with a continuous drain.

b. Piping from the basin floor (El. 1996'-6") to El. 1998'-6" is heat traced to keep all the supply pipe above the maximum frost depth free from ice closure.

During periods when the tower is idle, the fan stack missile protection design shown on Fig. 3.8-12 is intrinsically protected against excessive ice, snow or debris blockage. The drip ledge along the bottom periphery of the 28'-4" diameter concrete missile shield support beams will prevent damaging ice formation above the fan. The grating design (2 1/2 inches deep with 2 1/8 inches clear openings) and open beam supports which surround the missile shield contribute to prevention of ice blockage. The grating is completely shadowed by the cooling tower roof with the roof opening diameter being 6 inches less than the diameter of the missile shield. This will protect the grating from contact with vertical sleet or snowfall. Oblique precipitation or debris entering the roof opening will contact only a fraction of the grating. Fan design static pressure exceeds missile protection and tower losses by a margin of 15 percent to account for this possibility. Ice blockage of the grating which causes its static loss to exceed the fan rating could result in degradation of cooling tower performance. However, low UHS retention pond initial temperature (compared to design case) will provide additional cooling capability.

Water from the cooling tower basin is fed by gravity through two 36-inch pipes to the retention pond. Normal level in the retention pond results in standing water in the basin

sumps. Two immersion heaters per basin sump are provided to prevent ice blockage when the towers are idle.

RETENTION POND - The UHS retention pond which contains makeup water for the UHS cooling tower is an excavation in existing and fill soils.

The approximate dimensions of the pond at grade El. 1999.5 feet are 330 by 680 feet. The bottom of the pond elevation is 1977.5 feet, and the side slopes are 3 horizontal to 1 vertical. The side slopes are protected by riprap from the surrounding grade elevation to El. 1987.5 feet. The design water level in the pond is El. 1995.5 feet. The target (nominal) UHS retention pond level is maintained between levels corresponding to the low and high level alarms. Two submerged, reinforced concrete discharge structures discharge water into the pond from the UHS cooling tower. A reinforced concrete outlet structure is provided for outflow from the pond.

Approximately 56 acre-feet of water is maintained below the design water level of 18 feet, plant El. 1995.5. The minimum initial Technical Specification water level is 16.0 feet, plant El. 1993.5, which maintains a volume over 48.2 acre-feet in the UHS. The UHS was analyzed for the design basis LOCA in accordance with NRC Regulatory Guide 1.27 assuming two ESWS trains in operation for the first 7 days and single train operation thereafter. The total inventory loss from the UHS during the 30 day period under the most limiting meteorological conditions (maximum evaporation conditions) was conservatively calculated to be 40.9 acre-feet. The total water volume remaining after 30 days is greater than 7.3 acre-feet. The usable portion of this volume is greater than 4.97 acre-feet which provides a margin of 12% above the total volume requirement.

Degradation due to siltation will not occur because of the normal quiet state of the pond and the composition of the in situ clay materials. The in situ clays have very low permeabilities which make seepage negligible. The capacity of the pond is sufficient to accommodate any expected ice formation.

Structural design of the UHS retention pond is described in Section 3.8.4.

A 14-inch-diameter, non-seismic Category I make-up line provides normal makeup water for the pond. Source of the makeup water is the water treatment plant clearwell. Plant procedures control makeup to the pond from the clearwell deepwell or service water systems. No blowdown for the pond is provided.

Typical plans and sections for the UHS retention pond are shown on Figures 3.8-15, 3.8-16, and 3.8-17.

9.2.5.2.3 System Operation

Normal cooling of the safety-related equipment is by the service water system, as described in Section 9.2.1. When the ESW system is put into operation, water is drawn from the UHS retention pond by means of the ESW pumps. It is then pumped through

the Power Block components and returned to the cooling tower basin. The spray system is bypassed until UHS inlet water temperature from the Power Block reaches 84°F. The fans remain de-energized until UHS inlet water temperature from the Power Block reaches 95°F after which the fans will start in slow speed. The fans will switch to high speed when the UHS inlet water temperature reaches 105°F. After the EFT-0061 and EFT-0062 ESW pump discharge (ESW supply) temperature control loops are enabled by control room operators using handswitches EFHS0067 and EFHS0068 (one switch per train), the actuation temperatures are, in ascending order, 79°F (bypass valves close), 84.5°F (cooling tower fans start in low speed), and 89.5°F (cooling tower fans switch to high speed). The water flows from the cooling tower basin to the retention pond by gravity through two 36-inch pipes, one per train of the ESW. Refer to Section 9.2.1.2 for a description of the ESW pumps and piping outside the Power Block. Standard Plant FSAR Section 9.2.5 provides the heat loads on the UHS cooling tower and the UHS water chemistry analysis.

9.2.5.3 Safety Evaluation

SAFETY EVALUATION ONE - The UHS is sized to dissipate the maximum heat loads post DBA listed in Standard Plant FSAR Section 9.2.5 while providing an ESW supply water temperature less than or equal to 92.3°F. It is assumed that the DBA occurs at the time that the most adverse meterological conditions for tower performance prevail. The UHS pond temperature reached under these conditions will not exceed 92.3°F. The design-basis maximum ESW supply temperature from the UHS retention pond is 95°F. That value was used in the design of the UHS cooling tower cells (FSAR Site Addendum Table 9.2-4 of Reference 1) and is the assumed ESW inlet temperature to all loads served by ESW except for the electrical penetration room coolers. However, the maximum ESW supply and UHS retention pond temperature of 92.3°F establishes the upper acceptance criterion in the minimum heat transfer and maximum evaporation cases in the analysis supporting the 30-day UHS inventory requirement per RG 1.27 (Ref. 2). In addition, an ESW inlet temperature of 92.3°F is also assumed in the analysis of the electrical penetration room temperatures (room coolers supplied by ESW). The 92.3°F value is the maximum temperature allowed in these analyses to support UHS operability assuming an initial maximum temperature of 89°F.

SAFETY EVALUATION TWO - The UHS retention pond meets the requirements of NRC Regulatory Guide 1.27 for a single UHS water source.

The UHS cooling tower is designed to withstand the safe shutdown earthquake or design basis tornado and for single failure, either active or passive, without loss of function. Additionally, due to the manner in which emergency power is supplied to the pumps and cooling tower fans from the emergency diesels, the system functions are unimpaired by an active diesel failure.

Since the UHS pond is an excavated depression and the water is not retained by man-made structural features, the postulation in NRC Regulatory Guide 1.27 of the single failure of man-made structural features does not apply. The UHS pond is

designed to withstand the most severe natural phenomena expected. See Section 2.4.3 for coincident wind wave activity and Section 2.4.5 for surge and seiche sources. Slope stability is discussed in Section 2.5.5. The UHS pond is so located that its function is not to be affected by postulated accidents incurred by traffic on vehicle access roads or other site-related events.

Non-seismic, non-Category I structures near the seismic Category I ultimate heat sink cooling tower include the fire pumphouse, the portable water plant and the Maintenance Training Annex/Operations Support Facility, as shown in Fig 1.2-44. A postulated structural failure of these non-seismic buildings would not impose a hazard to the cooling tower since the tower enclosure is designed as a tornado-resistant structure.

Conformance with Regulatory Guide 1.27 is tabulated in Table 9.2-5. A single failure analysis for the UHS cooling tower is contained in Standard Plant FSAR Table 9.2-5.

SAFETY EVALUATION THREE - The UHS retention pond volume at the design level is approximately 56 acre-feet. At the minimum level required by the plant Technical Specifications the contained volume is 48.2 acre-feet of water. 40.9 acre-feet is needed to provide a 30 day supply of cooling and makeup water post LOCA under maximum evaporation conditions for this period. The total pond water volume remaining after 30 days is 7.3 acre-feet. The usable portion of this volume is 4.97 acre-feet, which is the volume of water above the minimum level needed to maintain the required net positive suction head for the ESWS pumps. This remaining volume provides a margin that is greater than 12% of the total water volume.

In the event normal plant facilities are not in operation within 30 days after an emergency shutdown, approximately 13 acre-feet of water are available from the water treatment plant clarifiers. This water can be pumped into the UHS retention pond by portable pumps for UHS heat dissipation purposes. In the event the clarifiers have been damaged, water can be trucked from offsite. An adequate number of 40,000 to 45,000 pound capacity bulk liquid carriers are available in the metropolitan area. These trucks would be mobilized to obtain water from Fulton (10 miles), Jefferson City (25 miles), or Columbia (32 miles). In the extremely unlikely event water would not be available from any of the above cities, portable pumps will be obtained and water can be pumped from the Missouri River (6 miles) to fill the trucks.

9.2.5.4 Testing and Inspections

The UHS is designed to include the capability for testing through the full operational sequence that brings the system into operation for reactor shutdown and for loss-of-coolant accidents, including operation of applicable portions of the protection system and the transfer between normal and standby power sources.

The components of the UHS, i.e., fans, valves, tower fill, and piping (to the extent practicable), are designed and located to permit preservice and inservice inspections.

9.2.5.5 Instrument Applications

The UHS instrumentation is designed to facilitate automatic operation, remote control, and continuous indication of system parameters. Redundant and independent power supplies for cooling tower fan controls and instrumentation are provided from Class 1E sources (refer to Chapter 8.0).

Discharge water from the power block is directed into the cooling tower basin through a normally open spray system bypass valve. The bypass valve is controlled by cooling tower inlet water temperature and ESW pump run time. This arrangement provides freeze protection for the tower fill. The bypass valve will automatically close when UHS inlet water temperature is at or above 84°F to direct the water through the cooling tower fill. If the UHS inlet water temperature increases to 95°F, the cooling tower fans will automatically start in slow speed. In addition, if temperature continues to rise, the fans will automatically shift to high speed at 105°F. The design setpoints for the UHS cooling tower fans provide freeze protection in cold weather and protect the UHS retention pond temperature from exceeding 92.3°F in warm weather post-LOCA. After the EFT-0061 and EFT-0062 ESW pump discharge (ESW supply) temperature control loops are enabled by control room operators using handswitches EFHS0067 and EFHS0068 (one switch per train), the actuation temperatures are, in ascending order, 79°F (bypass valves close), 84.5°F (cooling tower fans start in low speed), and 89.5°F (cooling tower fans switch to high speed). Fan status and valve position indication is provided locally and in the control room.

Level sensors located in the UHS provide control room indication of low pond level and high pond level. Makeup to the pond can also be accomplished by manual operation.

Refer to Standard Plant FSAR Figure 9.2-2 Sht. 3, for a description of UHS instrumentation.

TABLE 9.2-1 SERVICE WATER SYSTEM COMPONENT DATA[1]

Service Water Pump (all data is per pump)	
Quantity	3 (50% each)
Type	Vertical centrifugal-single stage
Capacity (gpm)	19,000
TDH, ft	165
Material	
Case	Cast iron
Impeller	Bronze
Shaft	416 S.S.
Design Code	Hydraulic Institute Standard
Driver	
Type	Electric motor
Horsepower	1000
RPM	1180
Power Supply	4160 V, 60 Hz, 3-phase
Design Code	NEMA
Seismic Design	None

NOTE: (1) The values specified in this table are nominal SW flow rates. Actual SW flow rates are maintained to ensure the design temperature and pressure of equipment served by the SW are maintained.

TABLE 9.2-2 ESSENTIAL SERVICE WATER SYSTEM COMPONENT DATA

Essential Service Water Pump (all data is per pump)	
Quantity	2 (100% each)
Type	Vert turbine - 2 stg. with packed stuffing boxes
Capacity	15,000
TDH, ft	328
Submergence required ft	8
Submergence available, ft (min)	8
Material	
Case	Carbon steel or Stainless Steel
Impeller	Bronze
Shaft	Stainless steel
Design Codes	ASME Section III Cl. 3
Driver	
Type	Electric motor
Horsepower	1,750
RPM	885
Power Supply	4160 V, 60 Hz, 3-phase, Cl.IE
Design Code	NEMA
Seismic design	Category I
Essential Service Water Pump Prelube Storage Tanks (all data is per tank)	
Quantity	2
Type	Vertical
Capacity, gallons	43
Design pressure	Atm.
Design temperature,°F	122
Shell material	Carbon steel or Stainless Steel
Corrosion Allowance	1/16 inch
Design code	ASME Section III, Cl. 3
Seismic design	Category I
Essential Service Water Self-Cleaning Strainers (all data is per strainer)	
Quantity	2
Capacity, gpm	15,000
Pressure drop, clean	4.7 psi
Pressure drop, dirty*	6.7 psi
Strainer openings	1/16 inch
Design pressure, psig	200
Design temperature,°F	100
Design Code	ASME Section III, Cl. 3

TABLE 9.2-2 (Sheet 2)

Driver	
Type	Electric motor
Horsepower	1.3 hp
RPM	1700
Power supply	480 V, 60 Hz 3-phase Cl. IE
Design Code	NEMA
Seismic design	Category I
Piping, Fittings, and Valves	
Design pressure, psig	200 (maximum)
Design temperature, °F	200 (maximum)
Material	Carbon Steel, Stainless Steel, or Polyethylene
Design Code	ASME Section III Cl. 3
Seismic Design	Category I

*At start of backwash

TABLE 9.2-3 DELETED

TABLE 9.2-4 ULTIMATE HEAT SINK COMPONENT DATA

Cooling Tower	
Number of towers	1
Number of cells per tower	4
Design Point Each Cell	
Water flow rate, gpm	7,500
Heat rejection rate, Btu/hr	145×10^6
Hot water temperature, °F	133.7
Cold water temperature, °F	95
Entering wet bulb temperature, °F	81
Range, °F	38.7
Approach, °F	14
Tower Performance Data Each Cell	
Dry air flow, lb/hr	2.587×10^6 lb D.A./hr/fan
Water/air ratio, L/G	1.45
Performance characteristic, KaV/L	2.04
Evaporation loss, lb/Btu	0.00088 lb H_2O/Btu/fan
Drift loss, % of flow	0.02%
Tower Fill	
Fill material	Crosspack corrugated asbestos cement board (ACB)
Effective cooling surface	
Plan area per cell	1,293.3 sq ft
Surface area of fill per cell	190,120 sq ft
Fill support spacing	4.042 ft
Number of fill deck layers	One
Packing height	7 ft
Drift Eliminators	
Material	Corrugated ACB or Corrugated Cellulose Silica Cement Board (CSCB)
Number of passes	One
Mechanical Equipment	
Fan	
Quantity	4 (1 per cell)
Diameter	24 ft
Number of blades	12
Speed	164/82 rpm
Tip speed	12,365 fpm

TABLE 9.2-4 (Sheet 2)

	Blade material	Glass reinforced polyester
	Fan horsepower	165 bhp
	Fan capacity	692,700 cfm
	Fan efficiency	71.8
	Seismic design	Category I
	Fan Pressure	
	Static	0.9449" H_2O
	Velocity	0.10" H_2O
	Total	1.0449" H_2O
	Air velocity entering tower	900 fpm
	Air velocity leaving tower	1,167 fpm
	Entering air density	0.07040 lbs/ft
	Leaving air density	0.06650 lbs/ft
Speed Reducer		
	Type	Right angle
	Quantity (per tower)	4
	Service factor	2.0 @ 200 bhp
	Gear material	SAE 4620
	Casing material	ASTM A 48
	Gear ratio	10.83:1
	Horsepower at base design	165 bhp
	Seismic design	Category I
Drive Shaft		
	Diameter	6-5/8" O.D.
	Length	11'-1 1/2"
	Critical speed	2,750 rpm
	Material	Stainless steel
Fan Motor		
	Quantity (per tower)	4
	Power supply required	480 V, 3-phase, 60 cycle
	Rated horsepower	200 hp/50 hp
	Rated ambient	50°C
	Speed	1,800 rpm/900 rpm
	Design code	NEMA
	Seismic design	Category I
	Power supply	Class 1E

*External Static Pressure

TABLE 9.2-4 (Sheet 3)

Distribution System	
Piping	
Number of inlet connections	1 per cell
Nominal size of connections	20"
Type of connections	Raised face flange
Seismic design	Category I
Coating	galvanized
Material	Carbon steel (SA 106 GR B)
Design pressure	50 psig
Design temperature	200°F
Design code	ASME Section III, Cl.3
Nozzles	
Quantity	542
Size	.601 sq in/nozzle
Material	Bronze
Pressure Drop	
Pressure drop through inlet	0.102" H_2O
Pressure drop through outlet	0.3729" H_2O
Pressure drop through fill, spray system, and drift eliminators	0.471" H_2O
Total pressure drop through tower	0.9449" H_2O
Retention Pond	
Quantity	1
Dimensions, L x W, ft	330 x 680
Target level	**
Minimum Technical Specification initial level	El. 1993'-6"
Normal water volume, acre-feet	51.2 at a level of 1994’-6”

** Target (nominal) UHS retention pond water level is maintained between levels corresponding to the low and high level alarms.

TABLE 9.2-5 DESIGN COMPARISON TO REGULATORY POSITIONS OF REGULATORY GUIDE 1.27, REVISION 2 DATED JANUARY 1976, TITLED "ULTIMATE HEAT SINK FOR NUCLEAR POWER PLANTS"

Regulatory Guide 1.27 Position	CALLAWAY-SA-Callaway Position
I. 1. The ultimate heat sink should be capable of providing sufficient cooling for at least 30 days (a) to permit simultaneous safe shutdown and cooldown of all nuclear reactor units that it serves and to maintain them in a safe shutdown condition, and (b) in the event of an accident in one unit, to limit the effects of that accident safely, to permit simultaneous and safe shutdown of the remaining units, and to maintain them in a safe shutdown condition. Procedures for ensuring a continued capability after 30 days should be available. Sufficient conservatism should be provided to ensure that a 30-day cooling supply is available and that design basis temperatures of safety-related equipment are not exceeded. For heat sinks where the supply may be limited and/or the temperature of plant intake water from the sink may eventually become critical (e.g., ponds, lakes, cooling towers, or other sinks where recirculation between plant cooling water discharge and intake can occur), transient analyses of supply and/or temperature should be performed.	I. 1. Complies Refer to Section 9.2.5.2.2.
2. The meteorological conditions resulting in maximum evaporation and drift loss should be the worst 30-day average combination of controlling parameters (e.g., dewpoint depression, windspeed, solar radiation). The meteorological conditions resulting in minimum water cooling should be the worst combination of controlling parameters, including diurnal variations where appropriate, for the critical time period(s) unique to the specific design of the sink. The following are acceptable methods for selecting these conditions: a. Based on regional climatological information, select the most severe observation for the critical time period(s) for each controlling parameter or parameter combination, with substantiation conservatism of these values for site use. The individual conditions may be combined without regard to historical occurrence.	2. Twenty-five years of meteorological data are used as the basis for the retention pond transient analysis. The worst consecutive 30-day maximum evaporation period is used to determine maximum pond evaporation and cooling tower evaporative loss. Meteorological data used are wet-bulb depression, windspeed and net solar radiation. Cooling tower evaporation loss and discharge water temperature are calculated using conservative methods. Guaranteed maximum drift loss for the cooling tower is included. The initial pond temperature on the first day of the accident is based upon the maximum pond temperature allowed by plant technical specifications. The transient temperature performance during the minum heat transfer period has been simulated by using the worst single day (7/12/69) meteorological conditions as the first day of the worst 30-day period 7/7/55 to 8/5/55). The diurnal fluctuation for the worst single day is accounted for by use of three-hour time increments, using the appropriate 3-hourly meteorological data. The peak pond outlet temperature occurs on the first day following a LOCA.

TABLE 9.2-5 (Continued) (Sheet 2 of 4)

Regulatory Guide 1.27 Position	CALLAWAY-SA-Callaway Position
b. Select the most severe combination of controlling parameters, including diurnal variations where appropriate, for the total of the critical time period(s), based on examination of regional climatogical measurements that are demonstrated to be representative of the site. If significantly less than 30 years of representative data are available, other historical regional data should be examined to determine controlling meteorological conditions for the critical time period(s). If the examination of other historical regional data indicates that the controlling meteorological conditions did not occur within the period of record for the available representative data, then these conditions should be correlated with the available representative data and appropriate adjustments should be made for site conditions.	
c. Less severe meteorological conditions may be assumed when it can be demonstrated that the consequences of exceeding lesser design basis conditions for short time periods are acceptable. Information on magnitude, persistence, and frequency of occurrence of controlling meteorological parameters that exceed the design basis conditions, based on acceptable data as discussed above, should be presented.	
The above analysis related to the 30-day cooling supply and the excess temperature should include sufficient information to substantiate the assumptions and analytical methods used. This information should include actual performance data for a similar cooling method operating under load near the specified design conditions or justification that conservative evaporation and drift loss and heat transfer values have been used.	
3. A cooling capacity of less than 30 days may be acceptable if it can be demonstrated that replenishment or use of an alternate water supply can be effected to assure the continuous capability of the sink to perform its safety functions, taking into account the availability of replenishment equipment and limitations that may be imposed on "freedom of movement" following an accident or the occurrence of severe natural phenomena.	3. Not applicable.
II. 1. The ultimate heat sink complex, whether composed of single or multiple water sources, should be capable of withstanding, without loss of the sink safety functions specified in regulatory position I, following events:	II. 1. Complies
a. The most severe natural phenomena expected at the site, with appropriate ambient conditions, but with no two or more such phenomena occuring simultaneously,	

TABLE 9.2-5 (Continued) (Sheet 3 of 4)

Regulatory Guide 1.27 Position	CALLAWAY-SA-Callaway Position
b. The site-related events (e.g., transportation accident, river diversion) that historically have occurred or that may occur during the plant lifetime,	
c. Reasonably probable combinations of less severe natural phenomena and/or site-related events,	
d. A single failure of manmade structural features,	
2. Ultimate heat sink features, which are constructed specifically for the nuclear power plant and which are not required to be designed to withstand the Safe Shutdown Earthquake or the Probable Maximum Flood, should at least be designed and constructed to withstand the effects of the Operating Basis Earthquake (as defined in 10 CFR Part 100, Appendix A) and waterflow based on severe historical events in the region.	2. Not applicable.
III. 1. The ultimate heat sink should consist of at least two sources of water, including their retaining structures, each with the capability to perform the safety functions specified in regulatory position I, unless it can be demonstrated that there is an extremely low probability of losing the capability of a single source.	III. 1. A water source for the unit is contained in the retention pond. The retention pond is seismic Category I and below grade. Hence, there is an extremely low probability of losing its capability. Operator actions are credited after a large break LOCA to diagnose and mitigate a postulated single failure of a UHS cooling tower bypass valve to close based on indications from NG07 and NG08 bus voltage annunciators and proper equipment status (bypass valve position, UHS cooling tower on/off status and fan speed) for the prevailing ESW return (UHS inlet) temperature and to switch temperature control loops for the UHS cooling tower bypass valves and cooling tower fans from the ESW return temperature to the ESW pump discharge (ESW supply) temperature. This is discussed in greater detail in Standard Plant FSAR Section 9.2.5.2.2.1.
2. For close-loop cooling systems there should be at least two aqueducts connecting the source(s) with the intake structures of the nuclear power units and at least two aqueducts to return the cooling water to the source, unless it can be demonstrated that there is extremely low probability that a single aqueduct can functionally fail entirely as a result of natural or site-related phenomena.	2. Complies
3. For once-through cooling systems, there should be at least two aqueducts connecting the source(s) with the intake structures of the nuclear power units and at least two aqueducts to discharge the cooling water well away from the nuclear power plant to ensure that there is no potential for plant flooding by the discharged cooling water, unless it can be demonstrated that there is extremely low probability that a single aqueduct can functionally fail as a result of natural or site-related phenomena.	3. Not applicable.

TABLE 9.2-5 (Continued) (Sheet 4 of 4)

Regulatory Guide 1.27 Position	CALLAWAY-SA-Callaway Position
4. All water sources and their associated aqueducts should be highly reliable and should be separated and protected such that failure of any one will not induce failure of any other.	4. Complies
IV. The technical specifications for the plant should include provisions for actions to be taken in the event that capability of the ultimate heat sink or the plant temporarily does not satisfy regulatory positions I and III during operation.	IV. No plant technical specifications are required for this regulatory position because: (1) Operator actions are credited after a large break LOCA to diagnose and mitigate a postulated single failure of a UHS cooling tower bypass valve to close based on indications from NG07 and NG08 bus voltage annunciators and proper equipment status (bypass valve position, UHS cooling tower on/off status and fan speed) for the prevailing ESW return (UHS inlet) temperature and to switch temperature control loops for the UHS cooling tower bypass valves and cooling tower fans from the ESW return temperature to the ESW pump discharge (ESW supply) temperature. This is discussed in greater detail in Standard Plant FSAR Section 9.2.5.2.2.1 and (2) the plant satisfies Regulatory Positions I and II during operation. The UHS mechanical draft cooling tower is designed to permit periodic determination of proper system operability, as specified in Technical Specifications. The UHS retention pond temperature and level will be monitored as specified in Technical Specifications.

TABLE 9.2-6 DELETED

TABLE 9.2-7 DELETED

TABLE 9.2-7 has been deleted

9.5 OTHER AUXILIARY SYSTEMS

9.5.1 FIRE PROTECTION SYSTEM

See Section 9.5.1 of the Standard Plant.

9.5.2 COMMUNICATION SYSTEMS (OFFSITE)

See Section 9.5.2 of the Standard Plant.

9.5.2.1 See Section 9.5.2 of the Standard Plant

9.5.2.2 See Section 9.5.2 of the Standard Plant

9.5.2.2.1 See Section 9.5.2 of the Standard Plant

9.5.2.2.2 See Section 9.5.2 of the Standard Plant

9.5.2.2.3 See Section 9.5.2 of the Standard Plant

9.5.2.2.4 See Section 9.5.2 of the Standard Plant

9.5.2.2.5 See Section 9.5.2 of the Standard Plant

9.5.2.2.6 See Section 9.5.2 of the Standard Plant

9.5.2.2.7 See Section 9.5.2 of the Standard Plant

9.5.2.2.8 See Section 9.5.2 of the Standard Plant

9.5.2.3 See Section 9.5.2 of the Standard Plant

9.5.2.4 See Section 9.5.2 of the Standard Plant

APPENDIX 9.5A - DELETED

APPENDIX 9.5B - DELETED

APPENDIX 9.5C - DELETED

APPENDIX 9.5D - DELETED

APPENDIX 9.5E - DELETED