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L-14-285

10 CFR 2.202

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-001

SUBJECT:
Perry Nuclear Power Plant
Docket No. 50-440, License No. NPF-58
FirstEnergy Nuclear Operating Company's (FENOC's) Revision of Overall Integrated Plan for Perry Nuclear Power Plant 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) (TAC No. MF0962)

On March 12, 2012, the Nuclear Regulatory Commission (NRC or Commission) issued an order (Reference 1) to FENOC. Reference 1 was immediately effective and directs FENOC to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event. Specific requirements are outlined in Attachment 2 of Reference 1.

Reference 1 required submission of an overall integrated plan pursuant to Section IV, Condition C. The final interim staff guidance (Reference 2) endorses industry guidance document Nuclear Energy Institute (NEI) 12-06, Revision 0 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided the FENOC overall integrated plan for Beaver Valley Power Station (BVPS), Unit Nos. 1 and 2, Davis-Besse Nuclear Power Station (DBNPS), and Perry Nuclear Power Plant (PNPP).

As indicated in the FENOC status report provided by letter dated August 28, 2014 (Reference 5), planned strategy changes for PNPP were being incorporated into a revision of the PNPP Overall Integrated Plan (OIP). The purpose of this letter is to provide Revision 1 of the PNPP OIP (Enclosure). The extent of changes made to the OIP as a result of the revised strategies preclude the use of revision bars; therefore, the document has been revised in its entirety.

Revision 1 of the PNPP OIP includes the following three significant changes to the coping strategies:

- Change from 480 volts alternating current (Vac) to 4160 Vac alternate power source
- Change from Suppression Pool "Feed and Bleed" to Suppression Pool Closed Loop Cooling
- Change from portable pumps at the barge slip to portable pumps in the Emergency Service Water Pumphouse (ESWPH)

The strategy changes incorporated into this revision do not impact compliance with Reference 3.

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact Mr. Thomas A. Lentz, Manager – Fleet Licensing, at 330-315-6810.

I declare under penalty of perjury that the foregoing is true and correct. Executed on September 25, 2014.

Respectfully,

Ernest J. Harkness

Enclosure:
Overall Integrated Plan for Perry Nuclear Power Plant, Revision 1

References:

1. NRC Order Number EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012
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
3. NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 0, dated August 2012
4. FirstEnergy Nuclear Operating Company's (FENOC's) Overall Integrated Plan 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 February 27, 2013
5. FirstEnergy Nuclear Operating Company's (FENOC's) Third 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 August 28, 2014

cc: Director, Office of Nuclear Reactor Regulation (NRR)
NRC Region III Administrator
NRC Resident Inspector (PNPP)
NRC Project Manager (PNPP)
Ms. Jessica A. Kratchman, NRR/JLD/PMB, NRC

ENCLOSURE
L-14-285

Overall Integrated Plan for Perry Nuclear Power Plant, Revision 1
(82 pages follow)

General Integrated Plan Elements

Determine Applicable Extreme External Hazard **Ref: NEI 12-06 Sections 4.0 - 9.0** **JLD-ISG-2012-01 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.*

The Perry Nuclear Power Plant (PNPP) site has been evaluated and the following external hazards have been identified:

- Seismic
- External Flooding
- Severe Storms With High Winds
- Snow, Ice And Extreme Cold
- Extreme Heat

The PNPP site has been reviewed against the Nuclear Energy Institute (NEI) Flexible and Diverse Coping Mitigation Strategies (FLEX) guidance (Reference 2) and it has been determined that the FLEX equipment should be protected from seismic, external flooding, severe storms with high winds, snow, ice and extreme cold, and extreme high temperatures (Reference 9). PNPP 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. PNPP is also developing procedures and processes to further address plant strategies for responding to these various hazards.

Seismic:

Per the Updated Safety Analysis Report (USAR) (Reference 4, Section 2.5), Seismic Input, the seismic criteria for PNPP includes two design basis earthquake spectra: Operating Basis Earthquake (OBE) and the Safe Shutdown Earthquake (SSE). The site seismic design response spectra define the vibratory ground motion of the OBE and the SSE. The maximum horizontal acceleration for the SSE is 0.15g. The OBE has a maximum horizontal acceleration of 0.075g. The maximum vertical response spectra for SSE are 0.15g and for OBE is 0.075g. Design response spectra for the SSE and OBE comply with Regulatory Guide 1.60.

Based on the FLEX guidance in Reference 2, seismic impact must be considered for all nuclear plant sites. As a result, the credited FLEX equipment needs to be assessed based on the current PNPP seismic licensing basis to ensure that the equipment remains accessible and available after a Beyond Design Basis External Event (BDBEE), and that the FLEX equipment does not become a target or source of a seismic interaction from other systems, structures or components. This assessment needs to include documentation ensuring that any storage location and deployment routes meet the FLEX criteria.

External Flooding:

The flood assessment for the PNPP site provided in Reference 4 considered four prospective sources of flooding: Lake Erie, intense local precipitation, and flooding by two small, nameless streams that border the site to the east and south. Flooding from Lake Erie is extremely improbable because the maximum monthly mean lake elevation is approximately 45 feet below plant final grade elevations (617 to 620 feet per United States Geological Survey). Localized flooding from the streams during a Probable Maximum Flood (PMF) will not affect plant buildings or equipment. The PMF reaches an elevation of 620’5”; however, the site building floor elevations are at an elevation of 620’6”. Localized ponding may occur but the resulting increase in surface elevation of water flowing over the surrounding roads and railroads (acting as weirs) would not exceed one inch.

In summary, safety-related equipment is protected from the PMF. Floor elevations of safety-related structures are above the PMF. Therefore, PNPP is considered a "dry" site and external flooding is NOT applicable to the PNPP site.

PNPP is developing procedures and strategies for delivery of offsite FLEX equipment during Phase 3 that considers regional impacts from flooding.

Severe Storms With High Winds:

NEI 12-06 (Reference 2), Figures 7-1 and 7-2 were used for this assessment. Figure 7-1 indicates that the high wind speed from a hurricane does not exceed 130 mph. Figure 7-2 indicates a maximum wind speed of 188 mph for PNPP. Therefore, high wind hazards are applicable to the PNPP site.

Snow, Ice And Extreme Cold:

Per the FLEX guidelines (Reference 2) all sites should consider the temperature ranges and weather conditions for their site for storing and deploying their FLEX equipment. That is, FLEX equipment should be suitable for use in the anticipated range of conditions for the site, consistent with normal design practices.

NEI 12-06 (Reference 2) discusses the potential for blockage of the intake structure. In extreme low temperatures it is possible that the cooling lake will develop frazil ice on its surface; however, the intake structures to the Ultimate Heat Sink (UHS) are approximately 2,600 feet offshore and well below the surface of the water. The possibility of floating ice sheets or frazil ice blocking the ports is very remote. For the very unlikely case where complete blockage of the intake structures would occur, water can be drawn from the discharge tunnel. Therefore, flow blockage from ice is NOT applicable to the PNPP site.

Applicability of snow and extreme cold:

The PNPP site is above the 35th parallel; therefore, the FLEX strategies must provide the capability to address the impedances caused by extreme snowfall with snow removal equipment, as well as the challenges that extreme cold temperatures may present. On Figure 8-1 of Reference 2, PNPP is located in the area identified as purple and pink, which indicates that 3-day snowfalls up to 36 inches should be anticipated. The maximum 24-hour snowfall observed was 26.5 inches, which occurred at Erie, Pennsylvania in December 1944. The minimum-recorded temperature in the area around the PNPP site is -20°F and occurred in Geneva per Reference 4, Table 2.3-4. Therefore, snow and extreme cold hazards are applicable to the PNPP site.

Applicability of ice storms:

The PNPP site is a Level 3 region as defined by Figure 8-2 of the NEI FLEX Implementation Guide (Reference 2). Therefore, ice storms are applicable to the PNPP site.

In summary, based on the available local data and Figures 8-1 and 8-2 of NEI 12-06, the PNPP site experiences significant amounts of snow, ice, and extreme cold temperatures. Therefore, snow, ice, and extreme cold temperature hazards are applicable to the PNPP site.

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 should consider the impacts of these conditions on the FLEX equipment and its deployment.

The maximum-recorded temperature in the area around the PNPP site was 103°F and occurred in Cleveland per Reference 4, Table 2.3-4.

In summary, based on the available local data and industry estimates, the PNPP site does not experience extreme high temperatures. However, per NEI 12-06, all sites will address high temperatures. Therefore, high temperatures are applicable to the PNPP site. Selection of FLEX equipment the PNPP site 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. **Ref: NEI 12-06 Section 3.2.1**	*Provide key assumptions associated with implementation of FLEX strategies:*

NEI 12-06 Assumptions

Section 3.2.1 of NEI 12-06 provides the following assumptions.

<u>Initial Plant Conditions</u>

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.

<u>Initial Conditions</u>

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 alternating current (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, and high winds, and associated missiles are available.

A6. Normal access to the UHS is lost, but the water inventory in the 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 lost with no prospect for recovery.

A7. Fuel for FLEX equipment stored in structures with designs that are robust with respect to seismic events, floods 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, 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 10 Code of Federal Regulations (CFR) 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, 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 (SRVs) initially operate in a normal manner if conditions in the reactor pressure vessel (RPV) so require. Normal valve reseating is also assumed.

A16. No independent failures, other than those causing the extended loss of all AC power/loss of normal access to the ultimate heat sink (ELAP/LUHS) event, are assumed to occur in the course of the transient.

Reactor Coolant Inventory Loss

Sources of expected boiling water reactor (BWR) 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 BWR recirculation pump seal leakage.

A20. BWR inventory loss due to operation of steam-driven systems, Safety Relief Valve (SRV) cycling, and RPV depressurization.

Spent Fuel Pool (SFP) Conditions

The initial SFP conditions are:

A21. All boundaries of the SFP are intact, including the liner, gates, transfer canals, etc.

A22. 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.

A23. SFP cooling system is intact, including attached piping.

A24. SFP heat load assumes the maximum design basis heat load for the site.

Containment Isolation Valves

A25. It is assumed that the containment isolation actions delineated in current station blackout coping capabilities is sufficient.

Site Specific Assumptions:

The following assumptions are specific to the PNPP site:

A26. PNPP will be able to identify an ELAP condition within 1 hour in order to enable actions which place the plant outside of the current design and licensing basis.

A27. Considerations for exceptions to the site security plan or other license/site specific requirements will be included in the FLEX Support Guidelines (FSGs).

A28. 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 and addressed on a schedule commensurate with other licensing bases changes.

A29. To support time sensitive FLEX actions, it is assumed adequate staffing levels will be available. 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 Guideline For Assessing Beyond Design Basis Accident Response Staffing And Communications Capabilities, 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.

A30. This plan defines strategies capable of mitigating a simultaneous loss of all 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 Emergency Operating Procedure (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 its Security Plan, as such, may warrant invocation of 10 CFR 50.54(x) and/or 10 CFR 73.55(p).

A31. Instrumentation of 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. **Ref: JLD-ISG-2012-01** **NEI 12-06 Section 13.1**	*Include a description of any alternatives to the guidance, and provide a milestone schedule of planned action*

PNPP plans to fully comply with the guidance in JLD-ISG-2012-01, Reference 3, and NEI 12-06 Reference 2, in implementing FLEX strategies for the PNPP site. Milestone schedule updates are now reflected in the six-month status reports.

Provide a sequence of events and identify any time constraint required for success including the technical basis for the time constraint. **Ref: NEI 12-06 Section 3.2.1.7** **JLD-ISG-2012-01 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).*

The sequence of events and any associated time constraints are identified for PNPP Modes 1 through 4 strategies for FLEX Phase 1 through Phase 3. These actions are bounding when compared to Mode 5, 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. The time and resources required to complete these tasks have been developed using plant staff walkthroughs and tabletop evaluations. The times stated are taken to be the elapsed time after the loss of power due to the external event. Time sensitive completion times are included.

Discussion of time constraints identified in Attachment 1A table.

1. Within 30 minutes perform cross tie of Unit 1 to Unit 2 Batteries
2. Prior to 1 hour, declare ELAP (Table item 3). This declaration allows actions to be taken which place plant components outside of the current licensing basis. This action is required at this time so that the FLEX load shed actions can be initiated at one hour after the event. As soon as the ELAP is declared, operators will contact the National Safer Response Center (NSRC) (formerly the Regional Response Center (RRC)) to request delivery of off-site equipment be initiated. Declaration of an ELAP is time critical.
3. Within 3 hours complete DC load shed actions
4. Within 4 hours provide alternate cooling to Reactor Core Isolation Cooling (RCIC) pump room by deployment of portable generator and fan.
5. At 5.5 hours, begin connecting RCIC suction source to allow RCIC feed with an alternate source to the heated Suppression Pool Water (Table item 11 and Figure A3-1). This action provides an alternate water source for RCIC and core cooling.

6. At 6 hours, start FLEX generator(s) to energize 4160/480 Vac vital buses (Table item 14). This is a critical task to power the plant 480 Vac equipment required for Phase 2. This equipment includes powering the battery chargers to ensure the batteries do not deplete within their 24 hour capacity. This allows motor operated valves (MOVs) to be remotely operated including the valves for Suppression Pool Make Up (SPMU), and the Suppression Pool Clean Up (SPCU) or Alternate Decay Heat Removal (ADHR) pump to provide "closed loop" containment cooling (credited) or alternatively, to enable the bleed function from the Suppression Pool and remove decay heat (non-credited).
7. At 6 hours, after starting the FLEX generator(s), start and operate the FLEX Lake Water Pump(s) at the Emergency Service Water Pump House (ESWPH) (Table item 12). This is a critical activity to provide Emergency Service Water (ESW) flow through the Residual Heat Removal (RHR) heat exchanger as cooling water and/or establish an alternate water source for the RCIC. Modular Accident Analysis Program (MAAP) analyses (Reference 1) have demonstrated that the Suppression Pool temperature will not exceed the value specified in Reference 11 for RCIC operability before 7.8 hrs. Establishing this water source ensures continued core cooling.
8. At 6 hours, initiate Suppression Pool Makeup with SPMU (Table item 16). The MAAP analysis of the coping strategies performed for PNPP credits SPMU at 6 hours to provide additional volume of water to the Suppression Pool.
9. At 6.5 hours, initiate the credited closed loop cooling strategy via the use of the ADHR/SPCU pumps.
10. At 9 hours, begin refueling for the small 110 Vac portable generator if RCIC Pump Room cooling is being accomplished by providing air flow to the room using a portable fan powered by the portable generator.
11. At 16 hours, start and operate diesel-powered compressor (Table item 21). Calculations have determined that instrument air receiver tanks can support operation of the SRV valves for at least 24 hours. This calculation is based on design leakage and air use for over 200 actuations. The coping analysis estimates less than 200 actuations in 24 hours.
12. At 24 hours, transition from "closed loop" cooling using ADHR/SPCU to Shutdown Cooling using RHR (Table item 23).
13. At 24 hours, begin SFP makeup (Table item 24) if needed. Calculations of the SFP heat up and boil off assuming inventory loss due to seismic sloshing and maximum heat load determined the time to lower water levels to 10 feet above the fuel is at least 29 hours. The SFP emergency makeup system can be initiated remotely from the Intermediate Building at any time after the FLEX Lake Water Pump(s) have initiated flow through the ESW system.

Technical Bases

An analysis of the core cooling and containment cooling coping strategy has been performed using the MAAP 4.0.7 code. This analysis provides the basis for the core cooling and containment cooling actions and timing (Reference 7).

Additionally, an analysis of the spent fuel pool was performed to determine inventory loss due to seismically induced sloshing and the heat up and boil down of the inventory in the pool. The analysis was performed using the maximum heat load in the pool assuming a full core offload (Reference 8).

Identify how strategies will be deployed in all modes. **Ref: NEI 12-06 section 13.1.6**	*Describe how the strategies will be deployed in all modes*

Deployment of FLEX equipment is described for each FLEX function in the subsequent sections and covers all operating modes. The broad-spectrum deployment strategies do not change for the different operating modes. The deployment strategies from the storage areas to the Operations Areas are identical and include debris removal, equipment transport, fuel transport, and power sources and requirements. The only difference is the utilization of the RCIC as a high pressure core cooling source for events initiating during Modes 1-4. The FLEX Lake Water Pump(s) will provide direct flow to the RPV in Mode 5 through the ESW, Low Pressure Core Spray (LPCS), and High Pressure Core Spray (HPCS) pipes when RPV makeup is needed. Fuel Pool Cooling and Cleanup (FPCC) alternate decay heat removal will be used to remove decay heat. 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.

PNPP will use deployment paths, which refer to the route from a storage location to the operations area(s) for generators and other equipment; and routing paths, which refer to the route from a staging location to the point of connection to existing plant equipment for hoses and cables. Deployment paths and routing paths are shown in Attachment 2 of this document for all strategies. Generator storage and operations areas are shown on Figure A3-17, Electrical Generator Storage and Operations Areas.

To ensure that the strategies can be implemented in all modes, areas adjacent to the equipment storage and Operations Areas, as well as the deployment and hose routing paths will be maintained clear at all times. These requirements will be included in an administrative program. See Reference 16.

Provide a milestone schedule. This schedule should include:
• **Modifications timeline**
  o **Phase 1 Modifications**
  o **Phase 2 Modifications**
  o **Phase 3 Modifications**
• **Procedure guidance development complete**
  o **Strategies**
  o **Maintenance**
• **Storage plan (reasonable protection)**
• **Staffing analysis completion**
• **FLEX equipment acquisition timeline**
• **Training completion for the strategies**
• **Regional Response Centers operational**
	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.

Ref: NEI 12-06 Section 13.1	
See Six Month Status Report updates.	

Identify how the programmatic controls will be met. **Ref: NEI 12-06 Section 11** **JLD-ISG-2012-01 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 later sections of this template and need not be included in this section.* *See section 6.0 of JLD-ISG-2012-01.*

Equipment associated with these strategies will be procured as commercial equipment with design, storage, maintenance, testing, and configuration control in accordance with NEI 12-06 Rev. 0, Section 11.

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 Rev. 0, Section 11.6.

Procedure Guidance

PNPP is a participant in the Boiling Water Reactor Owners Group (BWROG) and will implement FSGs in a timeline to support the implementation of FLEX by Spring 2015. The BWROG guidance is to assist utilities with the development of site-specific procedures to cope with an ELAP in compliance with the guidance and requirements of Reference 2. The strategies described for PNPP are consistent with the alternate means of heat removal strategies developed for the BWR 6 Mark III plants (Reference 10).

The proposed implementation strategy aligns with the procedure hierarchy described in NEI 12-06 (Reference 2) in that actions that maneuver the plant are contained within the controlling strategic procedures, and the tactical FSGs are implemented as necessary to maintain the key safety functions of Core Cooling, Spent Fuel Cooling, and Containment in parallel with the strategic procedure actions. The overall approach is symptom–based, meaning that the controlling procedure actions and FSGs are implemented based upon actual plant conditions.

PNPP will continue participation in the BWROG and will update plant procedures based upon generic industry guidance. It is expected that the following FSGs will be incorporated into existing plant procedures in order to develop the FSG interface:

- Operation of RCIC during ELAP conditions
- Alternate RCIC Suction Source
- DC Load Shed
- Initial Assessment and FLEX Equipment Staging
- Loss of DC Power
- Long Term RPV Inventory and Temperature Control
- Alternate SFP Makeup and Cooling
- Alternate Containment Cooling
- Transition from FLEX Equipment

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, First Energy Nuclear Operating Company, FENOC, 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.

The unavailability of equipment and applicable connections that directly performs a FLEX mitigation strategy will be managed using plant equipment control guidelines developed in accordance with NEI 12-06 Rev. 0, Section 11.5. Staffing The FLEX strategies documented in the event sequence analysis (Reference 9) assume: • On-site staff are at administrative shift staffing levels • No independent, concurrent events • All personnel on-site are available to support site response PNPP will have to address staffing considerations in accordance with NEI 12-06 (Reference 2) to fully implement FLEX at the site. Configuration Control Per NEI 12-06 (Reference 2) and the Interim Staff Guidance (Reference 3), the FLEX strategies must be maintained to ensure future plant changes do not adversely impact the FLEX strategies. 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, roads, buildings, and miscellaneous structures will not adversely impact the approved FLEX strategies in accordance with NEI 12-06 Rev. 0 Section 11.8.

Describe training plan	*List training plans for affected organizations or describe the plan for training development*
Training plans will be developed for plant groups such as the Emergency Response Organization, Fire, Security, Emergency Preparedness, Operations, Engineering, Mechanical Maintenance, and Electrical Maintenance. The training plan development will be done in accordance with PNPP procedures using the Systematic Approach to Training, and will be implemented to ensure that the required PNPP staff is trained prior to implementation of FLEX. The training program will comply with the requirements outlined in Section 11.6 of NEI 12-06.	
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*
The industry will establish two NSRCs to support utilities during beyond design basis events. Each NSRC will hold five sets of equipment, four 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 NSRC to the near site staging 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. FENOC has signed a contract with SAFER to meet the requirements of NEI 12-06, Section 12.
Notes: None

Maintain Core Cooling & Heat Removal

BWR Installed Equipment Phase 1

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

Ref: JLD-ISG-2012-01 Sections 2 and 3

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

Modes 1 – 4

Phase 1 actions include those that can be performed using installed plant equipment to extend initial coping, building on the current station black out response. The key functions to protect are core cooling, containment integrity and spent fuel pool cooling. In some cases, actions are required in support of a safety function rather than directly serving a safety function.

Reactor core cooling and heat removal is provided during Phase 1 by using the turbine driven RCIC pump to supply water to the RPV and operation of SRVs to vent stream from the RPV to the Suppression Pool. The RCIC pump is powered by the steam generated in the RPV. The instrumentation and controls required to operate the RCIC turbine are powered by the Division 1 125 Vdc bus ED1A so the availability of the equipment for providing core cooling is unaffected by an ELAP.

The RCIC pump is located on elevation 574' 6" of the Auxiliary (Aux) Building in a dedicated watertight room. The Aux Building structure is Seismic Category I, and protected against seismic events, floods, and high winds. The RCIC turbine, pump and supporting valves and piping are also seismically qualified. The RCIC pump and associated piping is expected to be available for all hazards addressed by FLEX.

The RCIC throttle valve and SRVs are required to support this function. The RCIC throttle valve is powered by an attached hydraulic system with control provided by 125 Vdc and will be used to balance makeup flow to the RPV with the loss of inventory due to steam discharge through the SRVs to maintain the water level in the RPV. This will minimize cycling of the RCIC system valves and maintain the RCIC pump operating during the event. As RPV pressure increases, the SRVs (electrically controlled) will be used to maintain RPV pressure by releasing steam from the RPV to the Suppression Pool.

The RCIC pump is designed to automatically start in the event of an initiation signal for RPV Low Level 2 (Reference 4, Section 5.4.6). If the automatic start does not occur, plant procedures provide the operator actions required to start the pump from the Control Room or locally from the RCIC room.

The normal water source for the RCIC pump is the Condensate Storage Tank (CST). However, the CST is not considered "robust" as defined in NEI 12-06 for protection from seismic and tornado events. Therefore, the Suppression Pool is credited as the source for the RCIC pump. Suction will be aligned to the Suppression Pool if the CST is unavailable during Phase 1 per existing operations procedure(s) (FSG 10.1). Makeup to the RPV is provided by the Suppression Pool inventory and makeup water to the Suppression Pool is not required during Phase 1 coping.

During Phase 1, all of the energy from the core decay heat and RPV sensible heat would be deposited in the Suppression Pool. This would result in a temperature increase in the pool that could challenge the continued operation of the RCIC with respect to current design basis limits. A BWROG task has qualified the operation of the RCIC up to a suction temperature of 230°F (Reference 11). In order to

Maintain Core Cooling & Heat Removal	
BWR Installed Equipment Phase 1	
maintain the operation of the RCIC to provide core cooling, equipment will be deployed for use in Phase 2 to provide an alternate cold water suction supply to the RCIC pump. If an ELAP occurs during Mode 4, water in the vessel will heat up. When temperature reaches 212°F, the vessel will begin to pressurize. The turbine driven systems are generally available for emergency use, thus during the pressure rise, RCIC can be returned to service with suction from the CST or Suppression Pool to provide injection flow to the vessel. When pressure rises, the operators will control pressure using an SRV to support RCIC operation. The primary and secondary strategies for Mode 4 are the same as those for Modes 1 - 3 as discussed above for core cooling. Once AC electrical power is restored, the Standby Liquid Control, SPCU, ADHR, and FLEX Lake Water Pump(s) are available to provide for RPV makeup in the event the RCIC is not available. **Modes 5 Core Cooling:** An estimation of time to core uncovery was performed with the vessel flooded to the vessel flange (Reference 5) to bound the time available if the ELAP event initiates in mode 5 where RCIC is not available. This calculation showed that more than 11 hours were required to boil down to Top of Fuel. This allows adequate time to arrange low pressure core cooling/injection and other responses as Phase 2 or Phase 3 actions using FLEX equipment.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* The following Off Normal Instruction (ONIs) and FSGs currently exist and would be used during the initial phase of the ELAP • ONI-R10-2 Total Loss of AC Power • ONI-SPI D-3 Cross Tying Unit 1 and Unit 2 Batteries • ONI-SPI D-1 Maintaining System Availability • ONI-SPI-D-2 Non-essential DC Loads • ONI-SPI H-3, Instrumentation Available During Station Blackout. • ONI-E12-2 Loss of Decay Heat Removal • FSG 10.1 RCIC FLEX Operation PNPP will continue participation in the BWROG and will update plant procedures upon changes to generic industry guidance. The BWROG Emergency Procedures Committee has developed changes to the Emergency Procedure Guides and Severe Accident Guidance (EPG/SAGs, References 12 and 13) to support continued operation of RCIC during an ELAP. These changes were completed in EPG/SAGs Rev 3. These changes modify RPV pressure control guidance to maintain RCIC operation. PNPP's response to the ELAP assumes that the operators follow ONI-R10-2 Total Loss Of AC Power guidance in the initial phase of the event to extend the 125 Vdc battery life, establish ventilation to rooms with vital equipment and to depressurize and control the RPV pressure and level.

Maintain Core Cooling & Heat Removal	
BWR Installed Equipment Phase 1	
	It is expected the following FSGs will be incorporated into plant procedures in order to develop the FSG interface for Phase 1: • FSG 10.3 RCIC Suction Alternate Supply • ONI-SPI D-3 Division 3 To Division 2 480 Volt Crosstie • ONI-SPI D-3 Nonessential DC Loads • FSG 80.1 Establishing FLEX Travel Paths
Identify modifications	*List modifications and describe how they support coping time.* There are no modifications required to support Phase 1.
Key Reactor Parameters	*List instrumentation credited for this coping evaluation phase.* • RPV Level • RPV Pressure • RPV Temperature • RCIC Flow Rate • Suppression Pool Temperature • Suppression Pool Level • Containment Pressure PNPP 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	

Maintain Core Cooling & Heat Removal
BWR 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.

The preferred coping strategy for Phase 2 consists of maintaining RCIC operation versus depressurizing the RPV and injecting water with low pressure pumps to maintain RPV level. A connection point is provided from the discharge piping of the RHR heat exchangers that can be connected to the connection point on the RCIC suction line to allow Suppression Pool water that is being cooled by "Closed Loop Suppression Pool Cooling" to supply the RCIC system. The expected temperature of the RHR heat exchanger outlet during "Closed Loop Suppression Pool Cooling" has been evaluated to be less than 140°F (RCIC suction design basis temperature). A secondary alternate source of water to the RCIC system is provided by a connection point on the ESW system that can be aligned to the RCIC pump suction to allow the FLEX Lake Water Pump(s) to provide an indefinite injectable volume (via Lake Water) to the RCIC system. With an alternative suction source aligned, RCIC system operation is not challenged by high temperatures of the process flow and RCIC operation continues until Shutdown Cooling can be established in Phase 3. Should RCIC fail during Phase 2, depressurizing the RPV and using low pressure injection of Suppression Pool or lake water into the RPV using the SPCU, ADHR, or FLEX Lake Water pump(s) is the secondary method of RPV injection. The actions and modifications required to continue injecting to the RPV are discussed below. The Suppression Pool heat removal actions and modifications will be discussed under the Maintain Containment Function. Establishing FLEX equipment to supply 4160/480 Vac power to support these functions is discussed in the Safety Function Support section.

Phase 2 actions include those which can be performed using on-site FLEX equipment to further extend coping until external support becomes available. It should be noted that precursor tasks may be required to enable application of required FLEX strategies. For example, in order to deploy FLEX equipment, debris removal activities may need to be initiated and partially completed, in order to effectively deploy equipment to the appropriate Operations Area.

<u>Establishing the FLEX water source</u>

In order to establish the FLEX water source from the UHS for various applications (component cooling and/or system injection), FLEX Lake Water Pump(s) will be "stored in a location near the point of deployment" in the ESWPH. The ESWPH structure and associated equipment are Seismic Category I, and protected against seismic events, floods, and high winds and robust for all FLEX events. The FLEX Lake Water Pump(s) ('N' pump and 'N + 1' pump) will be able to supply the required flow to either ESW A(B) loop (or both can be used if no equipment failures occur). The FLEX Lake Water Pump(s) will be electrically connected and have a suction hose(s) attached and lowered to the ESWPH suction bay and three discharge hoses connected from the FLEX Lake Water Pump(s) to the selected ESW loop to supply approximately 3000 gallons per minute (gpm) in the ESW Loop. Note that a portion of the discharge of the FLEX Lake Water Pump(s) can also be used intermittently via a dedicated hose connection to spray debris off the traveling screens if blockage occurs. The ESW system normally discharges back to the lake but is designed with return lines from the discharge of ESW A and ESW B to return water that has absorbed heat from heat exchangers loads cooled by the ESW system, back to the ESW forebay during periods of cold later water temperatures, where icing may be experienced, to prevent buildup of ice in the Forebay and Suction Bay of the ESWPH.

Two motor-driven FLEX Lake Water Pump(s) will be "stored in a location near the point of deployment" in the ESWPH ('N' pump and 'N + 1' pump). The storage location will be the floor space which would have been occupied by the Unit 2 ESW pump discharge piping. The FLEX Lake Water Pump(s) will have discharge piping which will utilize four hose connections (three connections for

Maintain Core Cooling & Heat Removal
BWR Portable Equipment Phase 2

ESW Supply and one hose connection for auxiliary use). Additionally, corresponding hose connections will be provided to allow connection of the FLEX Lake Water Pump(s) to the "A" and "B" trains of ESW. The receiving hose connections will tie into the ESW Loop at the ESW Pump discharge piping between the pump discharge check valve and discharge strainer. Three separate connection points will be installed with system boundary valves, and associated piping (routing to convenient locations) to each ESW Loop. Each connection point will terminate with a 5" hose connection.

Two new connection points will be installed on ESW Supply header piping in the Auxiliary Building 599' 6" elevation. These hose connections will originate from 24" ESW System Supply header piping in the overhead of Auxiliary Building 599' 6" elevation which supplies cooling water to the RHR Heat Exchangers and other ESW system loads. One set of two connection points will be installed on ESW A Loop, and another set on ESW B Loop.

Additionally, two new dry standpipes will be installed which vertically run through all elevations of the Auxiliary Building. The standpipes will penetrate the 620' 6" floor slab and terminate on this elevation with an isolation valve and a hose connection. The standpipes will have two hose connections and a mid-pipe isolation valve located on the 599' 6" elevation. Finally, the standpipes will have isolation valves and hose connections on the 574' 6" for the West dry standpipe and 568' 6" elevation for the East dry standpipe of the Auxiliary Building. One dry standpipe will be provided at the east and west end of the Auxiliary Building. Both dry standpipes will be designed and installed Seismic Category I, and protected against seismic events, floods, and high winds.

Emergency battery-backed lighting will be provided in the ESWPH. The lighting will be strategically placed to support operator actions in the ESWPH and will be capable of providing at least 24 hours of emergency lighting within the ESWPH. The cable and lighting boxes will be designed and installed Seismic Category I, and protected against seismic events, floods, and high winds. This installation will utilize the existing structural steel that supports the ESWPH south staircase.

Modes 1 - 4

In Phase 2, core cooling is performed by maintaining RPV water level with high pressure injection from RCIC. The robust water supply is from the Suppression Pool to the suction of the RCIC pump to maintain RPV water level. The SRV system will be used to control RPV pressure and to discharge steam to the suppression pool. RCIC and the SRVs are controlled with Division 1 125Vdc power.

An alternate robust water source for core cooling is the RHR system at the outlet of the RHR Heat Exchangers. The SPCU / ADHR pump will be placed into Closed Loop Suppression Pool Cooling flowing water from the Suppression Pool to the Suppression pool via the RHR Heat Exchangers. The RHR system can be aligned to the RHR to FPCC Return header via installed plant equipment. A new connection point on the RHR to FPCC Return header at Aux Building elevation 599' 6" will be connected to the suction of the RCIC pump for core cooling (Figures A3-2, A3-3) with a hose (via the dry standpipe discussed above).

A second robust alternate water source for core cooling is the lake water supplied through the ESW system. A connector point on the ESW A or ESW B Supply Header pipe at Aux Building elevation 599' 6" will be connected to the suction of the RCIC pump for core cooling (Figures A3-2, A3-3) with a hose (via the dry standpipe discussed above).

Other, non-robust, water sources can be used to supply RCIC for core cooling if available. These include the CST, the Mixed Bed Storage Tank or the Two Bed Storage Tank on the west side of the plant at el 620' 6" (grade). If these tanks are not available or become depleted, the lake water supplied

Maintain Core Cooling & Heat Removal
BWR Portable Equipment Phase 2

by the FLEX Lake Water Pump(s) through the ESW system would be aligned and provides an indefinite injectable volume.

Low Pressure Core Cooling

Core cooling can be maintained after the RPV has been depressurized to less than approximately 50 psig with continued core boiling via low pressure injection. This RPV pressure can be achieved from deliberate pressure reduction by using the controlled opening of an SRV (within the 100°F/hr. cooldown rate), or by rapid depressurization using a full division Automatic Depressurization System (ADS) initiation. The Emergency Operating Procedures provide guidance for use of the SPCU and ADHR pumps to provide RPV injection. The SPCU / ADHR pumps can be aligned to inject Suppression Pool water directly to the RPV as Alternate Injection Subsystems. The SPCU / ADHR pumps can also be used to inject to the RPV during Closed Loop Suppression Pool Cooling by operation of the RHR to RPV injection valve and RHR to Suppression pool test return valves to align flow from the outlet of the RHR heat exchangers back to the RPV vice the Suppression Pool. If SPCU and ADHR pumps cannot be used for RPV injection; the FLEX Lake Water Pump(s) (rated to supply 3000 gpm each at 150 psig) can provide RPV injection to the RPV at once the RPV is depressurized to 50 psig. In this strategy SRVs would be opened to maintain a low pressure condition. SRVs are controlled using DC power from the Control Room.

For SPCU / ADHR injection no modifications are required. Injection flow paths are via installed piping systems.

For the FLEX Lake Water Pump(s) a flush connection blanked flange is available on the LPCS that will be converted to a have a 5 inch hose Storz connector. The ESW A or ESW B system will be connected to the new LPCS Storz connector via a hose. After the manual valve FLUSH WTR TO LPCS PUMP DISCH LINE is opened and the LPCS INJECTION VALVE is opened electrically or manually, the ESW water will be injected through the LPCS into the RPV.

An additional method for low pressure core cooling (or suppression pool inventory addition) is similar to the primary method but injects through the HPCS. Water would be supplied from Lake Erie as the robust alternate water supply via ESW B. The hose connection to the RPV is via an existing flush point. ESW water will be provided by opening the manual valve HPCS PUMP DISCH LINE FLUSH CONN, then opening HPCS INJECTION VALVE. HPCS TEST VALVE TO SUPR POOL would be opened to supply the Suppression Pool. Both MOVs can be opened or closed via local manual action and are in accessible locations. Note that this HPCS connection point requires no modifications and currently serves as the plant's "Fast Fire Water" injection point.

Mode 5 Core Cooling:

Core cooling will be re-established in Phase 2 by restoration of the FPCC system flow with the systems heat exchangers in service to the Containment Upper Pools. This is the normal alternate decay heat removal method used during Refueling operations. If pool makeup is required, or FPCC system cannot be placed into service, core cooling will be re-established using the low pressure core cooling method described above. This alignment of the FLEX Lake Water Pump(s) supplying water through the ESW system to either the LPCS or HPCS can provide at least 250 gpm to the vessel which is sufficient to remove decay heat. A flow rate of at least 1000 gpm will suppress boiling. The heated water can then be directed back to the Suppression Pool through the steam line and an SRV or up through the reactor cavity to the upper pool depending on the level of the water in the cavity. (Reference 9)

Maintain Core Cooling & Heat Removal	
BWR Portable Equipment Phase 2	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	PNPP will continue participation in the BWROG and will update plant procedures based upon generic industry guidance. It is expected the following FSGs (in addition to Phase 1 FSGs) will be incorporated into existing plant procedures in order to develop the FSG interface for Phase 2: • Establishing Water Source from Lake Erie to ESW in the ESWPH • Aligning Alternate RCIC Suction Source • Establishing Closed Loop Suppression Pool Cooling • Low Pressure Core Cooling

Identify modifications	• Install six inch isolation valve(s) and Storz hose connection on the RCIC pump suction pipe (Figure A3-1)
	• Install Pipe connections on ESW A and ESW B pipes in ESWPH
	• Install Storz hose connections on ESW A and ESW B pipes in Auxiliary Building (Figures A3-2, A3-3)
	• Install hose connections on Demin Water Source Tanks
	  o Two Bed Storage Tank
	  o Mixed Bed Storage Tank
	• Modify LPCS Flange to install 5" Storz Connection (Figure A3-7)

Key Reactor Parameters	*List instrumentation credited for this coping evaluation phase.* • RPV Level • RPV Pressure • RPV Temperature • RCIC Flow Rate • Containment Pressure PNPP 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.
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	PNPP plans to store the FLEX Lake Water Pump(s) and hoses and other FLEX equipment in existing robust buildings meeting the requirements for storage of FLEX equipment. The electric pumps will be stored in the ESWPH utilizing space originally designated for the Unit 2 ESW pumps (Figure A3-4). The ESWPH is Seismic Category 1, and protected against seismic events, floods, and high winds. Both the Unit 2 EDG building and the Unit 2 Aux building were constructed to meet the site seismic requirements. Other satellite equipment locations will also be in safety related structures. FLEX equipment will be secured as appropriate during SSE and will be

Maintain Core Cooling & Heat Removal	
BWR Portable Equipment Phase 2	
	protected from seismic interactions from other components. No components will be stacked or at a raised elevation as to cause interference with the deployment of any FLEX equipment. A SSE having a peak horizontal ground acceleration of 0.15 g has been selected for design (USAR Section 2.5.2.6). The design basis values from the USAR will be used for PNPP's FLEX strategies. See Figure A3-16 (1 thru 5) for storage and deployment information.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	Storage for the FLEX lake Water pumps will be in the ESWPH. The ESWPH floor elevation is 580' 6." Maximum suction bay water height based upon maximum lake levels and surge heights is 580' 0" based upon the location of the intake structures approximately 1/2 mile off shore. The ESWPH is designed to preclude ground water in-leakage with sealed penetrations. The normal access to the ESWPH is 620' 6" and is above the maximum site flood level of 620' 5". Incidental in-leakage from ground water or system failures would be drained below the 580' 6" floor level by grating openings above the suction bay of the pump house and back to the lake via the intake structure. Storage for other equipment will be in the Unit 2 Emergency Diesel Generator Building and/or the Auxiliary Building at el. 620'6". The buildings are sited in a location above the PMF grade (620'5" for PNPP). Other satellite equipment locations will also be in safety related structures. See Figure A3-16 (1 thru 5) for storage and deployment information.
Severe Storms with High Winds	The ESWPH, the Unit 2 Emergency Diesel Generator Building and the Auxiliary Building are designed as Seismic Category 1 structures that meets the plant's design basis for the SSE (e.g., existing safety-related structure
Snow, Ice, and Extreme Cold	PNPP site is subject to significant amounts of snow, extreme low temperatures and existence of large amount of ice. PNPP storage locations will ensure that all FLEX equipment is provided general protection from the elements at the site. FLEX equipment is stored within buildings that will be maintained within a temperature range to ensure its function when called upon.
High Temperatures	The FLEX storage buildings will include adequate ventilation to ensure that high temperatures do not affect the functionality of FLEX equipment.

<table>
<tr><th colspan="3">Maintain Core Cooling & Heat Removal</th></tr>
<tr><th colspan="3">BWR Portable Equipment Phase 2</th></tr>
<tr><td colspan="3">Deployment Conceptual Design
(Attachment 2 contains Conceptual Sketches)
Upon declaration of the ELAP, personnel will be dispatched to connect the FLEX Lake Water Pump(s) at their staging location in the ESWPH. The FLEX Lake Water Pump(s) do not need to be deployed from their storage location; however, alternate strategies require deployment of electrical support equipment. The site has been evaluated for soil liquefaction due to a seismic event and found to not be susceptible. Therefore, the routes will be available. No significant debris is expected, however the FLEX equipment includes debris removal vehicles that can be used to clear the route. In addition, the site area is very open allowing blockages to be avoided. Hoses and other equipment required in the Unit 1 Aux Building will be deployed the short distance between the Unit 1 and FLEX Equipment Bay 2 (Unit 2 Auxiliary Building) (Figure A3-18) or will be stored in the Unit 1 Auxiliary Building.</td></tr>
<tr><th>Strategy</th><th>Modifications</th><th>Protection of connections</th></tr>
<tr><td>Identify Strategy including how the equipment will be deployed to the point of use.</td><td>Identify modifications</td><td>Identify how the connection is protected</td></tr>
<tr><td>Core Cooling using RCIC and Alternate Water Source.

Two installed pumps (SPCU/ADHR) will be used to establish flow though the RHR heat exchanges. The water exiting the RHR Heat Exchanger will be cooled and aligned to the RCIC pump suction to provide a clean water source to the RCIC system.

Two electric powered pumps will be staged in the ESWPH. The pumps will take suction from the ESWPH Suction Bay (from Lake Erie) and discharge through three 5” lines into corresponding hose connections that connect to the ESW A and/or B pump discharge pipe in the ESWPH between the pump discharge check valve and the strainers.

In the Unit 1 Aux. building, hoses will be attached from ESW A to the RCIC suction pipe. The alternate path is from the ESW B to the RCIC suction pipe.</td><td>• Install isolation valves and Storz hose connection on RCIC Suction
• Install Storz hose connection on the RHR to FPCC Return Header
• Install Storz hose connection on ESW A and B pipe in Auxiliary Building
• Install pipe connections on ESW A and B pipes in ESWPH
• Install Storz hose connection on Mixed Bed / Two Bed Storage Tanks
• Install ESW Dry Standpipes (Figures A3-5, A3-6)
• Modify LPCS Flange to install 5” Storz Connection
• Electrical Modifications are described in the Safety Function Support section</td><td>Connections within Auxiliary Building (ESW and RCIC) are protected by a robust structure

Connections in the ESWPH are protected by a robust structure

Mixed Bed and Two Bed Storage Tank connections are not robustly protected but may be available</td></tr>
</table>

Maintain Core Cooling & Heat Removal		
BWR Portable Equipment Phase 2		
Core Cooling using Low Pressure Method Two installed pumps (SPCU/ADHR) will be used to provide RPV injection using the Suppression Pool as the water source using installed system piping. The connections for the two electric pumps to provide lake water to the ESW system was previously discussed. Within the Unit 1 Auxiliary Building the ESW A would be connected with a hose to the LPCS. The alternate connection would be from the ESW B to the HPCS in order to provide lake water directly to the RPV.		New LPCS Storz connection and existing HPCS Storz connection are located within a robust structure (Auxiliary Building)
Notes: None		

Maintain Core Cooling & Heat Removal	
BWR 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. By Phase 3, additional 4160Vac generator(s) will have arrived from the NSRC and connected to a Unit 1 4160 Vac vital bus, (Figure A3-13). If not previously initiated in Phase 2, direct decay heat removal via the Shutdown Cooling (SDC) mode of RHR operation can now be initiated. One RHR heat exchanger is required with 3000 gpm of cooling water provided by the ESW system from Lake Erie. Once SDC is established, the RPV will stop steaming and makeup to the vessel can be terminated. In most cases, the most desirable strategy in Phase 3 will be to promptly proceed to cold shutdown. Operators will align and start an RHR pump, A or B. The associated RHR heat exchanger will have the lake water aligned to it through the corresponding ESW train. Normal plant line-ups (other than FLEX Lake Water Pump(s) at the ESWPH) can be followed with due consideration to the NSRC generator loading constraints. A secondary core cooling path is to use the RHR system in Suppression Pool Cooling mode (cooled by the ESW supplied by the FLEX Lake Water Pump(s) at the ESWPH). RCIC can be aligned to take suction from the Suppression Pool or alternatively, from the connection to the ESW system. Also, the low pressure core cooling path can be used to directly feed the RPV. This essentially extends the Phase 2 strategies into Phase 3, with the distinct difference being the utilization of the RHR System is a design basis alignment/configuration.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* PNPP will utilize industry developed guidance from the BWROG, EPRI, and NEI to develop site specific guidelines for the deployment and implementation of FLEX strategies, as well as the interfaces for FLEX strategies with existing plant procedures. • Transition from High or Low Pressure Core Cooling to RHR Cooling • FLEX alignment of ESW flow through the RHR Heat Exchangers.
Identify modifications	*List modifications and describe how they support coping time.* No additional modifications are required for Phase 3 Core Cooling.
Key Reactor Parameters	*List instrumentation credited for this coping evaluation phase.* • RPV Level • RPV Pressure • RPV Temperature • RHR flow rate • Suppression Pool Temperature • Suppression Pool Level • ESW flow rate

Maintain Core Cooling & Heat Removal		
BWR Portable Equipment Phase 3		
Deployment Conceptual Design **(Attachment 2 contains Conceptual Sketches)** No additional deployment of FLEX equipment is required in Phase 3 for Core Cooling.		
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*
Deployment of the NSRC Generator(s) is described in the Safety Function Support Section **Initiate RPV Cooling Using RHR pump** The ESW train providing lake water will be redirected to provide cooling to the RHR A or B Heat Exchangers using normal lineups. The discharge of ESW from the Heat Exchanger will be directed back to the lake through its normal flow path. RHR will be aligned for SDC using FSG procedures. **Initiate Suppression Pool cooling using RHR pump** The ESW train providing lake water will be aligned to provide cooling to the RHR A or B Heat Exchangers using normal lineups. The discharge of ESW from the Heat Exchanger will be directed back to the lake through its normal flow path. RHR will be aligned for Suppression Pool (SP) cooling using FSG procedures.	• None for Core Cooling • Electrical Modifications are described in the Safety Function Support section	FLEX Lake Water Pump(s) to ESW connections are described in Phase 2 section
Notes: None		

Maintain Containment

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

BWR 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.

Containment integrity is maintained by keeping containment atmospheric pressure less than the design limit of 15 psig. Containment integrity will be established under total loss of AC conditions by manually closing three valves: CNTMT POOLS RTN OTBD ISOL, DW B/U PURGE OTBD ISOL, and MSL DM & MS IV BYP OTBD ISOL VALVE, per current plant procedures.

During Phase 1, the Containment pressure and Suppression Pool temperature would increase to ~11 psig and 213°F, respectively. This is due to the Suppression Pool water absorbing the reactor's decay heat as the operators partially depressurize the RPV to ~200 psig (Reference 14). This is within the containment design pressure of 15 psig, but exceeds the Suppression Pool temperature limit of 185°F. The containment design temperature of 185°F for the Suppression Pool will likely be exceeded within 5 hours regardless of actions that can be taken. This limit normally comprises part of the consideration in maintaining Containment integrity; however, industry consensus is that this limit should not be inviolable at the conditions and limited time period contemplated for FLEX.

Containment function is not challenged early in the event; therefore, no actions are required in Phase 1 in support of containment function.

Mode 5 / Refueling

Containment function may be challenged throughout the event due to moderate steam release rate from the vessel. Action may be required to prevent pressurization of the containment. Control of Containment Pressure is addressed per the Emergency Operating procedures.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	The following procedures currently exist and would be used during the initial phase of the ELAP • ONI-R10-2 Total Loss of AC Power • ONI-SPI D-3, Cross Tying Unit 1 and Unit 2 Batteries • ONI-SPI D-1, Maintaining System Availability • ONI-SPI-D-2, Non-essential DC Loads • ONI-SPI H-3, Instrumentation Available During Station Blackout • ONI-E12-2, Loss of Decay Heat Removal PNPP will continue participation in the BWROG and will update plant procedures based upon generic industry guidance. It is expected the following FSGs will be incorporated into existing plant procedures in order to develop the FSG interface for Phase 1: • Initial Assessment and FLEX Equipment Staging
Identify modifications	*List modifications and describe how they support coping time.* There are no modifications required to support Phase 1.

Maintain Containment	
Key Containment Parameters	*List instrumentation credited for this coping evaluation phase.* • Suppression Pool Temperature • Suppression Pool Level • Drywell Pressure • Drywell Temperature • Containment Pressure
Notes: None	

Maintain Containment
BWR Portable Equipment Phase 2:

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

Modes 1-4

Decay heat is removed from the RPV via steam through one or more SRVs to the Suppression Pool. The primary method of heat removal from the Containment during Phase 2 is "Suppression Pool Closed Loop Cooling" with cooling water sourced from ESWPH via FLEX Lake Water Pump(s); electrical power provided for process flow through the ADHR/SPCU systems via FLEX on-site generators. See Figure A3-12 Closed Loop Cooling During Phases 2 and 3 for flowpath details.

Large 4160Vac 1.1 megawatt (MW) generators will be deployed in Phase 2. A new generator "docking station" will be installed in a Unit 2 Diesel Generator Bay (currently the Diesel Maintenance Shop). The 4160Vac generators will be connected to the docking station via single phase cables. From the docking station a new cable/conduit run will be installed and will connect into Bus EH-21. A "jumper" will be installed to support the FLEX strategy so that Bus EH-21 will be able to power buses EH-11/12/13 during a postulated event. See Reference 15 for details.

A new Manual Transfer Switch will be installed for the SPCU Pump and provide dedicated power supplies to the ADHR and SPCU pumps from bus EF-2-B.

Unit 2 ESW power cables running out to the ESWPH will be utilized, including the installation of a pump "docking station."

The docking station installed in the Diesel Generator Bay will also serve as the connection point for the NSRC (Phase 3) generator(s). The 4160Vac generators procured for Phase 2 will be of the same make/model as the NSRC equipment. These generators are capable of automatically synchronizing and load sharing (i.e., running in parallel). The docking station and cable runs will be capable of supporting multiple generator outputs.

The use of 4160Vac generators will allow electrical power to be provided to a large contingent of equipment offering versatility and flexibility during a beyond design bases event.

Early in Phase 2, when 480 Vac power becomes available from a FLEX generator, the Upper Containment pool will be dumped into the lower Suppression Pool by initiating SPMU. This requires manipulation of 480 Vac MOVs, and requires re-energizing one of the vital 480 Vac buses.

If needed later in Phase 2 at about 7 hours, Lake Erie water will be transferred to the Suppression Pool via the LPCS (primary) or HPCS (secondary) systems and new ESW hose connections in the Auxiliary Building. Cool water from the Lake Erie can also be added to the Suppression Pool to increase inventory and reduce overall bulk temperature. See Figure A3-8: LPCS Suppression Pool Inventory Addition Flowpath and Figure A3-9: HPCS Suppression Pool Inventory Addition Flowpath for flow paths.

As described above the primary method of containment heat removal will be "Suppression Pool Closed Loop Cooling" with cool water sourced from ESWPH via FLEX Lake Water Pump(s); electrical power provided for process flow through the ADHR/SPCU systems via FLEX on-site generators (Figure A3-17). Several (three to four) six inch risers will be installed off of the ADHR Pump discharge piping in the LPCS Pump Room. The piping configuration will originate at a tee installed in the ADHR pump discharge piping and will consist of a 10" system boundary valve, with riser connection piping runs containing one riser isolation valve per riser. Each riser will terminate at a fire hose connection. Portions of the ADHR System will be evaluated/upgraded to establish a seismic pedigree in accordance with the requirements for FLEX event coping equipment (document-only changes) and new piping will

Maintain Containment
be installed seismically. See Figure A3-10, ADHR Piping Modification Location for details of the modification. **Mode 5 / Refueling** Containment function will not normally be challenged during the event due to containment integrity being relaxed and the containment open during Mode 5 / Refueling. There may be brief periods during Mode 5 / Refueling when containment integrity might be required, such as during an operation with a potential to drain the reactor vessel. If a BDBEE occurred during these times the containment function would not be challenged based on containment response analysis performed for Modes 1 through 4 which uses cases bounding for Mode 5 due to the decrease in decay heat rate. **Containment Hydrogen Control** The PNPP Mark III containment atmosphere is not inerted and contains free oxygen during normal operation. An event that overheats the fuel can generate free hydrogen gas that could cause a violent hydrogen/oxygen reaction when within certain concentration ranges in the presence of an ignition source. To preclude damage to equipment inside the Containment, hydrogen igniters are energized to stimulate early, non-violent reactions of hydrogen and oxygen at low hydrogen concentrations outside the explosive ranges. During the postulated FLEX event and response, no fuel damage will occur but NEI 12-06 requires consideration of hydrogen control during FLEX events. <u>Primary Method</u> Installed Division 1 hydrogen igniters would be repowered to suppress hydrogen buildup in case of zirconium/water reaction from an overheated core. Normal power sources are from the Division I vital 480 Vac bus. Either division is adequate for control of hydrogen. With the onsite FLEX generator(s) connected in Phase 2, the current draw from the igniters is considered in the FLEX generator load assessment (Reference 9). Current plant procedures would be used for initiating hydrogen igniter operation. Portable small generators are also available for local 120 Vac operation of the igniters. <u>Secondary Method</u> Division 2 hydrogen igniters are also adequate for control hydrogen concentrations. Like Division 1, these are powered from the 480 Vac vital bus but small portable generators are available for backup use.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* PNPP will continue participation in the BWROG and will update plant procedures based upon generic industry guidance. It is expected the following FSGs will be incorporated into existing plant procedures in order to develop the FSG interface for Phase 2: • The use of ADHR/SPCU, powered by onsite FLEX generators to perform "closed loop cooling" of the Unit 1 suppression pool • Feeding Suppression Pool from ESW A or B • Operation of Containment Hydrogen Igniters during an ELAP
Identify modifications	*List modifications and describe how they support coping time.*

Maintain Containment	
	• Create Hose connections and hose path for ESW A to LPCS (Via Dry Stand Pipe) • Create Hose connections and hose path for ESW B to HPCS (Via Dry Stand Pipe) • Install Storz hose connection to LPCS in Auxiliary Building (Figure A3-7) • Install hose connections on ADHR Pump Discharge • Install hose connections on FPCC System Piping • Modification of ADHR pumps decontamination connection from 2" to 3-5" Storz connections for FLEX • Evaluate/Upgrade SPCU to seismically robust for FLEX • Evaluate/Upgrade ADHR to seismically robust for FLEX
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.* • U1 Suppression Pool Level • U1 Suppression Pool Temperature • SPCU flow rate • ADHR flow rate • Containment Pressure

Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	PNPP plans to store the FLEX Lake Water Pump(s) and hoses and other FLEX equipment in existing robust buildings meeting the requirements for storage of FLEX equipment. The electric pumps will be stored in the ESWPH utilizing space originally designated for the Unit 2 ESW pumps (Figure A3-4). The ESWPH is Seismic Category 1, and protected against seismic events, floods, and high winds. Both the Unit 2 EDG building and the Unit 2 Aux building were constructed to meet the site seismic requirements. Other satellite equipment locations will also be in safety related structures. FLEX equipment will be secured as appropriate during SSE and will be protected from seismic interactions from other components. No components will be stacked or at a raised elevation as to cause interference with the deployment of any FLEX equipment. A SSE having a peak horizontal ground acceleration of 0.15 g has been selected for design (USAR Section 2.5.2.6). The design basis values from the USAR will be used for PNPP's FLEX strategies. See Figure A3-16 (1 thru 5) for storage and deployment information.
Flooding	Storage for the FLEX lake Water pumps will be in the ESWPH. The ESWPH floor elevation is 580' 6." Maximum suction bay water height based upon maximum lake levels and surge heights is 580' 0" based upon the location of the intake structures approximately 1/2 mile off shore. The ESWPH is designed to preclude ground water in-leakage with sealed penetrations. The normal access to the ESWPH is 620' 6" and is above the maximum site flood level of 620' 5".

Maintain Containment	
	Incidental in-leakage from ground water or system failures would be drained below the 580' 6" floor level by grating openings above the suction bay of the pump house and back to the lake via the intake structure. Storage for other equipment will be in the Unit 2 Emergency Diesel Generator Building and/or the Auxiliary Building at el. 620'6". The buildings are sited in a location above the PMF grade (620'5" for PNPP). Other satellite equipment locations will also be in safety related structures. See Figure A3-16 (1 thru 5) for storage and deployment information.
Severe Storms with High Winds	The ESWPH, the Unit 2 Emergency Diesel Generator Building and the Auxiliary Building are designed as Seismic Category 1 structures that meets the plant's design basis for the SSE (e.g., existing safety-related structure
Snow, Ice, and Extreme Cold	PNPP site is subject to significant amounts of snow, extreme low temperatures and existence of large amount of ice. PNPP storage locations will ensure that all FLEX equipment is provided general protection from the elements at the site. FLEX equipment is stored within buildings that will be maintained within a temperature range to ensure its function when called upon. .
High Temperatures	The FLEX storage buildings will include adequate ventilation to ensure that high temperatures do not affect the functionality of FLEX equipment.

Deployment Conceptual Modification

(Attachment 2 contains Conceptual Sketches)

Hoses and other equipment required in the Unit 1 Aux Building will be deployed the short distance between the Unit 1 and FLEX Equipment Bay 2 (Unit 2 Auxiliary Building) (Figure A3-18) or will be stored in the Unit 1 Aux Building.

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*
Two electric powered pumps will be staged in the ESWPH. The pumps will take suction from the ESWPH Suction Bay (from Lake Erie) and discharge through three 5" lines into a corresponding hose connections that connects to the ESW A and/or B pump discharge pipe in the ESWPH between the pump discharge check valve and the strainers.	Electrical modifications are described in the Safety Function Support section.	FLEX Lake Water Pump(s) to ESW connections are described earlier.

Maintain Containment		
Within the Unit 1 Auxiliary Building the ESW A would be connected with a hose to the LPCS. The alternate connection would be from the ESW B to the HPCS. These connections are to provide lake water directly to the SP.		
Notes: None		

Maintain Containment	
BWR 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 (containment spray/hydrogen igniters) and strategy(ies) utilized to achieve this coping time. **Mode 5 / Refueling** Containment function may be challenged throughout the event due to moderate steam release rate from the vessel. Action may be required to prevent pressurization of the containment. Control of Containment Pressure is addressed per the Emergency Operating procedures.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* PNPP will continue participation in the BWROG and will update plant procedures based upon generic industry guidance. It is expected the following FSGs will be incorporated into existing plant procedures in order to develop the FSG interface for Phase 3: • Alternate Water Source from Lake Erie to ESWPH • Connecting Lake Erie Alternate Water Source to ESW A or B • Operation of Containment Hydrogen Igniters during an ELAP
Identify modifications	*List modifications and describe how they support coping time.* No additional modifications are required to maintain Containment in Phase 3.
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.* • Suppression Pool Level • Suppression Pool Temperature • RHR flow rate • ESW flow rate to RHR heat exchanger

Deployment Conceptual Modification (Attachment 2 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*
Shutdown Cooling using RHR and FLEX cooling of Heat Exchanger.	No additional modifications required.	Connections for RHR and ESW A use existing piping within a robust structure (Auxiliary Building)

Maintain Containment		
Suppression Pool Cooling using RHR and FLEX cooling of Heat Exchanger	No additional modifications required.	Connections for RHR and ESW A use existing piping within a robust structure (Auxiliary Building)
Notes: Deployment of the NSRC 4160Vac generator is described in the Safety Function Support Section.		

Maintain Spent Fuel Pool Cooling	
Determine Baseline coping capability with installed coping modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06:	
BWR 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. **Spent Fuel Pool** cooling is not challenged early in the event; however, access to the SFP area as a part of Phase 1 response could be challenged due to environmental conditions local to the pool and/or radiation levels from stored spent control rod blades.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	The following procedures currently exist and would be used during the initial phase of the ELAP • ONI-R10-2, Total Loss of AC Power • ONI-SPI D-3, Cross Tying Unit 1 and Unit 2 Batteries • ONI-SPI D-1, Maintaining System Availability • ONI-SPI-D-2, Non-essential DC Loads • ONI-SPI H-3, Instrumentation Available During Station Blackout • ONI-E12-2, Loss of Decay Heat Removal PNPP will continue participation in the BWROG and will update plant procedures based upon generic industry guidance. It is expected the following FSGs will be incorporated into existing plant procedures in order to develop the FSG interface for Phase 1: • Initial Assessment and FLEX Equipment Staging • Alternate SFP Makeup and Cooling
Identify modifications	*List modifications and describe how they support coping time.* Develop and install an SFP Level Monitoring system
Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.* SFP Level Per Order EA 12-051 PNPP 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	

Maintain Spent Fuel Pool Cooling
BWR 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. In Phase 2, the Spent Fuel Pool will heat to the boiling point and the level in the pool will continue to reduce. Calculations have been performed to determine the time to heat up the SFP and boil down to 10 ft. above the fuel using the maximum heat load associated with a full core offload. After reducing the pool inventory due to seismically induced sloshing, the time to reach 10 feet above the fuel was over 29 hours (Reference 9). A new emergency inventory make-up system for the SFP (called the Spent Fuel Pool Emergency Makeup System) will be installed. The system will essentially consist of a dump line to the SFP with an individually isolable hose connection point. New piping will be installed seismically. The system will consist of a new piping riser that will originate from Unit 2 Emergency Closed Cooling piping (the safety related cooling water source for the FPCC Heat Exchangers). The riser will penetrate the Intermediate Building (IB) 620'6" floor slab (in the Unit 2 Annulus Exhaust Gas Treatment System "B" Fan Room) and Fuel Handling Building west wall. The piping will run along the pool deck and terminate near the edge of the pool. Prior to entering the Fuel Handling Building an individually isolatable hose connection point will be provided to permit the connection temporary oscillating monitor nozzles for pool spray application. In Phase 2 actions will be taken to align make-up to the pool using lake water supplied through the ESW pipes to a new emergency makeup header adjacent to the spent fuel pool (Figure A3-11). Make-up will be established such that cooling will be maintained throughout the event. FLEX Lake Water Pump(s) will be staged in the ESWPH using space originally designated for the Unit 2 ESW pumps. Storz connections will be added to the ESW lines and hoses will connect the pumps to the ESW via the installed Storz connectors on the ESW A or alternately the ESW B pump discharge pipes to allow the lake water to flow to the Intermediate Building. Within the Intermediate Building, a new pipe with supply valves will be constructed to direct flow from the ESW system to provide makeup to the Spent Fuel Pool.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* PNPP will continue participation in the BWROG and will update plant procedures based upon generic industry guidance. It is expected the following FSGs will be incorporated into existing plant procedures in order to develop the FSG interface for Phase 2: • Spent Fuel Pool Emergency Makeup Using ESW for FLEX
Identify modifications	*List modifications and describe how they support coping time.* Construct a SFP makeup header supplied by ESW A and ESW B (Figure A3-11).
Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.* SFP Level Per Order EA 12-051

Maintain Spent Fuel Pool Cooling	
	PNPP will develop procedures to read this instrumentation locally or where applicable, using a portable instrument, as required by Section 5.3.3 of NEI 12-06.
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	PNPP plans to store the FLEX Lake Water Pump(s) and hoses and other FLEX equipment in existing robust buildings meeting the requirements for storage of FLEX equipment. The electric pumps will be stored in the ESWPH utilizing space originally designated for the Unit 2 ESW pumps (Figure A3-4). The ESWPH is Seismic Category 1, and protected against seismic events, floods, and high winds. Both the Unit 2 EDG building and the Unit 2 Aux building were constructed to meet the site seismic requirements. Other satellite equipment locations will also be in safety related structures. FLEX equipment will be secured as appropriate during SSE and will be protected from seismic interactions from other components. No components will be stacked or at a raised elevation as to cause interference with the deployment of any FLEX equipment. A SSE having a peak horizontal ground acceleration of 0.15 g has been selected for design (USAR Section 2.5.2.6). The design basis values from the USAR will be used for PNPP's FLEX strategies. See Figure A3-16 (1 thru 5) for storage and deployment information.
Flooding	Storage for the FLEX lake Water pumps will be in the ESWPH. The ESWPH floor elevation is 580' 6." Maximum suction bay water height based upon maximum lake levels and surge heights is 580' 0" based upon the location of the intake structures approximately 1/2 mile off shore. The ESWPH is designed to preclude ground water in-leakage with sealed penetrations. The normal access to the ESWPH is 620' 6" and is above the maximum site flood level of 620' 5". Incidental in-leakage from ground water or system failures would be drained below the 580' 6" floor level by grating openings above the suction bay of the pump house and back to the lake via the intake structure. Storage for other equipment will be in the Unit 2 Emergency Diesel Generator Building and/or the Auxiliary Building at el. 620'6". The buildings are sited in a location above the PMF grade (620'5" for PNPP). Other satellite equipment locations will also be in safety related structures. See Figure A3-16 (1 thru 5) for storage and deployment information.
Severe Storms with High Winds	The ESWPH is designed as safety related Seismic Category 1 structure that meets the plant's design basis for the SSE (e.g., existing safety-related structure)
Snow, Ice, and Extreme Cold	PNPP site is subject to significant amounts of snow, extreme low temperatures and existence of large amount of ice. PNPP will ensure

Maintain Spent Fuel Pool Cooling	
	that all FLEX equipment will be stored in locations that provide general protection from the elements at the site. FLEX equipment is stored within buildings that will be maintained within a temperature range to ensure its function when called upon.
High Temperatures	The FLEX storage buildings will include adequate ventilation to ensure that high temperatures do not affect the functionality of FLEX equipment.

Deployment Conceptual Design (Attachment 2 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*
Spent Fuel Pool Cooling using ESW ESW A and ESW B will be connected through installed pipes and valves to the new SFP emergency makeup header within the Intermediate Building. The valve manipulations to initiate or control SFP emergency makeup will be in the Intermediate Building, remote to the Spent Fuel Pool.	A new emergency inventory make-up system for the SFP will be installed, supplied by ESW A and ESW B.	Connections between ESW A or ESW B and new SFP emergency makeup header will be within robust structures (Auxiliary Building, Intermediate Building, and Fuel Handling Building.)
Notes: None		

Maintain Spent Fuel Pool Cooling	
BWR 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. The makeup for SFP inventory loss established in Phase 2 would be continued in Phase 3 until normal cooling is restored using the FPCC System. The water supplied to the SFP emergency makeup header concurrent with 2000 gpm to the RHR heat exchanger and 250 gpm to the RPV is within the 3000 gpm capacity of each of the FLEX Phase 2 pumps. Calculations (Reference 9) have shown that initiating makeup flow to the SFP prior to 29 hours will prevent fuel uncovery assuming maximum heat load from a full core offload.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* PNPP will continue participation in the BWROG and will update plant procedures based upon generic industry guidance. It is expected the following FSGs will be incorporated into existing plant procedures in order to develop the FSG interface for Phase 3: • Spent Fuel Pool Emergency Makeup Using ESW for FLEX
Identify modifications	*List modifications* No additional modifications
Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.* SFP Level Per Order EA 12-051 PNPP 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 2 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*
Spent Fuel Pool Cooling using ESW	No additional modification are required for Phase 3	Connections are discussed in Phase 2
Notes: None		

Safety Functions Support	
Determine Baseline coping capability with installed coping modifications not including FLEX modifications.	
BWR 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. **Support to the safety functions** during Phase 1 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 safety related battery power, which is extended by cross tying Unit 1 and Unit 2 safety related batteries and performing a load shed on the DC buses. Instrument function and Control Room habitability are supported by establishing appropriate Control Room ventilation. Control Room lighting is powered by the plant batteries and adequate portable lighting is provided to support activities outside of the Control Room. Essential instrumentation for monitoring core and containment parameters will be fed from 125 Vdc bus ED-1-A, which is powered by a 125 Vdc battery bank. The SBO procedure directs that the ED-2-A battery bank in Unit 2 to be cross tied to Unit 1 and then load shedding is performed such that all non-essential circuit breaker loads are opened within three hours of the event. The maximum mission time for the battery bank is then greater than 24 hours per station calculations. In conjunction with cross tying to the Unit 2 Division 1 batteries and load shedding the DC buses provide greater than 24 hours of power to essential instrumentation and RCIC control. Therefore, on-site portable equipment must be deployed, staged, and able to power essential instrumentation within 24 hours of the event for purposes of maintaining availability of DC power. The temperature in the RCIC room, the HPCS valve room, and other vital plant areas are not expected to be above limits defined in USAR Chapter 3 within the first 6 hours. Concerns for ventilation in these areas will be addressed in Phase 2.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	The following procedures currently exist and would be used during the initial phase of the ELAP • ONI-R10-2, Total Loss of AC Power • ONI-SPI D-3, Cross Tying Unit 1 and Unit 2 Batteries • ONI-SPI D-1, Maintaining System Availability • ONI-SPI-D-2, Non-essential DC Loads • ONI-SPI H-3, Instrumentation Available During Station Blackout. • ONI-E12-2, Loss of Decay Heat Removal PNPP will continue participation in the BWROG and will update plant procedures based upon generic industry guidance. It is expected the following FSGs will be incorporated into existing plant procedures in order to develop the FSG interface for Phase 1: • Initial Assessment and FLEX Equipment Staging
Identify modifications	*List modifications:* None required to support Phase 1
Key Parameters	*List instrumentation credited for this coping evaluation phase:* None
Notes: None	

Safety Functions Support

BWR 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.

Support to the safety functions is continued by 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 the initiation of the onsite FLEX generators, used to repower the batteries, and support the electrical needs of other equipment described above. The generators are also used to establish forced circulation in the battery rooms required once battery recharge operations are initiated to maintain conditions within the ranges required by the equipment contained therein. Instrument function and Control Room habitability do not require further action beyond that taken in Phase 1.

The 4160Vac generators will provide power for the Unit 2 Division 1 4160Vac Bus EH21, Unit 1 Division 1 4160Vac Bus EH11, Unit 1 Division 2 4160Vac Bus EH12 and Unit 1 Division 3 Bus EH13. Busses EH11, EH12, EH13, and EH21 will supply their respective 480 Vac busses and required 480 Vac loads. A modification in Bus EH21 will permit Bus EH21 (powered from the FLEX Generators) to power Bus TH21. Bus TH21 is one of the two off site sources of power to Unit 1 Class 1E switchgear. See Figure A3-13: FLEX Generator Hookups and Cable Routing for an overview of the 4160 Vac generator hookup and electrical distribution.

Load	KW
NORMAL BATTERY CHARGER EFD-1-A, 1R42-S006	50.0
NORMAL BATTERY CHARGER EFD-1-B, 1R42-S008	50.0
NORMAL BATTERY CHARGER EFD-1-C, 1E22-S006	25.0
FUEL OIL TRANSFER PUMP #1, 1R45-C001A	11.5
FUEL OIL TRANSFER PUMP #1, 1R45-C001B	11.5
ADHR Pump, or SPCU Pump	186.0
Distribution Panel F1C08	134.0
RCIC PUMP ROOM COOLER, 1M39-B004	4.0
LPCS PUMP ROOM COOLER, 1M39-B006	15.0
HPCS PUMP ROOM COOLER, 1M39-B003	20.0
DIV 1 H2 IGNITER, 1M56-S2011	12.0
ESW TRAVELING SCREEN A, P49-D001A	11.5
ESW SCREEN WASH PUMP A, P49-C002A	37.5
FLEX Lake Water Pump(s)	300.0
Control Room Ventilation Fans (2 total)	105.0
Control Complex Ventilation (3 Fans)	165.0
FHB HVAC EXH FAN A, M40-C002A and B (2 Fans)	60.0
120 Vac Logic and control power (6 busses)	70.0
Control Room Lighting	12.0
Misc. transient loads (valves)	30.0
Total Load	1310.0

This table provides minimum FLEX loading requirements (Reference 9). Generator sizing is to accommodate the ADHR or SPCU pump and FLEX Lake Water Pump(s) to run simultaneously along with operation of support equipment. These loads by themselves require slightly more than 1300 kw.

Safety Functions Support
BWR Portable Equipment Phase 2

To provide additional capacity for temporary lights, portable fans, an existing plant battery charger, hydrogen igniters, RCIC control and various MOVs, the use of two 1.1 MW, 4160 Vac generators was chosen. This provides 2,200 KW of capacity for 1,310 KW load. Several portable fans will be required to provide cooling to RCIC and the Control Room. The portable fans will place a small load on the generator(s). The generator loading is evaluated with up to 10 fans at 2 horsepower each.

Two 1.1 MW generators are specified by PNPP and in compliance with the N+1 policy, an additional generator will be stored on site. See Figure A3-16 (1 thru 5) for storage and deployment. The portable generators will have a primary connection on Unit 2 at EH-21. The deployment location for these generators is the Unit 2 Emergency Diesel Generator (EDG) building in one of the Unit 2 EDG bays. The 4160 Vac generators will connect through single-phase cables at the identified docking stations.

During Phase 2, portable diesel powered air compressors will be deployed to re-establish the air capability to control components at the plant. As existing plant calculations (Reference 9) show that this is not an urgent requirement during Phase 2, a small oil-free air compressor of greater than 10 cubic feet per minute (cfm) at 150 psig will suffice. The primary connection to the A train instrument air is an existing fitting on the A train at the 599' 6" elevation in the Intermediate Building. The secondary connection to the instrument air system is an existing fitting on the B train at the 620' 6" elevation of the Auxiliary Building (Figures A3-14, A3-15).

Task timing estimates are provided for the diesel fuel oil makeup strategy. These strategies describe the means to provide fuel from the on-site diesel fuel storage tanks to all the FLEX equipment that requires diesel fuel. These fueling strategies will be implemented before on-board FLEX fuel supplies are depleted.

The FLEX generators do not have an onboard fuel tank and each generator uses about 110 gallons per hour (gph) of diesel fuel under full load. The generators are equipped with fuel pumps that can be used to take a suction on an external supply. For the "N" set of diesels that will be used at Operations Area 1 (outside the Diesel Building), a hose will be connected to the day tank drain valve on one of the three day tanks. Any of the day tanks can be used and selection will be event specific based upon availability. Each day tank has approximately 3 hours' worth of fuel supply before the auto transfer of fuel oil from the storage tank to the day tank is disabled due to low tank level. From the time that the FLEX generator is started until the critical 480 Vac divisional busses are energized is estimated to be less than 1 hour. This is sufficient time to restore power to the associated division critical 480 Vac to allow the fuel oil transfer pumps to be restored to normal operation and automatically supply makeup needs of the day tank. As an alternate, any of the three in-ground fuel oil storage tanks can be used by running a hose to the tanks dewatering or dipstick connections and pumping fuel directly to the generator. Establishing the fuel oil supply is a matter of connecting a hose from the ¾ inch drain valve (1R45-F507 A(B) / 1R45-F566) and routing the hose to the FLEX generator and connecting the hose to the generator fuel oil connection. Staging of the FLEX generator is to occur between T+1 and T+5, this is sufficient time (4 hours) to stage the generators outside the FLEX Equipment Bay 1 (Diesel Building), establish the fuel oil supply and connect the required cabling using two infield personnel. See Figures A3-16, Sheets 1-5, for deployment routes.

For the "N+1" generator that will be used at the ESWPH if an "N" generator is unavailable, the "N+1" generator will be moved from the FLEX Equipment Area 2 (Unit 2 Auxiliary Building) and staged at Operations Area 1 (outside the Diesel Building) to replace the failed N Generator. If access to Operations Area 1 (outside the Diesel Building) is precluded due to debris the "N+1" generator will be moved from FLEX Equipment Area 2 (Unit 2 Auxiliary Building) and staged at Operations Area 2 (outside the ESWPH). As part of this deployment a portable fuel oil tank will be staged by the generator to serve as the fuel oil tank for the generator. Provisions for transporting fuel oil have been made by

Safety Functions Support

BWR Portable Equipment Phase 2

placing a tank in the bed of the debris removal trucks. This tank provides an initial fuel load to allow at least an hour of generator operation. Once the generator is staged at the ESWPH, actions to refuel the generator are started by transferring fuel oil from the in-ground fuel oil storage tanks to the portable storage tank using the tank in the bed of the debris removal trucks to transport the fuel oil to Operations Area 2 (outside the ESWPH). Three pumps are provided to assist in this transfer of fuel oil: a 110 Vac pump, a 12 Vdc pump and a hand pump are provided. Portable 110 Vac generators are available to be used to power the 110 Vac pump.

The Phase 2 demand on installed diesel fuel is:

• FLEX Generator 1 110 gph X 18 hr. =	1980 gal
• FLEX Generator 2 110 gph X 18 hr. =	1980 gal
• Portable Air compressor 1.5 gph X 12 hr. =	18 gal
• Portable 110 Vac Generator 1.5 gph X 20 hr. =	30 gal
	Total 4008 gal

Total refueling demand from on-site resources is then about 4000 gallons (assuming 18 hours of FLEX generator operation at fuel load). The 184,220 gallons (Tech Spec minimum values) in the three fuel oil storage tanks could then support well over 24 hours of Phase 2 operations.

To transport the fuel oil, a truck with one 100 gallon tank will be stored in the FLEX Equipment Bay 2 (Unit 2 Auxiliary Building).

The diesel-driven air compressor will have substantial on-board fuel storage and its small size (~10 cfm) will not require prompt refueling. The portable light stands will be available for use and are similar in having approximately a 60 hour operational fuel supply on-board. Portable 25 gallon hand dollies are available for refueling these loads.

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* PNPP will continue participation in the BWROG and will update plant procedures based upon generic industry guidance. It is expected the following FSGs will be incorporated into existing plant procedures in order to develop the FSG interface for Phase 2: • Deploying FLEX 4160 Vac Generators • Energizing Unit 1 4160 Vac and 480 Vac buses with FLEX Generators • Energizing Unit 2 4160 Vac and 480 Vac buses with FLEX Generators • Operation of SPCU pump from U2 480 Vac during ELAP • Operation of ADHR pump from U2 480 Vac during ELAP • Installation of portable air compressor tie in to the Instrument Air system in the Auxiliary Building
Identify modifications	*List modifications necessary for Phase 2* • 4160 Vac Connections to Unit 2 Bus EH-21

Safety Functions Support	
BWR Portable Equipment Phase 2	
	• Jumper installation to allow Bus EH-21 to power Buses EH-11/12/13 • Transfer Switch for SPCU cross tie to U2 480 Vac • Transfer Switch for ADHR cross tie to U2 480 Vac
Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* • FLEX generator on-board load

Storage / Protection of Equipment:	
Describe storage / protection plan or schedule to determine storage requirements The Primary and Alternate 4160 Vac Generators will be stored in FLEX Equipment Bay 1 (Unit 2 EDG Building) and FLEX Equipment Bay 2 (Unit 2 Auxiliary Building). The portable compressors will be stored in FLEX Equipment Bay 2 (Unit 2 Aux Building). The portable lights will be stored in either location.	
Seismic	PNPP plans to store the FLEX Lake Water Pump(s) and hoses and other FLEX equipment in existing robust buildings meeting the requirements for storage of FLEX equipment. The electric pumps will be stored in the ESWPH utilizing space originally designated for the Unit 2 ESW pumps (Figure A3-4). The ESWPH is Seismic Category 1, and protected against seismic events, floods, and high winds. Both the Unit 2 EDG building and the Unit 2 Aux building were constructed to meet the site seismic requirements. Other satellite equipment locations will also be in safety related structures. FLEX equipment will be secured as appropriate during SSE and will be protected from seismic interactions from other components. No components will be stacked or at a raised elevation as to cause interference with the deployment of any FLEX equipment. A SSE having a peak horizontal ground acceleration of 0.15 g has been selected for design (USAR Section 2.5.2.6). The design basis values from the USAR will be used for PNPP's FLEX strategies. See Figure A3-16 (1 thru 5) for storage and deployment information.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	Storage for the FLEX lake Water pumps will be in the ESWPH. The ESWPH floor elevation is 580' 6." Maximum suction bay water height based upon maximum lake levels and surge heights is 580' 0" based upon the location of the intake structures approximately 1/2 mile off shore. The ESWPH is designed to preclude ground water in-leakage with sealed penetrations. The normal access to the ESWPH is 620' 6" and is above the maximum site flood level of 620' 5". Incidental in-leakage from ground water or system failures would be drained below the 580' 6" floor level by grating openings above the suction bay of the pump house and back to the lake via the intake structure. Storage for other equipment will be in the Unit 2 Emergency Diesel Generator Building and/or the Auxiliary Building at el. 620'6". The

Safety Functions Support	
BWR Portable Equipment Phase 2	
	buildings are sited in a location above the PMF grade (620'5" for PNPP). Other satellite equipment locations will also be in safety related structures. See Figure A3-16 (1 thru 5) for storage and deployment information.
Severe Storms with High Winds	The ESWPH, the Unit 2 Emergency Diesel Generator Building and the Auxiliary Building are designed as Seismic Category 1 structures that meets the plant's design basis for the SSE (e.g., existing safety-related structure)
Snow, Ice, and Extreme Cold	PNPP site is subject to significant amounts of snow, extreme low temperatures and existence of large amount of ice. PNPP will ensure that all FLEX equipment will be stored in locations that provide general protection from the elements at the site. FLEX equipment is stored within buildings that will be maintained within a temperature range to ensure its function when called upon.
High Temperatures	The FLEX storage buildings will include adequate ventilation to ensure that high temperatures do not affect the functionality of FLEX equipment.

Deployment Conceptual Design

(Attachment 2 contains Conceptual Sketches)

The FLEX portable 4160 Vac generators will be stored in FLEX Equipment Bay 1 (Diesel Building) and FLEX Equipment Bay 2 (Unit 2 Aux Building) and deployed at the 620' 6" elevation at Operations Area 1 (outside the Diesel Building) or Operations Area 2 (outside the ESWPH). Operators will connect the generators to dedicated docking stations (1X11-S0001 and 1X11-S0002) to feed the Unit 1 and Unit 2 Class 1 1E 4160 V Load centers after the declaration of an ELAP.

The FLEX portable compressors will be stored in FLEX Equipment Bay 2 (Unit 2 Auxiliary Building). The compressor will be deployed to its Operations Area(s) 3 or 4, at the 620' 6" elevation outside of the Unit 1 Aux Building stairwell door. Figure A3-18 shows the short distance between FLEX Equipment Bay 2 (Unit 2 Auxiliary Building) and the Unit 1 Aux Building. As the site is considered a "dry" site, flooding will not impair the deployment of FLEX equipment. Also, site evaluations have determined that no soil liquefaction will occur during a seismic event. Any debris on the deployment path will not hinder deployment or will be removed.

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*
Energize U2 480 Vac using FLEX Generators	• 4160 Vac Connection to Bus EH-21 • 4160Vac bus "jumper" between Breakers EH2101 and EH2102	Docking Station 1X11-S0001 for connecting the FLEX generators will be located in FLEX Equipment Bay 1. This is a robust structure.
Replenish Instrument Air Receiver Tanks	• None	The connection of the portable air compressor to

Safety Functions Support		
BWR Portable Equipment Phase 2		
		existing connections located in the Unit 1 Auxiliary Building or Intermediate Buildings which are robust structures.
Diesel Fuel Distribution	• None	Day tanks are installed in the Diesel Generator Building which is a robust structure.
Notes: Portable lights will be available for use as needed.		

Safety Functions Support	
BWR 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. Off-site equipment from the NSRC will arrive on-site to supply Phase 3 coping capabilities. Electrically, this includes two 4160 Vac generators capable of providing additional power to the 4160 Vac buses. There will be two connection points for the 4160 Vac generators that will be protected from all BDBEE. A "Docking Station" 1X11-S0001, will be installed in the FLEX Equipment Area 1 (Diesel Building). This docking station will have a Distribution Center (portable Switchgear) (similar to NSRC equipment) that will allow four 4160 Vac generators to feed into the docking station. Two connection points will be used by on-site equipment allowing the use of the other two connection points to be used for off-site equipment. The NSRC has estimated that they will be able to provide two large generators. During Phase 3 the 4160Vac generators will enable the use of the RHR pumps to establish Shutdown Cooling or Suppression Pool Cooling (if not previously re-established). The Unit 1 Phase 3 electrical coping strategy is to provide additional power for the 4160 Vac Division 1 and Division 2 buses EH-11 and EH-12. A cross-tie between the buses exists. This enables the primary or alternate connection point to supply all loads. The primary connection will be to bus EH-21. The FLEX onsite and NSRC generator fuel needs can be reasonably supplied from the existing day tanks / underground tanks. Large fuel trucks will be delivered from the NSRC to provide indefinite coping for the fuel supply and to allow transfer for minor needs such as the air compressor and the portable lighting stands.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* PNPP will continue participation in the BWROG and will update plant procedures based upon generic industry guidance. It is expected the following FSGs will be incorporated into existing plant procedures in order to develop the FSG interface for Phase 3: • Setup and Operation of NSRC 4160Vac Generator for ELAP • Energizing U1 4160 Vac from FLEX Generator • Procedure for refueling the NSRC generator
Identify modifications	*List modifications necessary for phase 3* • Installation of 4160 Vac load docking stations for FLEX
Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* • On Board 4160Vac Generator load

Safety Functions Support		
BWR Portable Equipment Phase 3		
Deployment Conceptual Design **(Attachment 2 contains Conceptual Sketches)** Two NSRC 4160 Vac generators will arrive on-site and be deployed to the generator Operations Area outside of the Unit 2 EDG building. They will be connected to the EH-21 4160 Vac bus via load docking stations in the Unit 2 EDG building.		
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*
Provide additional power to the Division 1 and Division 2 4160 Vac with the NSRC Generators	• Installation of 4160 Vac load docking stations for FLEX	The "Docking Station" for the 4160 Vac connections will be located in the U2 EDG Building which is a robust structure.
Notes: None		

BWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						Performance Criteria	Maintenance
List portable equipment	**Core**	**Containment**	**SFP**	**Instrumentation**	**Accessibility**		**Maintenance / PM requirements**
Two Electric Driven Pumps	X	X	X			3000 gpm @ 150 psig discharge pressure	Will follow EPRI template requirements
Two Generators	X	X	X	X	X	4160Vac 1.1 MW	Will follow EPRI template requirements
Five Portable Light Towers					X		Will follow EPRI template requirements
Diesel driven Air Compressor	X	X				10 cfm @ 150 psig	Will follow EPRI template requirements
Fuel Transportation trailer and truck	X	X	X	X	X	Approximately 100 gal storage tank	Will follow EPRI template requirements
Hoses	X	X				Sizes specified in detailed design	Will follow EPRI template requirements
Cable	X	X		X			Will follow EPRI template requirements
Portable Fans	X	X		X	X	< 2 horsepower	Will follow EPRI template requirements

BWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						Performance Criteria	Notes
List portable equipment	**Core**	**Containment**	**SFP**	**Instrumentation**	**Accessibility**		
Two 4160Vac Generators	X	X	X	X		4160Vac, 1.1 MW	NSRC supplied generators
Two Electric Driven Pumps	X	X	X			3000 gpm @ 150 psig	Pumps used in Phase 2
Diesel Driven Air Compressor	X	X	X			~ 10 cfm @ 150 psig	Compressors used in Phase 2
Large Fuel Trucks	X	X	X	X	X		
Large Debris Removal Equipment					X		
Hose	X	X	X			As specified in detailed design	
Cable	X	X	X	X	X	As specified 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	**None**

Commodities
• Food
  o Meals ready to eat (MREs)
  o Microwavable meals
• Potable water
	None

Fuel Requirements • #2 Diesel fuel • Diesel fuel bladders	**None**
Heavy Equipment • Transportation equipment o 4 wheel drive tow vehicle • Debris clearing equipment	**None**
Communications Equipment • Satellite phones • Portable radios	**None**

Phase 3 Response Equipment/Commodities	
Item	**Notes**
Portable Lighting • Flashlights • Headlamps • Batteries • Exterior light units with diesel generators	**None**

References

1. WestinghouseCalculation LTR-US-BWR-14-18, Rev. 0, PERRY Unit 1 Supplemental FLEX Coping Time Analysis.
2. NEI 12-06, Revision 0, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," August 2012.
3. NRC JLD-ISG-2012-01, Revision 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. Perry Power Station Unit 1 Updated Safety Analysis Report (USAR).
5. Westinghouse Calculation, LTR-AEO-13-004, Revision 0, "Perry Mode 4 and Mode 5 Boil Off Calculations," January 31, 2013
6. Site Procedures
    - ONI-R10-2, Total Loss of AC Power
    - ONI-SPI D-3, Cross Tying Unit 1 and Unit 2 Batteries
    - ONI-SPI D-1, Maintaining System Availability
    - ONI-SPI-D-2, Non-essential DC Loads
    - ONI-SPI H-3, Instrumentation Available During Station Blackout.
    - ONI-E12-2, Loss of Decay Heat Removal
    - EOP-01, RPV Control
7. Westinghouse Calculation Note, CN-AEO-12-0001, Revision 0, "Perry FLEX-Coping Time Analysis," January 31, 2013
8. Westinghouse Calculation Note CN-SEE-II-12-45, Revision 0, "Determination of the Time to Boil for the Perry Nuclear Power Plant Unit 1 Spent Fuel Pool after an Earthquake," December 21, 2012.
9. FLEX Integrated Plan for the Perry Nuclear Power Plant Revision 0
10. GE Hitachi Report NED0-33771, Rev 1, "GEH Evaluation of FLEX Implementation Guidelines," January 2013.
11. GEH/BWROG, RCIC Pump and Turbine Durability Evaluation – Pinch Point Study, revision 0
12. EPG Issue Number 1103, 3/1/12
13. EPG Issue Number 1119, 3/1/12
14. FLEX Mechanical Design Report for the Perry Nuclear Power Plant, Revision 1, May 2014
15. FLEX Electrical Design Report for the Perry Nuclear Power Plant, Revision 1, May 2014
16. FLEX Programmatic Controls for the Perry Nuclear Power Plant (PNPP), Revision 1, July 2014

ACRONYMS

AC	Alternating Current
ADHR	Alternate Decay Heat Removal
ADS	Automatic Depressurization System
BDBEE	Beyond-Design-Basis External Events
BWR	Boiling Water Reactor
BWROG	Boiling Water Reactor Owner's Group
CFM	Cubic Feet per Minute
CFR	Code Of Federal Regulations
CST	Condensate Storage Tank
DC	Direct Current
EDG	Emergency Diesel Generator
ELAP	Extended Loss Of All AC Power
EOP	Emergency Operating Procedure
EPG	Emergency Procedure Guide
EPRI	Electric Power Research Institute
ESW	Emergency Service Water
ESWPH	Emergency Service Water Pump House
FENOC	FirstEnergy Nuclear Operating Company
FLEX	Flexible and Diverse Coping Mitigation Strategies
FSG	FLEX Support Guideline
FHB	Fuel Handling Building
FPCC	Fuel Pool Cooling and Cleanup
GPM	Gallons per Minute
GPH	Gallons per Hour
HPCS	High Pressure Core Spray
ISG	Interim Staff Guidance
LOOP	Loss Of Offsite Power
LPCS	Low Pressure Core Spray
LUHS	Loss Of Normal Access to The Ultimate Heat Sink
MAAP	Modular Accident Analysis Program
MOVs	Motor Operated Valves
MW	Megawatt
NEI	Nuclear Energy Institute

NSRC	National Safer Response Center
OBE	Operating Basis Earthquake
ONI	Off Normal Instructions
PMF	Probable Maximum Flood
PNPP	Perry Nuclear Power Plant
PSIG	Pounds per square inch, gauge
RCIC	Reactor Core Isolation Cooling
RHR	Residual Heat Removal
RPV	Reactor Pressure Vessel
RRC	Regional Response Center
SAFER	Strategic Alliance for FLEX Emergency Response
SAG	Severe Accident Guidelines
SDC	Shutdown Cooling
SBO	Station Blackout
SFP	Spent Fuel Pool
SP	Suppression Pool
SPCU	Suppression Pool Clean Up
SPMU	Suppression Pool Make Up
SRV	Safety/Relief Valve
SSE	Safe Shutdown Earthquake
USAR	Updated Safety Analysis Report
UHS	Ultimate Heat Sink
Vac	Volts Alternating Current
Vdc	Volts Direct Current

OPEN ITEMS

There are No Open Items Identified	

Attachment 1A

Sequence of Events Timeline

Item	Elapsed Time[1] (hours)	Action	New ELAP Time Constraint Y/N	Time Constraint (hours)	Time Constraint Reference	Remarks/Applicability
	0	Event Starts	N/A	N/A	N/A	Plant at 100% power
1		Perform Station Blackout Coping Actions	N	N/A	Reference 6	SBO actions are proceduralized in ONI-R10-2 and EOP-01
2	0	Perform Damage Assessment	N	N/A	N/A	Provide status of essential plant SSCs to inform FLEX strategies. Expected completion before hour 6
3	1	Declare ELAP	Y	1	Assumption	This declaration allows actions to be taken which place plant SSCs outside current licensing basis alignments. **Declaration is required to perform the following time critical actions.** • Contact must be established with the NSRC to ensure that off-site equipment is delivered when required. • Deployment of FLEX equipment and use of FSG This action will occur before hour 1
4	1	Deploy exterior light stands	N	N/A	N/A	Located at FLEX generator Operations Area and air compressor Expected to complete before hour 2

1 Elapsed time is the planned initiation time and is defined as the time from the loss of power due to the external event until the action is initiated. Initiation times, provided in this column are estimates of the effort required to support the completion of action within the defined time constraint. The elapsed times are conceptual and will be refined as FLEX strategies are verified.

Attachment 1A

Sequence of Events Timeline

Item	Elapsed Time[1] (hours)	Action	New ELAP Time Constraint Y/N[2]	Time Constraint (hours)	Time Constraint Reference	Remarks/Applicability
5	1	Deploy debris removal vehicles	N	N/A	N/A	Perform debris removal on deployment paths to support FLEX Lake Water Pump(s) deployment and FLEX hose staging. Expected to complete before hour 3
6	1	Align ESW trains in ESWPH	N	N/A	N/A	This step supports establishing FLEX cooling water Expected to complete before hour 3
7	1.5	Fuel Handling Building (FHB) exterior doors propped open	N	N/A	N/A	Time based on SFP time to boil at maximum heat load , prevents pressure build up in Fuel Building Expected to complete before hour 2
8	3	Deploy and connect hose from ESW A to RCIC suction	N	N/A	N/A	This step supports establishing alternative FLEX cooling water Expected to complete before hour 4
9	3	Align ESW in Auxiliary, Intermediate and Diesel Buildings and Control Complex	N	N/A	N/A	Aligns ESW system to supply RPV and SFP makeup This step supports establishing FLEX cooling water Expected to complete before hour 4
10	4	Deploy onsite FLEX 4160Vac Generator(s)	N	N/A	N/A	Support establishing power for battery chargers and pumps to support Suppression Pool heat removal Expected to complete before hour 6

Attachment 1A

Sequence of Events Timeline

Item	Elapsed Time[1] (hours)	Action	New ELAP Time Constraint Y/N[2]	Time Constraint (hours)	Time Constraint Reference	Remarks/Applicability
11	5.5	Connect alternate water source to the RCIC suction	Y	6	Reference 9	One of the earliest responses required for Phase 2. Will be performed concurrently with FLEX portable equipment deployment. This action provides an alternative source of water to replace the CST if it has failed to align RCIC operation to the assumptions of the USAR. Based on MAAP 4.0.7 coping analysis (Reference 1) this action maintains RCIC suction temperature within operable range per Reference 11. Expected to complete before hour 6
12	6	Start and operate FLEX Lake Water Pump(s) at ESWPH	Y	6	Reference 9	Critical action to establish Phase 2 core cooling and suppression pool cooling. Expected to complete before hour 6. Cooling to SP required at 7 hours. Supplying alternate water source for RCIC before 6 hours is consistent with MAAP analysis.
13	6	Monitor FLEX Lake Water Pump(s)	N	N/A	N/A	Continuous action to 72 hours
14	6	Start 4160Vac FLEX generators to energize vital bus(es)	Y	6	Reference 9	Energizing the 4160Vac/480V equipment supports • Powering the ADHR/SPCU pumps to establish closed loop containment cooling • battery chargers for 125 Vdc • Opening AC MOVs for SPMU Expected to complete before hour 6
15	6	Monitor FLEX generators	N	N/A	N/A	Continuous action to 72 hours

Attachment 1A

Sequence of Events Timeline

Item	Elapsed Time[1] (hours)	Action	New ELAP Time Constraint Y/N[2]	Time Constraint (hours)	Time Constraint Reference	Remarks/Applicability
16	6	Initiate SP makeup with SPMU	Y	7	Reference 9	Provides additional cooling to SP before 6 hours. AC power required to operate valve. Action expected to complete before hour 6 from the Main Control Room
17	6	Deploy and connect hose from ESW A to LPCS connection	N	N/A	N/A	This step supports establishing FLEX cooling water Expected to complete before hour 7
18	7	Implement the use of ADHR/SPCU for "closed loop" suppression pool cooling	Y	7	Reference 14	Only one (ADHR or SPCU) pump is used in closed loop suppression pool cooling) Expected to complete before hour 7
19	12	Establish FLEX Equipment Refueling	Y	16	Reference 9	Diesel pump fuel consumption requires refill tank Diesel pumps could require fuel before 16 hours. Refill generators as required. Continuous action to 72 hours
20	13	Deploy diesel-driven air compressor	N	N/A	N/A	Supports recharging Air Receiver Tank Expected to complete before hour 15, not required until at least Hour 16 (earliest)
21	16	Start and operate diesel-driven air compressor	Y	24	Reference 9	Recharge Instrument Air to continue ADS operation (Air Receivers are adequate for more than 24 hours) Continuous action to 72 hours
22	24	Deploy FLEX 4160 Vac NSRC Diesel Generator	N	N/A	N/A	Arrive at off -site staging area Deploy to on-site Operations Area and connect to 4160Vac load center Expected to complete before hour 26

Attachment 1A

Sequence of Events Timeline

Item	Elapsed Time[1] (hours)	Action	New ELAP Time Constraint Y/N[2]	Time Constraint (hours)	Time Constraint Reference	Remarks/Applicability
23	24	Align RHR A to SDC mode and ESW A to RHR A heat exchanger	N	N/A	N/A	Aligns valves and prepares for RHR operation Expected to complete before hour 26
24	24	Begin SFP makeup from ESW	Y	29	Reference 9	Initiate Makeup to SFP prior to level lowering below 10 ft. above fuel. Continuous action to 72 hours – Injection is intermediate based upon monitoring of level.
25	26	Start and operate FLEX 4160Vac NSRC generator	N	N/A	N/A	Start of Phase 3 operations. Continuous action to 72 hours
26	28	Secure ESW A to LPCS	N	N/A	N/A	Realign for SDC mode Expected to complete before hour 28
27	28	Start RPV cool-down	N	N/A	N/A	Initiate SDC mode of Core Cooling. Continuous action to 72 hours

Attachment 2

Conceptual Sketches A3-1 through A3-18

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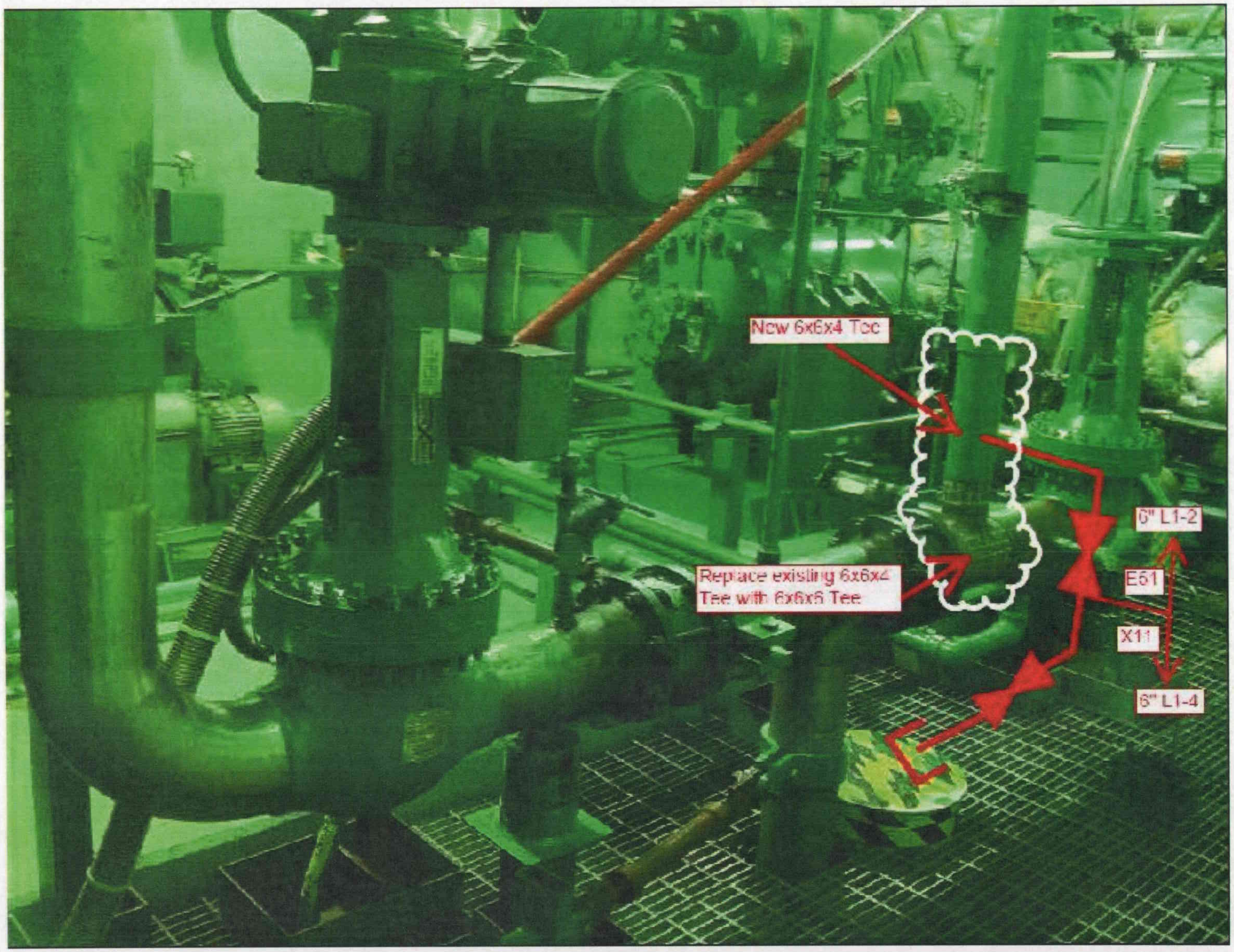


Figure A3-1: RCIC Alternate Suction Connection Point (el. 568' Auxiliary Building)

Figure A3-2: ESW A to RCIC Suction

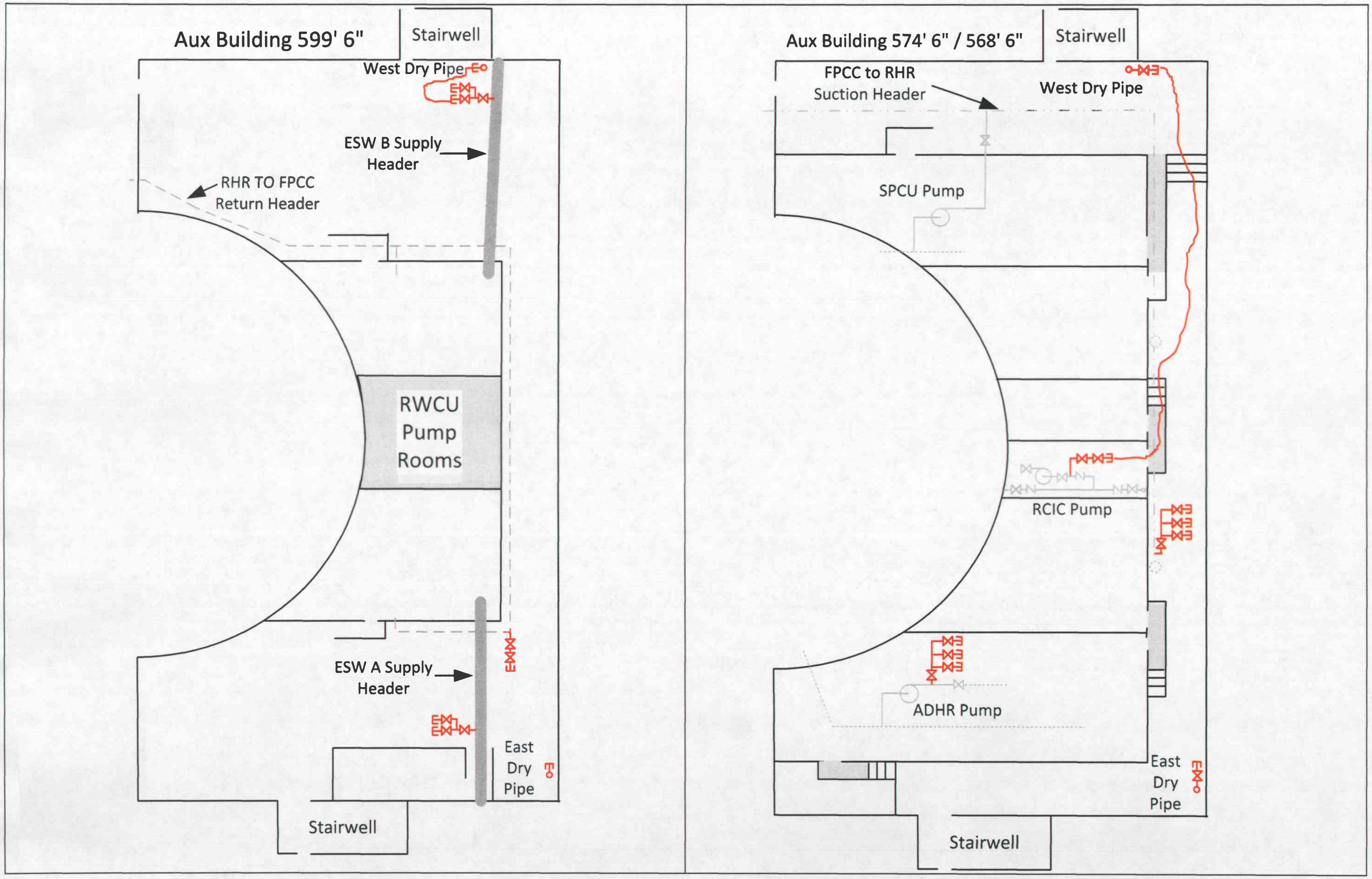
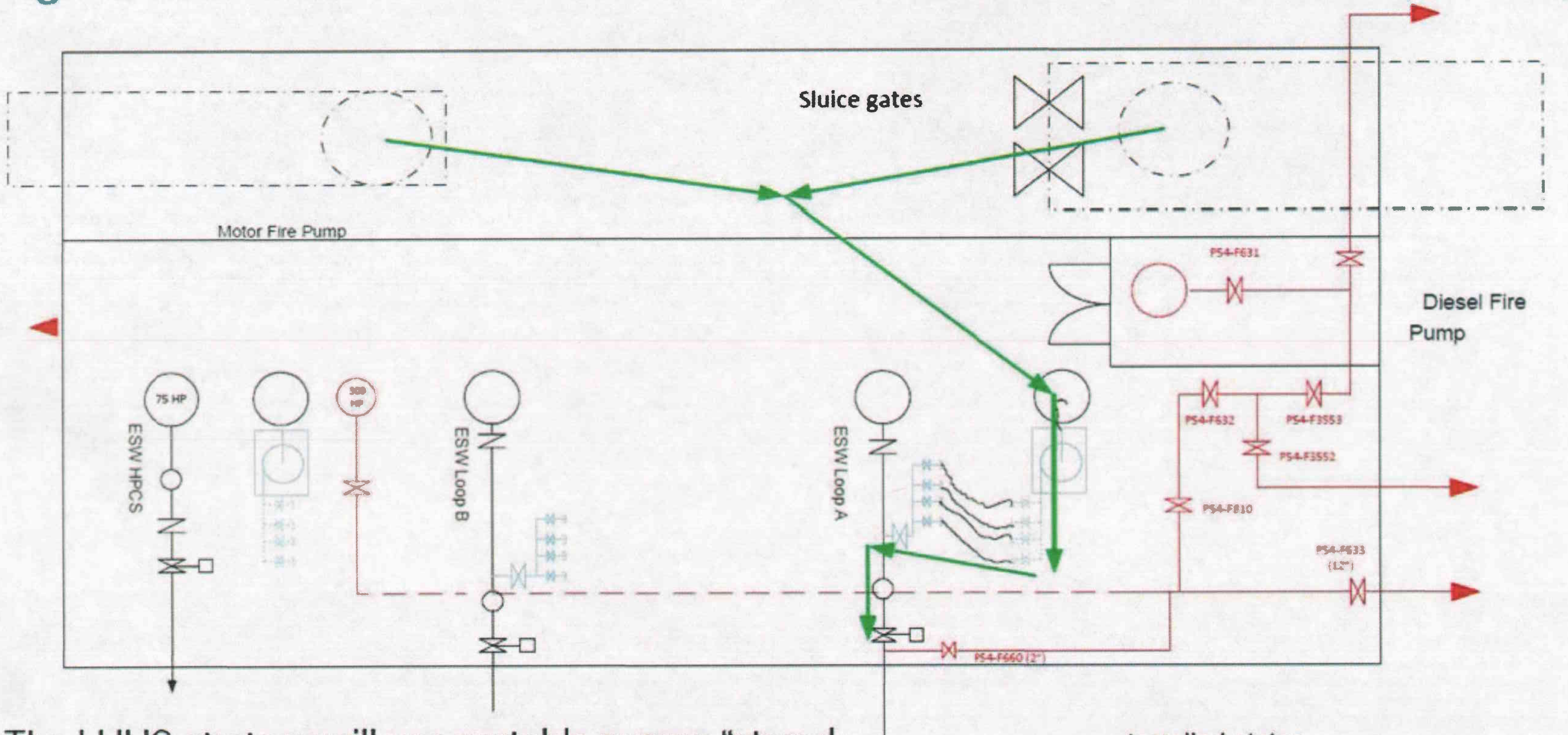


Figure A3-3: ESW B to RCIC Suction

Mitigation of Loss of Normal Access To Ultimate Heat Sink (LUHS)



The LUHS strategy will use portable pumps "stored in a robust structure in close proximity of deployment" (in the ESWPH). From this point, the needed cooling water to support the FLEX strategy will be provided.

Installed piping
Mod piping
Fire Main piping
Flow Path

Figure A3-4: Robust Water Makeup Source Routing

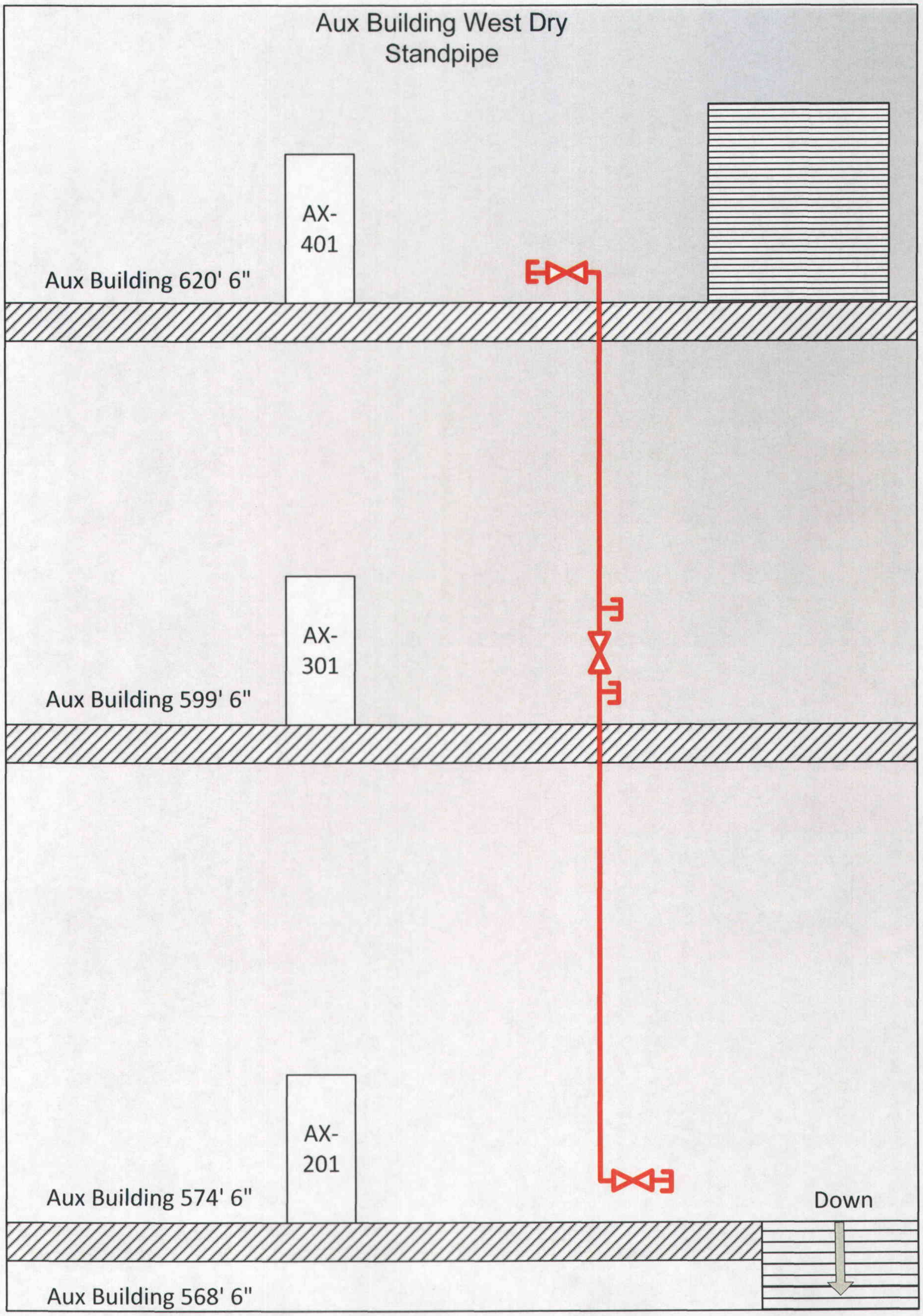


Figure A3-5: West Dry Standpipe

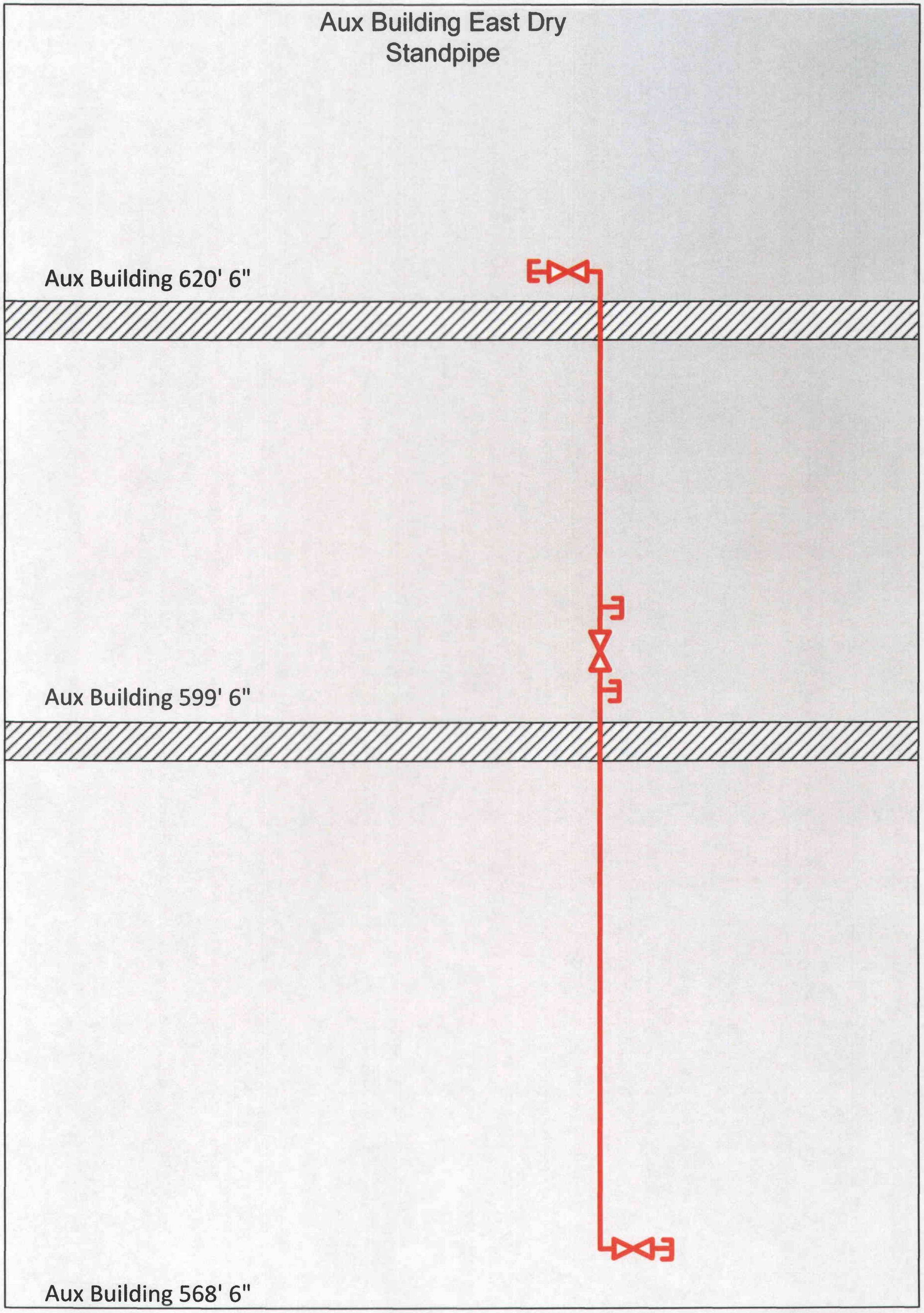


Figure A3-6: East Dry Standpipe

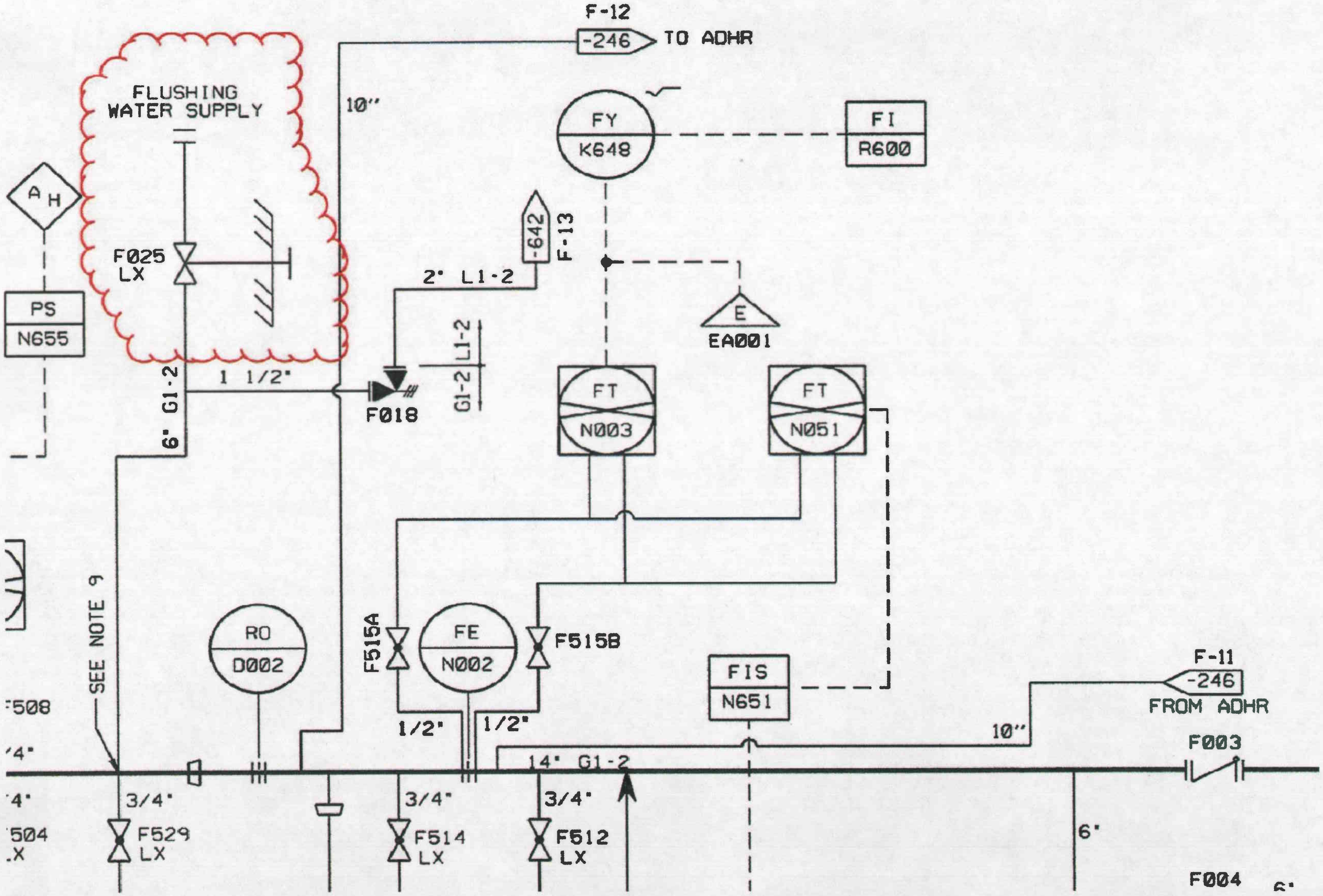


Figure A3-7: LPCS Hose Connection (302-0705)

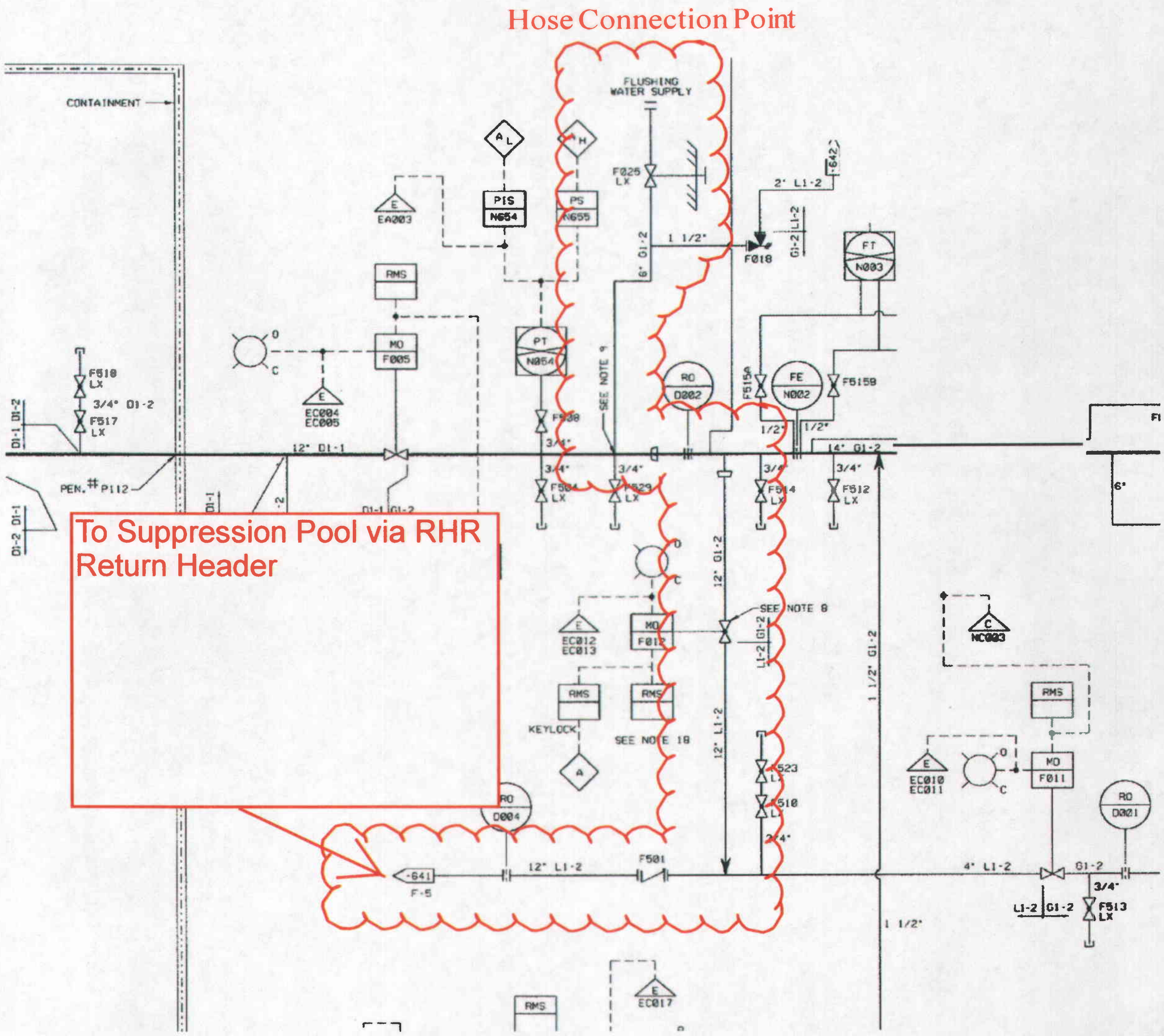


Figure A3-8: LPCS Suppression Pool Inventory Addition Flowpath (302-0705)

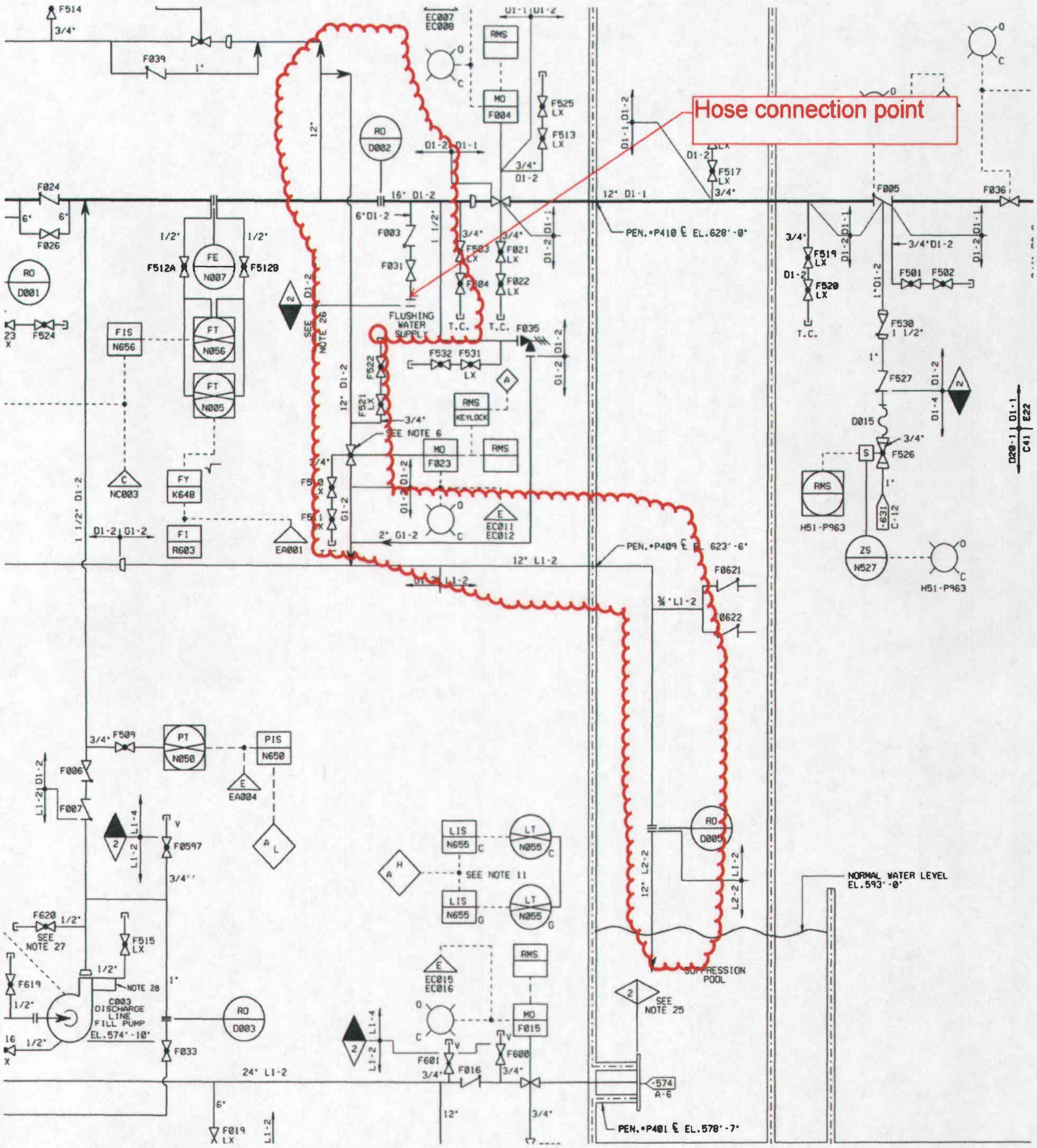


Figure A3-9: HPCS Suppression Pool Inventory Addition Flowpath (302-0701)

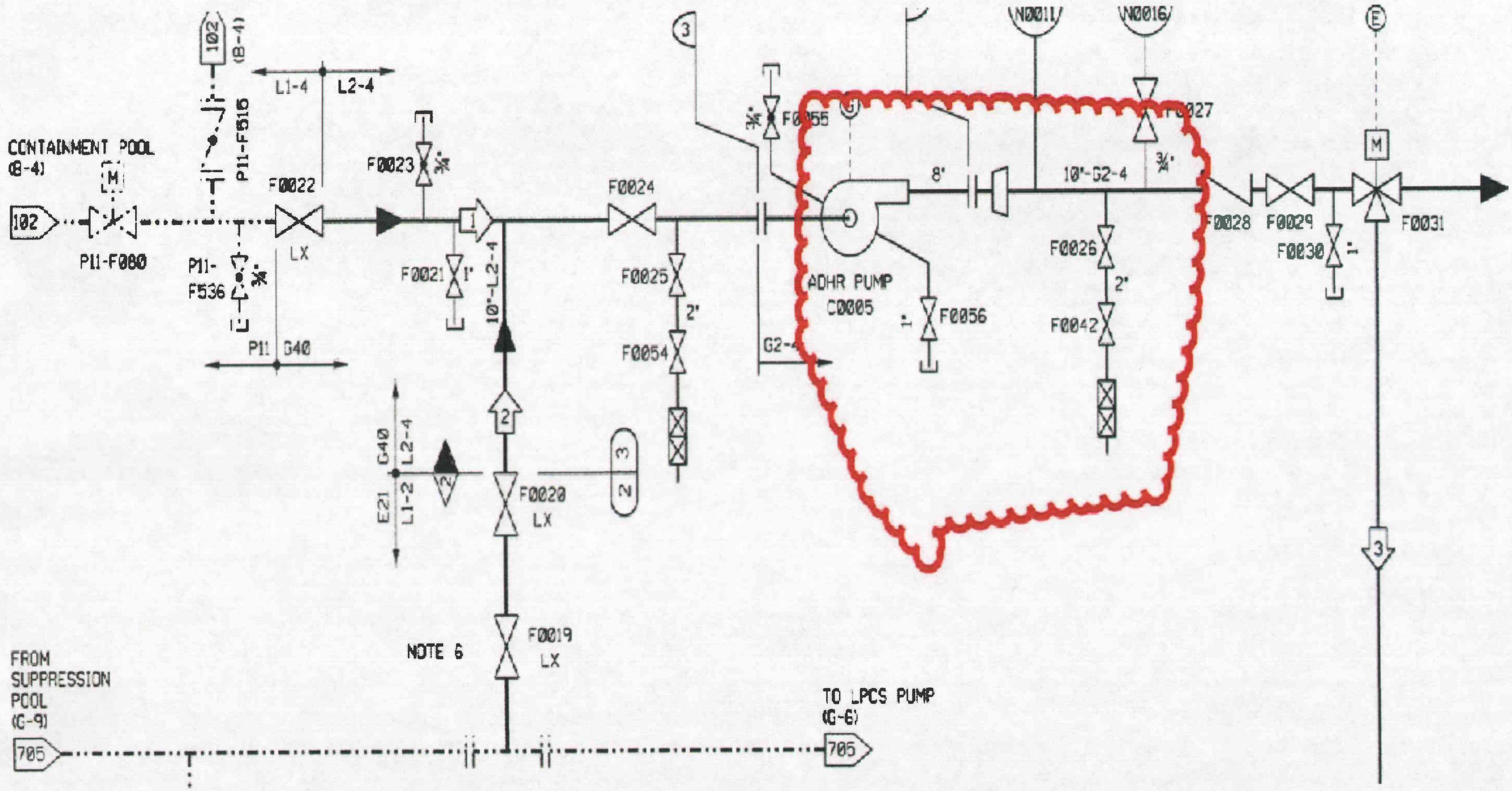


Figure A3-10: ADHR Piping Modification Location (302-0246)

Figure A3-11: SFP Fill Header Routing

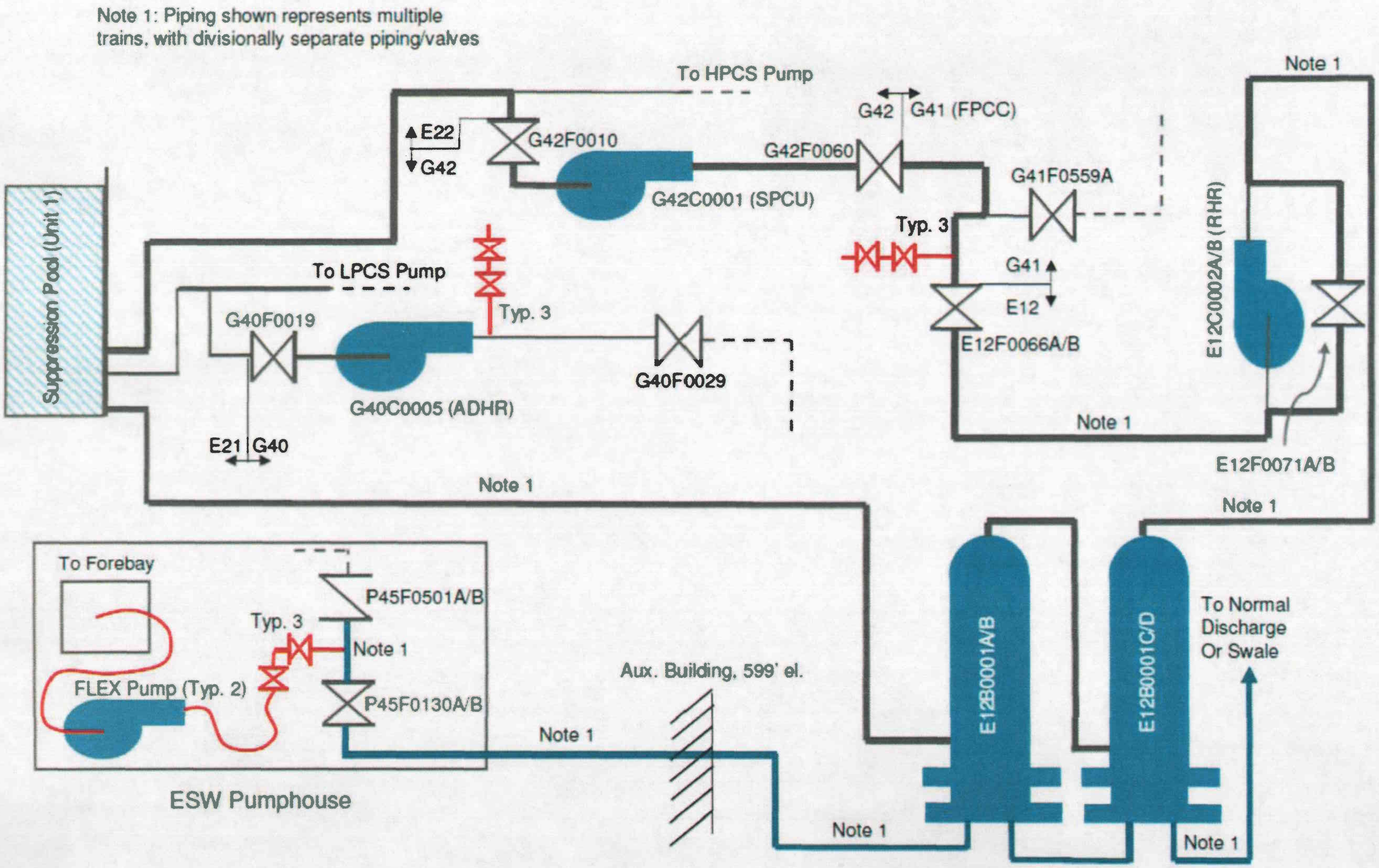


Figure A3-12: Closed Loop Cooling During Phases 2 and 3

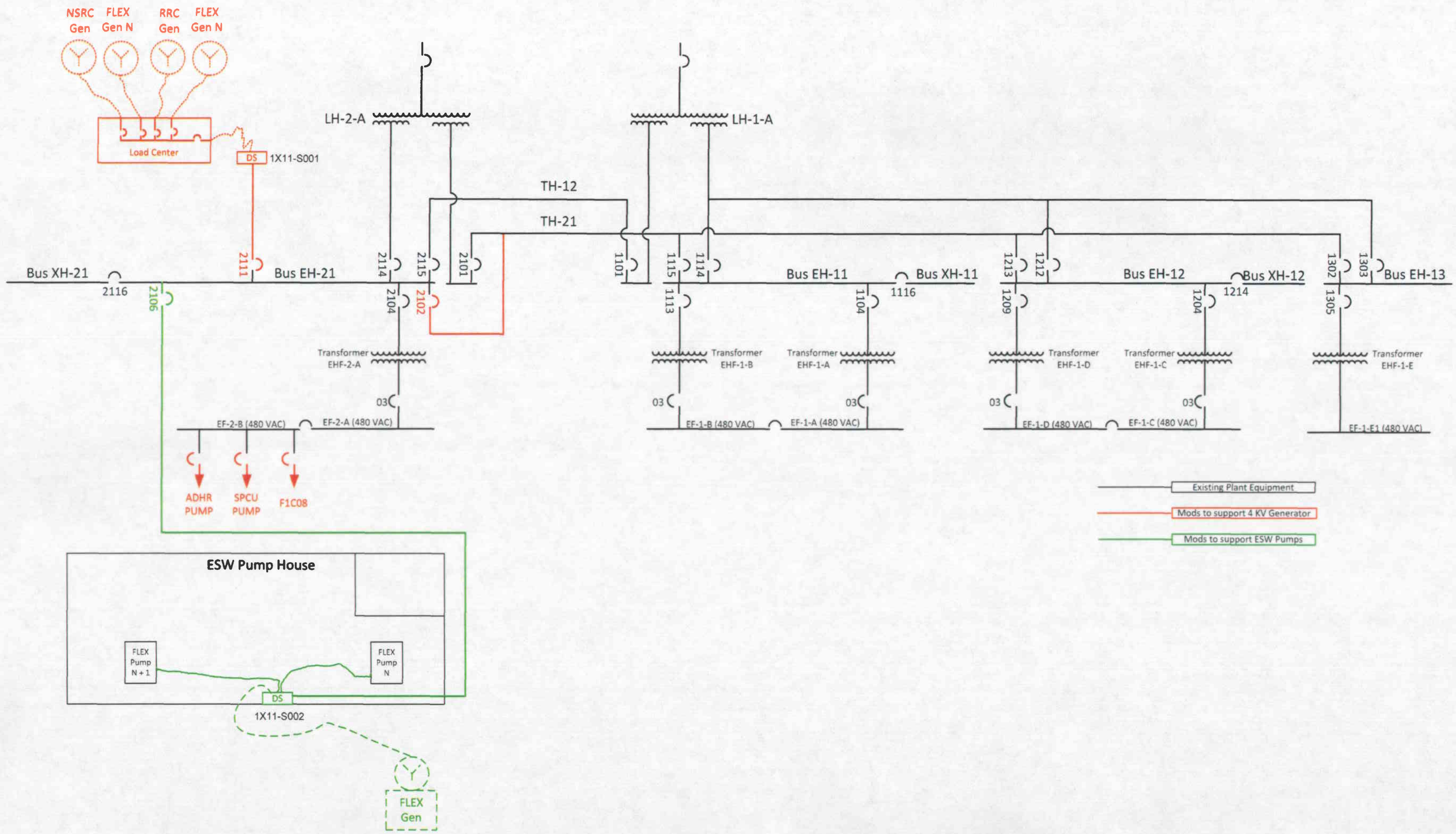


Figure A3-13: FLEX Generator Hookups and Cable Routing

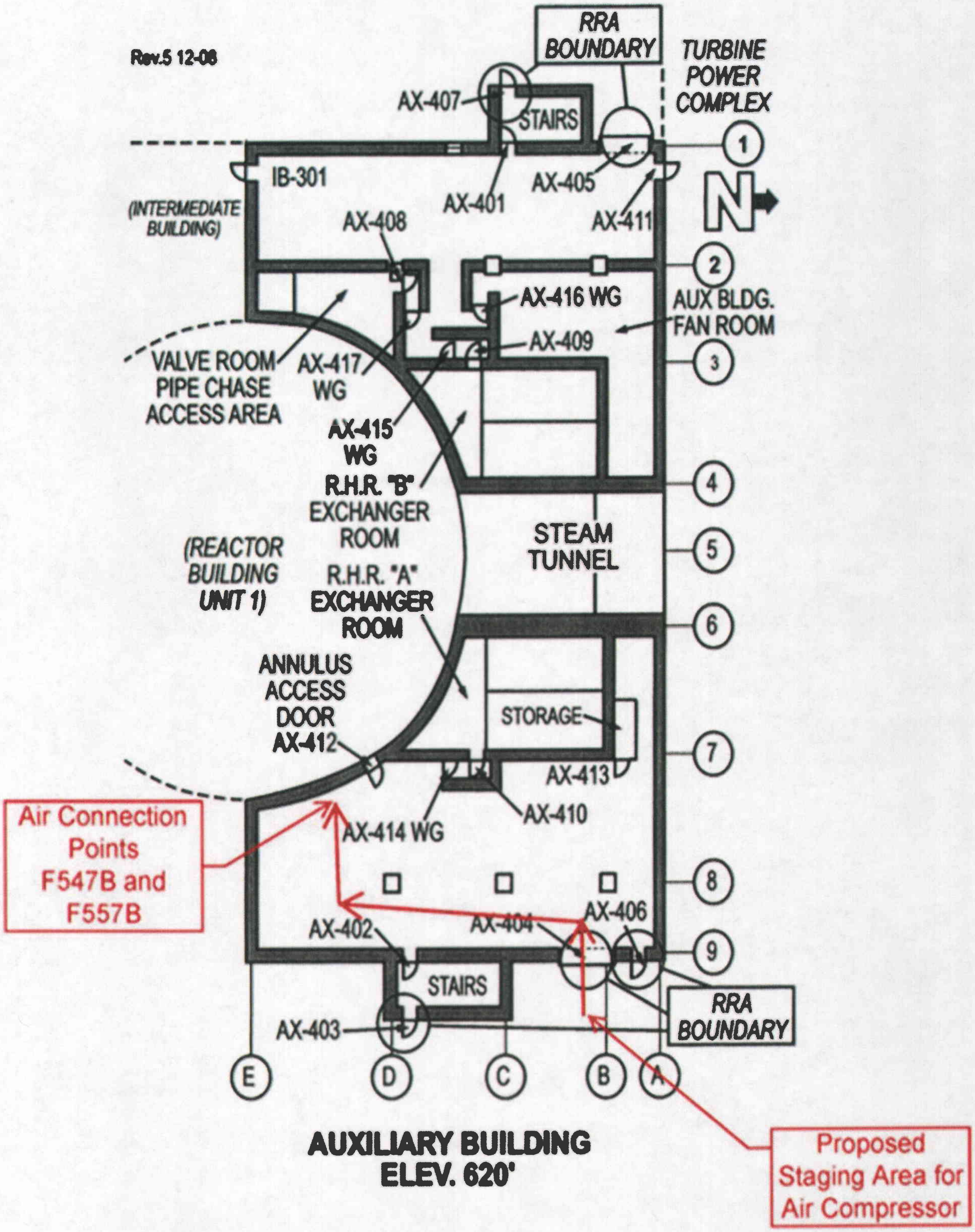
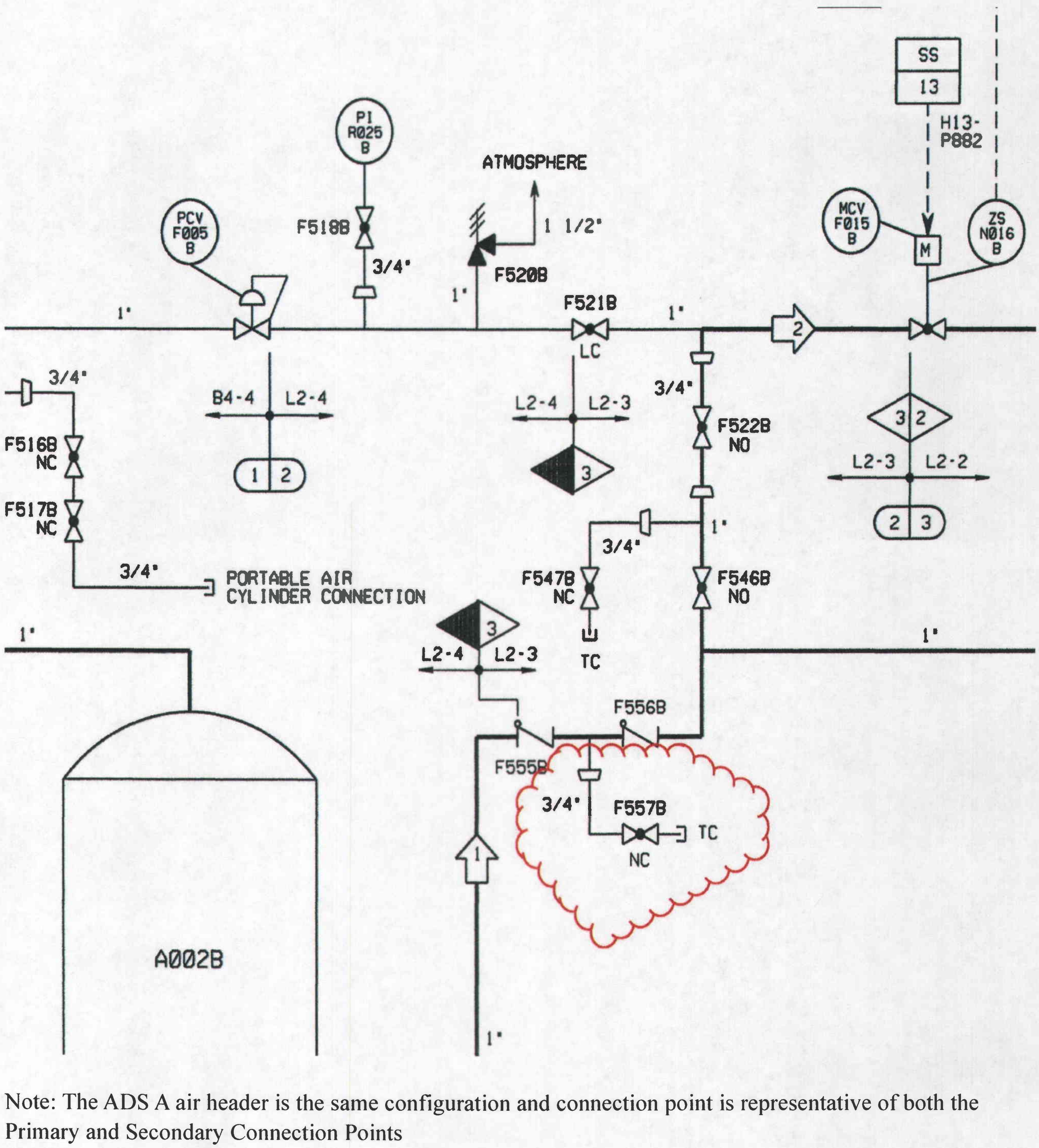


Figure A3-14: Hose Routing - Portable Air Compressor to Instrument Air



Note: The ADS A air header is the same configuration and connection point is representative of both the Primary and Secondary Connection Points

Figure A3-15: Portable Air Compressor Connection Point

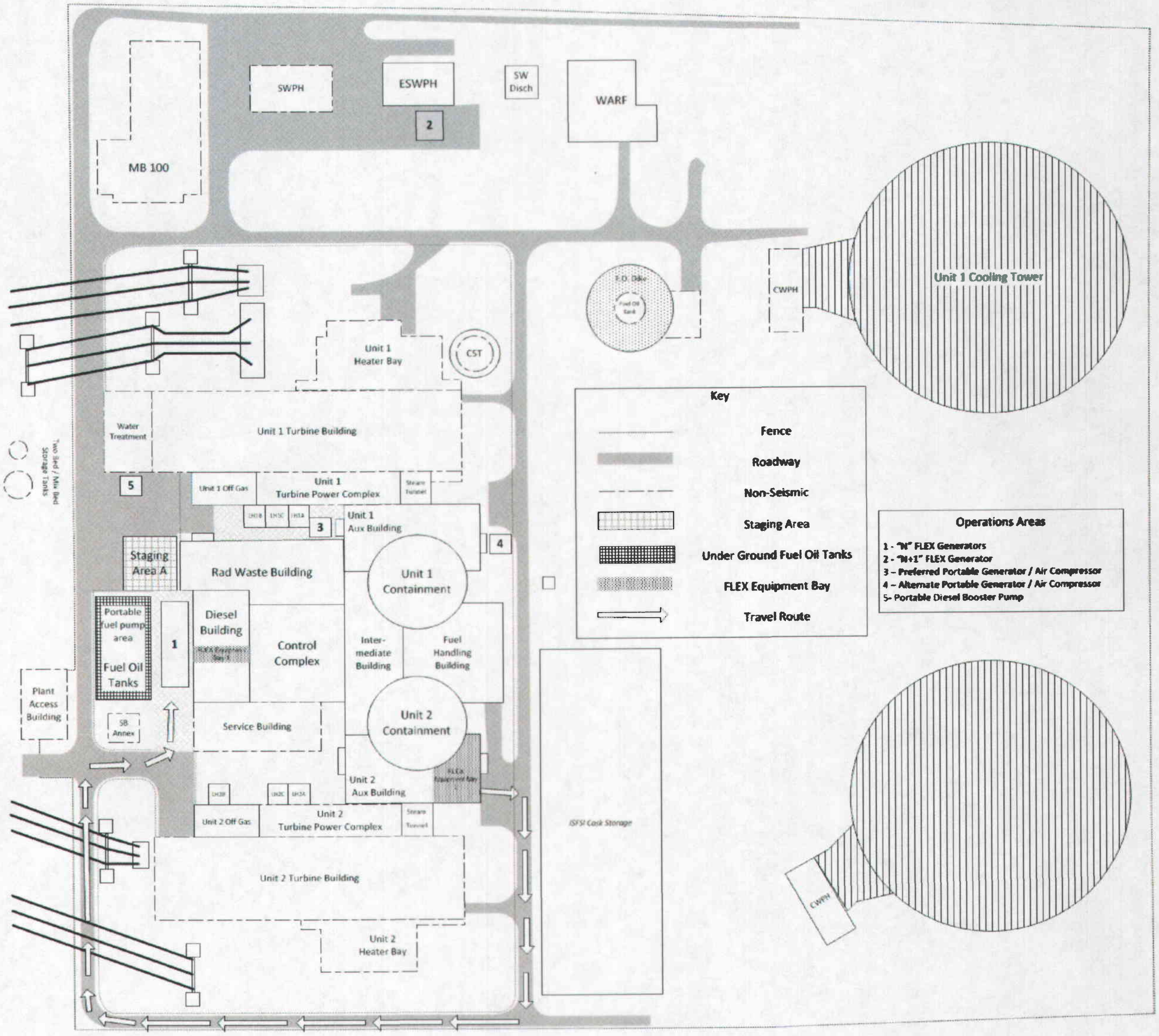


Figure A3-16, Sheet 1: Deployment Route 1 for Major FLEX Equipment

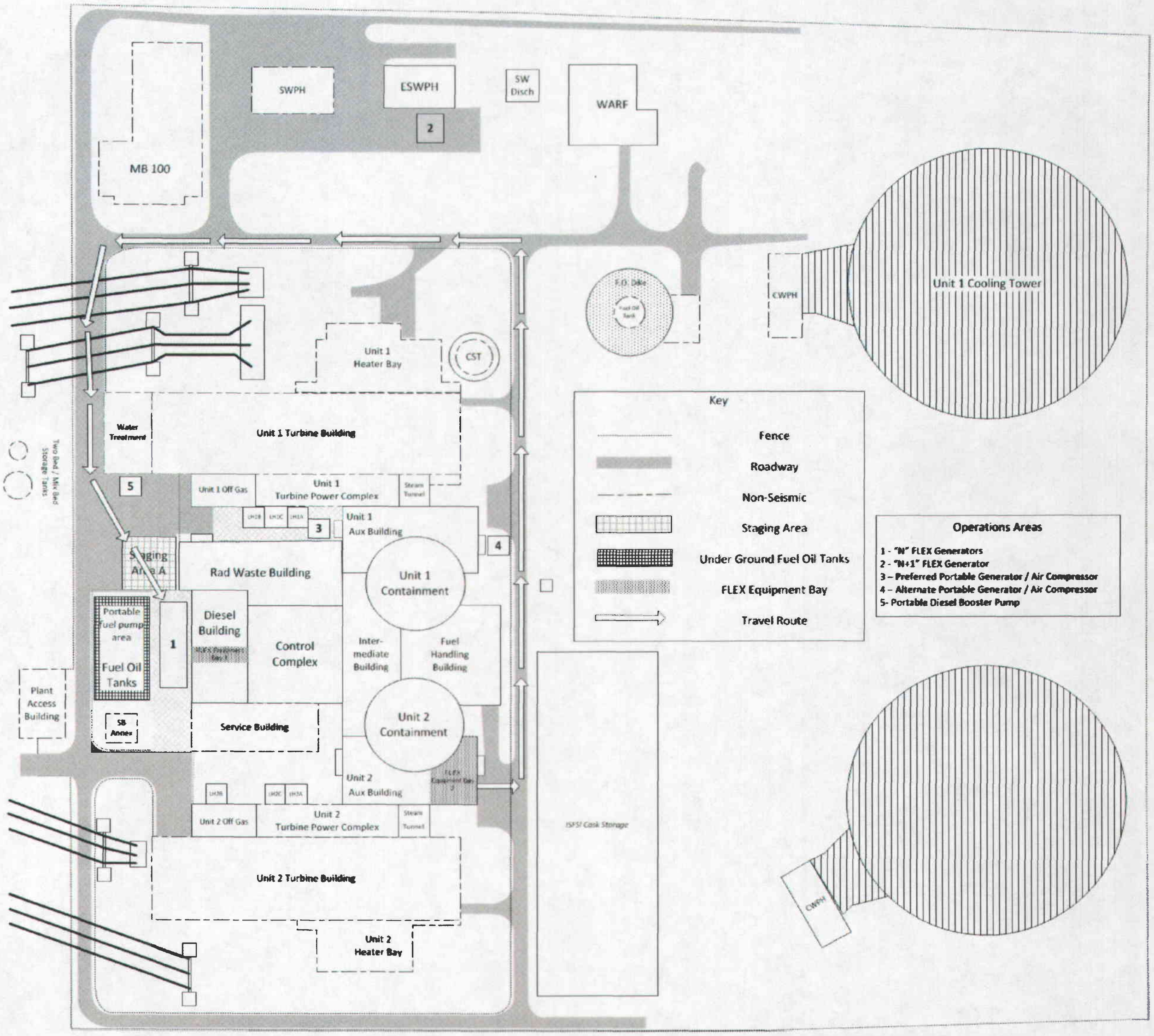


Figure A3-16, Sheet 2: Deployment Route 2 for Major FLEX Equipment

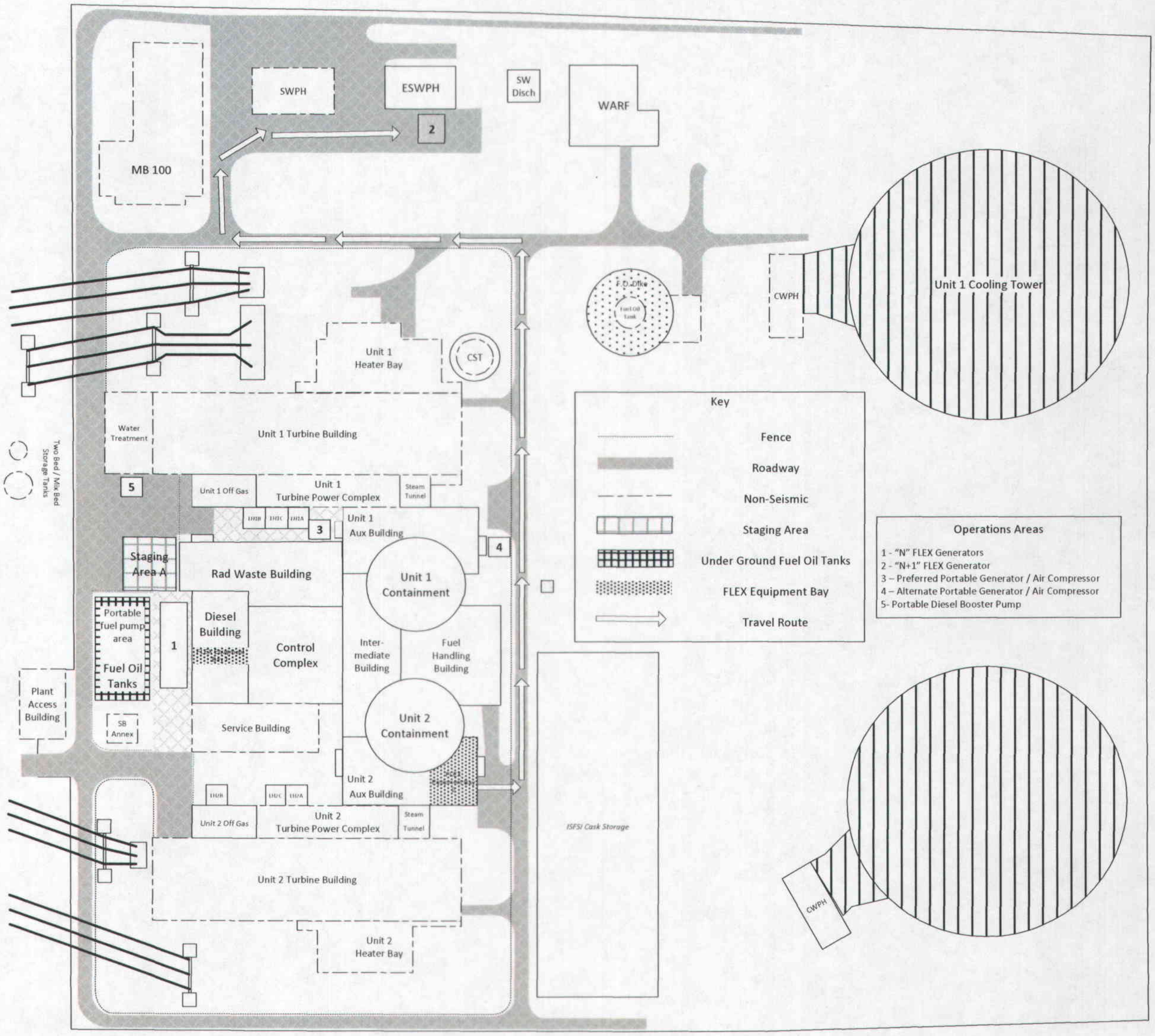


Figure A3-16, Sheet 3: Deployment Route 3 for Major FLEX Equipment

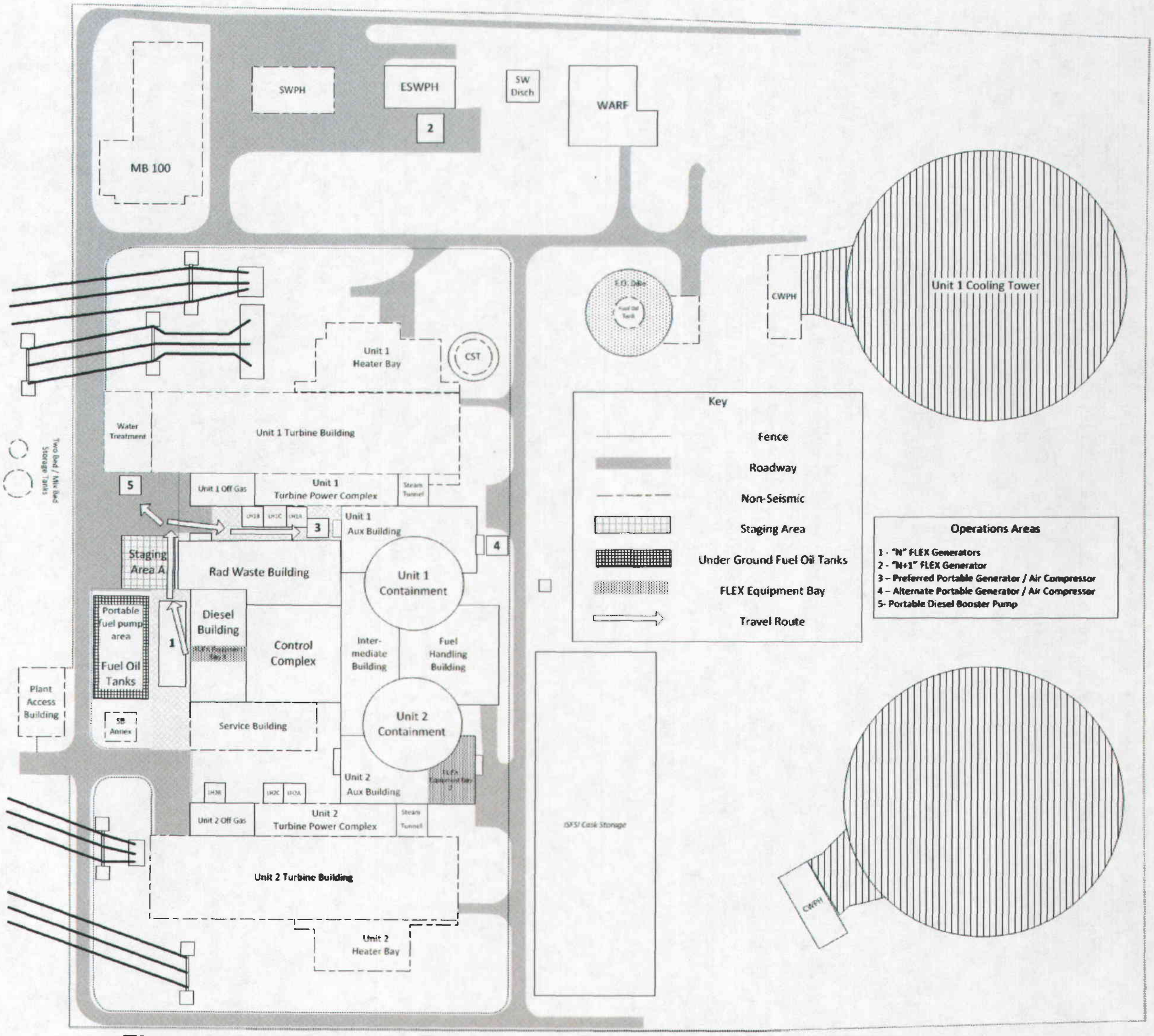


Figure A3-16, Sheet 4: Deployment Route 4 for Major FLEX Equipment

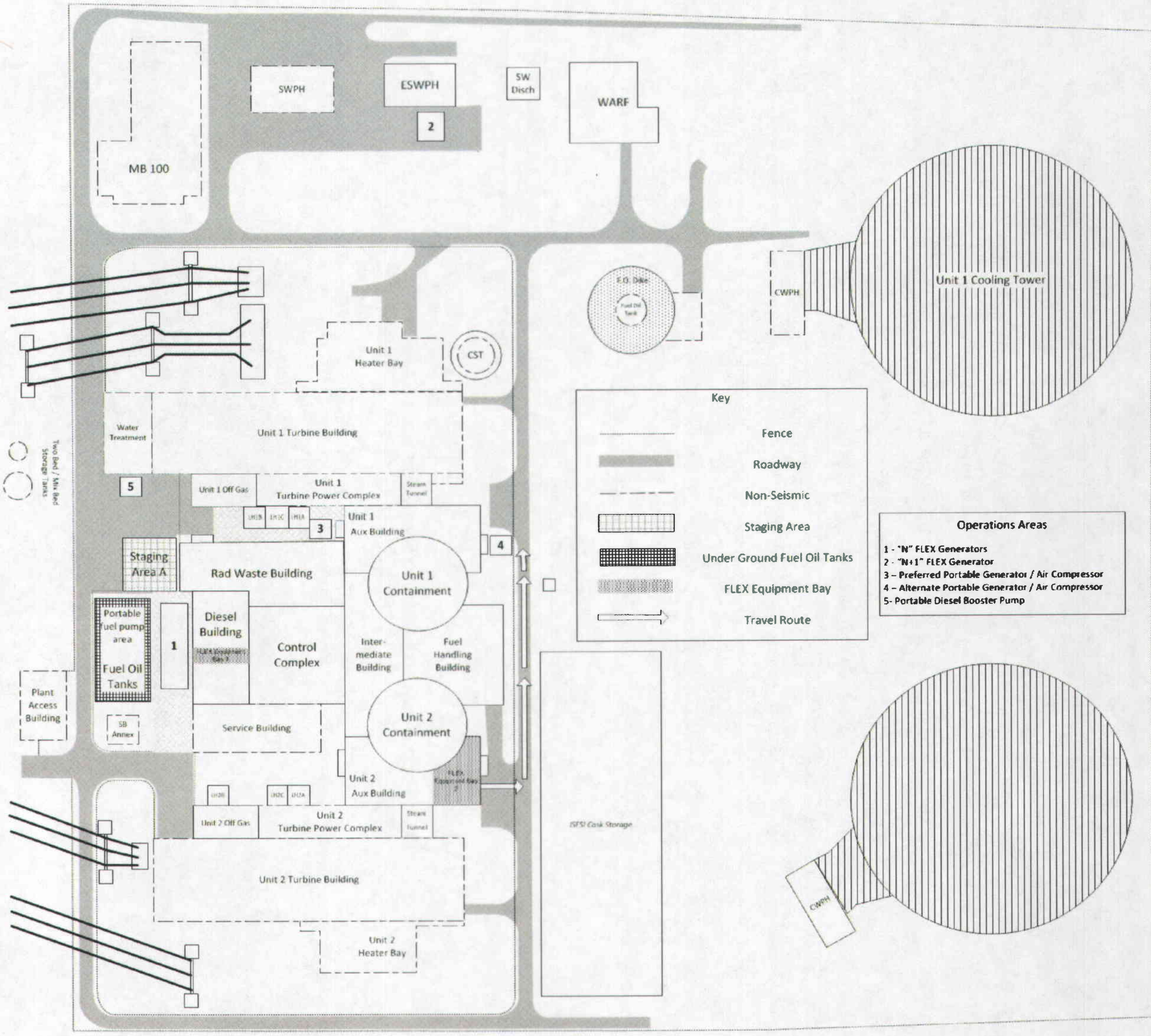


Figure A3-16, Sheet 5: Deployment Route 5 for Major FLEX Equipment

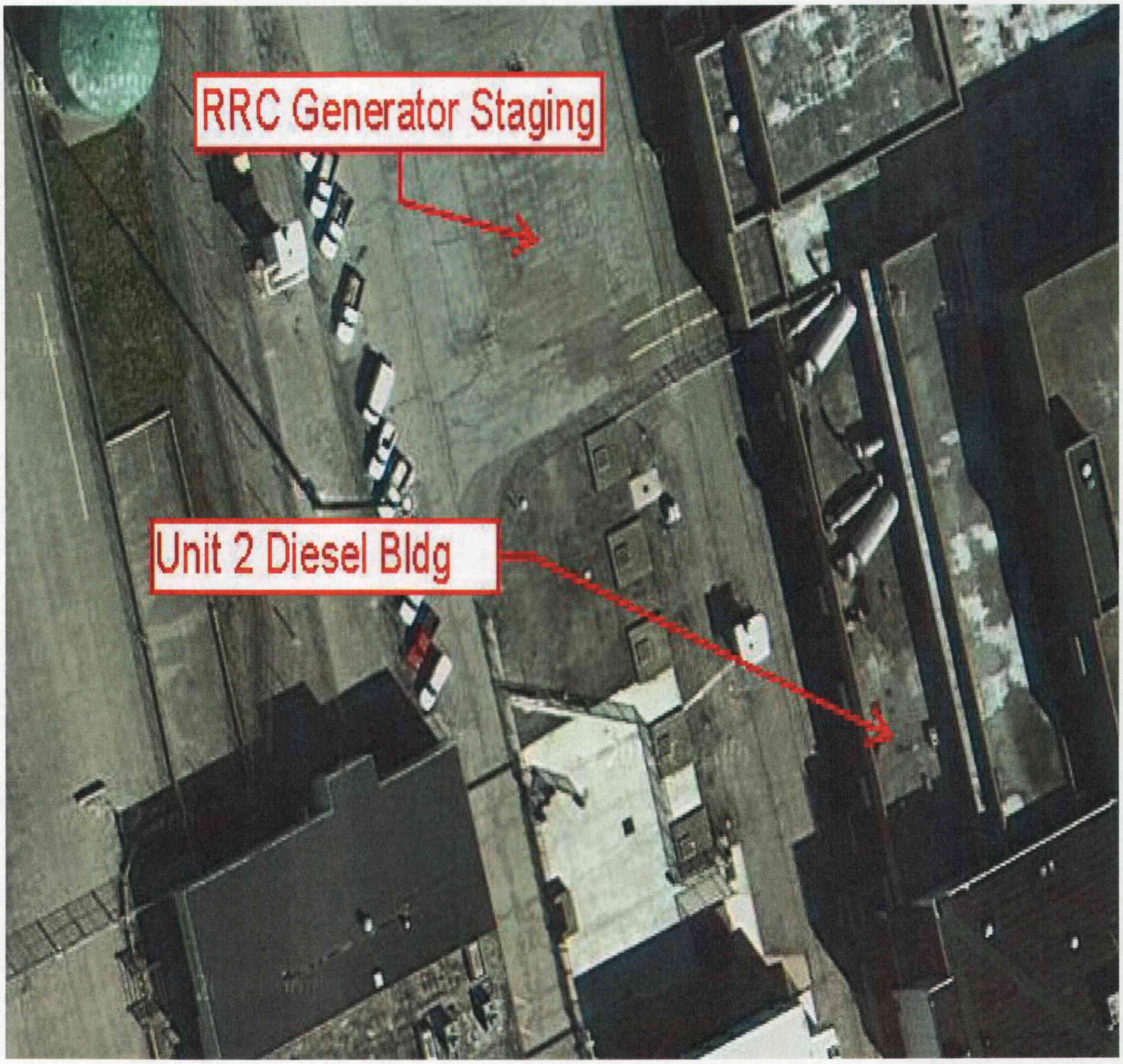


Figure A3-17: Electrical Generator Storage and Operations Areas

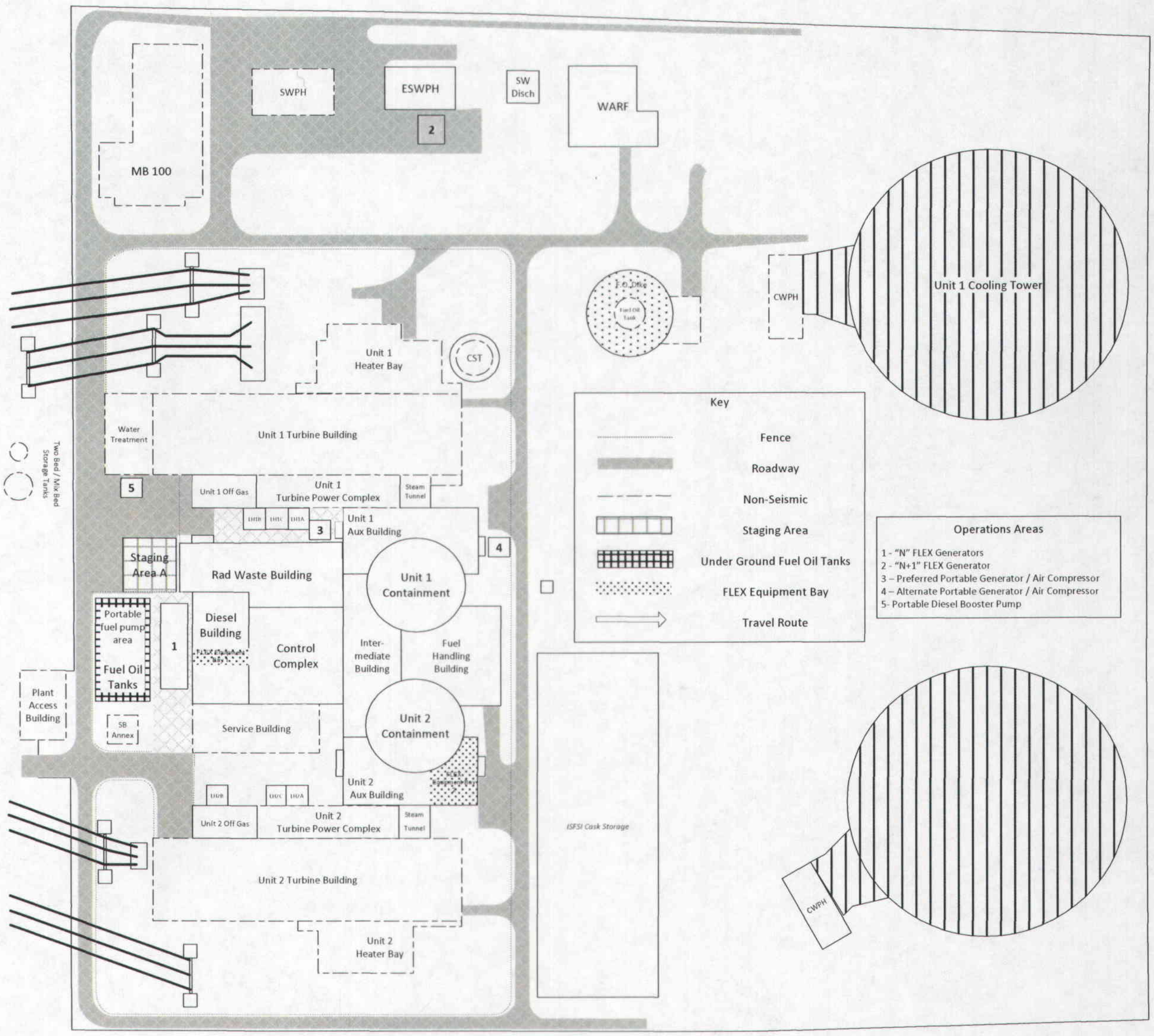


Figure A3-18: Main FLEX Storage, Staging, and Access