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Waterford 3

W3F1-2013-0017

February 28, 2013

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: Overall Integrated Plan in Response to March 12, 2012, Commission Order to Modify Licenses With Regard To Requirements for Mitigation Strategies for Beyond-Design-Basis External Events
(Order Number EA-12-049)
Waterford Steam Electric Station, Unit 3 (Waterford 3)
Docket No. 50-382
License No. NPF-38

References:

1. NRC Order Number EA-12-049, *Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, dated March 12, 2012 (ADAMS Accession No. ML12054A736)

2. NRC Interim Staff Guidance JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, Revision 0, dated August 29, 2012 (ADAMS Accession No. ML12229A174)

3. Nuclear Energy Institute (NEI) 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, Revision 0, dated August 2012 (ADAMS Accession No. ML12242A378)

4. Entergy letter to NRC, *Initial Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)*, dated October 26, 2012 (W3F1-2012-0093) (ADAMS Accession No. ML12300A447)

Dear Sir or Madam:

On March 12, 2012, the NRC issued an order (Reference 1) to Entergy Operations, Inc. (Entergy). Reference 1 was immediately effective and requires provisions for mitigating strategies for beyond-design-basis external events. Specific requirements are outlined in the Enclosure of Reference 1. Reference 1 requires submission of an Overall Integrated Plan by February 28, 2013.

The NRC Interim Staff Guidance (Reference 2) was issued August 29, 2012, and endorses industry guidance document NEI 12-06, Revision 0 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 3 provides direction regarding the content of this Overall Integrated Plan. Reference 3, Section 13, contains submittal guidance for the Overall Integrated Plan.

The purpose of this letter is to provide the Overall Integrated Plan pursuant to Section IV, Condition C.1, of Reference 1. The enclosure to this letter provides Waterford Steam Electric Station, Unit 3's (Waterford 3) Overall Integrated Plan pursuant to Reference 3. Reference 4 provided the Waterford 3 initial status report regarding Mitigation Strategies for Beyond-Design-Basis External Events, as required by Reference 1. Entergy has not yet identified any impediments to compliance with the Order, i.e., within two refueling cycles after submittal of the integrated plan, or December 31, 2016, whichever comes first. Future status reports will be provided as required by Section IV, Condition C.2, of Reference 1.

There are no new commitments identified in this submittal. Should you have any questions concerning the content of this letter, please contact Chester Fugate, Licensing Manager, at (504) 739-6685.

I declare under penalty of perjury that the foregoing is true and correct. Executed on February 28, 2013.

Sincerely,

DJ/WH

Enclosure: Waterford 3 Diverse and Flexible Coping Strategies (FLEX) Overall Integrated Implementation Plan

cc: Attn: Director, Office of Nuclear Reactor Regulation
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Enclosure

W3F1-2013-0017

Waterford 3 Diverse and Flexible Coping Strategies (FLEX)
Overall Integrated Implementation Plan

General Integrated Plan Elements

Waterford 3

Determine Applicable Extreme External Hazard Reference 2, Sections 4.0 - 9.0 Reference 3, Section 1.0	*Input the hazards applicable to the site; seismic, external flood, high winds, snow, ice, cold, high temps. Describe how NEI 12-06 Sections 5 – 9 were applied and the basis for why the plant screened out for certain hazards.*

This section is supported by Reference 9, Section 3:

The Waterford site has been evaluated and the following applicable hazards have been identified:

- Seismic events
- External flooding
- Severe storms with high winds
- Ice (Snow and extreme cold are screened out for Waterford)
- Extreme heat

Waterford has reviewed the Nuclear Energy Institute (NEI) FLEX guidance and determined the hazards that FLEX equipment should be protected from include seismic, external flooding, severe storms with high winds, ice (not snow and extreme cold), and extreme high temperatures. Waterford has determined the functional threats from each of these hazards and identified FLEX equipment that may be affected. The FLEX equipment is being purchased commercial grade and the storage locations will provide the protection required from these hazards. Waterford is also developing procedures and processes to further address plant strategies for responding to these various hazards.

Seismic:

Per NEI 12-06 (Reference 2), seismic hazards must be considered for all nuclear sites. Therefore, seismic hazards are screened in for Waterford. Per Reference 4, Section 2.5, the sandy aquifers which exist beneath the site are of sufficient density to preclude liquefaction during the postulated most severe earthquake conditions. Further, per Reference 4, Section 2.5.4.12, in order to improve conditions within the plant area and to prevent liquefaction around the NPIS, all recent material (initial plant grade to -40 ft. MSL) was excavated and replaced with compacted sand backfill. Further, to prevent excessive long-term consolidation settlement and differential settlement a floating foundation principle was utilized including a carefully monitored construction dewatering system to maintain foundation pressures as close as possible to their in situ state. Accordingly, the Waterford 3 site is not susceptible to soil liquefaction. However, the extent to which transportation routes to and from the plant site and the on-site regional response center (RRC) staging area are subject to soil liquefaction are yet to be determined.

External Flooding:

The water levels in the Mississippi River at Waterford 3 were estimated for the following three cases: 1) A Project Design Flood level of +24 ft. MSL, 2) A Moderate Mississippi River Flood coincident with the Probable Maximum Hurricane, yielding a maximum water level of +23.7 ft. MSL and 3) Probable Maximum Flood, for which the maximum water level considered possible is El. +27 ft. MSL.

The maximum flood level from any of the failures listed above was determined to be El. +27 ft. MSL which would not flood the safety related buildings because of a flood wall with a height of +30 ft. MSL.

The plant site is located such that runoff-produced flooding from local intense precipitation will not affect the safety of Waterford 3. The site is drained externally by drainage ditches around the plant. The exterior walls of the plant are flood protected up to El +30 ft. MSL (12.5 to 15.5 ft. above grade) which is far above any ponding that could be expected due to a severe rainfall up to and including the Probable Maximum Precipitation (PMP) and assuming blocked culverts.

Therefore, at this time the Waterford site is not considered a “dry” site and is therefore, susceptible to external flood.

High Wind:

Reference 4, Section 2.1 states that the geographic coordinates for the Waterford 3 reactor are Latitude 29° 59’ 42" North, and Longitude 90° 28’ 16" West. Figures 7-1 and 7-2 from NEI 12-06 were used for this assessment (Reference 2).

It was determined the Waterford site has the potential to experience damaging winds caused by a tornado exceeding 130 mph. Figure 7-2 of NEI 12-06 indicates a maximum wind speed of 200 mph for Region 1 plants, including Waterford. Therefore, high-wind hazards are applicable to the Waterford site.

In summary, based on available local data and Figures 7-1 and 7-2 of NEI 12-06, Waterford is susceptible to severe storms with high winds so the hazard is screened in.

Snow, Ice, and Extreme Cold

Per the FLEX guidance, all sites should consider the temperature ranges and weather conditions for their site in storing and deploying their FLEX equipment. That is, the equipment procured should be suitable for use in the anticipated range of conditions for the site, consistent with normal design practices.

Applicability of snow and extreme cold:
NEI 12-06 states plants above the 35^{th} parallel should provide the capability to address the impedances caused by extreme snow and cold. The Waterford site is located between the 29^{th} and 30^{th} parallel. Since the site is below the 35th parallel, the FLEX strategies need not consider the impedances caused by extreme snowfall with snow removal equipment, as well as the challenges that extreme cold temperature may present.

Applicability of ice storms:
The Waterford site is not a Level 1 or 2 region as defined by Figure 8-2 of the NEI FLEX Implementation Guide; therefore, the FLEX strategies must consider the impedances caused by ice storms.

In summary, based on the available local data and Figures 8-1 and 8-2 of NEI 12-06, the Waterford site does not experience significant amounts of snow and is not susceptible to extreme low temperatures, and is screened as being susceptible to “low to medium damage to power lines and/or existence of considerable amount of ice.” Therefore, the hazards of snow and extreme cold are screened out for Waterford.

Extreme Heat:

Per NEI 12-06, all sites must address high temperatures. Virtually every state in the lower 48 contiguous United States has experienced temperatures in excess of 110˚F. Many states have experienced temperatures in excess of 120˚F. Sites that should address high temperatures should consider the impacts of these conditions on the FLEX equipment and its deployment.

On the average there are only about seven days a year in the New Orleans area when the temperature rises to 95°F or higher and 102°F is the highest temperature of record occurring most recently on June 30, 1954 in Orleans Parish. The longest period in New Orleans with temperatures of 90°F or higher on successive days was 64 days, June 21 - August 23, 1917, but the temperature did not exceed 96°F. The warmest summer was 1951, when the temperature for June, July and August averaged 84.7°F.

In summary, per NEI 12-06, all sites will address extreme high temperatures. For FLEX, Waterford will consider the site maximum expected temperatures in their specification, storage, and deployment requirements, including ensuring adequate ventilation or supplementary cooling, if required.

Key Site assumptions to implement NEI 12-06 strategies. **Reference 2, Section 3.2.1**	*Provide key assumptions associated with implementation of FLEX strategies:*

Barring one deviation noted in the following section, assumptions are consistent with those detailed in NEI 12-06, Section 3.2.1 (Reference 2). Analysis has been performed consistent with the recommendations contained within the Executive Summary of the Pressurized Water Reactor Owner's Group (PWROG) Core Cooling Position Paper (OG-12-482) and assumptions from that document are incorporated into the plant-specific analytical bases. Key industry guidance and site-specific assumptions are presented here:

NEI 12-06 Assumptions

Initial Plant Conditions

The initial plant conditions are assumed to be the following:

A1. Prior to the event the reactor has been operating at 100 percent rated thermal power for at least 100 days or has just been shut down from such a power history as required by plant procedures in advance of the impending event.

A2. At the time of the postulated event, the reactor and supporting systems are within normal operating ranges for pressure, temperature, and water level for the appropriate plant condition. All plant equipment is either normally operating or available from the standby state as described in the plant design and licensing basis.

Initial Conditions

The following initial conditions are to be applied:

A3. No specific initiating event is used. The initial condition is assumed to be a loss of offsite power (LOOP) at a plant site resulting from an external event that affects the off-site power system either throughout the grid or at the plant with no prospect for recovery of off-site power for an extended period. The LOOP is assumed to affect all units at a plant site.

A4. All installed sources of emergency on-site ac power and station blackout (SBO) alternate ac power sources are assumed to be not available and not imminently recoverable.

A5. Cooling and makeup water inventories contained in systems or structures with designs that are robust with respect to seismic events, floods, ice, and high winds and associated missiles are available.

A6. As described in the following section, deviation is taken from: Normal access to the ultimate heat sink is lost, but the water inventory in the ultimate heat sink (UHS) remains available and robust piping connecting the UHS to plant systems remains intact. The motive force for UHS flow, i.e., pumps, is assumed to be lost with no prospect for recovery.

A7. Fuel for FLEX equipment stored in structures with designs which are robust with respect to seismic events, floods, ice, and high winds and associated missiles, remains available.

A8. Permanent plant equipment that is contained in structures with designs that are robust with respect to seismic events, floods, ice, and high winds, and associated missiles, are available.

A9. Other equipment, such as portable ac power sources, portable back up direct current (DC) power supplies, spare batteries, and equipment for 50.54(hh)(2), may be used provided it is reasonably protected from the applicable external hazards per Sections 5 through 9 and Section 11.3 of NEI 12-06 and has predetermined hookup strategies with appropriate procedures/guidance and the equipment is stored in a relative close vicinity of the site.

A10. Installed electrical distribution system, including inverters and battery chargers, remain available provided they are protected consistent with current station design.

A11. No additional events or failures are assumed to occur immediately prior to or during the event, including security events.

A12. Reliance on the fire protection system ring header as a water source is acceptable only if the header meets the criteria to be considered robust with respect to seismic events, floods, ice, and high winds and associated missiles.

Reactor Transient

The following additional boundary conditions are applied for the reactor transient:

A13. Following the loss of all ac power, the reactor automatically trips and all rods are inserted.

A14. The main steam system valves (such as main steam isolation valves, turbine stops, atmospheric dumps, etc.), necessary to maintain decay heat removal functions operate as designed.

A15. Safety/Relief Valves (S/RVs) or Power Operated Relief Valves (PORVs) initially operate in a normal manner if conditions in the reactor coolant system (RCS) so require. Normal valve reseating is also assumed.

A16. No independent failures, other than those causing the ELAP/LUHS event, are assumed to occur in the course of the transient.

Reactor Coolant Inventory Loss

Sources of expected pressurized water reactor (PWR) reactor coolant inventory loss include:

A17. Normal system leakage

A18. Losses from letdown unless automatically isolated or until isolation is procedurally directed

A19. Losses due to reactor coolant pump seal leakage (rate is dependent on the reactor coolant pump (RCP) seal design)

SFP Conditions

The initial SFP conditions are:

A20. All boundaries of the spent fuel pool (SFP) are intact, including the liner, gates, transfer canals, etc.

A21. Although sloshing may occur during a seismic event, the initial loss of SFP inventory does not preclude access to the refueling deck around the pool.

A22. SFP cooling system is intact, including attached piping.

A23. SFP heat load assumes the maximum design basis heat load for the site.

Containment Isolation Valves

A24. It is assumed that the containment isolation actions delineated in current station blackout coping capabilities is sufficient.

The following assumptions are specific to the Waterford site:

A25. It is expected that Waterford will be able to declare ELAP within approximately 60 minutes in order to enable actions which place the plant outside of the current design and licensing basis.

A26. Not used.

A27. Flood and seismic re-evaluations pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action system.

A28. Required staffing levels will be determined consistent with guidance contained in NEI 12-06 for each of the site specific FLEX strategies. Assumed available staffing levels will be determined consistent with NEI 12-01, as described below.

The event impedes site access as follows:

A. Post event time: 6 hours – No site access. This duration reflects the time necessary to clear roadway obstructions, use different travel routes, mobilize alternate transportation capabilities (e.g., private resource providers or public sector support), etc.

B. Post event time: 6 to 24 hours – Limited site access. Individuals may access the site by walking, personal vehicle or via alternate transportation capabilities (e.g., private resource providers or public sector support).

C. Post event time: 24+ hours – Improved site access. Site access is restored to a near-normal status and/or augmented transportation resources are available to deliver equipment, supplies and large numbers of personnel.

These results will be compared to confirm this assumption, or adjustments will be made to plant staffing or FLEX design to meet this requirement.

A29. Margin will be added to design FLEX components and hard connection points to address future requirements as re-evaluation warrants. Portable FLEX components will be procured commercially.

A30. The design hardened connections are protected against external events or are established at multiple and diverse locations.

A31. This plan defines strategies capable of mitigating a simultaneous loss of all alternating current (ac) power and loss of normal access to the ultimate heat sink resulting from a beyond-design-basis event by providing adequate capability to maintain or restore core cooling, containment, and SFP cooling capabilities at all units on a site. Though specific strategies are being developed, due to the inability to anticipate all possible scenarios, the strategies are also diverse and flexible to encompass a wide range of possible conditions. These pre-planned strategies developed to protect the public health and safety will be incorporated into the unit emergency operating procedures in accordance with established EOP change processes, and their impact to the design basis capabilities of the unit evaluated under 10 CFR 50.59. The plant Technical Specifications contain the limiting conditions for normal unit operations to ensure that design safety features are available to respond to a design basis accident and direct the required actions to be taken when the limiting conditions are not met. The result of the beyond-design-basis event may place the plant in a condition where it cannot comply with certain Technical Specifications and/or with its Security Plan, and, as such, may warrant invocation of 10 CFR 50.54(x) and/or 10 CFR 73.55(p).

A32. Instrumentation on FLEX equipment will be used to confirm continual performance.

Extent to which the guidance, JLD-ISG-2012-01 and NEI 12-06, are being followed. Identify any deviations to JLD-ISG-2012-01 and NEI 12-06. **Reference 3** **Reference 2, Section 13.1**	*Include a description of any alternatives to the guidance, and provide a milestone schedule of planned action.*

This section is supported by Reference 9, Section 4:

Waterford plans to fully comply with the guidance in JLD-ISG-2012-01 or NEI 12-06 in implementing FLEX strategies for the Waterford site including incorporation of NEI 12-06 guidance that station transients between Modes 1 to 5 are not included due to limited duration with the exception of the following:

Withstanding resolution of Open Item OI5, Waterford 3 will not require: 1) a portable UHS pump to supply inventory to wet cooling tower (WCT) basins as part of Phase 3 coping, or 2) portable fans/motors to supplant the dry cooling towers (DCTs). DCT motors will be repowered by the 4160 V generator once available from the RRC. Associated with the resolution of Open Item OI5, some additional DCT motors may be missile protected in support of such.

It is worth noting that the DCT motors are seismically robust, within the plant flood wall and 60% of them are missile protected (which as discussed in OI5 is expected to be all that is necessary to remove decay heat in Phase 3 post-ELAP). The WCTs are also seismically robust and within the plant flood wall. Since, withstanding resolution of Open Item OI5, the Waterford 3 is robust, it would be available and can be relied upon post-ELAP per Section 3.2.1.3(6) of NEI 12-06. This is consistent with NEI FLEX Inquiry Form 2012-18.

A milestone schedule is provided in Attachment 2 of this document.

Provide a sequence of events and identify any time constraint required for success including the technical basis for the time constraint. **Reference 2, Section 3.2.1.7** **Reference 3, Section 2.1**	*Strategies that have a time constraint to be successful should be identified with a technical basis and a justification provided that the time can reasonably be met (for example, a walkthrough of deployment).* *Describe in detail in this section the technical basis for the time constraint identified on the sequence of events timeline Attachment 1A* *See attached sequence of events timeline (Attachment 1A).* *Technical Basis Support information, see attached NSSS Significant Reference Analysis Reconciliation Table (Attachment 1B)*

The sequence of events and any associated time constraints are documented in Section 5 and Appendix C of Reference 9, and are identified below for Waterford's Modes 1-4 strategies for FLEX Phases 1 through Phase 3. These actions are bounding when compared to the Modes 5 & 6 and full core offload scenarios as they require the most personnel, actions, and time constraints. See attached sequence of events timeline (Attachment 1A) for a summary of this information. The times identified to initiate each action in this section and in Attachment 1A are based on resource loading to allow completion of all actions prior to their individual time constraints. Time critical completion times are included.

1. At the start of the event (0 hours), perform SBO actions. SBO actions are proceduralized in Reference 6.a to include establishing control room ventilation.
2. At hour 1, operators will declare an ELAP. This action is required complete at 1 hour so that the FLEX deep load shed actions can be initiated at one hour after the event. As soon as the ELAP is declared, operators will contact the RRC to request delivery of off-site equipment be initiated.
3. At hour 2, verify Appendix R portable lighting remains adequate until the FLEX generator is started in Phase 2. Lighting is discussed in current SBO procedure Reference 6.a.
4. No later than hour 4, begin manual control of the TDEFW pump. The control system is operable until the load shed before 4 hours (performed per item 5). Manual control needs to be performed after the control system is no longer powered.
5. No later than hour 4, the operators will establish an extended DC load shed to extend installed plant battery draw down time into Phase 2 of the ELAP when a FLEX generator will be utilized to supply required loads and / or recharge installed plant batteries.
6. At hour 4, perform Plant Cooldown at 75°F/hr to Tcold = 400°F. The time required to cooldown is 4 hours, based on a starting point of 550°F and a 2 hr hold point before cooldown.
7. At hour 6, initiate the post-ELAP damage assessment. The time requirement of 6 hours is based on the FLEX Support Guidelines (FSGs).
8. At hour 6, align the TDEFWP to take suction from the WCT basin. The time requirement of 6 hours is based on depletion of CSP inventory.
9. At hour 6, in order to deploy FLEX equipment, debris removal activities may need initiated and partially completed within the time requirement of 11 hrs in order to effectively deploy equipment to the

appropriate staging location.

10. At hour 10, perform manual operation of EFW and the atmospheric dump valves (ADVs). The 10 hr time requirement is based on the fact that the ADV accumulators are sized for 10 hours and can be manually operated after that.
11. At hour 12, deploy the FLEX 480 V generator. Deployment supports continued supply for DC loads by powering the installed battery chargers and is to be completed before FLEX SG makeup pump since the primary alignment is electric powered.
12. As time and resources permit, stage the SG FLEX makeup pump. TDEFW pump performance may continue, but this pump will be staged as a backup when resources permit.
13. At hour 19, deploy the RCS makeup pump. The RCS makeup pump needs to be available at 19 hours to ensure single phase natural circulation.
14. At hour 22, begin FLEX equipment fuel management. The time requirement is 22 hrs, based on the need to support continuous operation of on-site diesel powered FLEX equipment.
15. At hour 28.5, initiate SFP area ventilation and deploy FLEX SFP makeup hose in the SFP area. The time requirement of 28.5 hrs is based on the SFP boiloff and required makeup rate given an initial nominal water level of 44 feet and initial pool temperature of 140°F.
16. At hour 30, begin large debris removal. The time requirement of 30 hrs to clear deployment paths is based on the need to get large Phase 3 RRC equipment on site.
17. At hour 45, align the WCT makeup from the Mississippi river. The time requirement of 45 hrs is based depletion of the WCT.
18. At hour 45, Debris Removal (access). Debris removal does not need to be performed/deployment paths do not need to be cleared until makeup is needed to the WCT basins.
19. At hour 45, employ the mobile water purification system. The time requirement of 45 hrs is based on the need to provide clean water for SG makeup from the Mississippi River in the event that all the non-seismic tanks fail.
20. At hour >72, align the mobile boration unit. The time of >72 hrs is based on the RCS makeup source from the RWSP being enough inventory through 72 hrs. This is not a time sensitive requirement.
21. At hour >72, align the mobile heat exchanger unit for SFP cooling. The time of >72 hrs is based on the loss of capability to support SFP boiloff recovery. This is not a time sensitive requirement.
22. At hour >72, align the diesel driven UHS pump. The time of >72 hrs is based on the need to cool the CCW heat exchanger after the eventual loss of capability to support SG feed strategy. This is not a time sensitive requirement.
23. At hour >72, align the large (4160 V) generators. The time of >72 hrs is based on the need to restore shutdown cooling and achieve safe shutdown. This is not a time sensitive requirement.
24. At hour >72, deploy the diesel driven air compressors as necessary. The diesel driven air compressors may be used in order to power air operated equipment if necessary. This is not a time sensitive requirement.
25. At hour >72, establish large fuel truck service. The time of >72 hours is based on fuel depletion of onsite supplies and need to fuel large equipment. This is not a time sensitive requirement.
26. At hour 110.5, align the SFP makeup pump. The time requirement of 110.5 hrs is based on SFP boiloff and minimum SFP level for shielding.

Identify how strategies will be deployed in all modes. **Reference 2, Section 13.1.6**	*Describe how the strategies will be deployed in all modes.*
This section is supported by Reference 9, Section 6: Deployment of FLEX equipment is described for each FLEX function in the subsequent sections below and covers all modes. The broad-spectrum deployment strategies do not change for the different operating modes. The deployment strategies from the storage areas to the staging areas are identical and include debris removal (when applicable), equipment transport, fuel transport, and power sources and requirements. The only difference is the discharge connection location for the FLEX pumps. The primary and secondary RCS connection locations for Modes 1-4 will also be the connection locations utilized for Modes 5 and 6. Each of these strategies and the associated connection points are described in detail in the subsequent sections. The electrical coping strategies are the same for all modes. Deployment paths with respect to the applicable plant mode will be maintained clear. These requirements will be included in an administrative program.	
Provide a milestone schedule. This schedule should include: • **Modifications timeline** ○ **Phase 1 Modifications** ○ **Phase 2 Modifications** ○ **Phase 3 Modifications** • **Procedure guidance development complete** ○ **Strategies** ○ **Maintenance** • **Storage plan (reasonable protection)** • **Staffing analysis completion** • **FLEX equipment acquisition timeline** • **Training completion for the strategies** • **Regional Response Centers operational** **Reference 2, Section 13.1**	The dates specifically required by the order are obligated or committed dates. Other dates are planned dates subject to change. Updates will be provided in the periodic (six month) status reports. See attached milestone schedule in Attachment 2.
See attached milestone schedule Attachment 2.	

Identify how the programmatic controls will be met. **Reference 2, Section 11** **Reference 3, Section 6.0**	*Provide a description of the programmatic controls equipment protection, storage and deployment and equipment quality. See Section 11 in NEI 12-06. Storage of equipment, 11.3, will be documented in latter sections of this template and need not be included in this section.* *See Section 6.0 of JLD-ISG-2012-01.*

This section is supported by Reference 9, Section 7:

Equipment associated with these strategies will be procured as commercial grade equipment with design, storage, maintenance, testing, and configuration control in accordance with NEI 12-06 Rev. 0 Section 11.0 (Reference 2).

Procedure Guidance

Procedures and guidance to support deployment and FLEX coping strategy implementation, including interfaces with emergency operating procedures (EOPs), special events procedures, abnormal operating procedures (AOPs), and system operating procedures, will be coordinated within the site procedural framework. The procedural documentation will be auditable, consistent with generally accepted engineering principles and practices, and controlled within the Entergy document control system.

Entergy is a participant in the PWROG project PA-PSC-0965 and will implement the FSGs at Waterford in a timeline to support the implementation of FLEX by Fall 2015, leaving time for operator training. The PWROG has generated these guidelines in order to assist utilities with the development of site-specific procedures to cope with an ELAP in compliance with the requirements of Reference 2.

Actions that maneuver the plant will remain contained within the typical controlling procedures, and the FSGs will be implemented as necessary to maintain the key safety functions of core cooling, containment, and spent fuel pool cooling in parallel with the controlling procedure actions. The overall approach will be symptom-based, meaning that the controlling procedure actions and FSGs are initiated based on actual plant conditions. Entergy will continue participation in PA-PSC-0965 and will update plant procedures upon completion of the PWROG program.

Maintenance and Testing

The FLEX mitigation equipment will be initially tested (or other reasonable means used) to verify performance conforms to the limiting FLEX requirements. It is expected that the testing will include the equipment and the assembled sub-system to meet the planned FLEX performance. Additionally, Entergy will implement the maintenance and testing template upon issuance by the Electric Power Research Institute (EPRI). The template will be developed to meet the FLEX guidelines established in Section 11.5 of Reference 2.

Staffing

The timing and deployment for FLEX strategies were developed assuming:

- On-site staff are at administrative shift staffing levels

- No independent, concurrent events
- All personnel on-site are available to support site response

Entergy will have to address staffing considerations in accordance with NEI 12-06 (Reference 2) to fully implement FLEX at the site.

Configuration Control

The unavailability of equipment and applicable connections that directly perform a FLEX mitigation strategy will be managed using plant equipment control guidelines developed in accordance with NEI 12-06, Section 11.5.

Programs and controls will be established to assure personnel proficiency in the mitigation of beyond design-basis events is developed and maintained in accordance with NEI 12-06, Section 11.6.

The FLEX strategies and basis will be maintained in an overall program document. Existing plant configuration control procedures will be modified to ensure that changes to the plant design, physical plant layout, road, buildings, and miscellaneous structures will not adversely impact the approved FLEX strategies in accordance with NEI 12-06, Section 11.8.

Describe training plan	*List training plans for affected organizations or describe the plan for training development*

This section is supported by Reference 9, Section 7:

Training plans will be developed for plant groups such as the emergency response organization (ERO), Fire, Security, emergency planning/personnel (EP), Operations, Engineering, Mechanical Maintenance, and Electrical Maintenance. The training plan development will be done in accordance with Entergy procedures at Waterford using the Systematic Approach to Training, and will be implemented to ensure that the required site staff is trained prior to implementation of FLEX. The training program will comply with the requirements outlined in Section 11.6 of Reference 2.

Describe Regional Response Center plan	*Discussion in this section may include the following information and will be further developed as the Regional Response Center development is completed.* • *Site-specific RRC plan* • *Identification of the primary and secondary RRC sites* • *Identification of any alternate equipment sites (i.e., another nearby site with compatible equipment that can be deployed)* • *Describe how delivery to the site is acceptable* • *Describe how all requirements in NEI 12-06 are identified*

This section is supported by Reference 9, Section 7: The industry will establish two (2) RRCs to support utilities during beyond design basis events. Each RRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. Equipment will be moved from an RRC to a local Assemble Area, established by the strategic alliance for FLEX emergency response (SAFER) team and the utility. Communications will be established between the affected nuclear site and the SAFER team and required equipment moved to the site as needed. First arriving equipment, as established during development of the nuclear site's playbook, will be delivered to the site within 24 hours from the initial request. Entergy, for the Waterford site, has signed a contract with SAFER to meet the requirements of NEI 12-06, Section 12.
Notes:

Maintain Core Cooling & Heat Removal

Determine Baseline coping capability with installed coping[1] modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06:

- AFW/EFW
- Depressurize SG for Makeup with Portable Injection Source
- Sustained Source of Water

(Reference 3, Sections 2 and 3)

PWR Installed Equipment Phase 1

Provide a general description of the coping strategies using installed equipment including station modifications that are proposed to maintain core cooling. Identify methods (AFW/EFW) and strategy(ies) utilized to achieve this coping time.

Core Cooling with Steam Generators Available:

This section is supported by Reference 9, Section 8.1:

The coping strategy is to remove heat from the Reactor Coolant System (RCS) using the steam generators (SGs) and Atmospheric Dump Valves (ADVs). The plant is assumed to be operating at full power for 100 days at the start of the ELAP event, when all AC power is assumed to be lost. Existing SBO response procedures will govern the initial operator response. The TDEFWP will start as designed once RCS cooldown is initiated and provide cooling through the SGs. Existing SBO procedures also direct operators to begin a plant cooldown to a cold leg temperature of no less than 400^{o}F. This cooldown will help minimize RCP seal leakage, ensure passive injection of the safety injection tanks (SITs), and ensure natural circulation is maintained. The SITs will also be isolated before their full depletion to prevent nitrogen injection into the RCS.

Initial alignment of the TDEFWP suction is to the condensate storage pool (CSP), which is protected against all applicable hazards. Beyond 170,000 gallons, suction to the TDEFWP can be manually aligned to two wet cooling tower basins, each of which maintains storage volume of approximately 174,000 gallons each (Open Item OI1). The stored condensate in the CSP and WCT basins is sufficient for decay heat removal for approximately 45 hours without crediting water remaining in the steam generator post-trip. Both the ADVs and the TDEFW flow control valves are capable of local manual operation (handwheel). Additionally, given that there are nitrogen accumulators on the TDEFW flow control valves, and DC control power for these valves is not currently shed as part of plant SBO response procedures, remote control of these valves will be available for a limited duration early in the event. Access required for manual operation of the ADVs and TDEFW flow

[1] Coping modifications consist of modifications installed to increase initial coping time, i.e., generators to preserve vital instruments or increase operating time on battery powered equipment.

control valves is protected against all external hazards.

Core Cooling with Steam Generators not Available:

This section is supported by Reference 9, Section 8.3:

Core cooling is maintained through makeup to the RCS and coolant boil-off. Inventory may be maintained in the vessel by ensuring adequate RCS inventory make-up from the SITs via gravity. The ability to gravity feed depends upon SIT fluid height/backpressure, line losses through the gravity flow path, and developed pressure within the RCS. Pressure is maintained sufficiently low in the RCS by ensuring adequate venting is established prior to entering conditions wherein SG cooling is not available as a part of shutdown risk management. Notably, it is currently unclear how long gravity feed from the RWSP or SITs can be maintained in Phase 1. If this time is sufficiently short, Waterford 3 may choose to pre-stage requisite FLEX equipment in advance of entering applicable plant configurations.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* Emergency Operating Procedure OP-902-005 describes SBO recovery actions. The strategies in OP-902-005 must be tied to the appropriate FSG, when developed. Further, the PWROG is developing generic and NSSS-specific FLEX Support FSGs via PA-PSC-0965. The FSGs developed for Waterford 3 will consider the PWROG guidance.
Identify modifications	*List modifications* None.
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* 1. SG Level •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 2. EFW Flow indication •This will be powered as the Phase 2, Emergency DGs are aligned. 3. SG Pressure •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 4. CSP/WCT Level •This instrument will be powered as the Phase 2, Emergency DGs are aligned. 5. Core Exit Thermocouple (CET) Temperature •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 6. RCS Hot Leg Temperature (Thot) if CETs not available •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG)

	7. RCS Cold Leg Temperature (Tcold) •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 8. RCS Wide Range Pressure •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 9. RCS Passive Injection Level •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 10. Pressurizer Level •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 11. Reactor Vessel Level Indicating System •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 12. Neutron Flux •This instrument will be powered as the Phase 2, Emergency DGs are aligned. Waterford will develop procedures to read this instrumentation locally, where applicable, using a portable instrument, as required by Section 5.3.3 of NEI 12-06.
Notes: Core cooling strategies are provided for conditions where steam generators are available or where steam generators are not available but a sufficient RCS vent has been established to support core cooling. This assumption is per the guidance of NEI 12-06 FAQ 2012-19. Other configurations are not considered as these occur for short durations that are exempted per NEI 12-06 Table D.	

Maintain Core Cooling & Heat Removal

PWR Portable Equipment Phase 2

Provide a general description of the coping strategies using on-site portable equipment including station modifications that are proposed to maintain core cooling. Identify methods and strategy(ies) utilized to achieve this coping time.

Core Cooling with Steam Generators Available:

This section is supported by Reference 9, Section 8.1:

The transition into Phase 2 begins once the readily available inventory for the TDEFWP is depleted or once the operating conditions of the TDEFWP cannot be maintained. The primary strategy involves staging the portable pump in the Reactor Auxiliary Building (RAB). In this case, the portable pump will draw from the CSP/WCT basins through a modified drain valve located in the RAB on the -35' level. The portable pump discharge will be connected with hose to a modified hard pipe connection on the TDEFW discharge piping in the RAB. The secondary strategy involves staging a booster pump on the -35' level just East of the 'A' WCT basin (outside) with the portable pump being located in the Reactor Auxiliary Building on the +46' level below missile shielding. In this case, a booster pump will draw from the WCT basins directly and discharge via hose up the side of the RAB and to the portable pump. The portable pump discharge will be connected with hose to two tees (one just upstream of FW-179A and another just upstream of FW-179B on the +46' level of the RAB). For both strategies, suction will be taken from the CSP/WCTs. It is estimated that these sources will be available for ~45 hours. The next available source is the Mississippi River, which will used to makeup either the CSP or WCT basins such that the TDEFW or FLEX pump will continue to draw from the CSP/WCT basins. Note that at this stage of the conceptual design, the chemistry effects of ACS use on secondary wetted components are unknown (see also Open Item OI3).

Core Cooling with Steam Generators not Available:

This section is supported by Reference 9, Section 8.3:

For Core Cooling with Steam Generators not Available, the primary connection point would be to tie into the HPSI system on the vent line of the discharge line of pump A/B. The vent line is isolated by 1" valve SI-210. The vent line is a branch off of line 2SI4-76A/B. The conceptual routing begins at the suction source of the RWSP drain line in the injection pump area "A" (B15) with a flexible hose length of approximately 50 feet of flexible hose. The flexible hose would be connected to the suction connection of the high pressure, low volume pump in the same area. The discharge connection on the pump would be connected to approximately 35 feet of flexible hose to the connection point in the same room. The flexible hose would be connected into the HPSI system at the modified connection point with a high pressure connection. All connections/staging are in the same area (B15).

The secondary connection point would be to tie into the HPSI system on the vent line of the discharge line of pump A. The location of the tie-in point could be anywhere on the lines 2SI4-76A and 2SI4-78A between the two check valves SI-207A and SI-216.

Maintain Core Cooling & Heat Removal	
PWR Portable Equipment Phase 2	
For Core Cooling and Heat Removal with Steam Generators not Available strategies, connections to the system described above are identical to those described in the "Maintain RCS Inventory Control" section associated with events initiated from Modes 1-4 below. The hose routing, staging locations and deployment paths for the primary and secondary strategies in Modes 5 and 6 will be the same as well, and are shown in Figure G-5 through Figure G-7. The only difference would be in Modes 5 and 6 in that the FLEX pump will supply at a high flow and low pressure (in contrast to the high pressure pump required in higher Modes).	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* Procedures and guidance to support deployment and implementation including interfaces to EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Revision 0, Section 11.4 (Reference 2). Further, the PWROG is developing generic and NSSS-specific FLEX Support FSGs via PA-PSC-0965. The FSGs developed for Waterford 3 will consider the PWROG guidance.
Identify modifications	*List modifications* Core Cooling with Steam Generators Available: Associated with the primary strategy, the drain line with valve EFW-214 will need to be modified to be a 3" branch connection off of 3FW6-24A/B including a 3" isolation valve and Storz connection. The EFW suction drain line 3CC1-12B isolated by ACC-115A would need to be a 3" branch connection. Associated with the secondary strategy, two tees will be installed (one just upstream of FW-179A and another just upstream of FW-179B). Each will include two 3" isolation valves and one 3" Storz connection. Core Cooling with Steam Generators not Available: Associated with the primary strategies, the vent line with valve SI-210 will need to be modified to be a 3" branch connection off of line 2SI4-76A/B including a 3" isolation valve and 3" high pressure threaded connection. The RWSP drain line isolated by SI-715 could be modified to provide a connection on the floor -35' elevation in lieu of the connection on the -20' laddered platform. Associated with the secondary strategies, the line (the vent line of the discharge line of pump A – anywhere on the lines 2SI4-76A and 2SI4-78A between the two check valves SI-207A and SI-216) will need to be modified to include a 3" branch connection with a 3" isolation valve and 3" high pressure threaded connection. As

Maintain Core Cooling & Heat Removal	
PWR Portable Equipment Phase 2	
	with the primary strategy, the RWSP drain line isolated by SI-715 could be modified to provide a connection on the floor -35' elevation in lieu of the connection on the -20' laddered platform.
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* 1. SG Level •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 2. EFW Flow indication •This will be powered as the Phase 2, Emergency DGs are aligned. 3. SG Pressure •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 4. CSP/WCT Level •This instrument will be powered as the Phase 2, Emergency DGs are aligned. 5. Core Exit Thermocouple (CET) Temperature •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 6. RCS Hot Leg Temperature (Thot) if CETs not available •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 7. RCS Cold Leg Temperature (Tcold) •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 8. RCS Wide Range Pressure •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 9. RCS Passive Injection Level •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 10. Pressurizer Level •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 11. Reactor Vessel Level Indicating System •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 12. Neutron Flux •This instrument will be powered as the Phase 2, Emergency DGs are aligned. Waterford will develop procedures to read this instrumentation locally, where applicable, using a portable instrument, as required by Section 5.3.3 of NEI 12-06.

Maintain Core Cooling & Heat Removal	
PWR Portable Equipment Phase 2	
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* With the exception of the booster pump required for the core cooling with steam generators available secondary strategy, all equipment will be stored within the RAB, which is seismically qualified. It is expected that the booster pump will be stored at or near its staging location.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* With the exception of the booster pump required for the core cooling with steam generators available secondary strategy, all equipment will be stored within the RAB, which is protected from flooding. It is expected that the booster pump will be stored at or near its staging location.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* With the exception of the booster pump required for the core cooling with steam generators available secondary strategy, all equipment will be stored within the RAB, which is protected from severe storms with high winds. It is expected that the booster pump will be stored at or near its staging location.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* The equipment necessary for the primary strategy will be stored within the RAB, which is protected from ice. The equipment necessary for the secondary strategy will not be protected from ice.
High Temperatures	*List how equipment is protected or schedule to protect* With the exception of the booster pump required for the core cooling with steam generators available secondary strategy, all equipment will be stored within the RAB. It is expected that the booster pump will be stored at or near its staging location. All of the storage locations will be evaluated for high temperature effects and/or ventilation will be provided as required to assure no adverse effects on the FLEX equipment.
Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**	

Maintain Core Cooling & Heat Removal		
PWR Portable Equipment Phase 2		
The figures provided in Attachment 3 show the deployment paths from each of the storage locations to the staging locations for the primary strategies only. For all strategies, to deploy equipment requires only minimal activity within the RAB as all equipment, except for the booster pump for the secondary strategy, are staged and deployed within the RAB.		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
For Core Cooling with Steam Generators Available: The primary connection point would be to tie into the EFW system on the cross tie between EFW pump A, EFW pump B, and the TDEFWP. The tie-in connection would be into line 3FW6-24A/B in the location of a drain line with valve number EFW-214. This drain line is located near the emergency feed water pump A/B area B49 in the pump area B5 on RAB -35' level. The conceptual routing begins at the suction source of the EFW suction drain line in the pump area (B5) with a flexible hose length of approximately 35 feet. The flexible hose would be connected to the suction connection of the low pressure, high volume pump in the same area. The discharge connection on the pump would be connected to approximately 35 feet of flexible hose to the connection point in the same room. The flexible hose would be connected into the EFW system at the modified connection point. See Figure G-1 and Figure G-2.	The drain line with valve EFW-214 will need to be modified to be a 3" branch connection off of 3FW6-24A/B including a 3" isolation valve and Storz connection. The EFW suction drain line 3CC1-12B isolated by ACC-115A would need to be a 3" branch connection.	Both points of connection associated with the primary strategy are made within the RAB, which is protected against all applicable hazards.
For Core Cooling with Steam Generators Available: The secondary connection point would be to tie into the EFW system through two tees (one just upstream of FW-179A and another just upstream of FW-179B on the RAB +46' elevation). This tie-in location would provide a	Two tees will be installed (one just upstream of FW-179A and another just upstream of FW-179B). Each will include two 3" isolation valves and one 3" Storz connection.	The secondary connection points to the EFW system are made within the RAB.

Maintain Core Cooling & Heat Removal		
PWR Portable Equipment Phase 2		
flow path closer to the steam generators while being upstream of the containment penetration. The conceptual routing begins at the suction source from the basin of the 'A' WCT with hose running to the booster pump on the -35' level. The booster will draw from the WCT basins directly and discharge via hose up the side of the RAB and to the portable pump. The portable pump discharge will be connected with hose to two tees (one just upstream of FW-179A and another just upstream of FW-179B) on the +46' level of the RAB. See Figure G-3 and Figure G-4.		The secondary connection to the 'A' WCT basin is made on the -35' level (outside). The WCT basin is protected against all applicable hazards.
For Core Cooling with Steam Generators not Available: The primary connection point would be to tie into the HPSI system on the vent line of the discharge line of pump A/B. The vent line is isolated by 1" valve SI-210. The vent line is a branch off of line 2SI4-76A/B. The conceptual routing begins at the suction source of the RWSP drain line in the injection pump area "A" (B15) with a flexible hose length of approximately 50 feet of flexible hose. The flexible hose would be connected to the suction connection of the high pressure, low volume pump in the same area. The discharge connection on the pump would be connected to approximately 35 feet of flexible hose to the connection point in the same room. The flexible hose would be connected into the HPSI system at the modified connection point with a high pressure connection. All connections/staging are in the same area (B15).	The vent line with valve SI-210 will need to be modified to be a 3" branch connection off of line 2SI4-76A/B including a 3" isolation valve and 3" high pressure threaded connection. The RWSP drain line isolated by SI-715 could be modified to provide a connection on the floor -35' elevation in lieu of the connection on the -20' laddered platform.	Both points of connection associated with the primary strategy are made within the RAB, which is protected against all applicable hazards.
For Core Cooling with Steam Generators not Available: The secondary connection point would be to tie into the HPSI system on the vent line of	The line will need to be modified to include a 3" branch connection with a 3" isolation valve and 3" high	Both points of connection associated with

Maintain Core Cooling & Heat Removal		
PWR Portable Equipment Phase 2		
the discharge line of pump A. The location of the tie-in point could be anywhere on the lines 2SI4-76A and 2SI4-78A between the two check valves SI-207A and SI-216. Figure G-5 and Figure G-6 shows the location of this connection.	pressure threaded connection. As with the primary strategy, the RWSP drain line isolated by SI-715 could be modified to provide a connection on the floor -35' elevation in lieu of the connection on the -20' laddered platform.	the secondary strategy are made within the RAB, which is protected against all applicable hazards.
Notes: Core cooling strategies are provided for conditions where steam generators are available or where steam generators are not available but a sufficient RCS vent has been established to support core cooling. This assumption is per the guidance of NEI 12-06 FAQ 2012-19. Other configurations are not considered as these occur for short durations that are exempted per NEI 12-06 Table D.		

Maintain Core Cooling & Heat Removal	
PWR Portable Equipment Phase 3	
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain core cooling. Identify methods and strategy(ies) utilized to achieve this coping time. **Core Cooling with Steam Generators Available:** This section is supported by Reference 9, Sections 8.1 & 8.3: In Phase 3, core cooling through natural circulation heat removal from the RCS via the steam generators continues. Heat rejection through the steam generators is maintained via the TDEFW or the SG FLEX pump. Use of non-condensate grade inventory in the SG cannot be maintained indefinitely (see Open Item OI3). Phase 3 deployment of a unit capable of generating clean coolant for use in the SGs can extend the coping time. Indefinite coping is successfully established once a transition from SG cooling to shutdown cooling (SDC) is established. In support of SDC operation, Phase 3 deployments will ensure that power is restored to component cooling water system and dry cooling tower equipment as needed. It is expected that only the component cooling water system and dry cooling towers will need to be made operational to reject the heat load generated post-ELAP in Phase 3. However, this must be investigated more fully to confirm such (see Open Item OI5). A backup to the Phase 2 equipment will be provided from the regional response centers and will allow all Phase 2 functions for coping to continue to be utilized in Phase 3, even when there is a failure of the onsite Phase 2 equipment during the indefinite coping period. **Core Cooling with Steam Generators not Available:** This section is supported by Reference 9, Section 8.2: Reactor level and sub-criticality is adequately maintained via the Phase 2 strategy, however, borated sources are limited. Phase 3 deployment of a unit capable of generating pure water and then borating the pure water can further extend coping times with respect to RCS inventory management. This is discussed in detail in the first paragraph above.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* FSGs will be developed to support the Phase 3 strategies described for Core Cooling and Heat Removal. Further, the PWROG is developing generic and NSSS-specific FLEX Support FSGs via PA-PSC-0965. The FSGs developed for Waterford 3 will consider the PWROG guidance.
Identify modifications	*List modifications* Core Cooling with Steam Generators Available: None currently identified. Core Cooling with Steam Generators not Available: Each of the Phase 3

<table>
<tr><th colspan="2">Maintain Core Cooling & Heat Removal</th></tr>
<tr><td colspan="2">PWR Portable Equipment Phase 3</td></tr>
<tr><td></td><td>strategies will utilize standardized connections as described for the Phase 2 connections to prevent any compatibility issues with the offsite equipment.</td></tr>
<tr><td>Key Reactor Parameters</td><td>List instrumentation credited or recovered for this coping evaluation.
1. SG Level
•Normal Power Source = Battery
•Long-term Power Source = Temporary Portable Diesel Generator (PDG)
2. EFW Flow indication
•This will be powered as the Phase 2, Emergency DGs are aligned.
3. SG Pressure
•Normal Power Source = Battery
•Long-term Power Source = Temporary Portable Diesel Generator (PDG)
4. CSP/WCT Level
•This instrument will be powered as the Phase 2, Emergency DGs are aligned.
5. Core Exit Thermocouple (CET) Temperature
•Normal Power Source = Battery
•Long-term Power Source = Temporary Portable Diesel Generator (PDG)
6. RCS Hot Leg Temperature (Thot) if CETs not available
•Normal Power Source = Battery
•Long-term Power Source = Temporary Portable Diesel Generator (PDG)
7. RCS Cold Leg Temperature (Tcold)
•Normal Power Source = Battery
•Long-term Power Source = Temporary Portable Diesel Generator (PDG)
8. RCS Wide Range Pressure
•These instruments will be powered as the Phase 2, Emergency DGs are aligned.
9. RCS Passive Injection Level
•These instruments will be powered as the Phase 2, Emergency DGs are aligned.
10. Pressurizer Level
•These instruments will be powered as the Phase 2, Emergency DGs are aligned.
11. Reactor Vessel Level Indicating System
•These instruments will be powered as the Phase 2, Emergency DGs are aligned.
12. Neutron Flux
•This instrument will be powered as the Phase 2, Emergency DGs are aligned.

Waterford will develop procedures to read this instrumentation locally, where applicable, using a portable instrument, as required by Section 5.3.3 of NEI</td></tr>
</table>

Maintain Core Cooling & Heat Removal		
PWR Portable Equipment Phase 3		
	12-06.	
Deployment Conceptual Design		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*

Maintain Core Cooling & Heat Removal		
PWR Portable Equipment Phase 3		
For Core Cooling with Steam Generators Available: A mobile water purification system will be procured in order to enable water sources such as the Mississippi River to be purified to provide makeup to suction sources which require non-borated water. The design of this unit will not be completed during the conceptual design phase, and will need to be completed during detailed design.	TBD	TBD
For Core Cooling with Steam Generators Available: Shutdown cooling system (SDCS), Component cooling water system (CCWS) and DCT equipment will be repowered as necessary to reject heat as required to support Phase 3 activities. These specifics will not be completed during the conceptual design phase, and will need to be completed during detailed design (Open Item OI5).	TBD	TBD
For Core Cooling with Steam Generators not Available: Reactor level and sub-criticality is adequately maintained via the Phase 2 strategy, however, borated sources are limited. Phase 3 deployment of a unit capable of generating pure water and then borating the	Each of the Phase 3 strategies will utilize standardized connections as described for the Phase 2 connections to prevent any compatibility issues with the offsite equipment.	TBD

Maintain Core Cooling & Heat Removal		
PWR Portable Equipment Phase 3		
pure water can further extend coping times with respect to RCS inventory management. This is discussed in detail with the other FLEX Phase 3 strategies in the section on maintaining core cooling and heat removal.		
Notes: Core cooling strategies are provided for conditions where steam generators are available or where steam generators are not available but a sufficient RCS vent has been established to support core cooling. This assumption is per the guidance of NEI 12-06 FAQ 2012-19. Other configurations are not considered as these occur for short durations that are exempted per NEI 12-06 Table D.		

Maintain RCS Inventory Control	
Determine Baseline coping capability with installed coping[2] modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06: • Low Leak RCP Seals or RCS makeup required • All Plants Provide Means to Provide Borated RCS Makeup	
PWR Installed Equipment Phase 1:	
Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain RCS inventory control. Identify methods (Low Leak RCP Seals and/or borated high pressure RCS makeup) and strategy(ies) utilized to achieve this coping time. This section addresses RCS inventory control and subcriticality issues for conditions where steam generators are available. RCS inventory control and subcriticality issues for conditions where steam generators are not available are addressed in the core cooling section of this report. This section is supported by Reference 9, Section 8.2: Two functions are lost during an ELAP which challenge the ability of the RCS to maintain inventory: the inventory makeup and seal cooling. As a result, the Phase 1 activities involve a plant cooldown, which is expected to be more rapid and more targeted than currently described in SBO response procedures. This will be done to minimize RCP seal leakage and ensure passive injection of the safety injection tanks (SITs), which will replace inventory lost in Phase 1. Eventually, the SITs will be isolated (i.e., before full depletion) to prevent nitrogen injection into the RCS. Consistent with Reference 8 methodology, the total leakage from the Waterford RCP seals is assumed to be no greater than approximately 58 gpm during Phase 1. Notably however, this peak value is associated with normal system pressure and seal leakage will decrease by one and eventually two orders of magnitude as the primary system is cooled. The assumed RCS leakage through the RCP seals is made up through SIT inventory injecting. Natural circulation is maintained by ensuring adequate RCS inventory.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* Emergency Operating Procedure OP-902-005 describes SBO recovery actions. FSGs will be developed to support the Phase 1 strategies described for RCS inventory control. Further, the PWROG is developing generic and

[2] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

Maintain RCS Inventory Control	
	NSSS-specific FLEX Support FSGs via PA-PSC-0965. The FSGs developed for Waterford 3 will consider the PWROG guidance.
Identify modifications	*List modifications* None.
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* 1. Core Exit Thermocouple (CET) Temperature •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 2. RCS Hot Leg Temperature (Thot) if CETs not available •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 3. RCS Cold Leg Temperature (Tcold) •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 4. RCS Wide Range Pressure •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 5. RCS Passive Injection Level •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 6. Pressurizer Level •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 7. Reactor Vessel Level Indicating System •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 8. Neutron Flux •This instrument will be powered as the Phase 2, Emergency DGs are aligned. Waterford will develop procedures to read this instrumentation locally, where applicable, using a portable instrument, as required by Section 5.3.3 of NEI 12-06.
Notes: None.	

<table>
<tr><td colspan="2" align="center">Maintain RCS Inventory Control</td></tr>
<tr><td colspan="2">PWR Portable Equipment Phase 2:</td></tr>
<tr><td colspan="2">Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain RCS inventory control. Identify methods (Low Leak RCP Seals and/or borated high pressure RCS makeup) and strategy(ies) utilized to achieve this coping time.

This section addresses RCS inventory control and subcriticality issues for conditions where steam generators are available. RCS inventory control and subcriticality issues for conditions where steam generators are not available are addressed in the core cooling section of this report.

This section is supported by Reference 9, Section 8.2:

The Phase 2 activities for RCS inventory control involve aligning a pump to provide borated coolant for RCS makeup. Utilizing WCAP-17601 methodology (Reference 8), Waterford 3 has evaluated limiting plant specific scenarios for RCS inventory control, shutdown margin, and Mode 5/Mode 6 boric acid precipitation control with respect to the guidelines set forth in the NEI FLEX implementation guide strategies (Reference 2). These evaluations indicate that Waterford 3 does not need to take actions to provide additional negative reactivity during an ELAP event for RCS temperatures in excess of 400°F so long as single phase natural circulation is maintained. Additionally, there is sufficient margin that boration from SIT injection is not required (i.e., if it is necessary for the operators to isolate the SITs at the beginning of the ELAP event, the plant will remain subcritical throughout the 72 hour transient.) Any risk associated with boron precipitation will be mitigated by continued provision of adequate flushing flow. Finally, these evaluations currently indicate that the site will require RCS makeup due to RCP seal leakage near the end of the 24 hour coping period to maintain RCS inventory above the apex of the hot leg.

To this end, borated injection into the RCS is provided from the RWSP. This injection eventually re-establishes level in the pressurizer. As a first attempt, Waterford 3 will attempt to repower a charging pump to maintain RCS inventory control in Phase 2. Otherwise, in both the primary and secondary strategies, a high pressure electric FLEX pump will be stored and staged on the RAB -35' level and will discharge in to high pressure safety injection (HPSI) system piping in the RAB on the same elevation. The proposed connections, hose routing, staging locations and deployment paths for the primary and secondary strategies are shown in Figure G-5 through Figure G-7.</td></tr>
<tr><td colspan="2">Details:</td></tr>
<tr><td>Provide a brief description of Procedures / Strategies / Guidelines</td><td>Confirm that procedure/guidance exists or will be developed to support implementation.

FSGs will be developed to support the Phase 2 strategies described for RCS inventory control. Further, the PWROG is developing generic and NSSS-specific FLEX Support FSGs via PA-PSC-0965. The FSGs developed for Waterford 3 will consider the PWROG guidance.</td></tr>
<tr><td>Identify modifications</td><td>List modifications

Associated with the primary strategies, the vent line with valve SI-210 will need to be modified to be a 3" branch connection off of line 2SI4-76A/B including a 3" isolation valve and 3" high pressure threaded connection. The</td></tr>
</table>

Maintain RCS Inventory Control	
PWR Portable Equipment Phase 2:	
	RWSP drain line isolated by SI-715 could be modified to provide a connection on the floor -35' elevation in lieu of the connection on the -20' laddered platform. Associated with the secondary strategies, the vent line of the discharge line of pump A will need to be modified to include a 3" branch connection with a 3" isolation valve and 3" high pressure threaded connection. This can be done anywhere on the lines 2SI4-76A and 2SI4-78A between the two check valves SI-207A and SI-216). As with the primary strategy, the RWSP drain line isolated by SI-715 could be modified to provide a connection on the floor -35' elevation in lieu of the connection on the -20' laddered platform.
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* 1. Core Exit Thermocouple (CET) Temperature •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 2. RCS Hot Leg Temperature (Thot) if CETs not available •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 3. RCS Cold Leg Temperature (Tcold) •Normal Power Source = Battery •Long-term Power Source = Temporary Portable Diesel Generator (PDG) 4. RCS Wide Range Pressure •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 5. RCS Passive Injection Level •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 6. Pressurizer Level •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 7. Reactor Vessel Level Indicating System •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 8. Neutron Flux •This instrument will be powered as the Phase 2, Emergency DGs are aligned. Waterford will develop procedures to read this instrumentation locally, where applicable, using a portable instrument, as required by Section 5.3.3 of NEI

Maintain RCS Inventory Control	
PWR Portable Equipment Phase 2:	
	12-06.
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* All equipment will be stored within the RAB, which is seismically qualified.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* All equipment will be stored within the RAB, which is protected from flooding.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* All equipment will be stored within the RAB, which is protected from severe storms with high winds.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* All equipment will be stored within the RAB, which is protected from ice.
High Temperatures	*List how equipment is protected or schedule to protect* All of the storage locations will be evaluated for high temperature effects and/or ventilation will be provided as required to assure no adverse effects on the FLEX equipment.
Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)** The figures provided in Attachment 3 show the deployment paths from each of the storage locations to the staging location. To deploy equipment requires only minimal activity within the RAB as all equipment is staged and deployed within the RAB. The staging area for the Waterford 3 FLEX strategies are also shown in Attachment 3. There is adequate space in each of these staging areas for FLEX equipment and space will not be a concern. All FLEX equipment will be cart mounted for ease of deployment.	

Maintain RCS Inventory Control		
PWR Portable Equipment Phase 2:		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
The primary connection point would be to tie into the HPSI system on the vent line of the discharge line of pump A/B. The vent line is isolated by 1" valve SI-210. The vent line is a branch off of line 2SI4-76A/B. The conceptual routing begins at the suction source of the RWSP drain line in the injection pump area "A" (B15) with a flexible hose length of approximately 50 feet of flexible hose. The flexible hose would be connected to the suction connection of the high pressure, low volume pump in the same area. The discharge connection on the pump would be connected to approximately 35 feet of flexible hose to the connection point in the same room. The flexible hose would be connected into the HPSI system at the modified connection point with a high pressure connection. All connections/staging are in the same area (B15). Figure G-5 shows the routing	The vent line with valve SI-210 will need to be modified to be a 3" branch connection off of line 2SI4-76A/B including a 3" isolation valve and 3" high pressure threaded connection. The RWSP drain line isolated by SI-715 could be modified to provide a connection on the floor -35' elevation in lieu of the connection on the -20' laddered platform.	Both points of connection associated with the primary strategy are made within the RAB, which is protected against all applicable hazards.

Maintain RCS Inventory Control		
PWR Portable Equipment Phase 2:		
for this connection.		
The secondary connection point would be to tie into the HPSI system on the vent line of the discharge line of pump A. The location of the tie-in point could be anywhere on the lines 2SI4-76A and 2SI4-78A between the two check valves SI-207A and SI-216. The conceptual routing, discharge connection, deployment paths and staging locations are the same as for the primary strategy. Figure G-5 and Figure G-6 show the routing for this connection.	The line will need to be modified to include a 3” branch connection with a 3” isolation valve and 3” high pressure threaded connection. As with the primary strategy, the RWSP drain line isolated by SI-715 could be modified to provide a connection on the floor -35’ elevation in lieu of the connection on the -20’ laddered platform.	Both points of connection associated with the secondary strategy are made within the RAB, which is protected against all applicable hazards.
Notes: None.		

Maintain RCS Inventory Control	
PWR Portable Equipment Phase 3:	
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain RCS inventory control. Identify methods (Low Leak RCP Seals and/or borated high pressure RCS makeup) and strategy(ies) utilized to achieve this coping time. This section addresses RCS inventory control and subcriticality issues for conditions where steam generators are available. RCS inventory control and subcriticality issues for conditions where steam generators are not available are addressed in the core cooling section of this report. This section is supported by Reference 9, Section 8.2: Reactor level and sub-criticality is adequately maintained via the Phase 2 strategy; however, borated sources are limited. Phase 3 deployment of a unit capable of generating pure water and then borating the pure water can further extend coping times with respect to RCS inventory management. This is discussed in detail with the other FLEX Phase 3 strategies in the section on maintaining core cooling and heat removal.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* FSGs will be developed to support the Phase 3 RCS inventory control strategies. Further, the PWROG is developing generic and NSSS-specific FLEX Support FSGs via PA-PSC-0965. The FSGs developed for Waterford 3 will consider the PWROG guidance.
Identify modifications	*List modifications* Each of the Phase 3 strategies will utilize standardized connections as described for the Phase 2 connections to prevent any compatibility issues with the offsite equipment.
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* 1. Core Exit Thermocouple (CET) Temperature • Normal Power Source = Battery • Long-term Power Source = Temporary Portable Diesel Generator (PDG) 2. RCS Hot Leg Temperature (Thot) if CETs not available • Normal Power Source = Battery • Long-term Power Source = Temporary Portable Diesel Generator (PDG) 3. RCS Cold Leg Temperature (Tcold) • Normal Power Source = Battery • Long-term Power Source = Temporary Portable Diesel Generator (PDG) 4. RCS Wide Range Pressure • These instruments will be powered as the Phase 2, Emergency DGs are aligned. 5. RCS Passive Injection Level

Maintain RCS Inventory Control		
PWR Portable Equipment Phase 3:		
	•These instruments will be powered as the Phase 2, Emergency DGs are aligned. 6. Pressurizer Level •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 7. Reactor Vessel Level Indicating System •These instruments will be powered as the Phase 2, Emergency DGs are aligned. 8. Neutron Flux •This instrument will be powered as the Phase 2, Emergency DGs are aligned. Waterford will develop procedures to read this instrumentation locally, where applicable, using a portable instrument, as required by Section 5.3.3 of NEI 12-06.	
Deployment Conceptual Modification **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
Reactor level and sub-criticality is adequately maintained via the Phase 2 strategy, however, borated sources are limited. Phase 3 deployment of a unit capable of generating pure water and then borating the pure water can further extend coping times with respect to RCS inventory management. This is discussed in detail with the other FLEX Phase 3 strategies in the section on maintaining	Each of the Phase 3 strategies will utilize standardized connections as described for the Phase 2 connections to prevent any compatibility issues with the offsite equipment.	TBD

Maintain RCS Inventory Control		
PWR Portable Equipment Phase 3:		
core cooling and heat removal.		
Notes: This strategy will be finalized once equipment and equipment specifications coming from the RRC are finalized.		

Maintain Containment	
Determine Baseline coping capability with installed coping[3] modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06: • Containment Spray (Open Item OI2) • Hydrogen igniters (ice condenser containments only)	
PWR Installed Equipment Phase 1:	
Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain containment. Identify methods (containment spray/Hydrogen igniter) and strategy(ies) utilized to achieve this coping time. This section is supported by Reference 9, Section 8.4: Containment pressure and temperature are expected to increase during an ELAP due to loss of containment cooling and RCS leakage into containment. Based upon the performance of the installed RCP seals, the pressure and temperature are not expected to rise to levels which could challenge the containment structure. Containment evaluation will be performed based on the boundary conditions described in Section 2 of NEI 12-06. Based on the results of this evaluation, required actions to ensure maintenance of containment integrity and required instrument function will be developed.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* N/A
Identify modifications	*List modifications* N/A
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.* 1. Containment Pressure • This instrument will be powered as the Phase 2, Emergency DGs are aligned. 2. Containment Temperature

[3] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

Maintain Containment	
	• This instrument will be powered as the Phase 2, Emergency DGs are aligned. Waterford will develop procedures to read this instrumentation locally, where applicable, using a portable instrument, as required by Section 5.3.3 of NEI 12-06.
Notes:	

Maintain Containment	
PWR Portable Equipment Phase 2:	
Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain containment. Identify methods (containment spray/Hydrogen igniter) and strategy(ies) utilized to achieve this coping time. This section is supported by Reference 9, Section 8.4: Containment evaluation will be performed based on the boundary conditions described in Section 2 of NEI 12-06. Based on the results of this evaluation, required actions to ensure maintenance of containment integrity and required instrument function will be developed. Monitoring of containment conditions will still occur. FSGs will be developed for containment monitoring during a FLEX event.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* An analysis will be needed to demonstrate that containment pressure and temperature will stay at acceptable levels throughout the ELAP event and that no containment spray system will be required as part of FLEX (Open Item OI2).
Identify modifications	*List modifications* None
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.* 1. Containment Pressure • This instrument will be powered as the Phase 2, Emergency DGs are aligned. 2. Containment Temperature • This instrument will be powered as the Phase 2, Emergency DGs are aligned. Waterford will develop procedures to read this instrumentation locally, where applicable, using a portable instrument, as required by Section

Maintain Containment		
PWR Portable Equipment Phase 2:		
	5.3.3 of NEI 12-06.	
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**		
Seismic	*List how equipment is protected or schedule to protect* N/A	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* N/A	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* N/A	
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* N/A	
High Temperatures	*List how equipment is protected or schedule to protect* N/A	
Deployment Conceptual Modification **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to	*Identify modifications*	*Identify how the connection is protected*

Maintain Containment		
PWR Portable Equipment Phase 2:		
the point of use.		
N/A	N/A	N/A
Notes:		

Maintain Containment	
PWR Portable Equipment Phase 3:	
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain containment. Identify methods (containment spray/hydrogen igniters) and strategy(ies) utilized to achieve this coping time. This section is supported by Reference 9, Section 8.4 Containment evaluation will be performed based on the boundary conditions described in Section 2 of NEI 12-06. Based on the results of this evaluation, required actions to ensure maintenance of containment integrity and required instrument function will be developed. Monitoring of containment conditions will still occur. FSGs will be developed for containment monitoring during a FLEX event.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* N/A
Identify modifications	*List modifications* N/A
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.* N/A

Deployment Conceptual Modification (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*

Maintain Containment		
N/A	N/A	N/A
Notes:		

Maintain Spent Fuel Pool Cooling
Determine Baseline coping capability with installed coping[4] modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06: • Makeup with Portable Injection Source
PWR Installed Equipment Phase 1:
Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup via portable injection source) and strategy(ies) utilized to achieve this coping time. **Operating, Pre-Fuel Transfer, or Post-Fuel Transfer** This section is supported by Reference 9, Section 8.5: Spent fuel pool cooling is not challenged early in the event; however, access to the SFP area as a part of Phase 2 response could be challenged due to environmental conditions local to the pool so action is required to establish ventilation in this area and stage any equipment local to the spent fuel pool required to accomplish coping strategies (such as the primary SFP cooling strategy discussed below). The SFP vent will be established by opening the Fuel Building access door on the +21' elevation. There will be no volume lost from the SFP due to sloshing during the event. The time to boil for the combined SFP and Cask Storage Pit, based on an initial pool coolant temperature of 140°F and a nominal water level at 44' 0" (at water depth of 39' 6"), is calculated to be 28.5 hours for the normal spent fuel load. After the time to boiling has been reached in the SFP and Cask Storage Pit, the boil off rate is calculated to be 13.95 gal/min for the normal spent fuel load. Based on makeup coolant available at 140°F, the makeup flow rate required is 13.60 gal/min for the normal spent fuel load. **Fuel in Transfer or Full Core Off-Load** This section is supported by Reference 9, Section 8.5: Spent fuel pool cooling is not challenged early in the event; however, access to the SFP area as a part of Phase 2 response could be challenged due to environmental conditions local to the pool so action is required to establish ventilation in this area and stage any equipment local to the spent fuel pool required to accomplish coping strategies (such as the primary SFP cooling strategy discussed below). The SFP vent will be established by opening the Fuel Building access door on the +21' elevation. There will be no volume lost from the SFP due to sloshing during the event. The time to boil for the combined SFP and Cask Storage Pit, based on an initial pool coolant temperature of 140°F and a nominal

[4] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

<table>
<tr><td colspan="2">water level at 44’ 0” (at water depth of 39’ 6”), is calculated to be 3.06 hours for a full core offload. After the time to boiling has been reached in the SFP and Cask Storage Pit, the boil off rate is calculated to be 129.88 gal/min for a full core offload. Based on makeup coolant available at 140°F, the makeup flow rate required is 126.60 gal/min for a full core offload.</td></tr>
<tr><td colspan="2">Details:</td></tr>
<tr><td>Provide a brief description of Procedures / Strategies / Guidelines</td><td>Confirm that procedure/guidance exists or will be developed to support implementation.

FSGs will be developed to support the Phase 1 strategies described for SFP cooling. Further, the PWROG is developing generic and NSSS-specific FLEX Support FSGs via PA-PSC-0965. The FSGs developed for Waterford 3 will consider the PWROG guidance.</td></tr>
<tr><td>Identify modifications</td><td>List modifications

N/A</td></tr>
<tr><td>Key SFP Parameter</td><td>List instrumentation credited or recovered for this coping evaluation.

1.SFP Level
•This instrument will be powered as the Phase 2, Emergency DGs are aligned.
2.SFP Temperature
Waterford will develop procedures to read this instrumentation locally, where applicable, using a portable instrument, as required by Section 5.3.3 of NEI 12-06.</td></tr>
<tr><td colspan="2">Notes:</td></tr>
</table>

Maintain Spent Fuel Pool Cooling

PWR Portable Equipment Phase 2:

Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup via portable injection source) and strategy(ies) utilized to achieve this coping time.

Operating, Pre-Fuel Transfer, or Post-Fuel Transfer

This section is supported by Reference 9, Section 8.5:

There will be no volume lost from the SFP due to sloshing during the event. The time to boil for the combined SFP and Cask Storage Pit, based on an initial pool coolant temperature of 140°F and a nominal water level at 44' 0" (at water depth of 39' 6"), is calculated to be 28.5 hours for the normal spent fuel load. (Reference 9; Section 8.5)

After the time to boiling has been reached in the SFP and Cask Storage Pit, the boil off rate is calculated to be 13.95 gal/min for the normal spent fuel load. Based on makeup coolant available at 140°F, the makeup flow rate required is 13.60 gal/min for the normal spent fuel load. (Reference 9; Section 8.5)

Fuel in Transfer or Full Core Off-Load

This section is supported by Reference 9, Section 8.5:

There will be no volume lost from the SFP due to sloshing during the event. The time to boil for the combined SFP and Cask Storage Pit, based on an initial pool coolant temperature of 140°F and a nominal water level at 44' 0" (at water depth of 39' 6"), is calculated to be 3.06 hours for a full core offload. (Reference 9; Section 8.5)

After the time to boiling has been reached in the SFP and Cask Storage Pit, the boil off rate is calculated to be 129.88 gal/min for a full core offload. Based on makeup coolant available at 140°F, the makeup flow rate required is 126.60 gal/min for a full core offload. (Reference 9; Section 8.5)

Makeup for Boil-Off Applicable to all Conditions

It has been determined that SFP makeup is not required for the normal spent fuel load until 110.5 hours. In the event that the spent fuel pool contains a full core offload, SFP makeup is not required until 10.73 hours

The primary connection point for makeup will be a hard pipe permanently mounted to makeup inventory into the SFP from the SFP deck. Permanent piping would need to be installed from the +21' level to the SFP on the +46' level of the fuel handling building. Flexible hose would be routed from the suction source of the CSP or RWSP to the diesel driven FLEX pump located in inside the RAB, near the double doors to the RB trackway. The discharge hose would be routed into the fuel handling building to the hard pipe described.

The secondary connection point will be flexible hose into the SFP from the deck. Hose routing will be the

<table>
<tr><th colspan="2">Maintain Spent Fuel Pool Cooling</th></tr>
<tr><td colspan="2">same as for the primary strategy except once inside the fuel handling building, hose will be run up to the SFP deck and draped over the side of the pool. For the secondary strategy, the FLEX pump would be staged inside the RB trackway.

Additionally, a spray function needs to be provided to cool the fuel per Reference 4. The spray connection point would be a mounted or placed nozzle positioned to direct spray flow over the spent fuel from the SFP deck. The conceptual routing is the same as for the secondary connection except that the flex hose would be mounted to a nozzle that would provide spray to the pool. It is expected that existing spray nozzles for SFP spray will be utilized in this scenario.

These configurations meet the requirements of NEI 12-06 for the BDBEE of seismic, flood, ice, high winds and tornados, and high temperatures.</td></tr>
<tr><td colspan="2">Details:</td></tr>
<tr><td>Provide a brief description of Procedures / Strategies / Guidelines</td><td>Confirm that procedure/guidance exists or will be developed to support implementation.

FSGs will be developed to support the Phase 2 Spent Fuel Pool Cooling strategies. Further, the PWROG is developing generic and NSSS-specific FLEX Support FSGs via PA-PSC-0965. The FSGs developed for Waterford 3 will consider the PWROG guidance.</td></tr>
<tr><td>Identify modifications</td><td>List modifications

The RWSP and/or CSP access hatches will have to be modified to provide entrance for a flexible suction line to be fed down to the water.

For the primary connection point, permanent piping would need to be installed from the +21’ level to the SFP on the +46’ level of the fuel handling building.</td></tr>
<tr><td>Key SFP Parameter</td><td>List instrumentation credited or recovered for this coping evaluation.

1.SFP Level
•This will be powered as the Phase 2, Emergency DGs are aligned.
2.SFP Temperature

Waterford will develop procedures to read this instrumentation locally, where applicable, using a portable instrument, as required by Section 5.3.3 of NEI 12-06.</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2">Storage / Protection of Equipment:</td></tr>
</table>

Maintain Spent Fuel Pool Cooling	
Describe storage / protection plan or schedule to determine storage requirements	
Seismic	*List how equipment is protected or schedule to protect* The primary SFP makeup pump will be stored within the RAB on the +21' level and will protected from seismic activity. The secondary pump will be stored in a weather protected enclosure that is not protected from seismic activity.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* The primary SFP makeup pump will be stored within the RAB on the +21' level. The secondary pump will be stored in a weather protected enclosure. Only the primary pump is within the plant floodwall and will be protected from flooding.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* The primary SFP makeup pump will be stored within the RAB on the +21' level which is protected from missiles. The secondary pump will be stored in a weather protected enclosure which is not missile protected.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* Both the primary and secondary SFP pumps will be protected from ice as they will either be stored in the RAB or in a weather protected enclosure.
High Temperatures	*List how equipment is protected or schedule to protect* Both the primary and secondary SFP pumps will be protected from high temperatures.
Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)** For the primary strategy, the SFP makeup pump will be staged in the RAB by the double doors (equipment hatch) to the RB trackway. For the secondary strategy, the SFP makeup pump will be staged in the RB trackway (+21' el.). Suction hose will run from the CSP or the RWSP to the pump and discharge hose will run to either the SFP (secondary strategy) or to hard pipe in the FHB which will run to the SFP (primary strategy). All deployment paths are through the FHB, RAB and RB trackway. The FHB and RAB are fully qualified against all applicable hazards. The RB trackway on the +21' elevation would afford protection from seismic, flooding, ice and high temperature events. Additionally, the RB trackway would afford reasonable protection from high wind/missile impact events such that SFP makeup pump discharge hose	

Maintain Spent Fuel Pool Cooling		
can be routed through the area.		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
The primary connection point will be a hard pipe permanently mounted to makeup inventory into the SFP from the SFP deck. Permanent piping would need to be installed from the +21' level to the SFP on the +46' level of the fuel handling building. Flexible hose would be routed from the suction source of the CSP or RWSP to the diesel driven FLEX pump located in the RAB on the +21' level. Figure G-8 and Figure G-9 show the routing for this connection.	Permanent piping would need to be installed from the +21' level to the SFP on the +46' level of the fuel handling building. In addition, the RWSP and/or CSP access hatches will have to be modified to provide entrance for a flexible suction line to be fed down to the water.	The connection point is located inside the Fuel Handling Building, which is fully protected against all applicable hazards.
The secondary connection point will be flexible hose into the SFP from the deck. Flexible hose would be routed from the suction source of the CSP or RWSP to the diesel driven FLEX pump on the RB trackway. The discharge hose would be routed into the fuel handling building up to the SFP deck and draped over the side of the pool. Figure G-8 and Figure G-9 show the routing for this connection.	The RWSP and/or CSP access hatches will have to be modified to provide entrance for a flexible suction line to be fed down to the water.	The connection point is located inside the Fuel Handling Building, which is fully protected against all applicable hazards.
The spray connection point would be a mounted or placed nozzle positioned to direct spray	The RWSP and/or CSP access hatches will have to be modified to provide entrance for a flexible	The connection point is located inside the Fuel Handling Building, which is fully

Maintain Spent Fuel Pool Cooling		
flow over the spent fuel from the SFP deck. The conceptual routing is the same as for the secondary connection except that the flex hose would be mounted to a nozzle that would provide spray to the pool. The routing for this connection is the same as that for the secondary connection, shown in Figure G-8 and Figure G-9.	suction line to be fed down to the water.	protected against all applicable hazards.
Notes:		

Maintain Spent Fuel Pool Cooling

PWR Portable Equipment Phase 3:

Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup via portable injection source) and strategy(ies) utilized to achieve this coping time.

This section is supported by Reference 9, Section 8.5:

For Phase 3, Waterford 3 intends to continue with the Phase 2 strategies with additional support and equipment provided by off-site resources. This strategy credits that backups to the Phase 2 equipment would be delivered from the RRC to be on-site during Phase 3 should any Phase 2 equipment fail during the indefinite coping period.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* FSGs will be developed for implementation of the Phase 3 FLEX strategies. Further, the PWROG is developing generic and NSSS-specific FLEX Support FSGs via PA-PSC-0965. The FSGs developed for Waterford 3 will consider the PWROG guidance.
Identify modifications	*List modifications* None
Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.* 1.SFP Level 2.SFP Temperature Waterford will develop procedures to read this instrumentation locally, where applicable, using a portable instrument, as required by Section 5.3.3 of NEI 12-06.

Deployment Conceptual Design

(Attachment 3 contains Conceptual Sketches)

Strategy	**Modifications**	**Protection of connections**

Maintain Spent Fuel Pool Cooling		
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
A mobile heat exchanger unit may be used to reestablish SFP cooling.	None	To be determined in detailed design phase.
Notes:		

Safety Functions Support
Determine Baseline coping capability with installed coping[5] modifications not including FLEX modifications.
PWR Installed Equipment Phase 1
Provide a general description of the coping strategies using installed equipment including station modifications that are proposed to maintain and/or support safety functions. Identify methods and strategy(ies) utilized to achieve coping times. This section is supported by Reference 9, Section 8.6: Support to the safety functions is provided by continued observation of conditions by operators using specific instruments and coordinating activities from the control room. Maintaining indications and control requires maintenance of battery power, which is extended by performing a load shed. The battery room will not need to be vented in Phase 1 as a negligible amount of hydrogen off-gas will accumulate prior to recharging the batteries in Phase 2. Instrument function and control room habitability are supported by establishing control room ventilation consistent with current SBO response procedures. Control room lighting is powered by the plant batteries and adequate portable lighting is provided to support activities outside of the control room. The Phase I coping strategy is to use plant installed equipment to power the required loads. When an ELAP occurs, Waterford 3 uses batteries A and B to power their respective DC buses. After 30 minutes, if the emergency diesel generators have not restored power to the safeguards buses, the operators will implement the load shed strategies outlined in the SBO Procedure (Reference 6.a). This is designed to maintain power for up to four hours on each battery. Once the ELAP is announced, the operators will establish a deeper DC load shed. These actions will extend the life of the batteries for the remainder of the Phase I coping period. This deep load shed will likely include de-energizing the DC regulator valve for the TDEFWP and manually operating the valve locally to maintain flow to the SGs and SG volume. Additionally, the DC-powered containment isolation valves will be de-energized to minimize battery loading. Operation of these valves will be manual.

[5] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* Procedure OP-902-005, "Station Blackout Response," will need to be revised to incorporate the latest load shedding convention. FSGs will be developed to capture the additional DC load shed. Further, the PWROG is developing generic and NSSS-specific FLEX Support FSGs via PA-PSC-0965. The FSGs developed for Waterford 3 will consider the PWROG guidance.
Identify modifications	*List modifications* None.
Key Parameters	*List instrumentation credited for this coping evaluation phase.* DC Bus Voltage Waterford will develop procedures to read this instrumentation locally, where applicable, using a portable instrument, as required by Section 5.3.3 of NEI 12-06.
Notes: In support of Phase 1, Waterford 3 will explore replacing applicable lighting with LED fixtures to reduce plant heat load and extend lighting life.	

Safety Functions Support
PWR Portable Equipment Phase 2
Provide a general description of the coping strategies using on-site portable equipment including station modifications that are proposed to maintain and/or support safety functions. Identify methods and strategy(ies) utilized to achieve coping times. This section is supported by Reference 9, Section 8.6: The Phase 2 coping strategy involves using an on-site portable FLEX generator to provide 480 V electrical power for necessary plant equipment. The generator connection to the primary and diverse connection points will include a neutral and a ground conductor because Safeguards Buses 3A31, 3AB31, and 3B31 are three-phase, four-wire systems. In order to ensure proper operation of protective relaying and protection of personnel the neutral will be bonded to ground at the generator connection panel using the wye-connector. Two modifications will be needed in support of such. The first modification will replace a spare breaker in each of the safeguards buses. The spare breaker will need to be modified to have quick-connect contacts on the face or be directly connected to a junction box with similar quick-connect contacts. The second modification will be required at each of the charging pumps. The charging pump cabling will be used to deliver 480 V power from the Safeguards Bus rooms to the charging pump rooms on the -35' Level of the RAB. The transfer switches will be located on the junction boxes next to the pump motors. The normal position will provide power to the charging pumps. The alternate position will re-route power to a connection point just inside the charging pump rooms. At this connection point, the cables from the FLEX pump will be routed from the FLEX pump staging area, across the -35' Level, into any charging pump room, and connected to the new connection point. Use of either portable FLEX pump (SG makeup pump or RCS makeup pump) will require running cable to one of these rooms (one for each pump). No more than two pumps will be powered at any given time. That is, either both the SG makeup FLEX pump and the RCS makeup FLEX pump will be powered, or the SG makeup FLEX pump and an installed charging pump will be powered. The primary FLEX generator will be stored and deployed on the roof of the RAB. In this case, to get power from the generator to the vital buses, power cables would need to be routed down the north RAB ladder well (Ladder #4) from the roof (+69' Level), down to the +21' level and into one of the vital bus rooms. The secondary FLEX generator will be stored and deployed on grade level outside (+21' Level). In this case, to get power from the generator to the vital buses, power cables would need to be routed from the generator, into a flood door and into one of the vital bus rooms. Smaller diesel generators loaded on carts, similar to the ones used for other strategies will be used as necessary to power communications equipment, portable fans, fuel oil transfer pumps and portable lighting. Load sequencing calculations and procedures were determined to be unnecessary to prevent overloading or tripping the FLEX generators. Loads will be applied one at a time and manually added by locally operating the breakers. Load sequencing would be difficult to predetermine because loads will be restored on an as-

Safety Functions Support	
PWR Portable Equipment Phase 2	
need basis, dependent on which function needed to be restored first (i.e. battery chargers, ventilation, electrically powered pumps used for FLEX strategies, etc.). Additionally, the generators will be sized such that there is sufficient load margin to support starting the largest load with all other loads running. If there is still a concern, FLEX procedures will be developed to provide the maximum amount of electrical loading on each FLEX generator prior to starting each load. Either Diesel Generator 3A Fuel Oil Transfer Pump A or Diesel Generator 3B Fuel Oil Transfer Pump B will be repowered by the FLEX generator (Section 8.6 of Reference 9). Hose can be routed from the makeup piping from the pump discharge to the daytank as needed to replenish the FLEX generator fuel supply.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* FSGs will be developed to support the Phase 2 strategies described for Safety Functions Support. Further, the PWROG is developing generic and NSSS-specific FLEX Support FSGs via PA-PSC-0965. The FSGs developed for Waterford 3 will consider the PWROG guidance.
Identify modifications	*List modifications* Two modifications will be needed. The first modification will replace a spare breaker in each of the safeguards buses. The spare breaker will need to be modified to have quick-connect contacts on the face or be directly connected to a junction box with similar quick-connect contacts. The second modification will be required at each of the charging pumps. The charging pump cabling will be used to deliver 480 V power from the Safeguards Bus rooms to the charging pump rooms on the -35' Level of the RAB. The transfer switches will be located on the junction boxes next to the pump motors. The normal position will provide power to the charging pumps. The alternate position will re-route power to a connection point just inside the charging pump rooms. At this connection point, the cables from the FLEX pump will be routed from the FLEX pump staging area, across the -35' Level, into any charging pump room, and connected to the new connection point.
Key Parameters	*List instrumentation credited for this coping evaluation phase.* DC Bus Voltage Waterford will develop procedures to read this instrumentation locally, where applicable, using a portable instrument, as required by Section 5.3.3

Safety Functions Support	
PWR Portable Equipment Phase 2	
	of NEI 12-06.
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* Being on the roof of the RAB, the primary FLEX generator will be protected from seismic events. Being in the yard, the secondary generator will not be.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* Being stored on the roof of the RAB, the primary FLEX generator will be protected from flooding. Being stored on grade East of the RAB, the secondary FLEX generator will not be protected from flooding.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* The primary FLEX generator (on the roof) will be missile protected by a missile-shielded barrier with a hinged door to allow the generator to be moved following the event for FLEX actions. However, the secondary FLEX generator (on grade level) will not be missile protected.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* The primary FLEX generators will be protected from ice while the secondary generator will not be.
High Temperatures	*List how equipment is protected or schedule to protect* Both the primary and secondary FLEX generators will be procured such that they are protected from high temperature events.
Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**	

Safety Functions Support		
PWR Portable Equipment Phase 2		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
The primary FLEX generator will be stored and deployed on the roof of the RB. In this case, to get power from the generator to the vital buses, power cables would need to be routed down the north RB ladder well (Ladder #4) from the roof (+69' Level), down to the +21' level and into one of the vital bus rooms. Cable routing is shown in Figure G-16 through Figure G-19, and will be at a maximum approximate distance of 440-ft of cable.	Two modifications will be needed. The first modification will replace a spare breaker in each of the safeguards buses. The spare breaker will need to be modified to have quick-connect contacts on the face or be directly connected to a junction box with similar quick-connect contacts. The second modification will be required at each of the charging pumps. The charging pump cabling will be used to deliver 480 V power from the Safeguards Bus rooms to the charging pump rooms on the -35' Level of the RAB. The transfer switches will be located on the junction boxes next to the pump motors. The normal position will provide power to the charging pumps. The alternate position will re-route power to a connection point just inside the charging pump rooms. At this connection point, the cables from the FLEX pump will be routed from the FLEX pump staging area, across the -35' Level, into any charging pump room, and connected to the new connection point.	The roof storage location will survive all applicable external hazards.
The secondary FLEX generator will be stored and deployed on	Same as for the primary strategy	Deploying the generator on grade level may require debris removal

Safety Functions Support		
PWR Portable Equipment Phase 2		
grade level outside (+21' Level). In this case, to get power from the generator to the vital buses, power cables would need to be routed from the generator, into a flood door and into one of the vital bus rooms. Cable routing is shown in Figure G-20 requiring an approximate 335-ft of cable.	(box above).	in order to move the generator to the staging area and allow the operators to route the cable into the RAB. Additionally, the generator may be stored several hundred feet away from the staging area. Transportation for the generator will be required. A large truck could supply both towing and debris removal functions.
Notes: None.		

Safety Functions Support	
PWR Portable Equipment Phase 3	
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain and/or support safety functions. Identify methods and strategy(ies) utilized to achieve coping times. This section is supported by Reference 9, Section 8.6: Phase 3 involves receiving a medium voltage (4160 V) generator from the Regional Response Center to power certain plant equipment to aid in cooling down the plant to a stable, Mode 5 condition. It is currently estimated that the RRC will be able to provide a 2 MW Diesel Generator. The generator will re-power the existing 4160 V buses to supply power to the loads necessary for shutdown cooling. The generator connection to the primary and diverse connection points will include a ground conductor because 3A3 and 3B3 are three phase, four wire systems. In order to ensure proper operation of protective relaying and protection of personnel the neutral will be bonded to ground at the generator connection panel using the wye-connector. A modification will be needed to place a replacement breaker in each 4160 V bus area. The replacement breaker will need to be modified to have quick-connect contacts on the face or be directly connected to a junction box with similar quick-connect contacts. To use the breaker, an existing breaker must be racked out, and the replacement breaker inserted in its place. An example would be racking out the normal Diesel Generator Breaker. Either Diesel Generator 3A Fuel Oil Transfer Pump A or Diesel Generator 3B Fuel Oil Transfer Pump B will be repowered by the FLEX generator (Section 8.6 of Reference 9). Hose can be routed from the makeup piping from the pump discharge to the daytank as needed to replenish the FLEX generator fuel supply.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* FSGs will be developed to support the Phase 3 strategies described for Safety Functions Support. Further, the PWROG is developing generic and NSSS-specific FLEX Support FSGs via PA-PSC-0965. The FSGs developed for Waterford 3 will consider the PWROG guidance.
Identify modifications	*List modifications* A modification will be needed to place a replacement breaker in each 4160 V bus area. The replacement breaker will need to be modified to have quick-connect contacts on the face or be directly connected to a junction box with similar quick-connect contacts. To use the breaker, an existing

Safety Functions Support	
PWR Portable Equipment Phase 3	
	breaker must be racked out, and the replacement breaker inserted in its place. An example would be racking out the normal Diesel Generator Breaker.
Key Parameters	*List instrumentation credited for this coping evaluation phase.* No instrumentation is required to support the Phase 3 electrical coping strategies.
Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**	

Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
The generator will re-power the existing 4160 V buses to supply power to the loads necessary for shutdown cooling. The generator connection to the primary and diverse connection points will include a ground conductor because 3A3 and 3B3 are three phase, four wire systems.	A modification will be needed to place a replacement breaker in each 4160 V bus area. The replacement breaker will need to be modified to have quick-connect contacts on the face or be directly connected to a junction box with similar quick-connect contacts. To use the breaker, an existing breaker must be racked out, and the replacement breaker inserted in its place. An example would be racking out the normal Diesel Generator Breaker.	The connection(s) will be protected against all applicable external hazards.

Safety Functions Support
PWR Portable Equipment Phase 3
Notes: None.

The following is supported by Reference 9, Appendices A & B:

PWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance requirements
EFW primary / Modes 5 & 6 pump	X					380 gpm 1,202 ft. total delivered head (TDH)	Will follow EPRI template requirements
EFW secondary pump (diesel)	X					380 gpm 1,202 ft. TDH	Will follow EPRI template requirements
EFW secondary booster pump	X					380 gpm 131 ft. TDH	Will follow EPRI template requirements
Modes 5 & 6 pump (spare)	X					380 gpm 1,202 ft. TDH	Will follow EPRI template requirements
Two (2) RCS Modes 1-4 Pumps	X					40 gpm 3,518 ft. TDH	Will follow EPRI template requirements
Two (2) SFP Pumps			X			250 gpm 167 ft. TDH	Will follow EPRI template requirements
Two (2) Water Transfer Pumps	X		X			380 gpm 82 ft. TDH	Will follow EPRI template requirements

PWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance requirements
Two (2) 400 kW Generators				X		480V, 602A, 400kW	Will follow EPRI template requirements
Pettibone All-Terrain Fork-Lift (or Similar)					X		Will follow EPRI template requirements
Pickup Truck	X		X		X		Will follow EPRI template requirements
Two (2) EFW / Modes 5 & 6 Primary Pump Suction Hoses	X					50 ft. 3”	Will follow EPRI template requirements
Two (2) EFW / Modes 5 & 6 Primary Pump Discharge Hoses	X					35 ft. 3”	Will follow EPRI template requirements
EFW Secondary Pump Discharge Hoses and Flow Splitter	X					40 ft. & 300 ft., 3”	Will follow EPRI template requirements
EFW Secondary Booster Pump Suction Hose	X					100 ft. 4”	Will follow EPRI template requirements
EFW Secondary Booster Pump Discharge Hose	X					200 ft. 4”	Will follow EPRI template requirements

PWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance requirements
Two (2) RCS Modes 1-4 Suction Hoses	X					50 ft. 3”	Will follow EPRI template requirements
Two (2) RCS Modes 1-4 Discharge Hoses	X					35 ft. 2”	Will follow EPRI template requirements
Two (2) SFP Suction Hoses			X			190 ft. 4”	Will follow EPRI template requirements
Primary SFP Discharge Hose			X			120 ft. 4”	Will follow EPRI template requirements
Secondary SFP Discharge Hose			X			520 ft. 4”	Will follow EPRI template requirements
Two (2) Water Transfer Pump Suction Hoses	X		X			726 ft. 4”	Will follow EPRI template requirements
Two (2) Water Transfer Pump Discharge Hoses	X		X			980 ft. 4”	Will follow EPRI template requirements
Two (2) sets of FLEX Cables for 480V Generator	X			X		TBD	Will follow EPRI template requirements

PWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance requirements
Two (2) sets of FLEX Cables for 4160V Generator (Unless provided from RRC)	X			X		TBD	Will follow EPRI template requirements

PWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		
EFW Primary/ RCS Mode 5/6 Backup Pump	X					380 gpm 923 ft. TDH	480V power
EFW Secondary Backup Pump	X					380 gpm 967 ft. TDH	17.5 gal fuel required
EFW Secondary Booster Backup Pump	X					380 gpm 131 ft. TDH	6.5 gal fuel required
RCS Modes 1-4 Pump	X					40 gpm 3518 ft. TDH	480V power
SFP Pump			X			250 gpm 167 ft. TDH	7.75 gal fuel required
Water Transfer Pump to makeup CSP or RWSP	X		X			TBD	TBD
Pettibone (or similar)					X		Debris Removal
Fire Truck					X		Water Transport/Supply
Fuel Truck							Fuel Transport/Supply
Mobile Boration Unit	X						This item to be developed in detailed design.
Mobile Water Purification System	X	X	X				This item to be developed in detailed design.
Mobile HX Unit		X	X				This item to be developed in detailed

PWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		
							design.
Large 4160 VAC/2MW Diesel Generator	X	X	X				This item to be developed in detailed design.

Phase 3 Response Equipment/Commodities	
Item	**Notes**
Radiation Protection Equipment • Survey instruments • Dosimetry • Off-site monitoring/sampling • Radiological counting equipment • Radiation protection supplies • Equipment decontamination supplies • Respiratory protection	

Commodities
• Food
  ○ Meals ready to eat (MRE)
  ○ Microwavable meals
• Potable water	

Fuel Requirements •#2 Diesel Fuel •Diesel fuel bladders	
Heavy Equipment • Transportation equipment (tow vehicle) ○ 4WD • Debris clearing equipment (Pettibone)	

References

1. U.S. Nuclear Regulatory Commission, EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," March 12, 2012. [ADAMS Accession Number ML12056A045]
2. NEI 12-06, Rev. 0, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," August 2012.
3. U.S. Nuclear Regulatory Commission, JLD-ISG-2012-01, Rev. 0, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," August 2012.
4. Waterford Steam Electric Station Unit No. 3, Final Safety Analysis Report, Rev. 306.
5. Waterford Response to INPO IER L1-11-4, "Near-Term Actions to Address the Effects of an Extended Loss of All AC Power in Response to the Fukushima Daiichi Event," November 12, 2011.
6. Waterford Site Procedures
    a. Procedure OP-902-005 "Station Blackout Response."
7. Waterford Site Drawings
    a. G-160, Sheet 6, Rev. 14, "Components Cooling Water System."
    b. G-137, Rev. 27, "General Arrangement Reactor Auxiliary Bldg. – Plan El. – 35.00'."
    c. G-153, Sheet 4, Rev. 41, "Feedwater, Condensate & Air Evacuation Systems."
    d. G-167, Sheet 1, Rev. 49, "Safety Injection System."
    e. G-763, Sheet 1, Rev. 20, "Floor Plans, Composite Ground Floor Plans."
    f. G-141, Rev. 23, "General Arrangement Fuel Handling Building-Plans."
    g. G-127, Rev. 34, "Plot Plan."
    h. G-161, Sheet 4, Rev. 12, "Primary, Condensate & Demineralized water Storage Tank Piping."
    i. G-161, Sheet 3, Rev. 31, "Fire, Make-up & Domestic Water Systems."
    j. G-760, Sheet 1, Rev. 14, "Elevator & Stairs."
    k. G-764, Sheet 2, Rev. 18, "Floor Plans."
    l. G-766, Sheet 2, Rev. 13 – "Floor Plans, Composite Roof Plans."
8. Westinghouse Report, WCAP-17601-P, Rev. 1, "Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs," January 15, 2013.
9. Westinghouse Report, "TR-FSE-13-12, "Waterford Unit 3 FLEX Integrated Plan," February 2013, Revision 0.
10. Not used.
11. PWR Owners Group letter OG-12-482, Revision 0, "Transmittal of LTR-PCSA-12-78, 'Transmittal of PA-PSC-0965 Core Team PWROG Core Cooling Management Interim Position Paper,' PA-PSC-0965," November 15, 2012.

Open Items

OI1. The suction path from the TDEFWP to the WCTs would be through a non-running ACCWS pump post-ELAP. It is expected that both the TDEFWP and the currently sized EFW FLEX pump (primary strategy) will have sufficient capability and/or NPSH to do so. However, this will need to be confirmed more fully as the detailed design of the primary strategy for maintaining core cooling and heat removal evolves (with SGs available). See also Reference 9, Sect. 8.1.2.2.1.5.

OI2. An analysis will be needed to demonstrate that containment pressure and temperature will stay at acceptable levels throughout the ELAP event and that no containment spray system will be required as part of FLEX.

OI3. At this stage of the conceptual design, the chemistry effects of alternate cooling source (ACS) use on secondary wetted components are unknown.

OI4. It is currently unclear how long gravity feed from the SITs can be maintained during Modes 5 and 6 in Phase 1. The ability to gravity feed depends upon SIT fluid height/backpressure, line losses through the gravity flow path, and developed pressure within the RCS. If this time is sufficiently short, Waterford 3 may choose to pre-stage requisite FLEX equipment in Modes 5 and 6.

OI5. It is expected that only the component cooling water system and dry cooling towers will need to be made operational to reject the heat load generated post-ELAP in Phase 3. However, this must be investigated more fully to confirm such. Notably, only 60% of the dry cooling tower fan motors are currently missile protected and none of the wet cooling tower (WCT) fan motors are missile protected. If more than 60% of dry cooling tower (DCT) capacity is needed to support Phase 3, DCT and/or WCT fan motors may need to be missile protected. Currently available information follows:

The DCT one train heat removal in an accident would be 113.38 Mbtu/hr (Reference 50, Pg 18). Given that 60% of the DCT is missile protected, its assumed that that 40% of the heat removal capability is lost. 38 hours after shutdown, decay heat is less than 68 Mbtu/hr (ANS 79 decay heat curve) and less than the heat removal capacity of the DCTs. As the event proceeds, the required heat removal will decrease. Until this point in the event, Phase 1 and 2 FLEX strategies will be capable of removing decay heat. Final system operating details for the CCW and DCT (i.e., number of pumps and fans to operate) still need to be determined.

List of Acronyms

ac	Alternating Current
ACCWS	Auxiliary CCWS
ACS	Alternate Cooling Source
ADV	Atmospheric Dump Valve
AFW	Auxiliary Feedwater
ANS	American Nuclear Society
AOP	Abnormal Operating Procedure
B&W	Babcock & Wilcox Co.
BDBEE	Beyond-Design-Basis External Event
CCW	Circulating Cooling Water
CCWS	Component Cooling Water System
CET	Core Exit Thermocouple
CFR	Code of Federal Regulations
CSP	Condensate Storage Pool
DC	Direct Current
DCT	Dry Cooling Towers
DG	Diesel Generator
EFW	Emergency Feedwater
ELAP	Extended Loss of AC Power
EOP	Emergency Operating Procedure
EP	Emergency Planning/Personnel
EPRI	Electric Power Research Institute
ERO	Emergency Response Organization
FHB	Fuel Handling Building
FLEX	Flexible and Diverse Coping Mitigation Strategies
FSG	FLEX Support Guideline
HPSI	High Pressure Safety Injection
IER	Industry Event Report
INPO	Institute of Nuclear Power Operations
ISG	Interim Staff Guidance
LOOP	Loss of Offsite Power
LUHS	Loss of Normal Access to the Ultimate Heat Sink
MRE	Meal Ready to Eat
MSIV	Main Steam Isolation Valve
MSL	Mean Sea Level
NEI	Nuclear Energy Institute
NPIS	Nuclear Plant Island Structure
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
PDF	Project Design Flood
PDG	Portable Diesel Generator
PORV	Power Operated Relief Valve
PMP	Probable Maximum Precipitation
PWR	Pressurized Water Reactor
PWROG	Pressurized Water Reactor Owner's Group
RAB	Reactor Auxiliary Building
RB	Reactor Building
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RRC	Regional Response Center
RWSP	Refueling Water Storage Pool
SAFER	Strategic Alliance for FLEX Emergency Response
SBO	Station Blackout
SDC	Shutdown Cooling
SDCS	Steam Dump Control System
SFP	Spent Fuel Pool
SG	Steam Generator
SIT	Safety Injection tTank
S/RV	Safety/Relief Valve
T&D	Timing and Deployment
TD	Turbine Driven
TDEFW	Turbine Driven Emergency Feedwater
TDEFWP	Turbine Driven Emergency Feedwater Pump
TDH	Total Dynamic Head
TS	Technical Specification
UHS	Ultimate Heat Sink
WCAP	Westinghouse Commercial Atomic Power (topical report)
WEC	Westinghouse Electric Co.
WCT	Wet Cooling Tower

Attachment 1A

Sequence of Events Timeline

The following is supported by Reference 9, Section 5 and Appendix C:

Action item	**Elapsed Time (hrs)**[1]	**Action**	**New ELAP Time Constraint Y/N**[2]	**Time Constraint (hrs) (Section 5 of Reference 9)**	**Remarks / Applicability**
	0	Event Starts	NA	NA	Plant @100% power
1	0	Perform Station Blackout Coping Actions	N	NA	SBO actions are proceduralized in Reference 6.a to include establishing control room ventilation.
2	1	Declare ELAP	Y	1	The ELAP declaration is a time critical step that allows operators to take actions outside of their licensing basis.

[1] Elapsed times are estimates. Following completion of staffing studies, operator action times will be provided for each time sensitive action. Actions will be completed as soon as practical based on available onshift staffing. All actions will be completed prior to the time constraints.

[2] Instructions: Provide justification if No or NA is selected in the remark column. If yes include technical basis discussion as required by NEI 12-06 section 3.2.1.7.

Action item	Elapsed Time (hrs)[1]	Action	New ELAP Time Constraint Y/N[2]	Time Constraint (hrs) (Section 5 of Reference 9)	Remarks / Applicability
3	2	Portable Appendix R Lighting	Y	2	Performed by current SBO Procedure - temporary emergency lighting should be used before the Phase 2 generators are started, since it is assumed that load shedding will eliminate lighting provided by batteries.
4	4	Manually Control the TDEFWP	Y	4	The control system is operable until the load shed before 4 hours. Manual control needs to be performed after the control system is no longer powered.

Action item	Elapsed Time (hrs)[1]	Action	New ELAP Time Constraint Y/N[2]	Time Constraint (hrs) (Section 5 of Reference 9)	Remarks / Applicability
5	No later than 4	Perform Extended dc Load Shed	Y	4	Initial load shed was performed as part of the SBO procedure. An extended load shed should be performed within 4 hours to to extend installed plant battery draw down time into Phase 2 of the ELAP when a FLEX generator will be utilized to supply required loads and / or recharge installed plant batteries..
6	4	Perform plant cooldown	Y	4	550°F temperature to 400°F (550-400)/75 = 2 hrs + 2 hr hold point before cooldown.

Action item	**Elapsed Time (hrs)[1]**	**Action**	**New ELAP Time Constraint Y/N[2]**	**Time Constraint (hrs) (Section 5 of Reference 9)**	**Remarks / Applicability**
7	6	Align the TDEFWP to take suction from the WCT basin	Y	6	Aligning the WCT basin requires a series of valve alignments all within the Auxiliary building. This action is assumed to take 30 minutes.
8	6	Perform Damage Assessment	Y	6	Informs FLEX strategy - FSG Requirement.
9	10	Perform manual operation of EFW and the ADVs	Y	10	ADV accumulators are sized for 10 hours and can be manually operated after that.
10	12	Deploy and connect FLEX 480 V Generator	Y	12	Timing is to be completed before FLEX SG makeup pump since the primary alignment is electric powered.
11	As Time/Resources Permit	Stage SG FLEX Make-up Pump	Y	As Time/Resources Permit	TDEFW pump performance may continue; however, back-up should be staged when resources permit.

Action item	Elapsed Time (hrs)[1]	Action	New ELAP Time Constraint Y/N[2]	Time Constraint (hrs) (Section 5 of Reference 9)	Remarks / Applicability
12	19	Deploy RCS Makeup Pump	Y	19	RCS Makeup pump needs to be available at 19 hours to ensure single phase natural circulation.
13	22	FLEX Equipment Fuel Management	Y	22	Based on the need to support continuous operation of on-site diesel powered FLEX equipment.
14	28.5	SFP Area Ventilation	Y	28.5	Based on SFP time to boil (28.5 hrs at nominal SFP level of 15' above fuel).
15	28.5	Deploy SFP Makeup Hoses to SFP Area	Y	28.5	Based on time to boil after initial nominal water level of 44 feet and initial pool temperature of 140°F.
16	30	Large Debris Removal	Y	30	Large debris should be cleared in order to receive Phase 3 RRC equipment.

Action item	Elapsed Time (hrs)[1]	Action	New ELAP Time Constraint Y/N[2]	Time Constraint (hrs) (Section 5 of Reference 9)	Remarks / Applicability
17	45	Align WCT Makeup from the Mississippi River	Y	45	Upon depletion of the WCT basins, makeup should be provided to the WCT basins from the Mississippi River.
18	45	Debris Removal (access)	Y	45	Debris removal does not need to be performed/deployment paths do not need to be cleared until makeup is needed to the WCT basins.
19	45	Align Mobile Water Purification System	Y	45	This can be setup as soon as available to provide clean water for SG makeup. The time 45 hours is provided because this is the time that the Mississippi River Water would need to be aligned in a seismic event where all seismic tanks fail.

Action item	**Elapsed Time (hrs)[1]**	**Action**	**New ELAP Time Constraint Y/N[2]**	**Time Constraint (hrs) (Section 5 of Reference 9)**	**Remarks / Applicability**
20	>72	Align Mobile Boration Unit	Y	>72	RCS & SFP Make-up sourced from RWSP - Expected to be sufficient inventory through 72 hours. This is not a time sensitive requirement.
21	>72	Align Mobile Heat Exchanger Unit	Y	>72	The Mobile Heat Exchanger is used to support the SFP boil off strategy. This is not a time sensitive requirement.
22	>72	Establish Diesel Driven UHS Pump	Y	>72	Establish ultimate heat sink pump to cool the CCW heat exchanger. This is not a time sensitive requirement.
23	>72	Align 4160V Generator	Y	>72	The Phase 3 electrical generator should be deployed to restore SDC and achieve safe shutdown. This time requirement is not time sensitive.

Action item	**Elapsed Time (hrs)[1]**	**Action**	**New ELAP Time Constraint Y/N[2]**	**Time Constraint (hrs) (Section 5 of Reference 9)**	**Remarks / Applicability**
24	>72	Diesel Driven Air Compressors	Y	>72	The diesel driven air compressors may be used in order to power air operated equipment if necessary. This is not a time sensitive requirement.
25	>72	Establish Large Fuel Truck Service	Y	>72	Need time is based on depletion of on-site supplies and supplying larger equipment. This is not expected to be a time sensitive requirement.
26	110.5	Deploy SFP Makeup Pump	Y	110.5	Level of 15'6" above racks required for shielding ((44 ft water level - 36.5 ft water level)*102 ft^3/in above fuel racks * 7.4805 gal/ft^3 *(1min/13.95 gal boiled) = 4922 minutes plus thetime to boil yields over 110 hours)).

Attachment 1B

NSSS Significant Reference Analysis Deviation Table

Item	Parameter of interest	WCAP value (WCAP-17601-P, Revision 1)	WCAP page	Plant applied value	Gap and discussion
	All	Supported by Reference 9, there are no planned deviations in the Waterford FLEX conceptual design with respect to the PWROG guidance. Entergy has evaluated WCAP-17601 considering Waterford site-specific parameters and determined the conclusions of that document are applicable to Waterford. Entergy has performed analysis consistent with the recommendations of the PWROG core cooling position paper (Reference 11).			

Attachment 2

Milestone Schedule

The following milestone schedule is provided. The dates are planning dates subject to change as design and implementation details are developed. Any changes to the following target dates will be reflected in the subsequent six (6) month status reports.

Waterford Milestone Schedule		
Activity	**Original Target Completion Date**	**Status (Will be updated every 6 months)**
Submit Overall Integrated Implementation Plan	**February-2013**	
6 Month Status Updates		
Update 1	*August-2013*	
Update 2	*February-2014*	
Update 3	*August-2014*	
Update 4	*February-2015*	
Update 5	*August-2015*	
Update 6	*February-2016*	
Perform Staffing Analysis	**November-2015**	
Modifications		
Engineering and Implementation		
N-1 Walkdown	*May-2014*	

Design Engineering	*October-2014*	
Implementation Outage	*November-2015*	
On-site FLEX Equipment		
Purchase	*December-2014*	
Procure	*September-2015*	
Off-site FLEX Equipment		
Develop Strategies with RRC	*December-2013*	
Install Off-site Delivery Station (if necessary)	*November-2015*	
Procedures		
Create Waterford FSG	*November-2015*	
Create Maintenance Procedures	*November-2015*	
Training		
Develop Training Plan	*May-2015*	
Implement Training	*November-2015*	
Submit Completion Report	**November-2015**	

Attachment 3

Conceptual Sketches

Sketches herein are supported by Reference 9, Section 8.

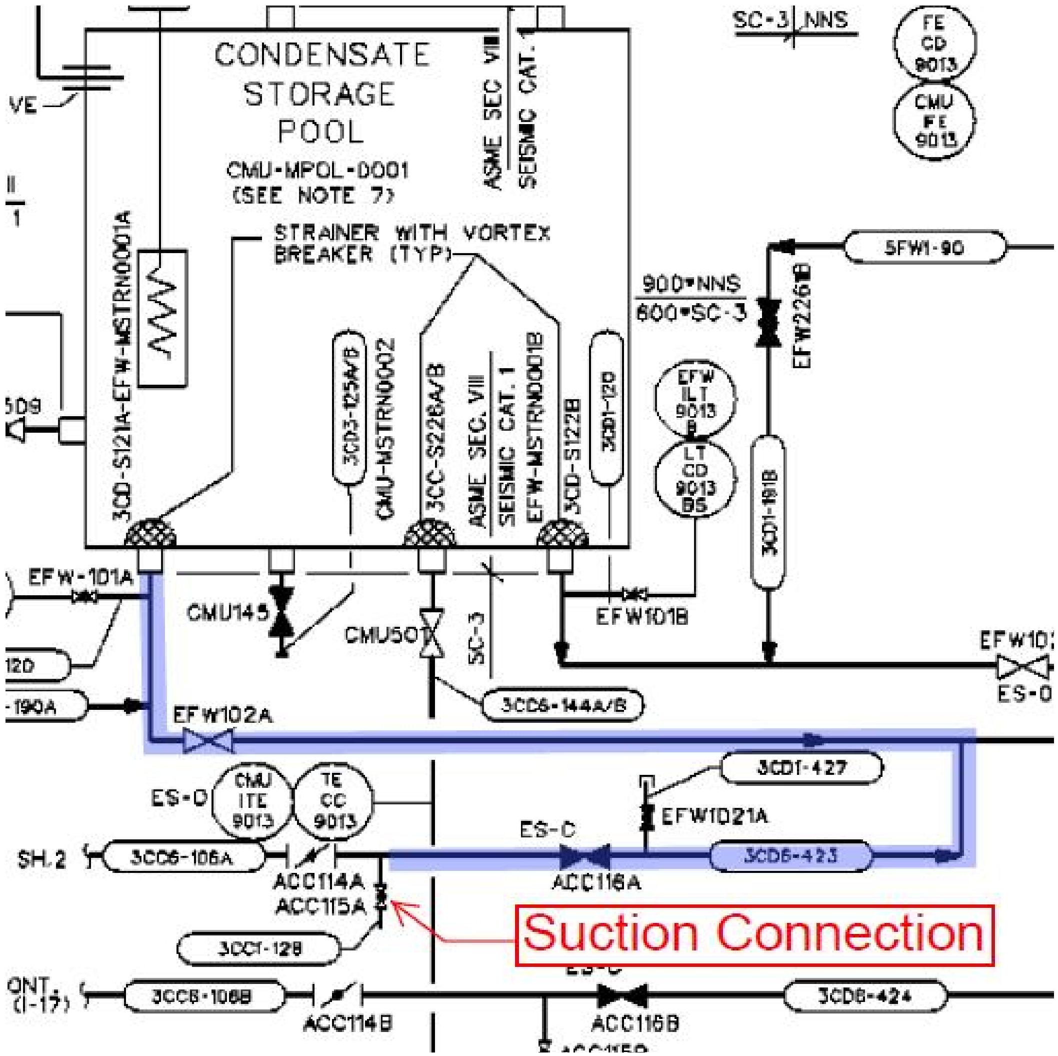

Figure G-1: Core Cooling & Heat Removal Primary Connection

(Reference 7.a)

WESTINGHOUSE NON-PROPRIETARY CLASS 3

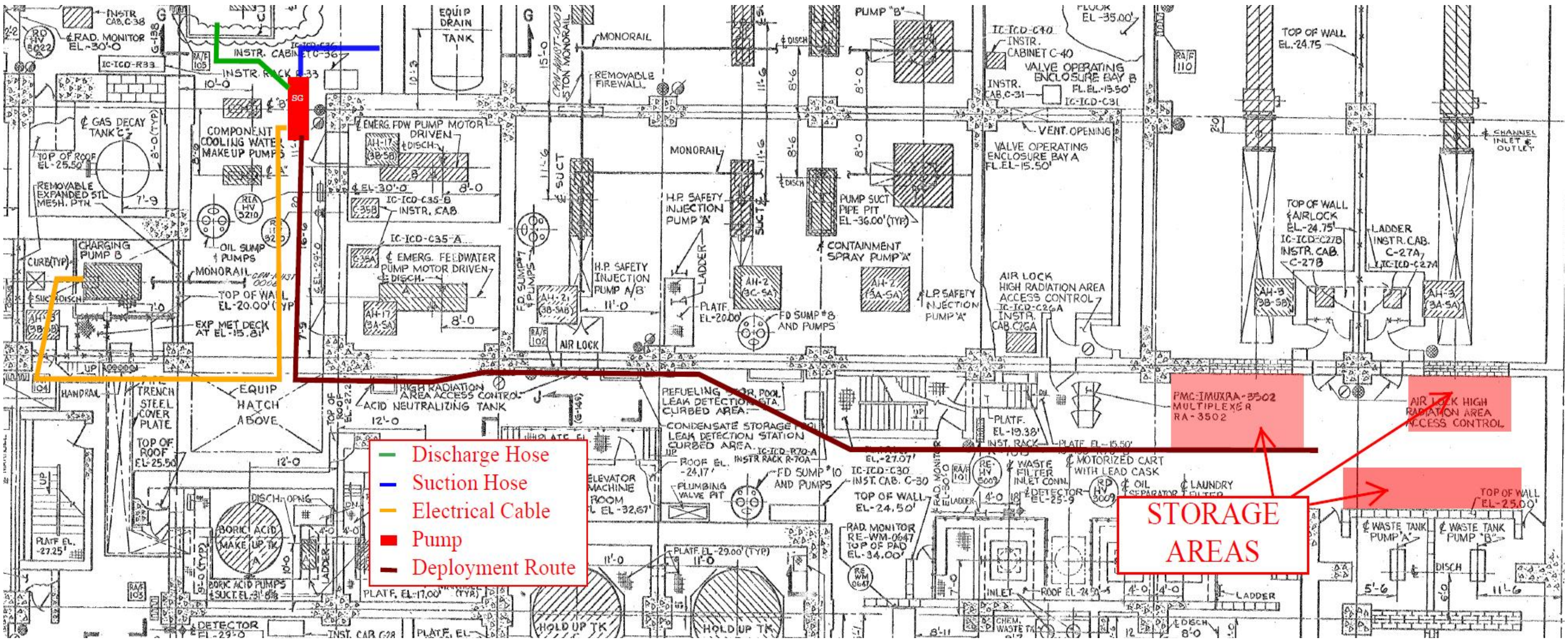

Figure G-2: Core Cooling & Heat Removal Primary Conceptual Routing

(Reference 7.b)

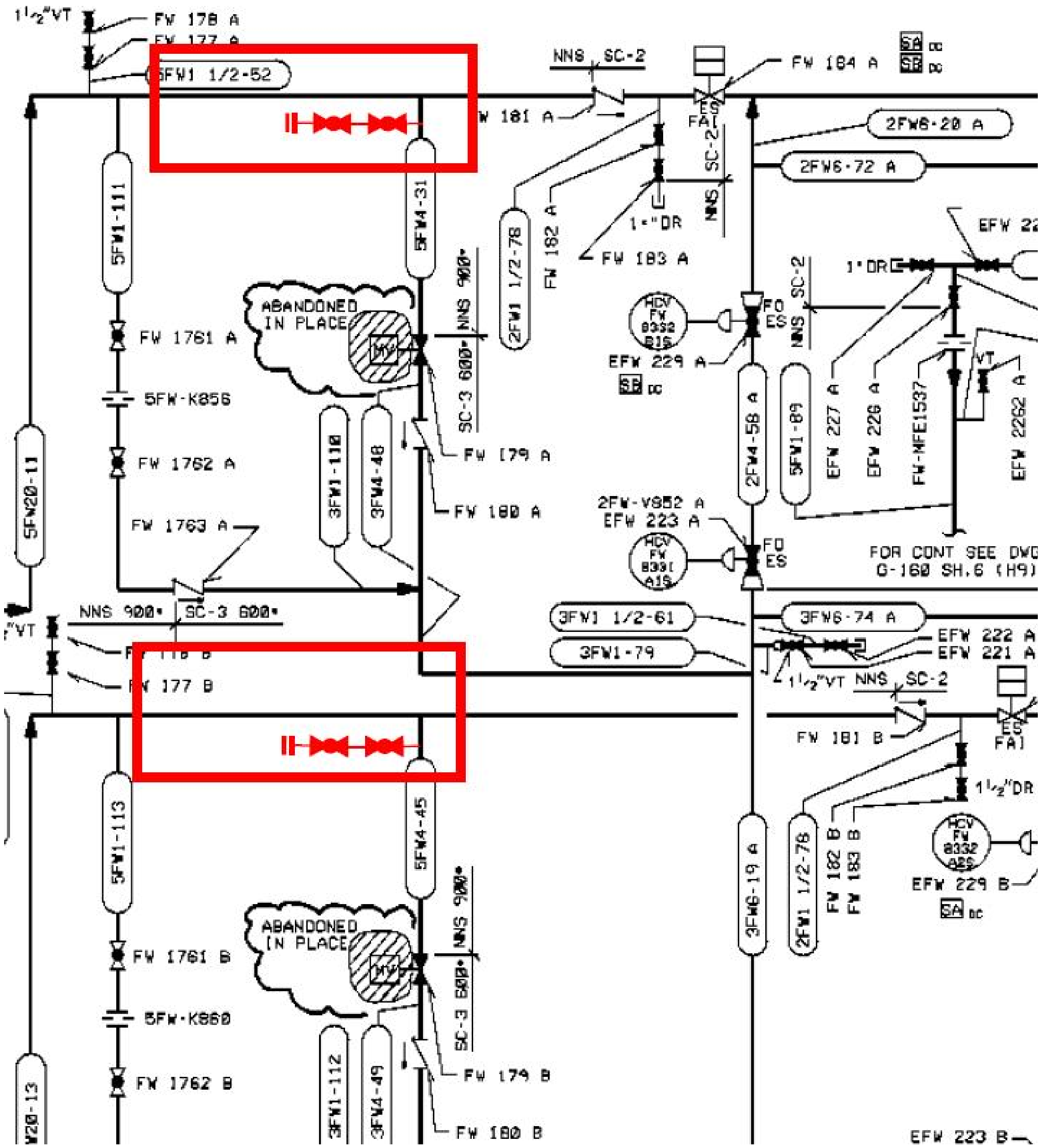

Figure G-3: Core Cooling & Heat Removal / EFW Secondary Connection

(Reference 7.c)

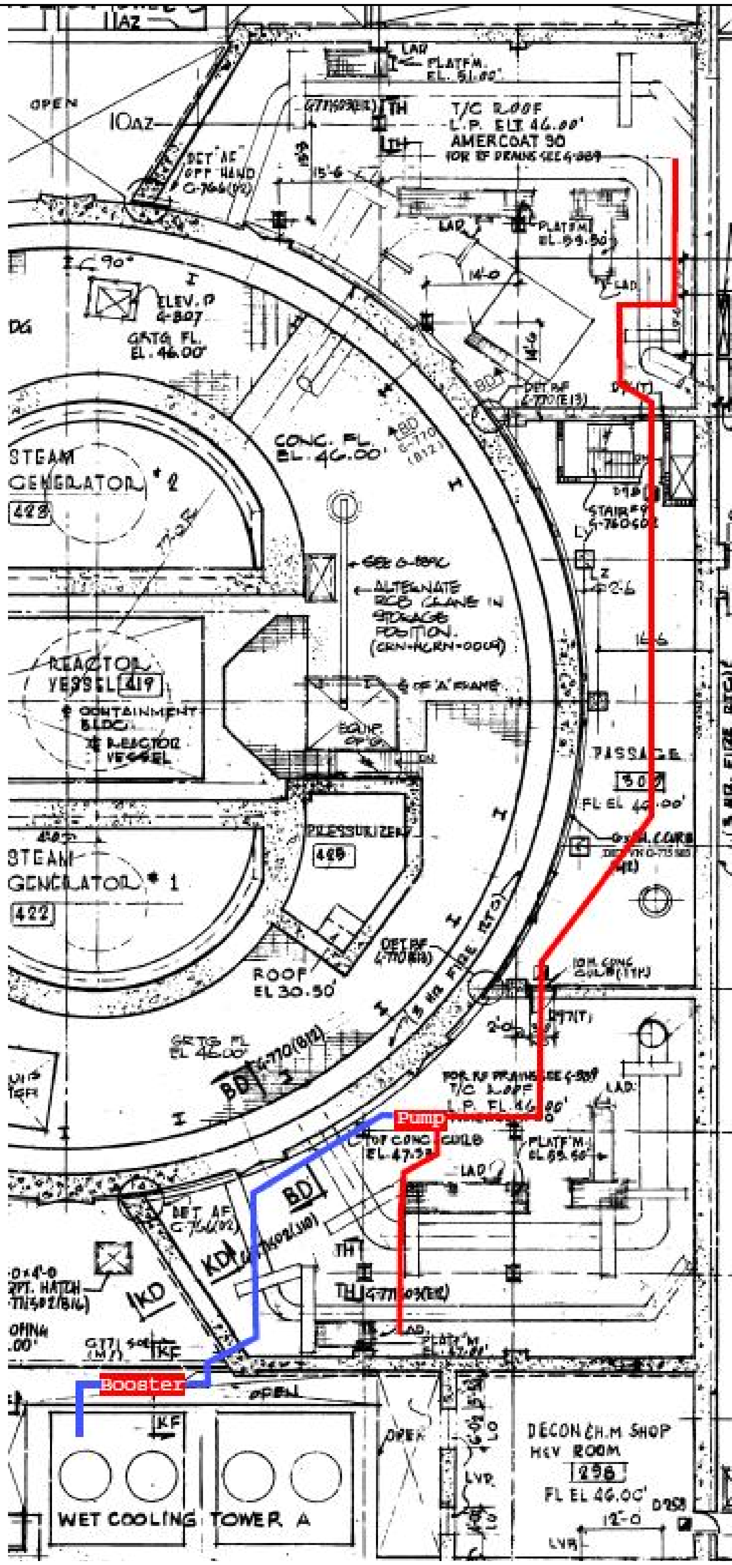

Figure G-4: Core Cooling & Heat Removal / EFW Secondary Conceptual Routing
(Reference 7.k)

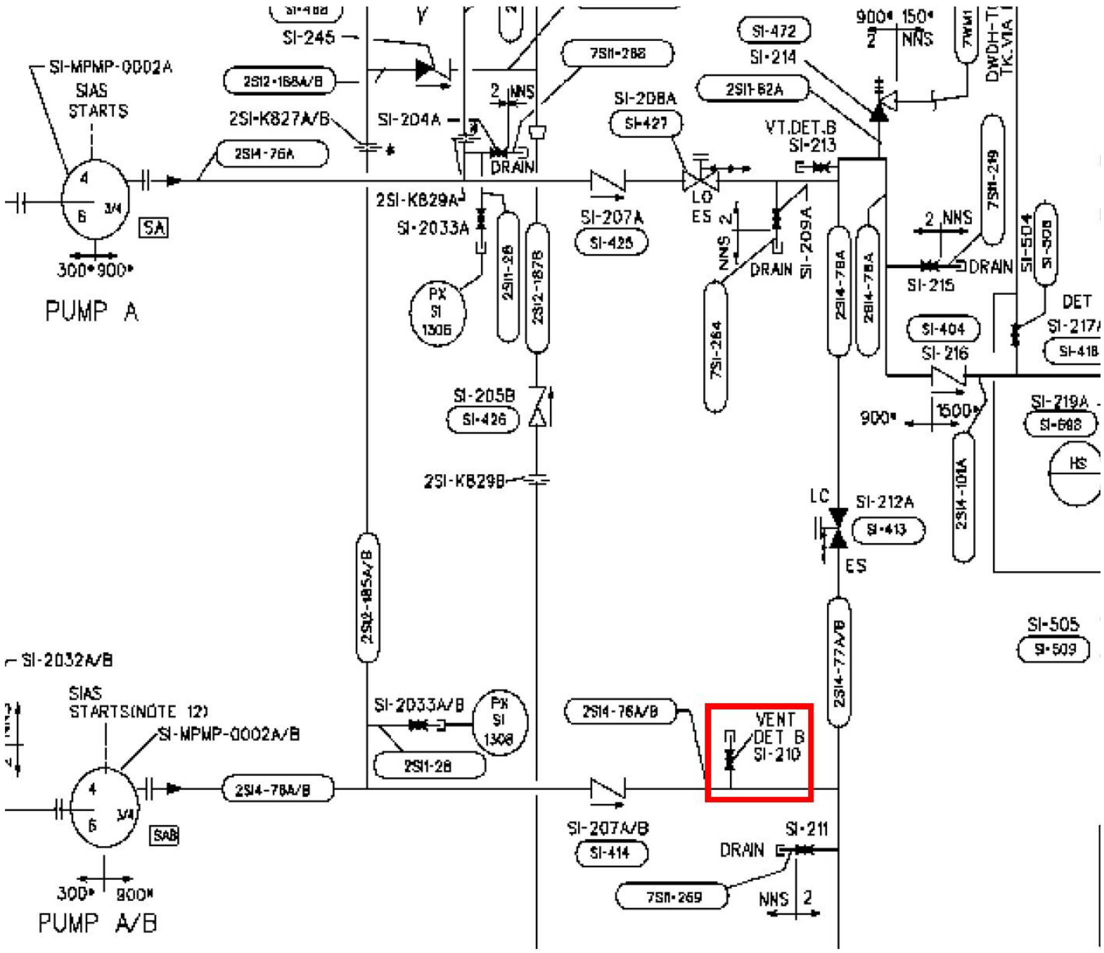

Figure G-5: RCS Inventory Primary Connection

(Reference 7.d)

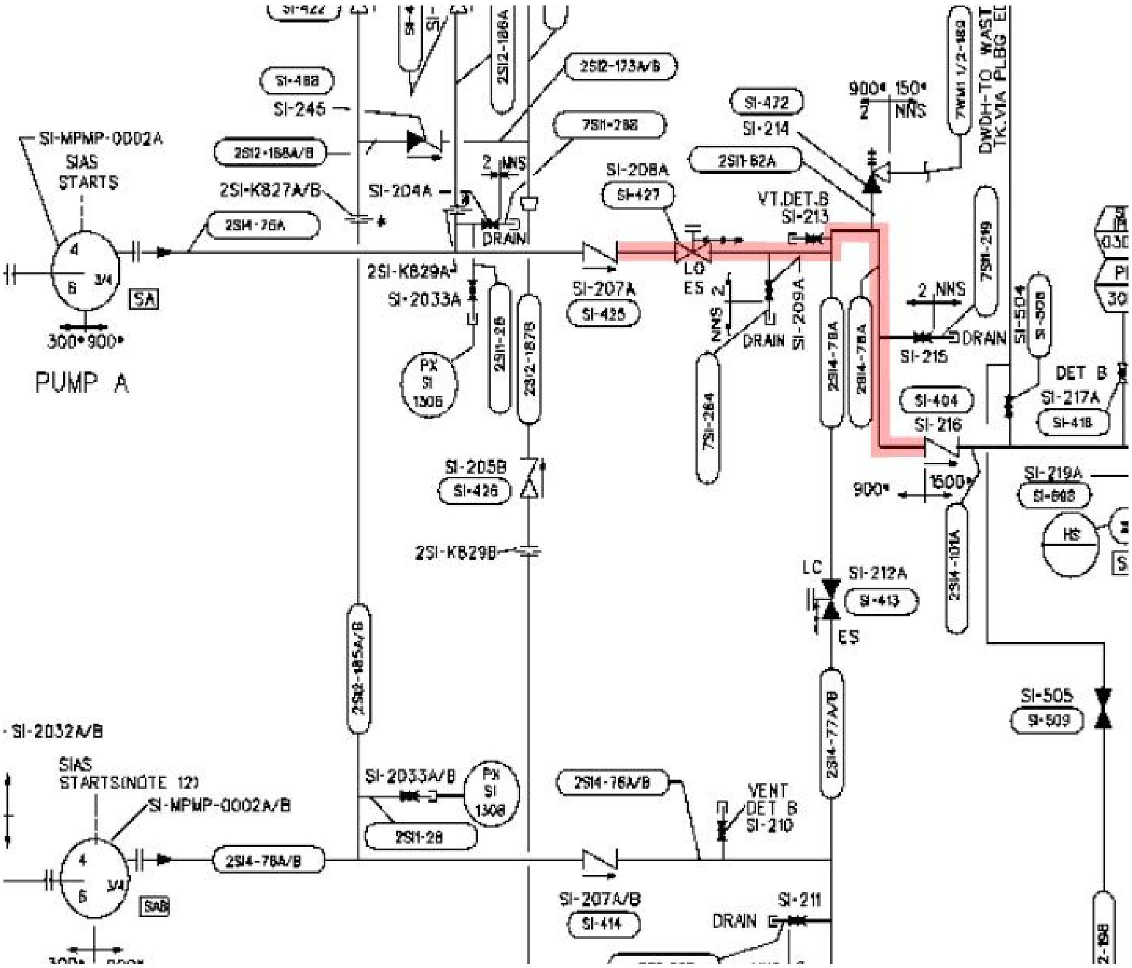

Figure G-6: RCS Inventory Secondary Connection
(Reference 7.d)

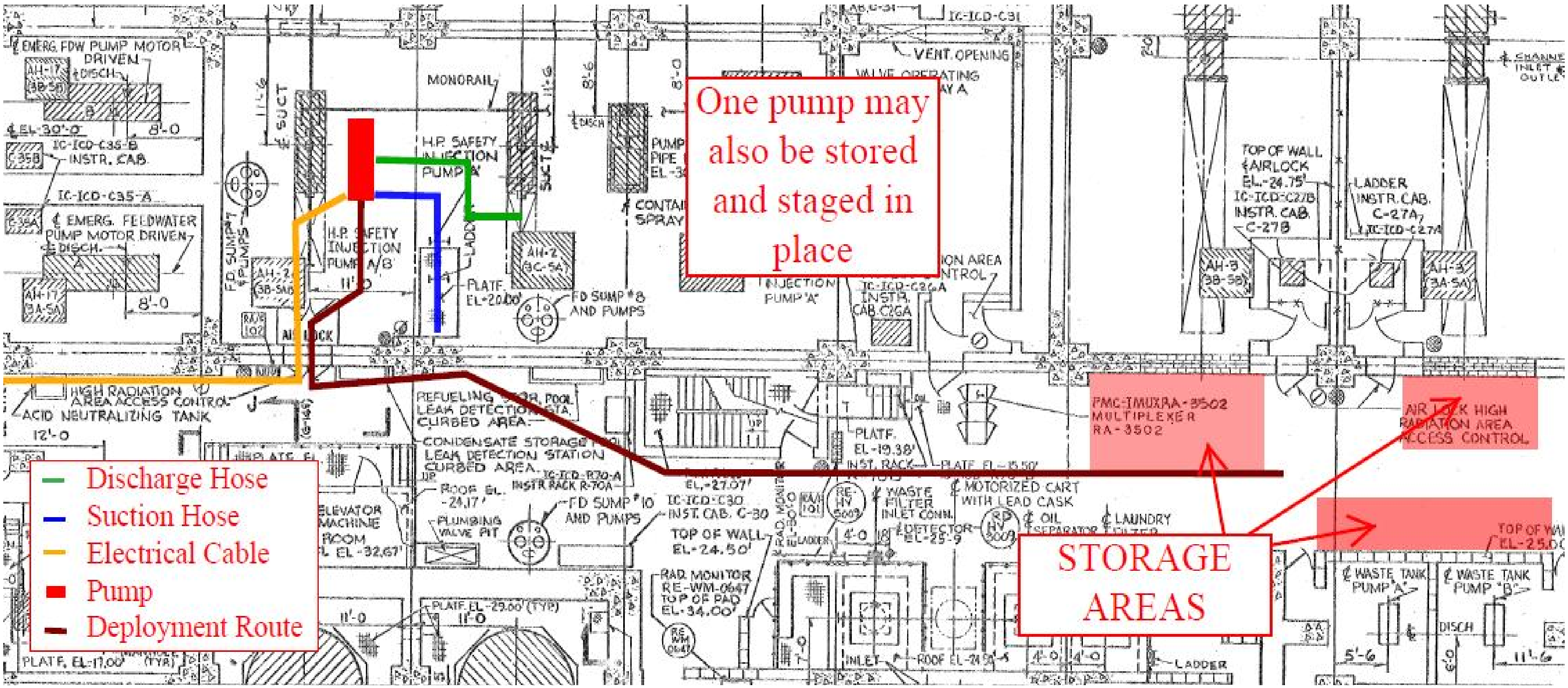

Figure G-7: RCS Inventory Primary & Secondary Conceptual Routing
(Reference 7.b)

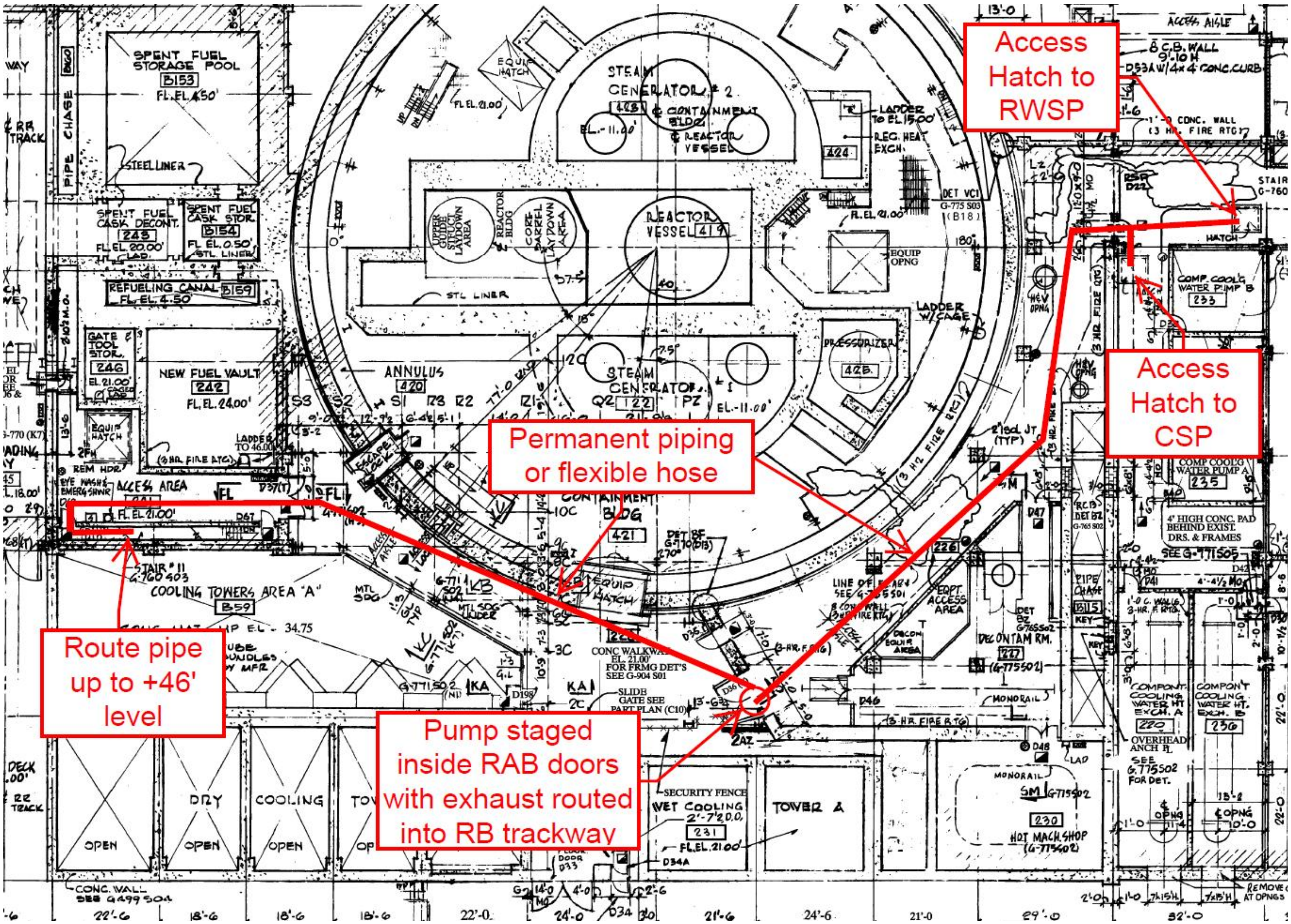

Figure G-8: Spent Fuel Pool Cooling Primary Routing
(Reference 7.e)

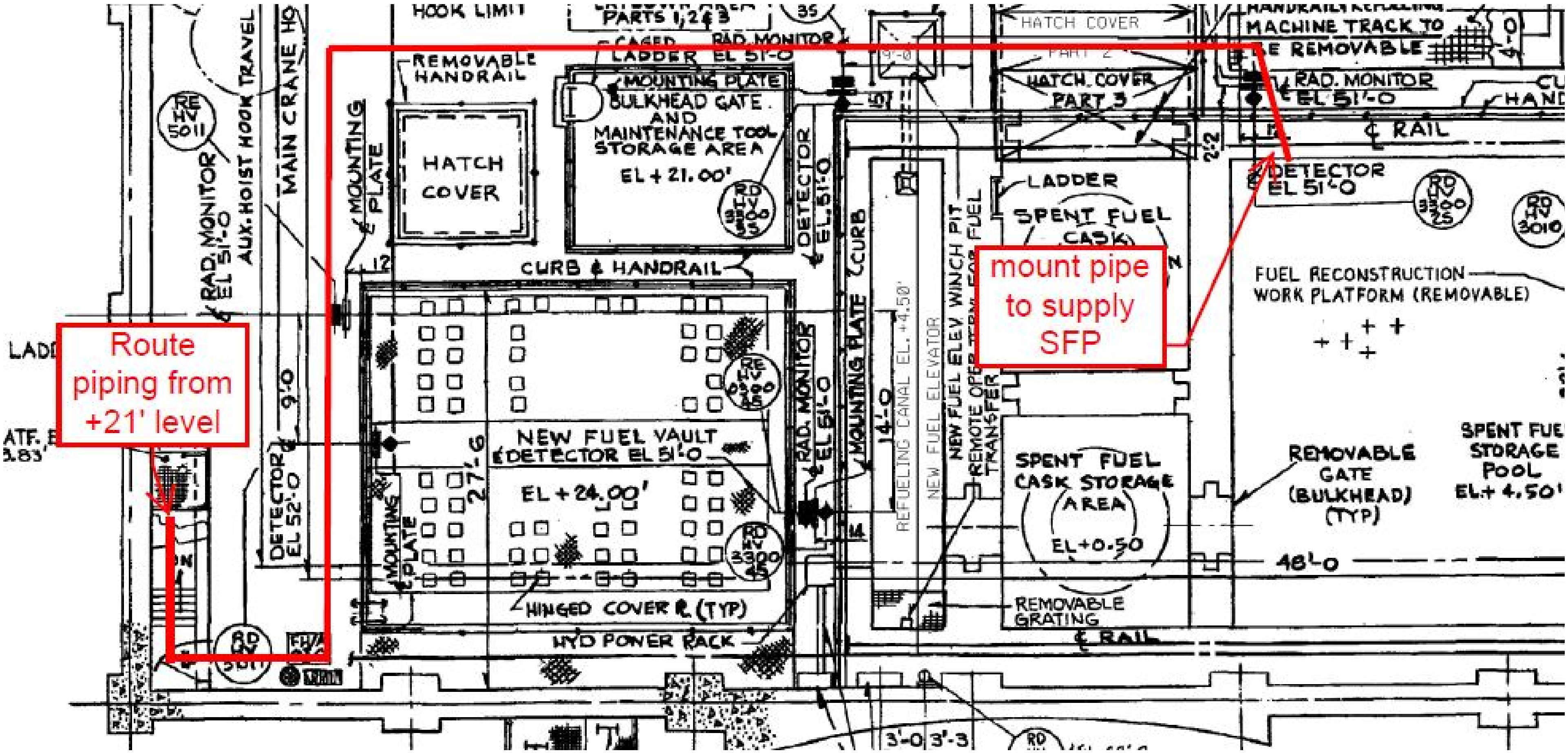

Figure G-9: Spent Fuel Pool Cooling Primary Routing (Continued)
(Reference 7.f)

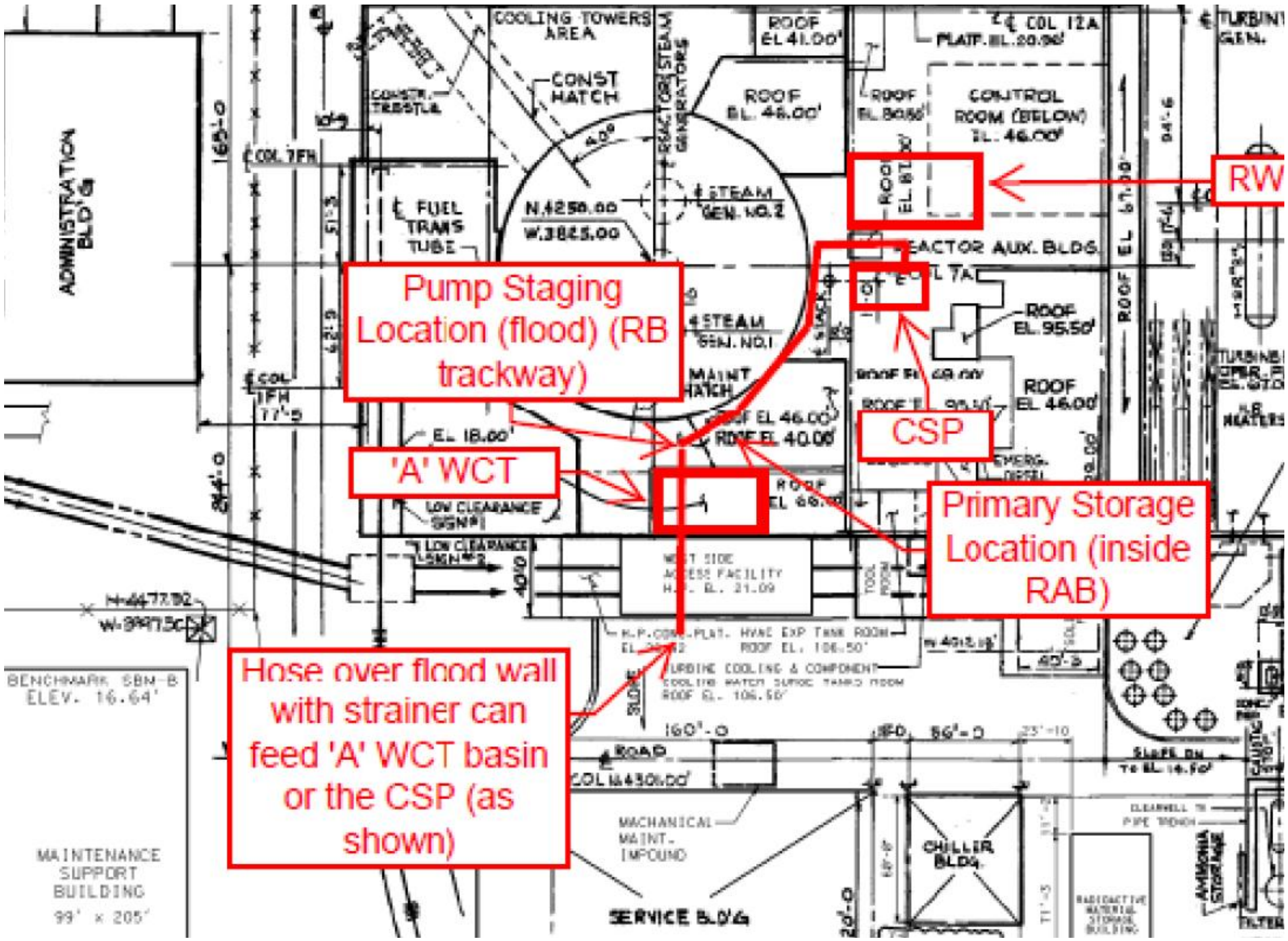

Figure G-10a: Additional Water Source Conceptual Routing – River (flooding scenario)
(Reference 7.g)

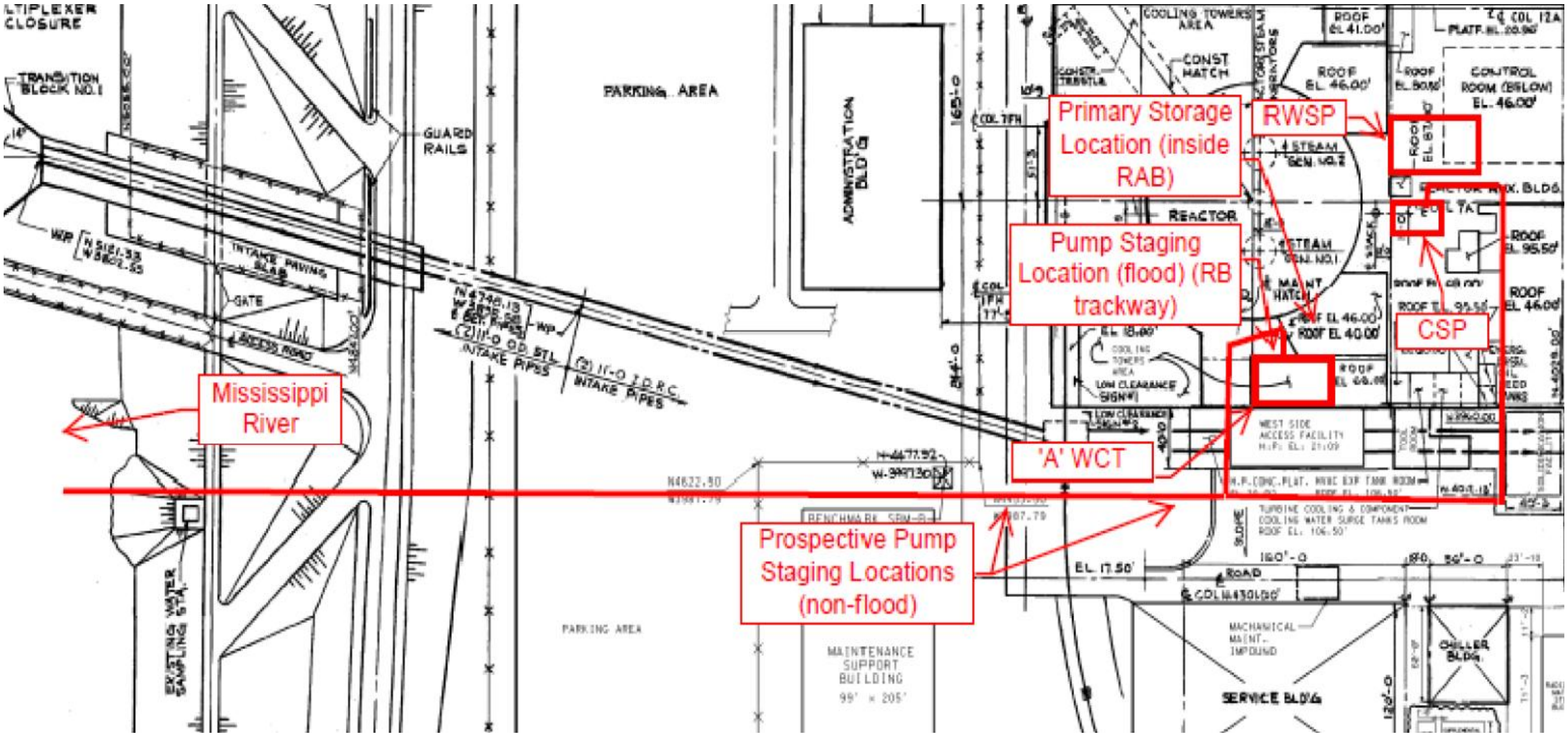

Figure G-10b: Additional Water Source Conceptual Routing – River (non-flooding scenario)
(Reference 7.g)

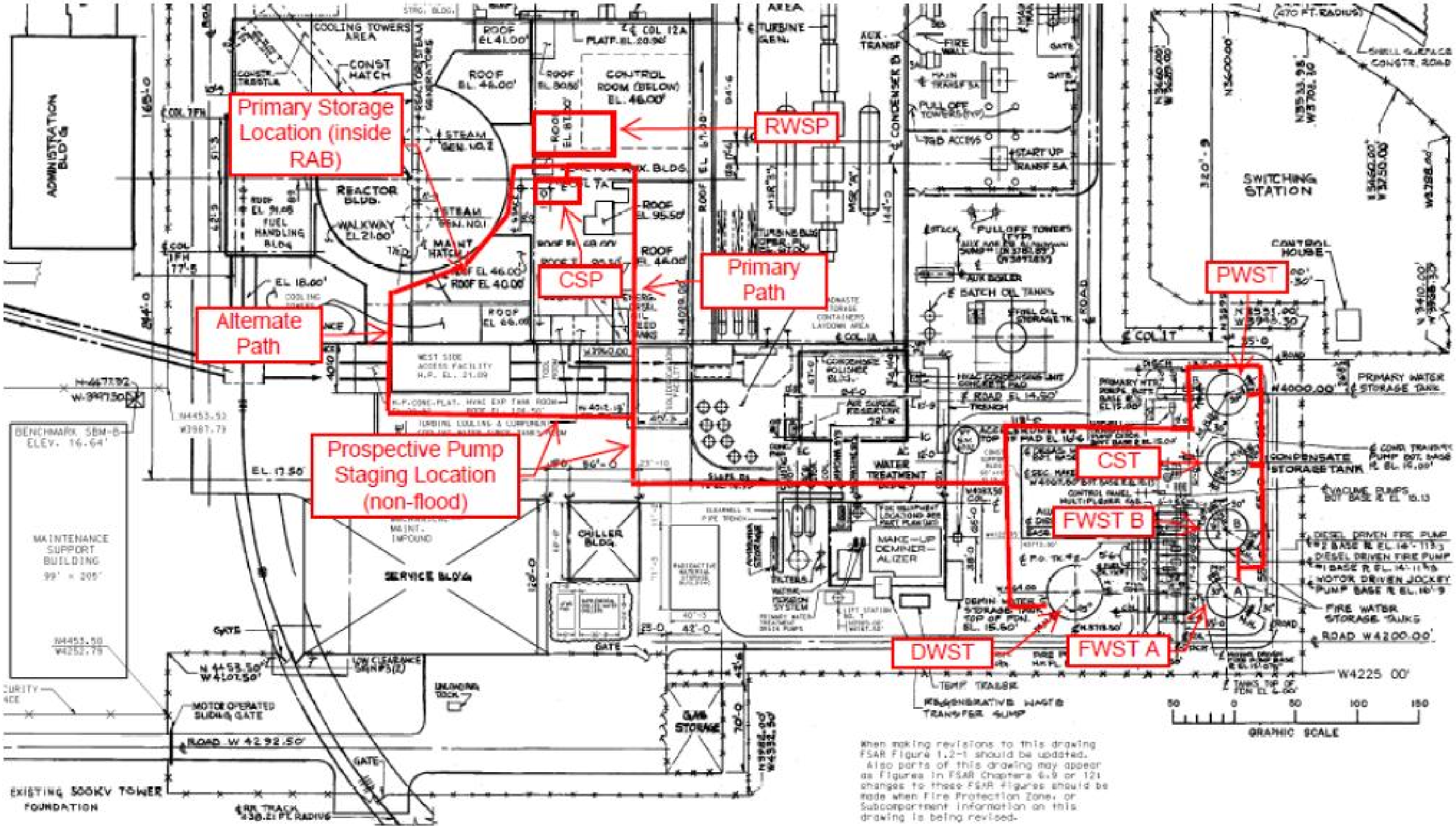

Figure G-11: Additional Water Source Conceptual Routing – Tanks

(Reference 7.g)

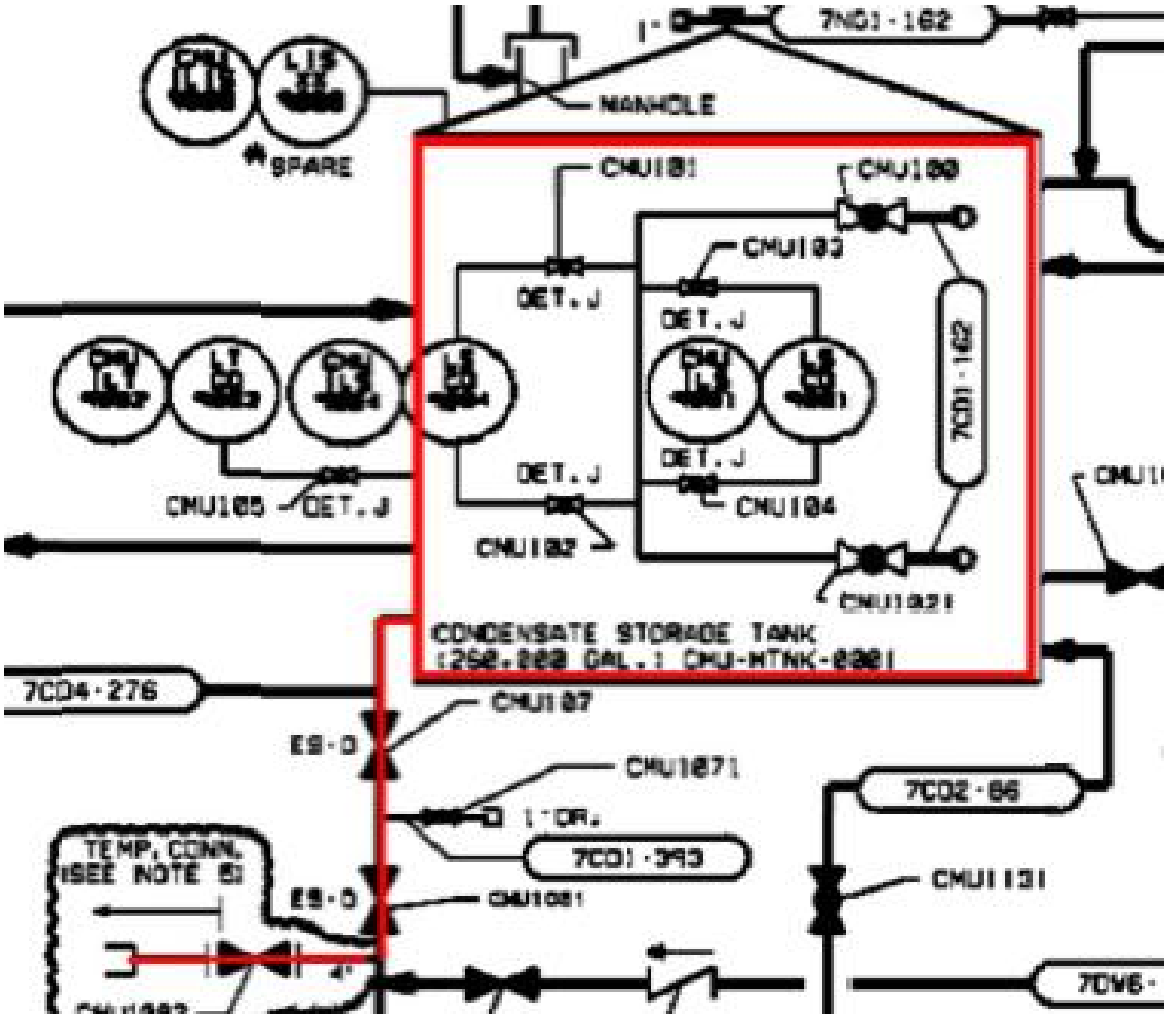

Figure G-12: Connection to CST
(Reference 7.h)

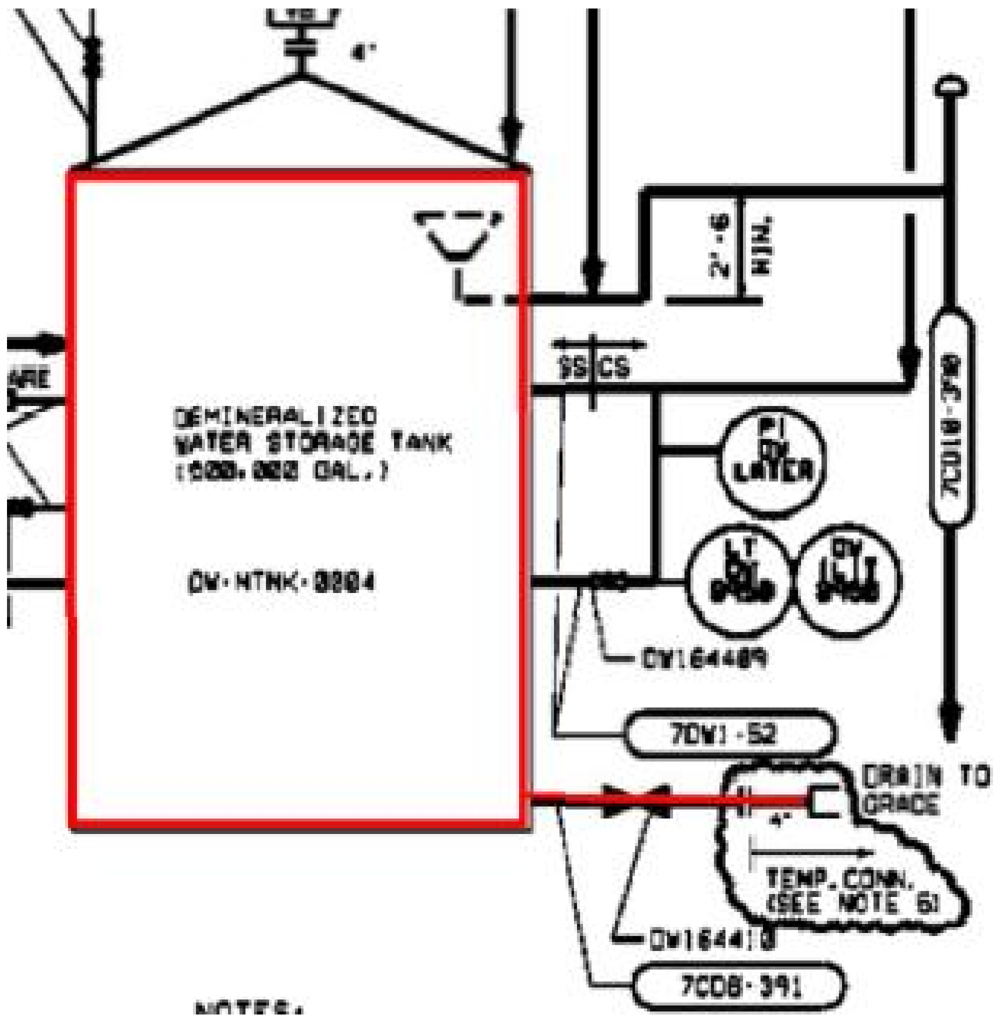

Figure G-13: Connection to DWST

(Reference 7.h)

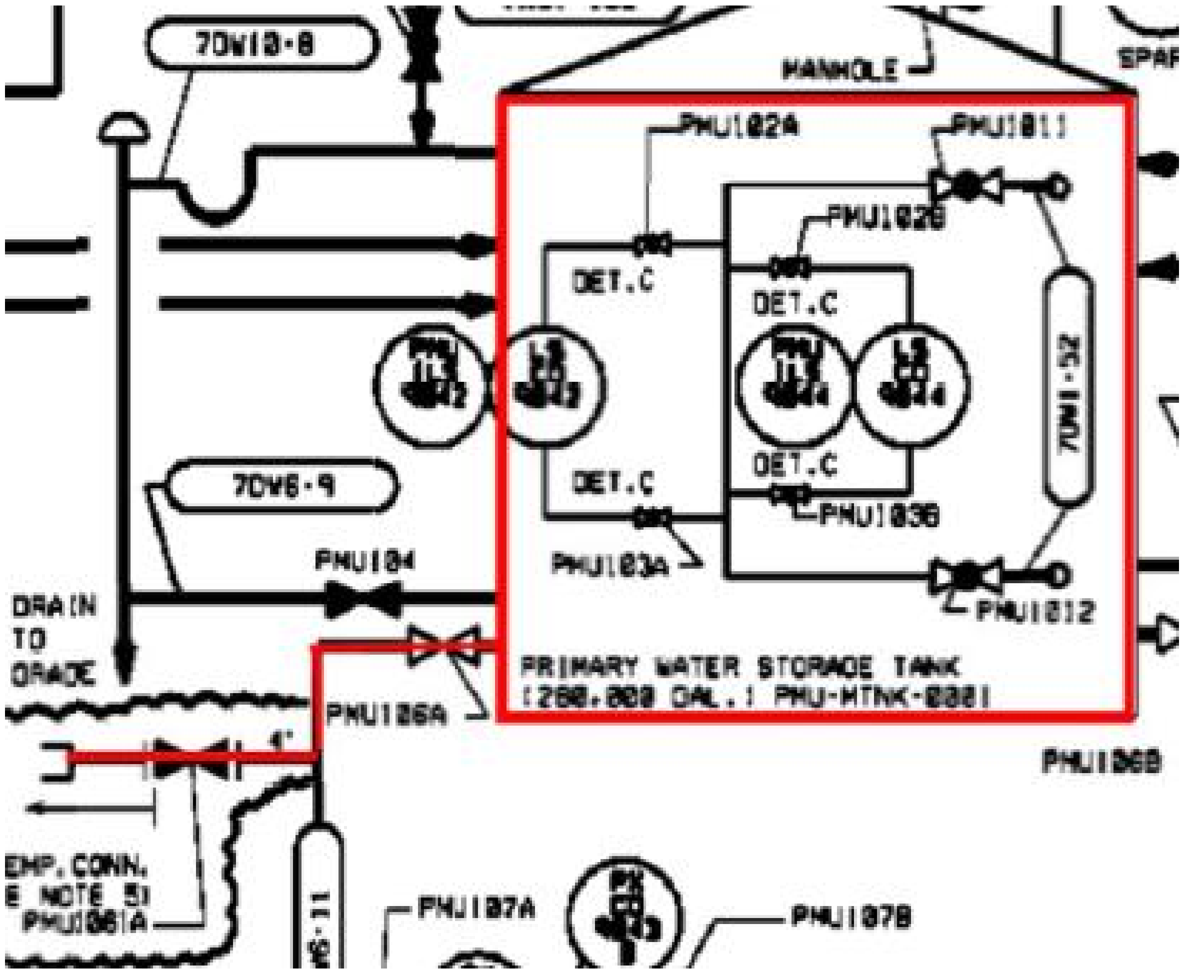

Figure G-14: Connection to PWST
(Reference 7.h)

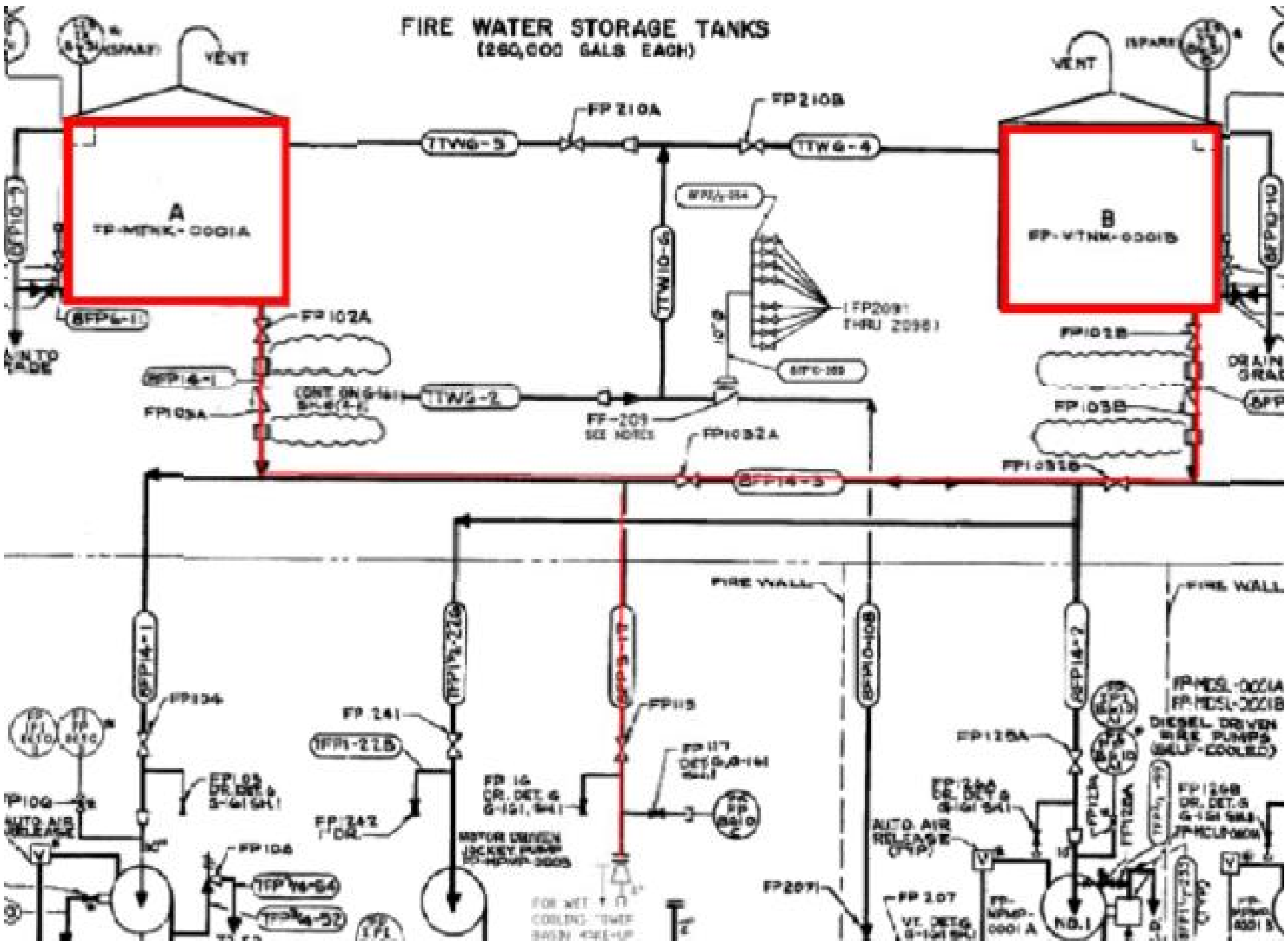

Figure G-15: Connection to FWSTs

(Reference 7.i)

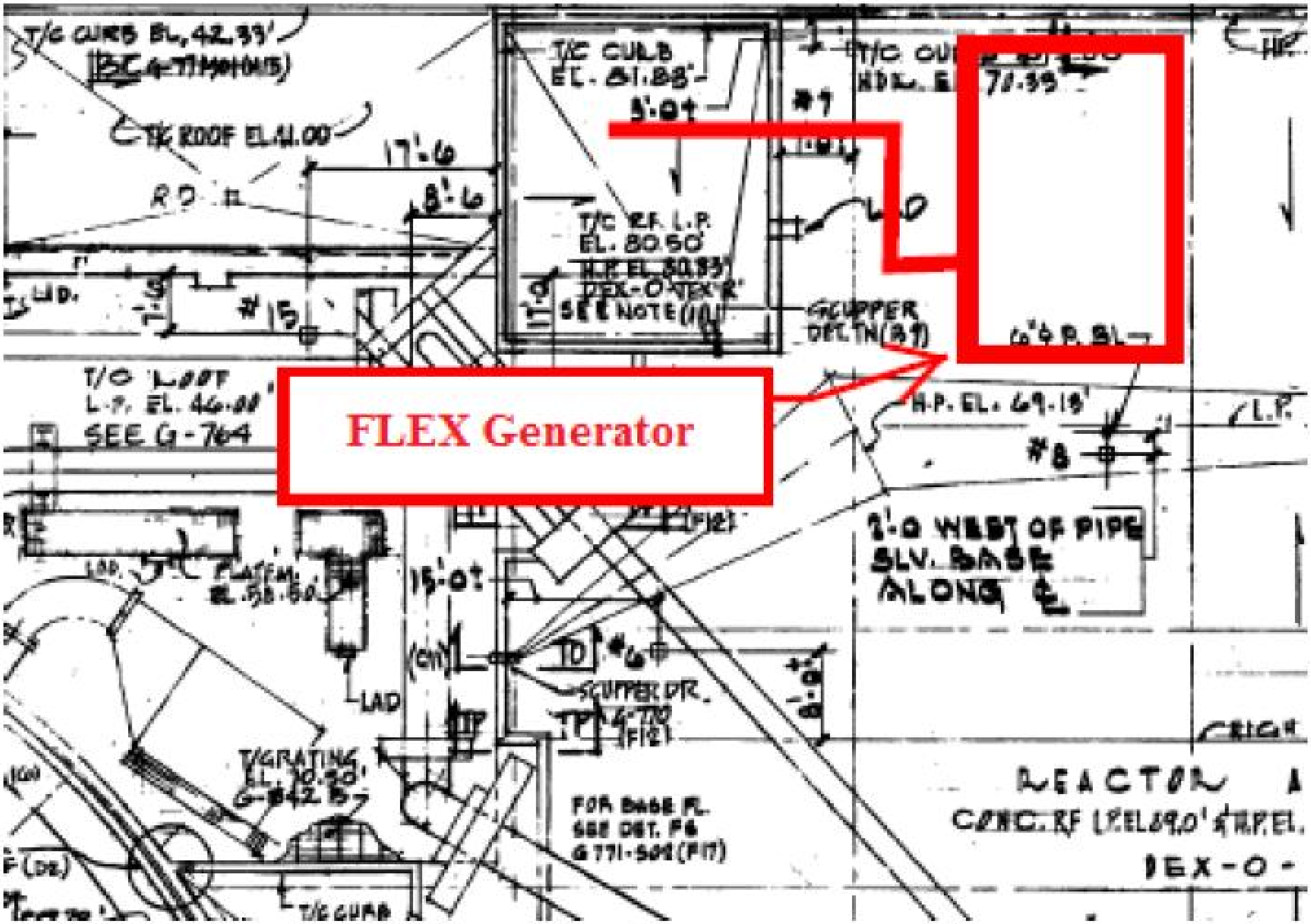

Figure G-16: Conceptual Routing from Primary FLEX Generator

(Reference 7.l)

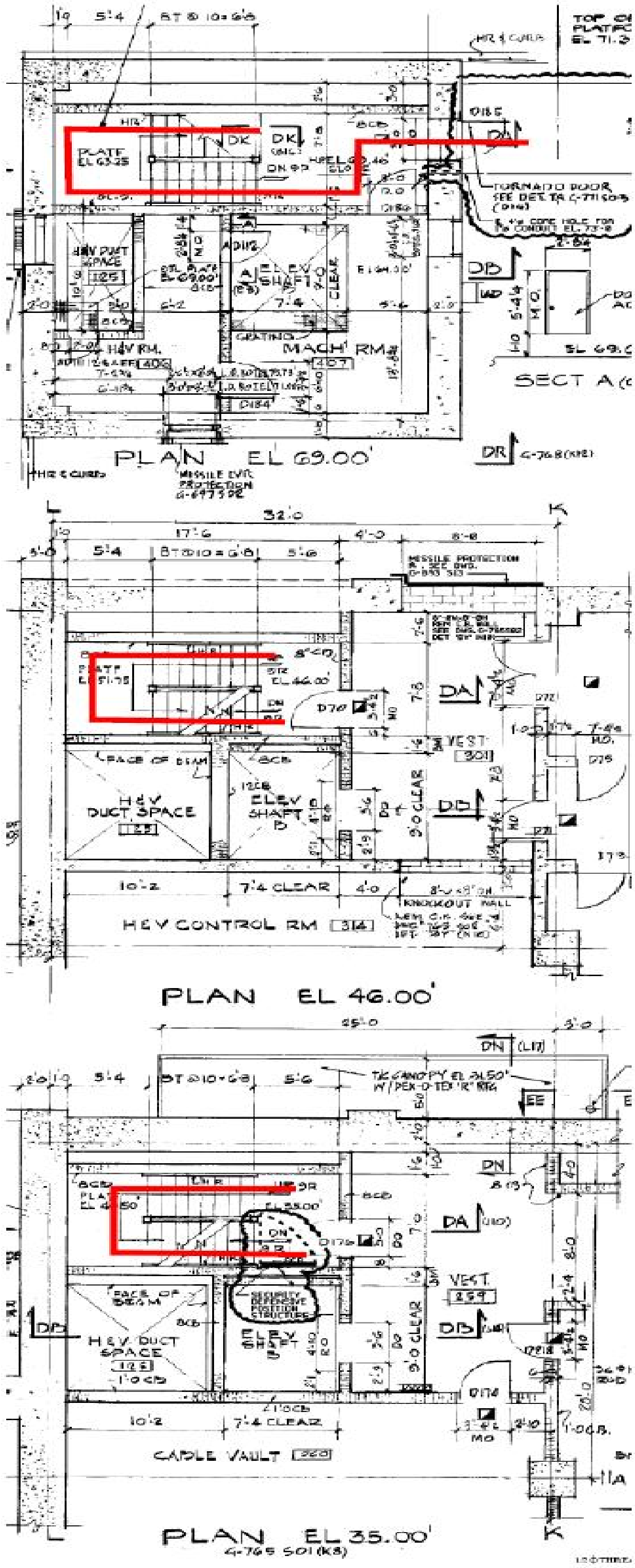

Figure G-17: Conceptual Routing from Primary FLEX Generator

(Reference 7.j)

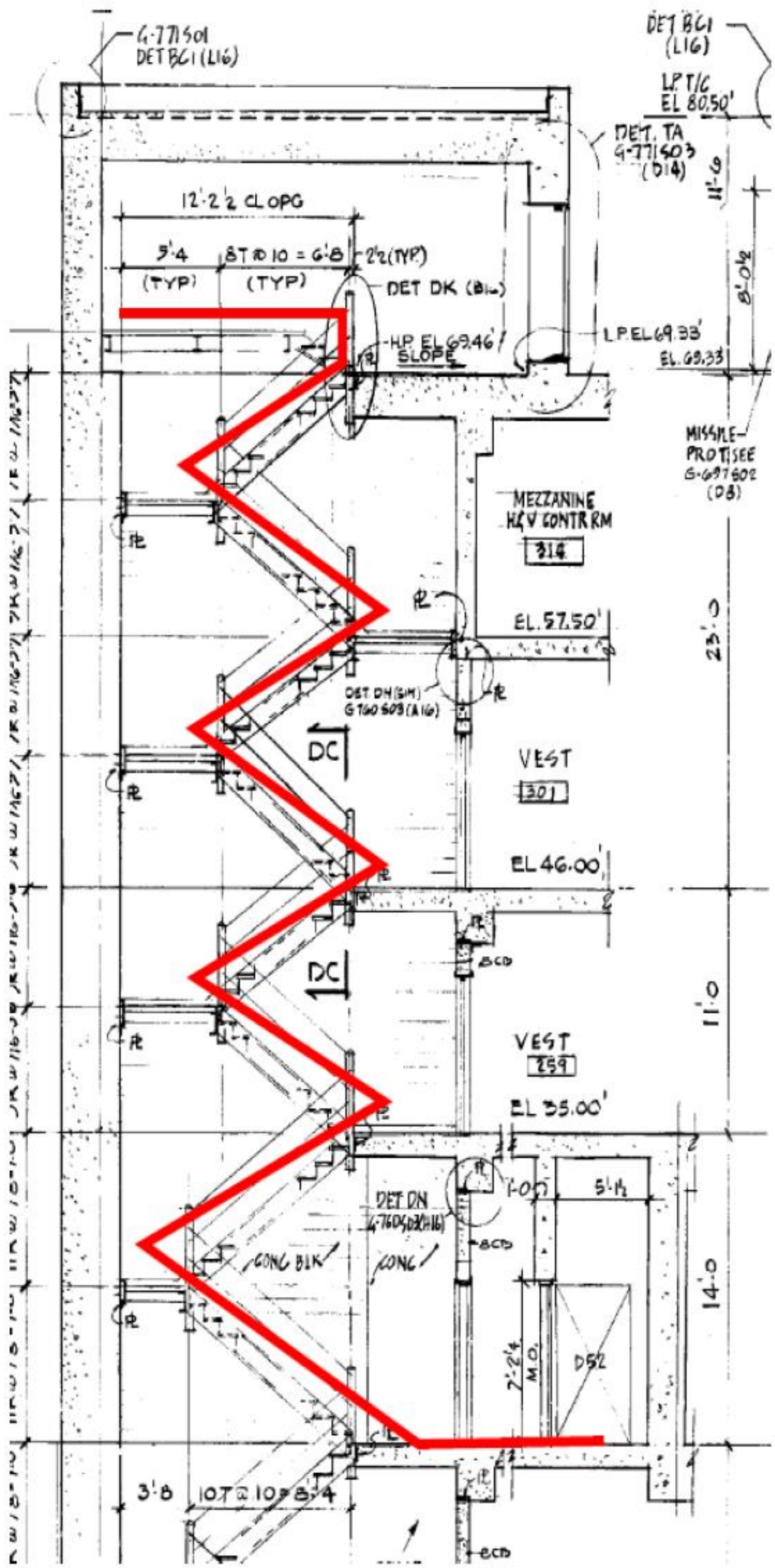

Figure G-18: Conceptual Routing from Primary FLEX Generator

(Reference 7.j)

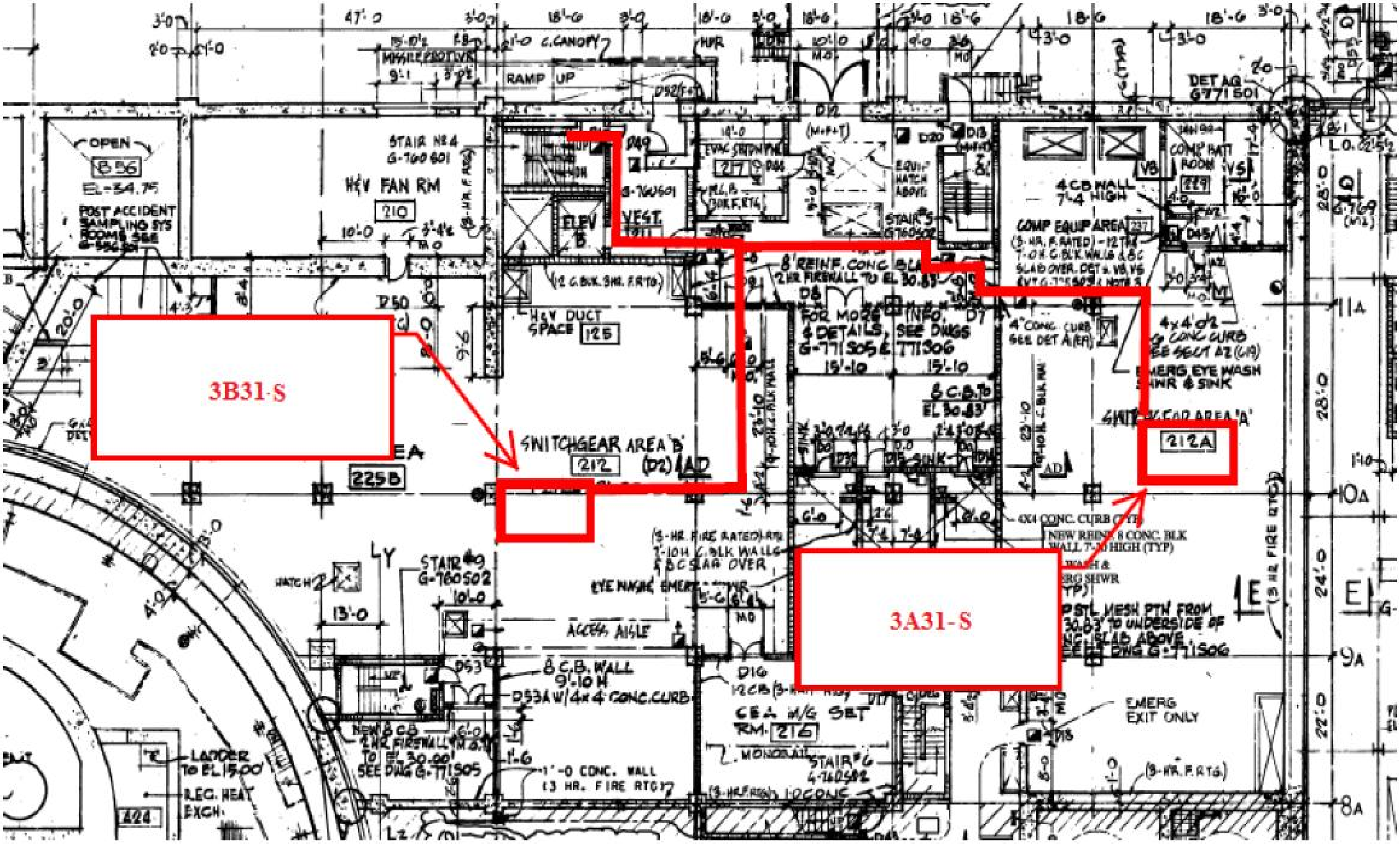

Figure G-19: Conceptual Routing from Primary FLEX Generator

(Reference 7.e)

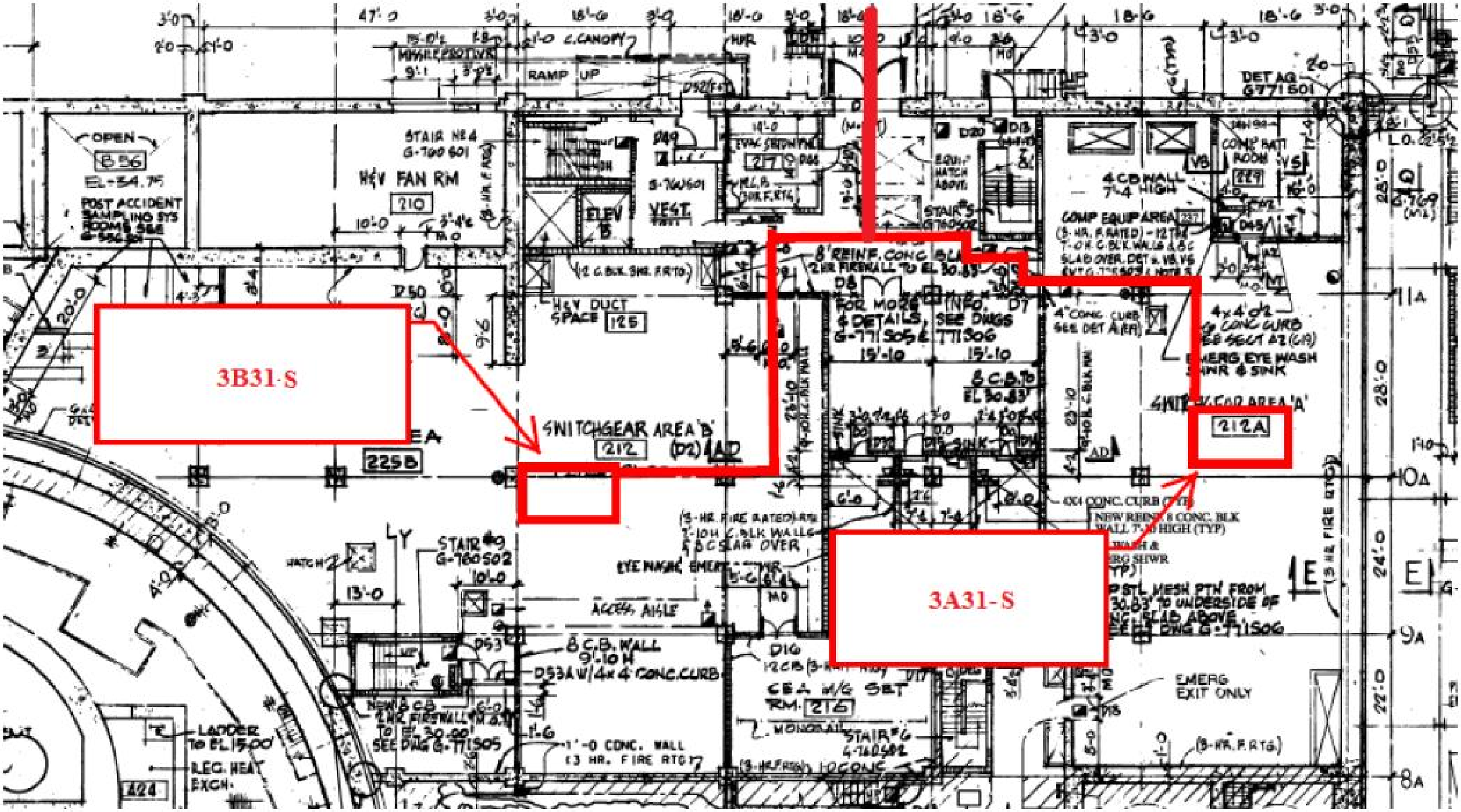

Figure G-20: Conceptual Routing from Secondary FLEX Generator
(Reference 7.e)

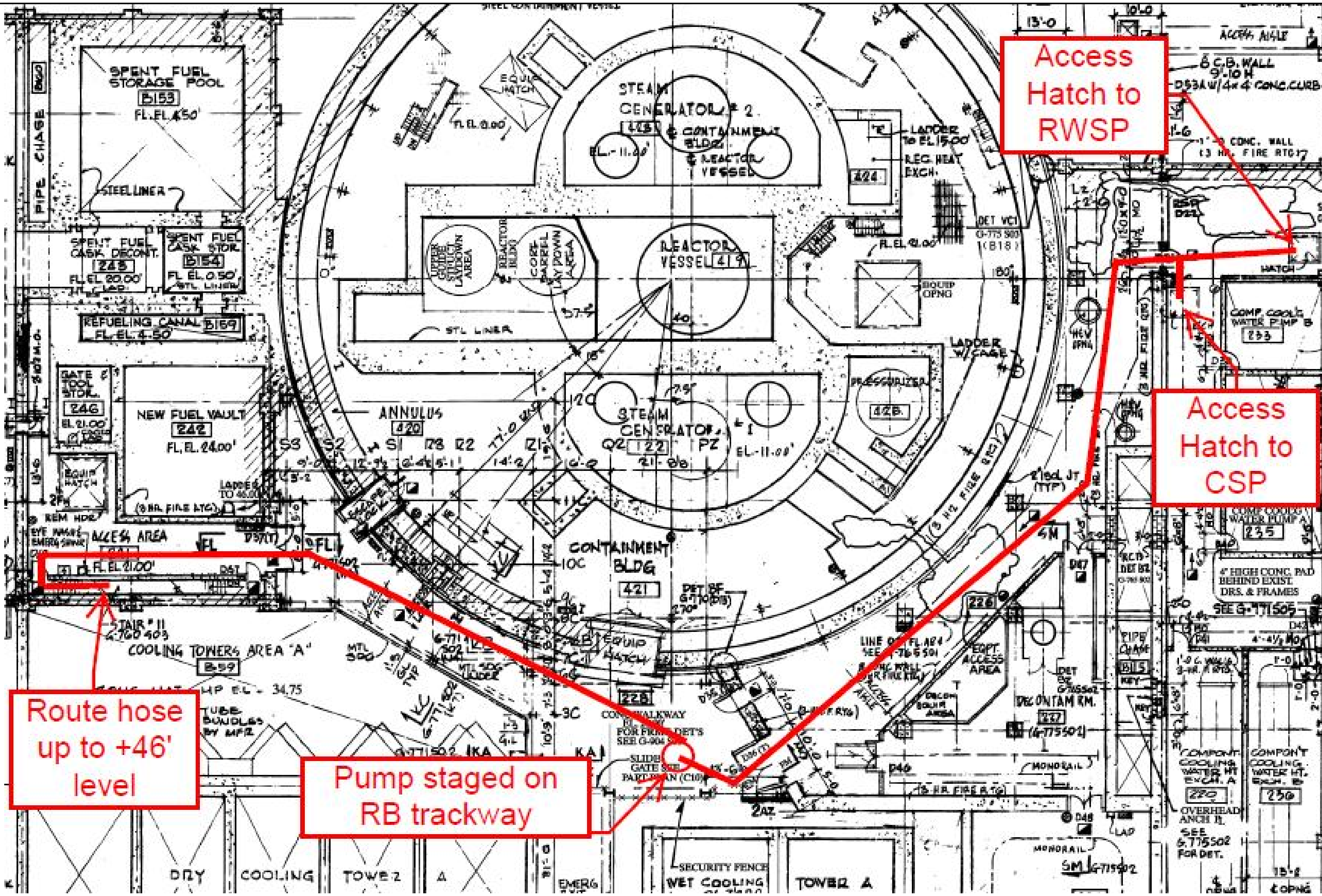

Figure G-21: Spent Fuel Pool Cooling Secondary Routing
(Reference 7.e)

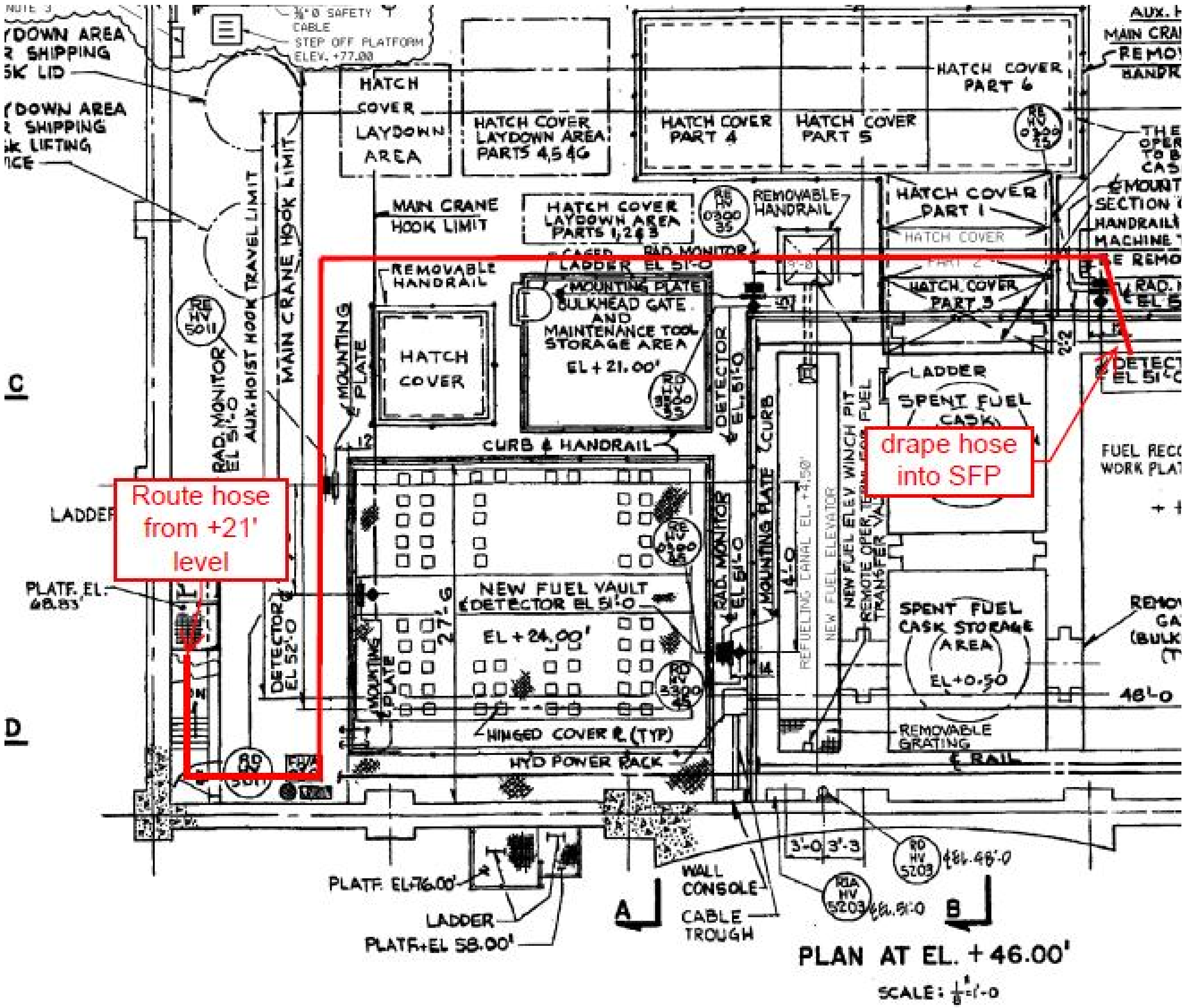

Figure G-22: Spent Fuel Pool Cooling Secondary Routing (Continued)
(Reference 7.f)