QUESTION 312.1

Section 2.1.2 of the FSAR indicates that PP&L owns the entire plant exclusion area. State whether or not this includes the mineral rights. In the event the mineral rights are owned by others indicate the authority to control all activities within the exclusion area.

RESPONSE:

See revised Subsection 2.1.2.1.

QUESTION 312.2

It is noted that the city of Hazleton, Pennsylvania, about 15 miles southeast of the plant is listed as the nearest population center. Indicate the projected 40 year growth of Berwick, Pennsylvania (current population of about 12,000), and whether it may become the new population center as defined in 10CFR Part 100 during the lifetime of the nuclear facility.

RESPONSE:

See revised Subsection 2.1.3.5.

QUESTION 312.3

Figure 2.1-2 of the FSAR shows an existing cemetery within the property line of the nuclear plant. Describe the current use of this land and indicate your control in the event of an emergency. Indicate if the cemetery is within the exclusion area.

RESPONSE:

The cemetery, as shown in Figure 2.1-2, is not within the exclusion area.

The Susquehanna SES Emergency Plan provides information on control of this area in the event of an emergency.

QUESTION 312.4

Provide a revised figure 2.1.2 which includes a distance scale.

RESPONSE:

The axes of this Figure provide this information in feet.

QUESTION 312.5

Provide a basis for the selected severity value of railway tank car ruptures, i.e., 12 percent of accidents leading to Regulatory Guide 1.78 volume limits. Clarify the statement "...two percent of accidents, severe enough to create a full tank rupture would be expected in less than 10 percent." Since reference 2.2-11 dates back to 1972, indicate the expected rail car accident frequency change, if any, which may occur if the rail car accident statistics were updated to the present time.

RESPONSE:

See revised Subsection 2.2.3.1.3.

QUESTION 312.6

(1) Indicate the nature of the firefighting equipment and operations which will be used to mitigate the effects of the potential radiant heat associated with an oil fire at the river.

(2) Provide an estimate of the potential duration of smoke and radiant heat in the event of an oil fire at the river following an oil pipeline rupture.

RESPONSE:

See revised Subsection 2.2.3.1.4.

QUESTION 312.7

List all plant structures, systems, and components, as outlined in Regulatory Guide 1.117, in terms of the protection provided against the design basis tornado missiles. Describe their approximate locations and the barriers (thickness, material) which may exist between them and potential tornado missiles.

RESPONSE:

As stated in Subsections 3.5.1.4 and 3.3.2, Table 3.3-2 lists the systems that are protected against tornadoes and the enclosures which provide this protection. The enclosing structures are described in detail in Section 3.8. See section 3.13 for any exceptions to Regulatory Guide 1.117 (June 1976).

QUESTION 312.8

(1) Provide an estimate of the free air space volumes that are serviced by the control room and secondary ventilation emergency HVAC systems. Also indicate the normal outside air intake rate for each of these HVAC systems.

(2) Table 6.4-1 of the FSAR lists the control structure isolation damper closure times. Indicate the total time between a chlorine detector signal generation and the closure of the isolation dampers.

(3) Describe briefly the measures to be taken in precluding potentially contaminated air in the H&V equipment room (FSAR Figure 9.4-1M) from leaking into the control room and control structure HVAC ductwork, thus creating a source of unfiltered infiltration into the habitability zones. Discuss the leakage characteristics of the H&V equipment room with respect to adjacent zones, and indicate provisions for controlling duct work leakage paths e.g. pilot traverse holes, hatches, joints.

(4) Since the control room and secondary envelope HVAC systems are included in the habitability zone, some air exchange between the two systems can be anticipated either through leakage paths or due to door openings. Describe the leak paths across the ventilation barrier between the control room and the secondary envelope.

(5) Discuss briefly the need for including extraneous zones (for example, the cable spreading rooms and the relay rack rooms) within the habitability zone.

RESPONSE:

FSAR Subsections 6.4.2.1, 6.4.2.3 and 6.4.2.4, Table 6.4-1 and Appendix 15B have been revised to include the requested information.

Since the chlorine detection system has been deleted, reference to the system is removed from the FSAR.

QUESTION 312.9

Indicate if the last sentence in the first paragraph of FSAR Subsection 15.6.2.5 is correct.

RESPONSE:

FSAR Subsection 15.6.2.5 has been revised to correct a typographical error in the last sentence.

QUESTION 312.10

The last paragraph of FSAR Subsection 6.2.3.2.3 "Containment Bypass Leakage" indicates that the total design bypass leakage rate is 56.6 scfh and that this value was assumed in the accident dose evaluation presented in Chapter 15. However, in FSAR Subsection 15.6.5.5.1.2 it is stated "It was assumed that no activity will bypass the SGTS filter."

Explain this apparent discrepancy.

RESPONSE:

This discrepancy has been resolved as described in the response to Question 021.03.

QUESTION 312.11

Table 2.2-1 in the FSAR states that two pipelines in the vicinity of site are used for petroleum. Indicate if these lines are used for high flammability petroleum products such as gasoline.

RESPONSE:

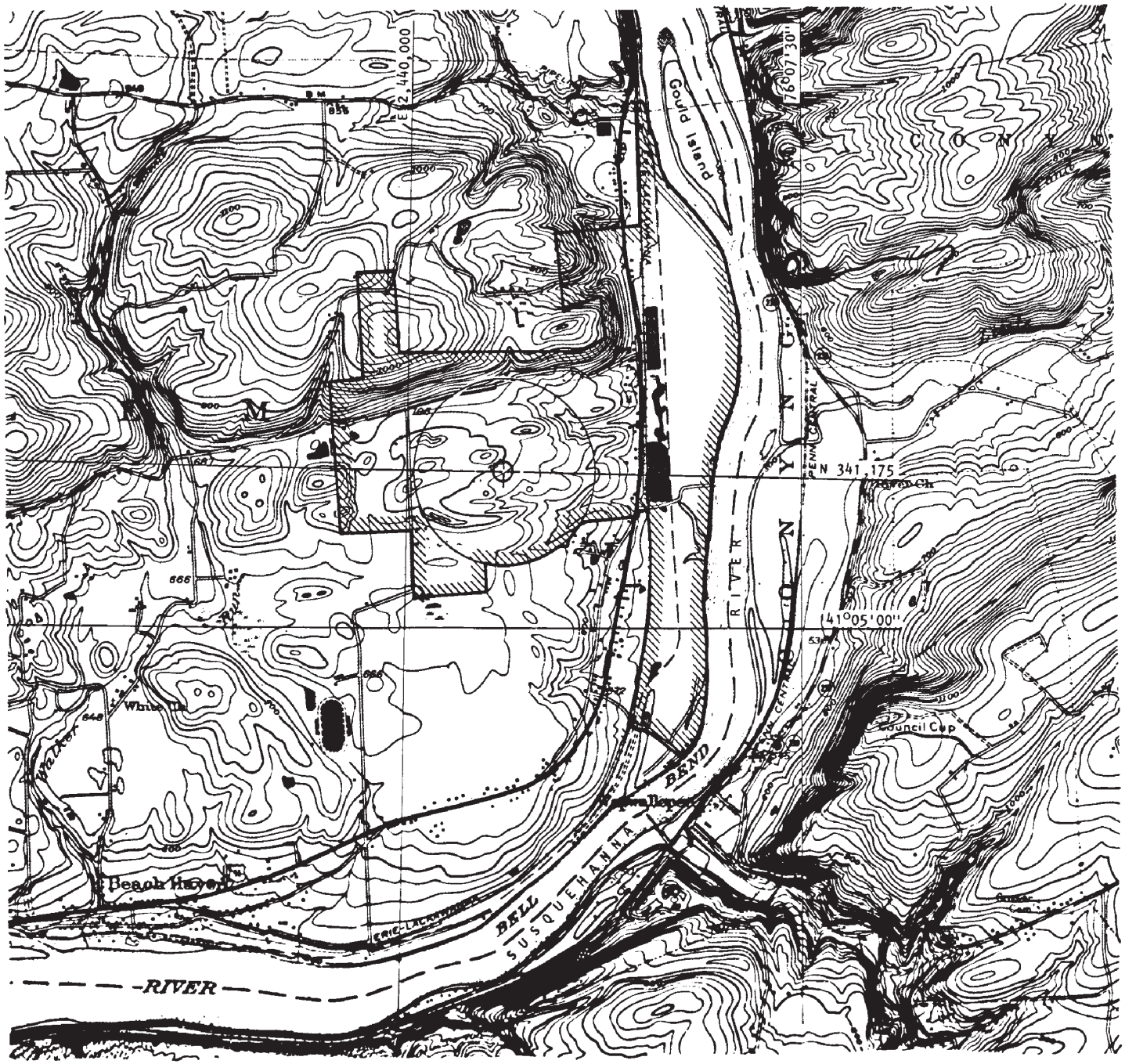
See revised Table 2.2-1

QUESTION 312.12

None of the maps in the FSAR clearly show the exclusion area boundary. Provide a full scale section of the USGS map of the Berwick, PA quandrangle which clearly shows the exclusion area as well as the plant boundary. (FSAR Figure 2.1-1 is too small to provide sufficient detail.)

RESPONSE:

See the SSES Emergency Plan or the Technical Specifications for a depiction of the exclusion area.



N

2000 0 2000 4000

SCALE IN FEET

(1:24,000)

LEGEND:

STATION BOUNDARY LINE

EXCLUSION AREA BOUNDARY

CENTER POINT OF EXCLUSION AREA (N341,175; E2,441,970.5)

REFERENCE:
THE BASE MAP IS TAKEN FROM PART OF THE U.S. GEOLOGICAL SURVEY, BERWICK, PA. 7½ MINUTE QUADRANGLE (TOPOGRAPHIC). PHOTOREVISED 1969.

FSAR REV.65

SUSQUEHANNA STEAM ELECTRIC STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT
STATION EXCLUSION AREA
FIGURE 312.12-1, Rev 47

AutoCAD: Figure Fsar 312_12_1.dwg

QUESTION 312.13

Although it is not mentioned in FSAR Section 2.1.3.4 Low Population Zone, Figure 2.1-1 shows a race track or an athletic field approximately 1 1/4 miles southwest of the reactor site. Indicate the use of this facility, the peak attendance and frequency of use.

RESPONSE:

Perlukes Park and Race Track located approximately 1-1/4 miles southwest of the Susquehanna SES is not currently is use, and future use of the facility is undetermined.

QUESTION 312.14

It is stated that you will comply with ANSI N101.2. What is your intended degree of compliance with Regulatory Guide 1.54, "Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants?" If there are any coating materials not qualified according to Reg. Guide 1.54, provide estimates of their quantities to show that these quantities are insignificant.

RESPONSE:

See Section 3.13 and Subsection 6.1.2.

QUESTION 312.15

In reference to Question 021.30, provide a graph which shows the secondary containment pressure following a loss of coolant accident during the switch over from the normal ventilation system exhaust to operation of the standby gas treatment system.

RESPONSE:

Subsection 6.2.3.2.1 of the FSAR has been revised to provide a reference to Figure 6.2-60 entitled "Secondary Containment Pressure Transient Post - LOCA."

QUESTION 312.16

Please indicate the length of main steam line between the outboard and inboard MSIVs.

RESPONSE:

See Subsection 5.4.5.2.

QUESTION 312.17

Provide the structural composition of all walls and roofs of buildings enumerated in Table 3.3-2 of the FSAR housing safety-related equipment, as well as the building locations. Discuss the sizes and orientations of any openings in these buildings.

RESPONSE:

See PLA-581, N. W. Curtis to B. J. Youngblood, dated December 9, 1980.

QUESTION 312.18

Describe the extent to which the control room air intake and diesel generator exhaust tubes are protected from tornado-generated missiles.

RESPONSE:

See PLA-582, N. W. Curtis to B. J. Youngblood, dated December 9, 1980.

QUESTION 312.19

Provide the descriptions and locations of all safety-related equipment not contained within reinforced concrete buildings or structures.

RESPONSE:

See Subsection 3.3.2.4.

QUESTION 312.20

Discuss the capability of the plant safety-related structures, systems, and components to withstand at least missiles C and F of the Revision 0 to SRP 3.5.1.4 (specified below:)

	Missile	Fraction of Total Tornado Velocity
C.	Steel rod, 1 inch diameter x 3-feet long, weight - 8 lbs.	0.6
F.	Utility pole, 13-1/2 inch diameter, 35-feet long, weight - 1490 lbs.	0.4

RESPONSE:

See revised Subsection 3.5.2.2.

QUESTION 312.21

In Section 15.B.2 "Control Room Dose Model," the text indicates that geometrical considerations lead to the use of Halitsky's model for atmospheric dispersion instead of Murphy's model for atmospheric dispersion, as described in SRP 6.4. Please provide a detailed justification of this substitution including a relative comparison between the two models.

RESPONSE:

An expanded explanation of the use of the Halitsky method of building wake X/Q calculation has been included in FSAR Section 15.B.2.

QUESTION 312.22

List in Tables 15.6-18 and 15.6-19 the actual numerical values of X/Q used in the calculation of LOCA consequences listed in 15.6.5 and give the basis for their selection.

RESPONSE:

The numerical values of X/Q used in the calculation of LOCA consequences listed in Subsection 15.6.5 are already given in Tables 15.0-3 and 15.0-4. Subsection 15.0.3.6 which references Section 2.3 provides short-term site-specific X/Qs as required by Regulatory Guide 1.70. In addition, Table 15.6-22 which tabulated the assumptions used in the LOCA analysis, also specifies that the X/Qs may be found in Tables 15.0-3 and 15.0-4. Tables 15.6-18 and 15.6-19 contain dose consequences only and were never intended to contain X/Qs, thus no FSAR change is necessary.

QUESTION 312.23

In FSAR Section 6.2.3.2.1, the applicant stated that with only one SGTS train, the secondary containment would be drawn down to a negative 0.25" WG pressure within 60 seconds. In staff question 312.15, the staff asked for a secondary pressure curve following the LOCA to determine if the proposed SGTS design could meet the commitment to draw down the secondary containment within the required time using the design flow rates. Instead of providing the draw down curve for the rated system flow, the applicant provided two draw down curves at flow rates less than the design flow, neither of which meets the 60-second criteria committed to. The response to Q312.15 is therefore not satisfactory.

The applicant has not demonstrated the ability of the SGTS using its rated flowrate to achieve a negative pressure of 0.25" WG in the secondary containment within 60 seconds following a LOCA, as the applicant has stated in FSAR Section 6.2.3. To resolve this concern, the applicant should provide a secondary containment pressure curve following the LOCA assuming the SGTS is operating at its rated flow.

RESPONSE:

See revised Subsection 6.2.3.2.1 and Figure 6.2-60.

QUESTION 312.24

It is not clear from the FSAR and associated amendments that the dose contribution from MSIV leakage is calculated correctly. In Amendment 1 (8/78) the applicant indicates that the MSIV-LCS is not operational for 20 minutes following the postulated accident, yet the accident analysis in Chapter 15 of the FSAR assumes that all MSIV leakage is filtered. This implies that the main steam line isolation valve leakage control system (MSIV-LCS) is assumed operational from the start of the accident. Based upon this finding, the current FSAR analysis for the MSIV leakage dose contribution following a postulated LOCA is unacceptable and the applicant should provide an analysis for the MSIV leakage offsite dose contribution paying strict attention to the actual operation time of the MSIV-LCS given in the FSAR.

RESPONSE:

See revised Subsection 15.6.5.5.1.2.

NOTE:

MSIV-LCS information maintained here for historical purposes. The MSIV-LCS has been deleted. The function is now performed by the Isolated Condenser Treatment Method (Section 6.7).

QUESTION 313.1

The classification system for emergency conditions used by PP&L is identified in the emergency plan, as is the system used by the Luzerne County Office of Civil Defense and the PA Bureau of Radiological Health. While these classification systems appear compatible, the terms used are different and no direct comparison is made in the plan. Provide such a comparison between the classification terms used by PP&L and those used by the offsite agencies, either in the text of Section 4 of the plan or on Figure 6.1.

RESPONSE:

As established in 10CFR50 Appendix E and NUREG 0654/FEMA REP 1, Rev. 1, PP&L, State, and Local Emergency Plans have incorporated the same emergency classification system.

QUESTION 313.2

Regulatory Guide 1.101 at Section 4.1.4 states that emergency action levels should be defined in relation to the functioning of safety systems and in terms of specific contamination levels in environmental media. Provide this information.

RESPONSE:

Emergency Action Levels are defined in Section 5.0 of the SSES Emergency Plan and in appropriate Emergency Plan Implementing Procedures.

QUESTION 313.3

Provide the bases used to select the minimum radiation level (170 mrem) which you propose for declaring a Site Emergency.

RESPONSE:

See Response to question 313.2.

QUESTION 313.4

The plan does not identify any provisions for medical doctors to respond to requests for onsite assistance. Provide evidence, in the form of a letter of agreement to show the arrangements reached with any medical doctors for such assistance.

RESPONSE:

Pennsylvania Power & Light feels there are no regulatory or practical requirements for having medical doctors respond to requests for onsite assistance.

Section 5.3.2, "Local Services Support" of Regulatory Guide 1.101, does not specify the need to have onsite medical assistance in the form of a doctor. For all practical considerations, the ambulance crew responding to a personnel emergency will be able to provide life-saving care until the injured individual(s) is transported to a local hospital for more definitive care. A point of fact is that emergency medical response teams are qualified for this type of assistance since they must deal with these situations on a daily basis and are specifically trained for emergency lifesaving measures.

QUESTION 313.5

Provide separate sections to describe the assessment actions for the Site Emergency and the General Emergency. Describe the methodologies and techniques used by the plant staff for each emergency and identify any differences in the timing or extent of response actions. A brief summary of the content of the appropriate emergency instructions would be beneficial. See Regulatory Guide 1.101, Annex A, at Section 6.2.

RESPONSE:

Assessment actions are defined in Section 7.0 of the SSES Emergency Plan and in appropriate Emergency Plan Implementing Procedures.

QUESTION 313.6

Concerning protective actions, describe steps taken to make available on request to occupants in the low population zone, information concerning how the emergency plans provide for notification to them and how they can expect to be advised what to do.

RESPONSE:

Public protective actions are implemented through the Susquehanna Alert Notification System and public education/information dissemination programs. Public actions/facilities and public education/information dissemination are discussed in Sections 8.5 and 9.4 of the SSES Emergency Plan.

QUESTION 313.7

Describe the training provided the appropriate staff members of the Berwick Hospital to show that they are prepared and qualified to handle radiological emergencies.

RESPONSE:

Training requirements for hospital staff personnel are discussed in Section 9 of the SSES Emergency Plan.

QUESTION 313.8

Provide a commitment to conduct annual exercises to test the adequacy of the emergency plan and the implementing procedures. See Regulatory Guide 1.101, Annex A, at Section 8.1.2.

RESPONSE:

The response is provided in Section 9 of the SSES Emergency Plan.

QUESTION 313.9

The letter of agreement in Appendix A with the PA State Council of Civil Defense states that "Additional supportive plans are being developed for actions associated with possible radiation accidents occurring at nuclear power stations located within the State." Provide information on the current status of these plans as they may affect emergency planning at the Susquehanna site.

RESPONSE:

The Pennsylvania Emergency Management Agency (PEMA) Emergency Plan - Annex E to the Commonwealth of Pennsylvania "Disaster Operations Plan," Nuclear Incidents (Fixed Facility) is the applicable support document for SSES. This document is referenced in Section 3 of the SSES Emergency Plan, and PEMA responsibilities are outlined in Section 6.4.1 of the SSES Emergency Plan.

QUESTION 321.1

Provide the design and operating pressures of the steam jet air ejectors in the main condenser evacuation system.

RESPONSE:

The response is provided in revised Subsection 10.4.2.2.

QUESTION 321.2

In addition to the information provided in FSAR Subsection 11.2.1, provide a table listing tanks outside reactor containment which contain potentially radioactive liquids. The table should include tanks both inside and outside plant buildings and should not be restricted to radwaste system components. For each tank, indicate the provisions incorporated to Monitor tank levels, to annunciate potential overflow conditions, and to collect and process liquids in the event of an overflow. Acceptable provisions are given in Branch Technical position - ETSB 11-1 (Rev. 1).

RESPONSE:

This information is provided in revised Subsection 11.2.1.

QUESTION 321.3

Provide an analysis with respect to each position in the Branch Technical Position, ETSB No. 11-2, "Design, Testing and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Reactor Plants," for each atmosphere cleanup system designed to collect airborne radioactive materials during normal plant operation including anticipated operational occurrences. Only the items of noncompliance need be listed with the justification for noncompliance.

RESPONSE:

Table 9.4-1 has been revised to include this information.

Question 321.4

Provide the storage capacity of the solid waste management system for packaged solid waste in terms of the maximum number of 200 ft or 50 ft containers and 55 gal. drums that can be accommodated at one time.

RESPONSE:

This information is provided in revised Subsections 11.4.2.2 and 11.4.2.3.

QUESTION 321.5

In accordance with the Branch Technical Position, ETSB 11-3, "Design Guidance for Solid Radioactive Waste Management Systems Installed in Light-Water-Cooled Nuclear Power Reactor Plants," discuss the provisions for assuring that all liquids will be combined into the solid matrix after processing is complete. Indicate the steps to be taken if solidification is not complete.

RESPONSE:

This information is provided in revised Subsection 11.4.2.2.

QUESTION 321.6

Your response to Question 321.5 on the solidification process control program and the parameters to be considered for the solidification of waste is not adequate. In accordance with BTP-ETSB 11-3, provide more detail concerning the process control program including the following:

(1) Data concerning the expected waste types to be processed. The process control program should be based on tests performed with simulated waste formulations based on the expected inputs. You should discuss how the process control program considers the chemical constituents of the waste stream, the pH of the waste stream, boric acid content, solids content of the waste, concentration and type of radwaste, curing time, etc.

(2) Data concerning the solidification agents (cement + silicate) to waste ratios to be used. The process control program should consider the correct ratios for the various input types and contaminant levels.

(3) Data concerning the effects of various contaminants on the solidification process.

Specifically, address oil and detergent content in wastes, lab chemicals, and non-depleted ion-exchange resins.

(4) Discuss the experimental procedures to be used in your process control program. Discuss sampling of the waste input to the Solid Radwaste System as it relates to your process control program to assure a satisfactory solidified product. Where will the waste be sampled? Discuss how the results of the process control program will be analyzed and used as operational considerations.

(5) We are not familiar with the material, "Safety Set." Provide a product description, including the chemical or physical method of solidifying surface liquid during expected process conditions.

RESPONSE:

1) The solidification system supplier, UNC United Nuclear Industries has prepared a topical report which addresses the waste formulation process control program requirements and process chemistry requirements of the system. This proprietary report has been submitted

under a separate cover (PLA-691 dated March 25, 1981). The Process Control Program (PCP) is to be incorporated as an appendix to the Radiation Effluent Technical Specifications. The expected quantities of wastes are given in Tables 11.4-1 and 11.4-2 of the FSAR.

2) The formulation ranges of solidification agents required to achieve dry solidification of the various waste materials are described in the UNC topical report. Refer to subsection 11.4.2.2 and Table 11.4-8 for a discussion of the formulation established during shop testing. Refer also to the PCP.

3) The acceptable level of various contaminants which can be satisfactorily processed in the solidification system is discussed in the UNC topical report. SSES is designed with oil interceptors in all drain sumps where oil is expected (Reference Section 9.3.3). In addition, any adverse effects of nominal oil contamination will be detected during the solid radwaste system preoperational testing.

(4) Refer to the PCP (attached to the Radiological Effluent Technical Specifications) for a discussion of solid radwaste system process controls.

QUESTION 321.7

Your response to Question 321.6, items 1-4, on the Process Control Program (PCP) for Solidification is not acceptable, since the United Nuclear Industries (UNI) topical report has not been reviewed and approved by NRC staff as an acceptable reference. You should submit a PCP. The PCP may be extracted from or based on information contained in the draft UNI topical report. Your response to item 5 is acceptable.

RESPONSE:

The Process Control Program (PCP) for Solidification has been (PLA-692 dated March 25, 1981) submitted as part of the Radiological Effluent Technical Specifications. The proprietary UNC topical report was submitted under a separate cover (PLA-691 dated March 25, 1981).

QUESTION 331.1

Describe your ALARA design review process, including how the ALARA design review is factored into the overall design process. Describe the ALARA design guidance given to designers from various disciplines. Provide the qualifications and organizational position of the people responsible for the ALARA design review. Explain how expertise from the non-health physics disciplines is factored into the ALARA design review. Describe how the dose assessment presented in FSAR Section 12.4 is utilized in ALARA design and design review (1) to identify areas where ALARA changes are needed and (2) to identify areas where ALARA changes are needed and (3) to judge the cost-effectiveness of possible ALARA changes. Describe changes which were made in your design as a result of the ALARA design review and dose assessment.

RESPONSE:

The response is provided in Subsection 12.1.2.4.

QUESTION 331.2

Section 12.3.4 of Regulatory Guide 1.70, Revision 2 calls for information on the sensitivity of airborne radioactivity monitoring systems.

Describe how your continuous airborne radioactivity systems will provide adequate coverage of general areas, rooms, and corridors which have a possibility of containing airborne radioactivity and which may be occupied by personnel. In order to provide adequate coverage, the systems must be capable of detecting ten MPC-hours of airborne particulate and iodine radioactivity.

RESPONSE:

The response is provided in Subsection 12.3.4.

QUESTION 331.3

Your dose assessment as presented in FSAR Section 12.4 is not acceptable. Revise your dose assessment to incorporate the following:

(1) The collective doses presented under Routine Operations and Routine Maintenance should be based on expected dose rates rather than design dose rates to provide a more realistic estimate of dose.

(2) Dose estimates for In-Service Inspections, Waste Processing and Refueling should be calculated in the same manner as you calculated the doses for Routine Operations and Maintenance.

The use of averages from operating plant exposure data is acceptable for Special Maintenance. However, those averages should be tailored to your design.

Changes which you have made in your design to reduce doses in performing special maintenance should be reflected in your man-rem estimates.

RESPONSE:

The response is provided in Subsection 12.4.1.3.9.

QUESTION 331.4

It is our position that the minimum qualifications of the Health Physics Supervisor on-site should meet the guidance of Regulatory Guide 1.8, Revision 1. An individual, normally stationed off-site, who meets these minimum qualifications is not acceptable to meet Regulatory Guide 1.8. Section 12.5.1.4 should be revised to meet this criteria of Regulatory Guide 1.8.

RESPONSE:

See revised Subsection 12.5.1.4.

QUESTION 331.5

Describe the radiation protection aspects of decommissioning that you have included in your design to insure that occupational dose will be "ALARA."

RESPONSE:

The design features necessary to maintain radiation exposures ALARA during decommissioning operations are, in general, the features that have been implemented to keep exposures ALARA during the operational life of the plant. These are discussed in detail in Sections 12.1 and 12.3. Some of these features which are especially applicable to decommissioning are:

a. Flushing and draining connections which will provide for removal of radioactive fluids, allow rinsing to reduce residual activity, and provide an entry point for introduction of decontamination solutions.

b. Ventilation systems to minimize the spread of airborne radioactivity will be particularly useful in preventing exposures to internal radioactivity during decommissioning when large quantities of airborne radioactive particulates can be generated by cutting, sawing, and demolition.

c. The space envelopes reserved around equipment to facilitate maintenance will also allow for more rapid dismantling since cutting machines and the like can be installed that much quicker with correspondingly lower exposure time.

d. The use of flanged connections on pumps in radioactive waste systems and the removal provisions built into some major plant components will reduce personnel exposures during removal of these items.

e. Separation of radioactive from non-radioactive systems and location of active components of non-radioactive systems in low radiation areas will permit dismantling of normally clean systems with minimal exposure to personnel.

f. The availability of a complete, shielded, radwaste facility will allow efficient, low dose processing of residual fluids and decontamination solutions, as well as the packaging and shipping of solid radioactive

materials. Other existing facilities such as access control stations and decontamination areas will also perform their intended functions in helping to keep exposures ALARA.

g. The use of liners and protective coatings will lower exposures by minimizing decontamination times and by reducing the quantities of materials that must be handled as radioactive waste.

QUESTION 331.6

Describe the additional shielding that you have provided for personnel and equipment hatches or penetrations that pass through the drywell wall to attenuate the radiation to below the required level defined by the radiation zone outside the drywell wall during normal operation and anticipated operational occurrences. (FSAR pg. 12.3-9)

RESPONSE:

This description is contained in revised Subsection 12.3.2.2.2.

QUESTION 331.7

Provide a breakdown of the activities which are included in the total 237.7 man-rem/unit for routine maintenance. Regulatory Guide 8.19, "Occupational Radiation Dose Assessment in Light Water Reactor Plants Design Stage Man-Rem Estimates," which has been published for comment will provide further guidance.

RESPONSE:

The method used to estimate the routine maintenance dose for Susquehanna is discussed in revised Subsection 12.4.1.3.2.

QUESTION 331.8

Your estimate in FSAR Tables 12.2-35 and 36 of the airborne radioactivity which workers will be exposed to does not include tritium. Include tritium in your estimate and in your dose assessment analysis.

RESPONSE:

Subsections 12.2.2.6 and 12.2.2.7 as well as Tables 12.2-30, 12.2-31, 12.2-35, 12.2-36, 12.2-37, 12.4-10 and 12.4-11 have been revised to include the requested information.

QUESTION 331.9

Preparing for maintenance and inspection in the high radiation fields near the reactor coolant system at shutdown can result in significant man-rem. Discuss how you plan to minimize personnel exposure using the "ALARA" guideline. Include also access to areas with limited passageway, i.e., equipment hatches, personnel locks, manholes, etc.

RESPONSE:

In order to minimize personnel exposure, the following have been included in the design and procedures for Susquehanna SES:

1. Prior to maintenance in certain areas, mockups will be used.

2. Permanent work platforms are provided in high radiation areas.

3. Flushing connections on systems are provided to relieve crud build-up.

4. Snap-on insulation will be used.

5. Hinged doors are provided on shield wall for access to RCPB piping.

6. Use of removable shield plugs.

The administrative controls exercised when preparing for maintenance and inspection activities in high radiation fields are described in Subsection 12.5.3.

QUESTION 331.10

Describe the features that you have incorporated into your design to maintain occupational radiation exposure ALARA by minimizing and controlling the buildup, transport and deposition of activated corrosion products in reactor coolant and auxiliary systems. Include information on the following steps taken to minimize Co-58 and Co-60, including:

(1) The use of reduced nickel content in systems in contact with reactor coolant.

(2) The low cobalt impurity specification in system in contact with reactor coolant.

(3) The minimization of high cobalt, hard facing wear materials in the systems in contact with reactor coolant.

(4) The use of high flow rate/high temperature filtrations for systems in contact with reactor coolant.

(5) The selection of valves and packings materials to minimize crud buildup and maintenance.

(6) Provisions for decontamination of components and systems contaminated with activated corrosion products.

(7) The types of cleanup systems for removal of crud from primary coolant during operation.

RESPONSE:

See new Subsection 12.3.1.4 for this response.

QUESTION 331.11

You have not described an in-plant accident radiation and airborne radioactivity monitoring system as required in our standard review plan.

It is our position that the in-plant accident radiation and airborne radioactivity monitoring systems should provide personnel with the capability to assess the radiation hazard in areas which may need to be accessed during the course of an accident. The accident monitoring systems may include the normal area radiation monitors, airborne radioactivity monitors, and portable radiation monitoring equipment. The accident monitoring systems should have a usable range which includes the maximum calculated accident levels, and they should be designed to operate properly in the environment caused by the accident. Describe your accident monitoring systems, and describe how your systems will meet this position.

RESPONSE:

See Subsection 18.1.30 for the discussion on accident monitoring instrumentation.

QUESTION 331.12

Radiation dose rates in excess of 100 rads per hour can occur in the vicinity of spent fuel transfer tubes. It is our position that the SFTT area should have structural barriers to prevent inadvertent access to the high radiation levels near the area and sufficient shielding to assure acceptable radiation levels in adjacent occupied areas. Provide plan and elevation layout drawings of the SFTT areas, including these adjacent areas. Your response should include procedures for positive access control and radiation monitoring in the areas near the SFTT, as well as audible and visible radiation alarm signals to be actuated if radiation fields increase above ambient levels in the area. (Describe how your spent fuel transfer tube operation meets this position.)

RESPONSE:

There are no Spent Fuel Transfer Tubes at the Susquehanna SES. For a description of the Fuel Storage and Handling Systems, see Section 9.1.

QUESTION 331.13

It is our position that decommissioning will be in accordance with Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposure at Nuclear Power Stations will be ALARA." Revision 3, June, 1978. Verify that decommissioning will be in accordance with Regulatory Guide 8.8 or submit equivalent alternative.

RESPONSE:

Decommissioning of the Susquehanna SES will be in accordance with all applicable NRC regulations in effect including those related to occupational exposure.

The NRC has since 1975 been in the process of re-evaluating decommissioning policies and is now considering amending existing regulations to provide more specific guidance on decommissioning criteria for production and utilization facility licensees.

In light of future regulatory uncertainty, and potential decommissioning technology evolution, it is not prudent at this time for PP&L to establish detailed methods of implementing specific parts of existing Commission Regulations.

QUESTION 331.14

Provide results of design review for additional shielding required to provide access to vital areas and protect safety equipment after a core degradation accident.

RESPONSE:

A study on the requirements for additional shielding to provide access to vital areas and protect safety equipment after a core degradation accident has been performed. The results of this study are discussed in Subsection 18.1.20.

QUESTION 331.15

Provide a description of the radiation protection features incorporated in the system for sampling and analyzing reactor coolant and containment atmosphere after a core degradation accident.

RESPONSE:

The system for sampling and analyzing reactor coolant and containment atmosphere after a core degradation accident has been designed. This system is discussed in Subsection 18.1.21.

QUESTION 331.16

Table 13.1-2 of your FSAR states that you will fill the position of Health Physics Supervisor 90 days prior to fuel loading. In Section 12.5.1.4 you have committed that the individual filling the Health Physics Supervisor will meet the criteria for Radiation Protection Manager in Regulatory Guide 1.8. Your technical specifications will also require such qualifications. You should provide a resume of the education, training, and experience of the individual selected to fill this position as soon as it is available.

RESPONSE:

See Table 13.1-2 for resume of the Health Physics Supervisor.

QUESTION 331.17

Section 12.5.3.7.2.6 of the FSAR states that an individual will be considered qualified as a Health Physics Monitor after the initial training period of one year. Your technical specifications will require that your Plant Staff meet the qualifications of ANSI 18.1. This ANSI Standard requires two years' experience before an individual is considered qualified as a radiation protection technician. If you wish to propose an alternative qualification program for your Health Physics Monitors, you should provide a detailed description of the qualification program. Otherwise your FSAR should be amended to show Health Physics Monitor qualification per ANSI 18.1.

RESPONSE:

The resumes of the Health Physics Monitors, and a table summarizing the training program for Health Physics Monitors was submitted by letter dated March 27, 1981 (PLA 693, Curtis to Youngblood.)

QUESTION 331.18

It appears that two neutron survey meters are not adequate to meet the anticipated needs of a two unit plant. You should provide a table to show equipment adequate to operate a two unit plant. In addition, you should provide a table specifying the quantity and types of respiratory protection equipment available.

RESPONSE:

A table showing survey equipment was submitted by letter dated March 27, 1981 (PLA 693, Curtis to Youngblood).

The quantities and types of respiratory protection equipment was submitted by letter date April 16, 1981 (PLA 728, Curtis to Youngblood.)

QUESTION 331.19

On 1/22/81 you made preliminary response to TMI-related requirements in NUREG-0737. In your final responses you should provide the information requested in Sections 11.B.2, 11.F.1(3) and III.D.3.3 of NUREG-0737.

RESPONSE:

Responses to all items in NUREG-0737, including II.B.2, II.F.1, and III.D.3.3, were transmitted by letter dated March 16, 1981 (PLA-659, Curtis to Youngblood).

QUESTION 361.1

FSAR Figure 2.5-8 is unclear. Provide two new maps: (1) one map showing earthquake epicenters and province boundaries out to their maximum extent for provinces coming within 200 miles of the site (no geologic symbols) and (2) a second map showing only earthquake epicenters (no geologic symbols or province boundaries) within 200 miles of the site. The earthquake symbols should be changed to better differentiate epicentral intensities on the maps.

RESPONSE:

Figure 2.5-8a shows earthquake epicenters and tectonic province boundaries for provinces coming within 200 miles of the site. Figure 2.5-8b shows earthquake epicenters within 200 miles of the site. On both maps, earthquake symbols have been changed to better differentiate epicentral intensities.

QUESTION 361.2

Since the design response spectra for the OBE and SSE deviate from those suggested in Regulatory Guide 1.60, provide and compare graphs showing both the design response spectra and the Regulatory Guide 1.60 spectra for the OBE and SSE.

RESPONSE:

The comparison is given in revised Subsection 3.7b.1.1.

QUESTION 361.3

FSAR Figure 2.5-11 depicts the regional landsat lineaments. A discussion of these lineaments and their relationship to the regional geology has not been provided in the FSAR text. Provide a detailed discussion of the lineaments. Include in this discussion the relationship of lineaments as proposed by Saunders and Hick, 1976 to the regional geology.

RESPONSE:

The response to the question is provided in Subsection 2.5.1.1.3.5.

QUESTION 361.4

Discuss the potential for and hazards resulting from subsurface gas and waste storage in the local geologic structures in the near site vicinity.

RESPONSE:

This response to this question is provided in Subsection 2.2.3.1.7.

QUESTION 361.5

FSAR Figures 2.5-18 and 2.5-19 are blurred. Please provide legible copies of these figures.

RESPONSE:

FSAR Figures have been revised.

QUESTION 362.1

Provide typical cross sections of the slope north of the spray pond area. Show steepest sections closest to the pond.

RESPONSE:

This information is contained in revised FSAR Subsections 2.5.1.2.5.2 and 2.5.5. FSAR Figure 2.5-22 has been revised, and a new Figure 2.5-56 has been added.

QUESTION 362.2

Explain the basis for the statement in the FSAR "heave at the base of excavated rock slopes or in the bottom of excavations was not noted." Were measurements made?

RESPONSE:

See Subsection 2.5.1.2.5.8 for response.

QUESTION 362.3

When will FSAR Figure 2.5-15, Geologic Map of Spray Pond Area, and FSAR Figure 2.5-16, Geologic Profiles in Spray Pond area be provided?

RESPONSE:

Figure 2.5-15 provides the geologic map of the Spray Pond Area. The need for proposed Figure 2.5-16 has been eliminated because it is considered redundant to the information shown on Figures 2.5-30, 2.5-40, and 2.5-56.

QUESTION 362.4

Clarify the identification of Category I pipelines with respect to FSAR Figures 2.5-17 and 2.5-22. Identify where such pipelines are supported on rock and where they are supported on soil.

RESPONSE:

Figure 2.5-17A has been added to the FSAR to supply this information.

QUESTION 362.5

FSAR Figure 2.5-32 shows relative density related to N values at the ESSW Pumphouse. On this plot include relative density values obtained from nearby undisturbed samples and from in situ field density tests (Test Pit and Trench investigations) together with the corresponding N values at each density test location. Discuss the applicability of the Gibbs and Holtz relationship at this site in view of the presence of gravel which can cause blow counts to be misleading.

RESPONSE:

See Subsection 2.5.4.2.2(b) for response.

QUESTION 362.6

Provide information on physical properties, structure and variability of the near surface materials as well as logs of test pits and trenches as discussed in this section, page 2.5-94 paragraph 2 of the FSAR. FSAR Appendix 2.5c currently shows only logs of Test Pits 1 and 2.

RESPONSE:

Near surface materials at the site consist of an upper silty sand and a lower sandy gravel, which in turn is underlying by siltstone bedrock. The locations of all test pits and trenches are shown on Figure 2.5-22 of the FSAR. The two test pit logs presented in the FSAR, labeled "Pit 1" and "Pit 2" were revised to read "Pit B-1" and "Pit B-2" respectively in order to be compatible with Figure 2.5-22. Logs for the above test pits and all other test pits at the site are presented in Appendix 2.5C.

Subsurface data for the two north-south trenches are incorporated in revised Figures 2.5-21a and 2.5-21b of the FSAR. These cross sections show the approximate locations of each trench.

QUESTION 362.7

On FSAR Figure 2.5-37 provide typical cross sections showing the levels of Category I foundations. Also provide an east-west section on the east side of Unit 1 Reactor. Extend Section C further south to show the edge and foundation level of the Radwaste Building. On all sections indicate the limits of compacted fill and natural materials.

RESPONSE:

Figure 2.5-37 has been amended to include the information requested. Subsection 2.5.4.5.1 has been amended accordingly.

QUESTION 362.8

Provide appropriate density test data for recompaction of the surface layer and for compaction of the Category I fill and backfill.

RESPONSE:

Test data is available for the soil compaction carried out in the vicinity of the spray pond. Appendix 2.5C of the FSAR has been revised to include this data.

Granular backfill was not used in other areas adjacent to Seismic Category I structures.

QUESTION 362.9

When will settlement readings on the ESSW Pumphouse Basement (FSAR Table 2.5-8) be provided?

RESPONSE:

The response to this question is given in 362.22.

QUESTION 362.10

Identify the boring number and sample depth for each CR tests number (FSAR Table 2.5-14).

RESPONSE:

The boring number and sample depth for all CR tests listed in FSAR Table 2.5-14 are given in Table V of Ref. 2.5-102 (Geotechnical Engineers, Inc., Report on Soil Testing, Susquehanna Steam Generating Station, October 11, 1974).

Table 2.5-14 has been revised, through the addition of a footnote, to contain this information.

QUESTION 362.11

Discuss how the integrity of the concrete pond liner will be assured during static and dynamic loading so that the 0.12 ft/yr coefficient of permeability will be maintained to eliminate the potential for liquefaction. What monitoring of seepage is planned?

RESPONSE:

FSAR Subsection 2.5.5.2.2.1 has been revised and Figure 2.5-57 has been added to address this question.

QUESTION 362.12

Provide references 2.5-98, 2.5-99a dn 2.5-102.

RESPONSE:

(a) Reference 2.5-98 entitled "Dames & Moore, Supplemental Foundation Investigation Report, Susquehanna Steam Electric Station, Units 1 and 2, September 24, 1973", was previously listed as a reference on page 44 of Attachment 1 to PSAR Amendment No. 17, and transmitted to NRC on March 14, 1975.

(b) FSAR Reference 2.5-99 entitled "Weston Geophysical Engineers, Inc., Seismic Velocity and Elastic Moduli Measurements, Spray Pond, Susquehanna Steam Electric Station, October 18, 1974", was previously submitted to NRC as Appendix "A" of Attachment 1 to PSAR Amendment No. 17.

(c) FSAR Reference 2.5-102 entitled "Geotechnical Engineers, Inc., Report on Soil Testing, Susquehanna Steam Generating Station, October 11, 1974", was previously submitted to NRC as Appendix "C" of Attachment 1 to PSAR Amendment No. 17. Copies were transmitted to NRC on March 14, 1975.

QUESTION 362.13

In the FSAR Section 2.5.4.1.2 the effects of preloading of the bedrock at the site are discussed. Provide a discussion of the effects of preloading on the glacial till and outwash material, the estimated magnitude of preloading, and the effects of preloading on:

(a) Standard Penetration Test (SPT) values

(b) Relative density values estimated from SPT values as shown on Figure 2.5-32

(c) Coefficient of lateral earth pressure as shown on Figure 2.5-39

(d) Cyclic shear stress ratio at failure as shown on Table 2.5-14.

Provide cross-references to relevant discussions in other sections as appropriate.

RESPONSE:

The FSAR text has been amended in Subsection 2.5.4.1.2 to respond to this question. In addition, the fact that the soils are normally consolidated is incorporated in Subsections 2.5.4.2.2, 2.5.5.1.1. 2.5.5.1.4, and 2.5.5.2.2.

QUESTION 362.14

Density determinations on undisturbed sand specimens are shown on FSAR Table V, reference 2.5-102. Calculate the relative density of each sample using the most appropriate maximum and minimum density values available and also by using the maximum probable ranges of maximum and minimum density values. Provide similar data for in place field density tests performed on exposed soils in the bases of the spray pond, pumphouse, or pipeline excavations prior to compaction. Compare these relative density values to the values estimated from Standard Penetration Test results.

RESPONSE:

The response to this question is provided in Subsection 2.5.5.1.4.5.

QUESTION 362.15

Some flyash is known to be corrosive. Provide evidence to show that the lean mix concrete known as sand cement flyash backfill is not corrosive.

RESPONSE:

The response to this question is provided in Subsection 2.5.4.5.3.

QUESTION 362.16

On FSAR page 2.5-122, correct the equation for G.

RESPONSE:

Subsection 2.5.5.2.2.2.3 has been revised.

QUESTION 362.17

Provide a copy of the curve of damping ratio versus strain used in the liquefaction analysis. Explain why the range of damping ratio ± 30% is conservative. Support the explanation with any laboratory test results which are available.

RESPONSE:

The response to this question is provided in Subsection 2.5.5.2.2.2.7.2.

QUESTION 362.18

Summarize the statistical distribution of field density test results, relate them to Category I structures, and compare the results with design criteria. The test report sheets from United States Testing Company show various sample identities such as:

existing soil in pond
existing material Type B
borrow soil
stone screenings
Type B fill
Type A fill
Sand Material Type I
Class A material

Provide the specifications for each of the various sample identities, include the specified gradation and compaction criteria for required fills.

RESPONSE:

The response to this question is provided in Appendix 2.5C.

QUESTION 362.19

Provide a summary of the field tests which show that the properties of the sand-cement-flyash backfill met specifications given in Section 2.5.4.5.3 of the FSAR. In your response, list the field tests performed, describe the frequency of testing and provide a statistical analysis of strength test results using a format similar to Figure 2.5-60.

RESPONSE:

The response to this question is provided in Subsection 2.5.4.5.3.

QUESTION 362.20

Provide a description of the bedding requirements for seismic Category 1 pipelines and conduits. Provide a description of the quality control procedures adopted to ensure that these requirements were met. Summarize relevant field test results using a format similar to Figure 2.5-60.

RESPONSE:

Refer to new Subsection 2.5.4.5.4 of the FSAR for the discussion on bedding requirements.

QUESTION 362.21

FSAR Figure 2.5-38 shows rock and groundwater contours for the spray pond. On the west side of the pond, at rock contour EL 650 the estimated groundwater contour is EL 670. Explain the apparent discrepancy between the design groundwater level of EL 665 and the predicted ground water level of EL 670 in an area where the pond base is supported on about 17 ft. of granular, glacial soils. Provide an additional liquefaction analysis for this part of the spray pond. Revise the relevant sections of the FSAR, including 2.5.4.10.2 (third last paragraph) as necessary, based on your response to this item.

RESPONSE:

The seepage loss from the spray pond and its impact on ground water has been reevaluated, the original design value for seepage loss (3×10^5 gallons in 30 days) was based on a conservative maximum for different materials that might be used for the spray pond liner.

However, since the SSES pond liner is reinforced concrete, figures 2.5-38, 2.5-40 and 2.5-47 have been revised to conservatively reflect the existing design conditions.

Table 2.5-15 shows maximum ground water elevations that would occur beneath the center of the pond with the various liner parameters indicated. A seepage rate of 1.2×10^5 gallons per 30 days, which is twice the calculated rate, would result in a ground water elevation of 650 feet beneath the center of the pond; the estimated ground water levels shown on Figures 2.5-38 and 2.5-40 reflect this seepage rate. These contours indicate that at no place beneath the spray pond would the maximum ground water elevation exceed the design value of 665 feet. Therefore, the existing liquefaction analysis is valid and Subsection 2.5.4.10.2 does not require revision.

QUESTION 362.22

Update Table 2.5-8 of the FSAR to include settlement readings on the ESSH pumphouse from October 1978 to the present. Also, provide a list of unusual occurrences, such as the occurrence of the OBE or rapid lowering of the groundwater level, which have the potential for causing settlement of the pumphouse. We require that settlement monitoring of the pumphouse continue on at least an annual frequency for a period of at least four years, and after an unusual occurrence that has the potential for causing settlement of the pumphouse. Discuss the technical specifications for settlement monitoring, including limits of acceptable settlement and action plans if these limits should be exceeded.

RESPONSE:

Subsection 2.5.4.13.2 has been revised to provide this information.

Table 2.5-8 has been revised and Figure 2.5-62 has been added.

QUESTION 362.23

Provide a discussion of the cracking of the spray pond liner that occurred during liner construction. Describe the location, depth and length of typical and extreme cracks. Describe the corrective measures that were adopted. Provide your evaluation of the cause(s) of cracking, including your opinion regarding the influence of hydrostatic uplift or soil settlement as contributing factors.

RESPONSE:

Subsection 2.5.4.14 has been revised to include the requested information.

QUESTION 362.24

Excavated material reportedly was temporarily stored at the spray pond location during construction. Provide a brief description of material handling procedures which shows that there are no safety-related cut slopes or embankments comprised of dumped material. Alternatively, show that compaction criteria were met for such dumped soil materials.

RESPONSE:

See revised Subsection 2.5.4.14 for response.

QUESTION 362.25

We understand from your submittals and response of Q.362.8 that the backfill against seismic Category 1 structures is lean concrete (sand-cement-flyash). Thus, we conclude that all seismic Category 1 pipes and conduits are supported on lean concrete where they enter or leave structures, and therefore there should be no concern with differential settlement at the interface between structure-supported and ground-supported parts of pipelines or conduits. Please confirm that this is correct.

RESPONSE:

The response to this question is provided in Subsection 2.5.4.5.3.

QUESTION 371.1

Several flood elevations in the text and tables are inconsistent. For example, the June 24, 1972 flood level at Danville is given as 435.5 feet above Mean Sea Level, while in the text it is stated that the level was 1.6 feet above that of the March 9, 1904 event (458.8 feet above MSL). Also, the text states that the estimated flood level at the site during the June 1972 event was about 518 feet MSL, while the table gives it as 516.6 feet MSL. Correct these and any other inconsistencies in the text.

RESPONSE:

See revised Subsections 2.4.2.1.2 and 2.4.3.3, Section 2.4.3 and Table 2.4-4.

QUESTION 371.2

Justify the statement (FSAR p. 2.4-9) that the buried conduit, that is part of the site drainage system required to pass the PMP runoff, cannot be blocked:

(1) Consider debris that can be carried by the PMP runoff and show that the conduit and all entrances to it cannot be blocked.

(2) Are there provisions to regularly check the conduit to ensure that it has not failed or become blocked? If so, discuss them.

(3) If your response to either of the above indicate that the conduit may not be available to pass the runoff from a PMP, discuss the consequences in terms of site flooding.

RESPONSE:

Subsection 2.4.2.3 has been revised to provide the response to this question.

QUESTION 371.3

A discussion of flood effects on the river intake system is necessary. Is this system designed to withstand the probable Maximum Flood on the Susquehanna River? If not, what is the maximum river stage the system is designed for and how is it that stage characterized (e.g., how does it compare with the flood of record)?

RESPONSE

The river intake structure is not required to be designed to withstand the Probable Maximum Flood (PMF) since it serves no safety related function. The intake structure is designed for the Project Standard Flood which would reach an elevation of 525 feet (msl). The PMS elevation is 548 feet (msl). The flood of record occurred on June 24,1972 (Table 2.4-4) and reached an elevation of 516.6 feet (msl). A description of the intake structure's non-safety related function is presented in Section 9.2.

QUESTION 371.4

Discuss the effects of blockages of the river intake or discharge system by ice. Include a discussion of the frequency of such occurrences.

RESPONSE:

FSAR Subsection 2.4.7 has been revised to include this information.

QUESTION 371.5

Provide a discussion of the low river stage in relation to the requirements of the intake and discharge systems. Include figures showing the locations of the major components of these systems and cross-sections showing their relationship to various river levels.

RESPONSE:

Subsection 2.4.11.2 has been revised and Figures 2.4-52 and 2.4-53 have been added to the FSAR to supply this information.

QUESTION 371.6

Discuss the implications of the September 30, 1976 amendment to 18 CFR Part 803, that requires compensation for water withdrawn from the Susquehanna River during periods of low flow.

(a) How do you intend to comply with the regulation?

(b) Will the plant have to be shut down during low river flow? How often will the UHS pond have to be used to comply with the regulation?

RESPONSE:

A discussion of compliance with 18CFR303 is found in Subsection 2.4.11.4.

The Ultimate Heat Sink (UHS) will not be used to comply with this regulation.

TABLE 371.6-1

IMPACT OF LOW FLOW ON SUSQUEHANNA OPERATION

	4 day outage (Average Annual)			28 day outage (Once in 30 years)			96 day outage (Maximum recorded)		
	60% CF	70% CF	80% CF	60% CF	70% CF	80% CF	60% CF	70% CF	80% CF
Energy Reduction [1] (Million KWH)	142	165	189	991	1156	1322	3398	3965	4531
Capacity Factor Reduction (percentage points)	0.8	0.9	1.0	5.4	6.3	7.2	18.5	21.6	24.6

(1) Based on station capacity of 2100 MW and a scheduled outage rate of approximately 15% (1977 PJM GUS Report) with forced outage rates adjusted to give the indicated capacity factors.

QUESTION 371.7

Discuss the low level alarms in the river intake structure. At what river level do the alarms go off? What happens if the alarm is activated?

RESPONSE:

FSAR Subsection 2.4.11.6 has been revised to include this information.

QUESTION 371.8

Is the 665 foot MSL groundwater level that is referred to in the first paragraph a measured or a design level?

RESPONSE:

Response: It is a design level.

QUESTION 371.9

Provide descriptions, including figures and cross-sections, of the Ultimate Heat Sink pond and its components. Figures showing intakes, discharges, pumps, sprays, etc. are needed

RESPONSE:

The Ultimate Heat Sink Pond and the ESSW Pumphouse are described in Subsection 3.8.4.1 of the FSAR.

QUESTION 371.10

How is the buildup of concentration of dissolved solids in the UHS pond prevented? Is there provision for monitoring the water chemistry in the pond?

RESPONSE:

Please see revised Subsections 9.2.7.2 and 9.2.7.3.

QUESTION 371.11

Discuss the consequences of an emergency shutdown immediately following a period when cooling tower blowdown is diverted to the UHS pond. Did your analysis of the pond's thermal performance consider this additional heat input and the resulting higher initial pond temperature?

RESPONSE:

Please see revised Subsections 9.2.7.2 and 9.2.7.3.

QUESTION 371.12

Identify (manufacturer, type) and provide diagrams of the spray nozzles and their arrangement in the pond. Discuss the consequences of a freezing rain or waves from the pond covering the nozzles with ice.

RESPONSE:

The required information is contained in revised FSAR Subsection 9.2.7.2.2.

QUESTION 371.13

Discuss the meteorological data used to satisfy the criteria of Regulatory Guide 1.27. What data base was used, how were the values given in FSAR Tables 9.2-9 and 9.2-10 chosen, and why were only averages for the first day and the next 29 chosen? Justify the conservatism of meteorological conditions used.

RESPONSE:

FSAR Subsection 9.2.7.3.7.1 has been revised to include this information.

QUESTION 371.14

Provide a detailed description of the models used to analyze pond performance. Provide figures showing heat input to the pond with time, integrated heat, and calculated pond temperature and volume with time for the case of maximum water loss and maximum pond temperature.

RESPONSE:

The required model descriptions are contained in revised Subsection 9.2.7.3.3.

QUESTION 371.15

Discuss the origin of FSAR Figures 9.2-15 and 9.2-16. Are they from your model, from measurements made at operating spray ponds or from another source?

RESPONSE:

This discussion is contained in revised FSAR Subsection 9.2.7.3.7.

QUESTION 371.16

Indicate where those items, identified in amendment 17 of the PSAR to be responded to or discussed further in the FSAR, are discussed.

RESPONSE:

Indicated below are those items identified in Amendment 17 of the PSAR for which further response in the FSAR was indicated. References to our responses are also provided.

NRC Letter dated February 15, 1974.

Item 1(c). Discuss short-circuiting from wind blown spray.
Response: Refer to Subsection 9.2.7.3.7.1

Item 1(f). Account for recirculation in your performance system model.
Response: Refer to Subsection 9.2.7.3.3

NRC Letter dated January 15, 1975

Question 1. Provide plan drawings of the spray pond, pump intake area and location of the ESSW pumphouse.

Response: See Dwgs. M-274, Sh. 1, C-795, Sh. 1, and Figures C-795, Sh. 1 and Figures 3.8-96, 3.8-97 and 9.2-24.

Question 3. Provide foundation sections necessary to evaluate the stability of the pumphouse and service water piping.

Response: See figures 2.5-42, Dwg. C-63, Sh. 1, and Figures 3.8-96, 3.8-97, 3.8-98 and 3.8-104.

Question 5. Discuss dewatering for the spray pond and ESSW pumphouse.

Response: Refer to subsection 2.5.4.10.2.

Question 7. Discuss fill material beneath the ESSW pumphouse.

Response: Refer to subsection 3.8.5.1.

QUESTION 371.17

Describe the pre-operational tests and the analysis of the resulting data to be used to confirm the UHS pond will perform as predicted.

RESPONSE:

This description is contained in revised FSAR Subsection 9.2.7.4.

QUESTION 371.18

Provide a list of references used for this section.

RESPONSE:

The references used for this section are included below:

1) W. E. Ranz and W. R. Marshall, "Evaporation from Drops", Chemical Engineering Process Vol. 48, Nos. 3 & 4 (March, April 1952).

2) V. E. Schrock and G. J. Trezek, "Rancho Seco Nuclear Service Spray Pond Performance Evaluation," unpublished report submitted to Sacramento Municiple Utility district (July 1, 1973).

3) Spray Engineering Company for Pennsylvania Power and Light Company, "Drops Size Spectrum Test Report", unpublished (April 1974).

4) G.P. Williams, "Probability Charts for Predicting Ice Thickness, The Engineering Journal, EIC (June 1963).

5) Kays, W.M. and London, A.L., "Compact Heat Exchangers", (Palo Alto, CA: National press, 1955).

QUESTION 371.19

Provide a map of the site clearly showing the topography as altered by the plant. Note that FSAR Figure 2.4-1 is inadequate because it is very difficult to see the contours in the vicinity of the plant.

RESPONSE:

Figure 2.5-24 has been revised and shows all the present roads and finished grading for both Units 1 and 2.

QUESTION 371.20

Describe the "pressure resisting doors" used to prevent water from reaching safety-related equipment. Document that they are water tight for the maximum water level they must withstand. Indicate that procedures will be used to ensure that the door will be properly closed during a flood. Alternately, if you can document that the maximum water level will be below the sill level of the doors to all safety-related buildings, it may not be necessary to keep the doors shut.

RESPONSE:

A description of the "pressure resisting doors" used to prevent water from reaching safety-related equipment has been included in subsection 2.4.2.3 of the FSAR.

QUESTION 371.21

You state, on page 2.4-29 of the FSAR, that "...all safety-related equipment (in the ESSW pumphouse) are located at higher elevation (than the 684.7 feet MSL you calculated as the maximum wind wave runup) and has suitable protection."

What is the elevation of the safety-related equipment and what is the suitable protection?

RESPONSE:

See revised Subsection 2.4.8.4.1 for response.

QUESTION 371.22

Please provide a copy of, or a better reference to the TAMS report referred to in your response to Q371.6.

RESPONSE:

The referenced TAMS report is attached.

AVAILABILITY OF SUSQUEHANNA RIVER FLOW

The availability of Susquehanna River flows for use consumptively at the Susquehanna Steam Electric Station was examined. The analysis, based on the Susquehanna River Basin Commission regulations governing consumptive uses and a repetition of the historical flows, shows there would be 4 days of shortage per year on the average. There would be 12 years out of 71 in which shortages would occur, ranging from 2 days to 96 days. The following table summarizes the results of the analysis, and provides estimated return periods for various durations of shortages.

Days of Shortages	Order Number	Return Period[1]
96	1	158
31	2	34
28	3	30
25	4	28
14	5	15
12	6	13
10	7	12
7	8	9
4	9-10	8
3	11	7
2	12	6
0	13-71	

The basic studies were made as a part of the ongoing hydrologic work Tippetts-Abbett-McCarthy-Stratton is doing for Pennsylvania Power & Light Company concerning an alternative water supply for the SSES. These studies are reviewed and summarized below.

[1] Based on a Log-Pearson Type III Distribution, as given in U.S. Water Resources Council, "Guidelines in Determining Flood Flow Frequency," Bulletin 17, March 1976.

Requirements of the SRBC

The Susquehanna River Basin Commission regulations concerning consumptive uses of Susquehanna River flow were published in 18 CFR 803, September 14, 1976. Those parts of the regulation which are pertinent to the study follows:

"S803.61 Consumptive Uses of Water

(a) Definitions. For purposes of this section the words listed below are defined as follows:

(1) Consumptive Use. Water withdrawn from its source, via a man-made conveyance system, but not directly returned thereto making it unavailable for other water users.

(2) Dedicated Augmentation. Release from an upstream storage facility which is intended for another instream or withdrawal use.

(b) Requirements.

(1) Compensation shall be required for consumptive uses of water during periods of low flow. Compensation is required during periods of low flow for the purposes of protection of public health; stream quality control; economic development; protection of fisheries; recreation; dilution and abatement of pollution; the prevention of undue salinity; protection of the Chesapeake Bay; and other purposes as determined by the Commission.

(2) Consumptive uses by a project not exceeding 20,000 gpd from a total withdrawal of less than 100,000 gpd from surface or groundwaters are exempt from the requirement unless such uses adversely affect the purposes outlined in (1).

(c) Method of Compensation.

(1) Methods of compensation acceptable to the Commission will depend upon the character of the project's source of water supply and other factors noted below.

(i) Stream source. Compensation in an amount equal to the project's total consumptive use shall be required when the stream flow at the point of taking equals or is anticipated to equal the low flow criterion which is the 7-day 10-year low flow plus the project's total consumptive use and dedicated augmentation. The commission reserves the right to apply a

higher low flow criterion for a particular stream reach when it finds, as the result of evidence presented at a public hearing, that it is needed to serve the purposes outlined in (b)(1). . . .

(f) Effective Date. This section shall apply to all consumptive uses initiated since January 23, 1971. Any project that has initiated consumptive use after the effective date is subject to this requirement. Such users or projects which will begin consumptive uses in the near future must comply with the requirement within a time period to be set by the Commission for individual projects."

The periods when compensation would be required are the same as the times when the Susquehanna flow would not be available for consumptive use at the SSES. At all other times, the river flow would be available.

Estimate of the 7-day 10-year (Q7-10) low flow

The USGS gaging station near Wilkes-Barre is about 20 miles upriver from the SSES and is the closest location where river flows are recorded. The historic flow at this gage was used to indicate requirements at the SSES.

The USGS estimated the value of the !7-10 at this gage to be 770 cfs.[2] The value was used as a basis for determining the availability of the Susquehanna River flow at the SSES.

Other Factors

Two other factors were considered as possibly affecting the estimate of the availability of Susquehanna River water for consumptive purposes. However, it was determined that these factors did not have an appreciable effect on the estimate. The factors evaluated were:

1. Past and future consumptive uses by others.

2. Releases from existing reservoir.

TAMS evaluation considered a number of effects of consumptive uses and upstream reservoir releases which are discussed below.

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[2] Bulletin No. 12, "Low Flow Characteristics of Pennsylvania Streams," published by the Department of Environmental Resources, Commonwealth of Pennsylvania in Cooperation with the U.S. Department of Interior, Geological Survey, October 1977.

According to the SRBC regulations, consumptive uses of substantial amounts initiated after January 23, 1971, must be compensated for. Flows released from storage could not be considered as a part of the normal flow when estimating the need for compensation unless allocated.

The SRBC[3] estimated that consumptive use above the Wilkes-Barre gage will increase from 91 cfs in 1971 to 155 in 1990. A review of the water supply needs above Wilkes-Barre as summarized in the Susquehanna Study Report[4] indicates that about 40 percent of this consumptive use would result from domestic and industrial needs and 60 percent from irrigation. TAMS estimated that less than 2 percent of these future consumptive uses would be for farm and urban domestic needs and they would not require compensation under Section 803.61-b-2 of the regulations.

The effects of past consumptive uses on the estimate of the Q7-10 were reviewed. If the historical records were corrected to reflect consumptive uses as of January 1971, the Q7-10 flow might be slightly less. The overall results of such corrections would probably be to increase the number of days when the river flow would be below the minimum value. However, a preliminary computation indicated that such a correction would not significantly change the USGS estimate of the Q7-10. Because of inadequate historical records of past consumptive uses and the insignificant changes, no detailed corrections to the records are considered to be warranted.

There are two Corps of Engineers reservoir projects under construction and six existing reservoirs above SSES. The existing projects are mainly for flood control. Several have secondary purposes, none of which impound sufficient water for SSES augmentation needs. However, the two projects under construction do have storage space which could be allocated for low flow augmentation. At this time, no detailed information has been disclosed on future releases, so TAMS has made the conservative assumption in this paper that any releases from upstream reservoirs would not be available for consumptive use at the SSES unless so specified.

Estimate of Non-Availability of Consumptive Water Supply

The estimated number of days each year based on the historic record at Wilkes-Barre when Susquehanna River flow would not be available for consumptive use at the SSES is tabulated in the enclosed Tables. These are the days during the period 1905-1975 when the recorded flow at the Wilkes-Barre gage would be less than Q7-10 (770 cfs) plus the consumptive use of the SSES (50 cfs) or 820 cfs.

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3 "Information on Flow Criteria and Make Up for Consumptive Withdrawals," Susquehanna River Basin Commission, March 1976.

4 "Susquehanna River Basin Study," Appendix F. Susquehanna River Basin Coordinating Committee, June 1970.

**DAYS DURING THE PERIOD 1905-1975
THAT SUSQUEHANNA RIVER FLOWS
COULD NOT BE USED CONSUMPTIVELY AT THE SSES**

	July**	Aug.	Sept.	Oct.	Nov.	Total
1905	-	-	-	-	-	0
06	-	-	-	-	-	0
07	-	-	-	-	-	0
08	-	-	12	-	-	12
09	-	-	-	-	-	0
1910	-	-	-	-	-	0
11	-	3	-	-	-	3
12	-	-	-	-	-	0
13	-	-	4	-	-	4
14	-	-	-	-	-	0
15	-	-	-	-	-	0
16	-	-	-	-	-	0
17	-	-	-	-	-	0
18	-	-	-	-	-	0
19	-	-	-	-	-	0
1920	-	-	-	-	-	0
21	-	-	-	-	-	0
22	-	-	-	-	-	0
23	-	-	-	-	-	0
24	-	-	-	-	-	0
25	-	-	-	-	-	0
26	-	-	-	-	-	0
27	-	-	-	-	-	0
28	-	-	-	-	-	0
29	-	-	-	-	-	0
1930	-	-	-	-	-	-
31	-	-	-	-	-	-
32	-	-	-	-	-	-
33	-	-	-	-	-	-
34	-	-	-	-	-	-
35	-	-	-	-	-	-
36	-	-	-	-	-	-
37	-	-	-	-	-	-
38	-	-	-	-	-	-
39	-	6	22	-	-	28

	July**	Aug.	Sept.	Oct.	Nov.	Total
1940	-	-	-	-	-	0
41	-	-	5	9	-	14
42	-	-	-	-	-	0
43	-	-	-	-	-	0
44	-	-	-	-	-	0
45	-	-	-	-	-	0
46	-	-	-	-	-	0
47	-	-	-	-	-	0
48	-	-	-	-	-	0
49	-	-	-	-	-	0
1950	-	-	-	-	-	0
51	-	-	-	-	-	0
52	-	-	-	-	-	0
53	-	-	1	3	-	4
54	-	-	-	-	-	0
55	1	9	-	-	-	10
56	-	-	-	-	-	0
57	-	-	-	-	-	0
58	-	-	-	-	-	0
59	-	-	7	-	-	7
1960	-	-	-	-	-	0
61	-	-	-	-	-	0
62	-	8	23	-	-	31
63	-	-	-	19	6	25
64	-	12	28	31	25	96
65	2	-	-	-	-	2
66	-	-	-	-	-	0
67	-	-	-	-	-	0
68	-	-	-	-	-	0
69	-	-	-	-	-	0
1970	-	-	-	-	-	0
71	-	-	-	-	-	0
72	-	-	-	-	-	0
73	-	-	-	-	-	0
74	-	-	-	-	-	0
75	-	-	-		-	0
Total	3	38	102	62	31	236

* Based on reservoir releases when flow was equal to or less than 820 cfs at the Susquehanna Gage at Wilkes Barre.

** Based on historical record, augmentation releases would never be required in the months December through June.

QUESTION 371.23

You state, on page 2.4-39 of the FSAR, that the river low level alarm is set at 488.5 feet MSL. From the stage discharge curve, FSAR Figure 2.4.6, that level corresponds to a discharge of about 5000 cfs. From the discharge-duration curve, FSAR Figure 2.4-30, the river discharge is below 5000 cfs about 40 percent of the time at Wilkes-Barre. Since the discharge-duration relationship at the site would not be very different than at Wilkes-Barre, it appears that the low level alarm would be activated quite often. What is the purpose of the alarm and what happens when it is activated?

RESPONSE:

Subsection 2.4.11.6 has been revised to supply this information.

QUESTION 371.24

Indicate how you intend to ensure spray pond cooling capability beyond 30 days, especially if:

(1) the Susquehanna River flow is below the level at which you can withdraw water in compliance with 18 CFR Part 803.

(2) the river stage is below that needed for the intake system to operate.

We note that on page 9.2-26 of the FSAR, you refer to Section 13.3 which in turn refers to your emergency plan. We were unable to find a discussion of makeup water to the spray ponds in that document.

RESPONSE:

Subsection 9.2.7.1 has been revised to include this information.

QUESTION 371.25

You state on FSAR page 9.2-26, that at times of subfreezing temperatures, return flow to the spray pond will be first discharged directly into the pond, through a by-pass line, without passing through the spray network. Please indicate, on a diagram of the pond, the location of the by-pass line and document that its location precludes short circuiting of hot water to the intake without significantly thawing the pond. Document that the return temperature will remain below the design maximum temperature at all times.

RESPONSE:

Subsection 9.2.7.2.3 of the FSAR has been revised to address this question.

QUESTION 371.26

On page 9.2-34 of the FSAR you refer to an Appendix D, which we have not been able to find in the FSAR. Please either direct us to its location in the FSAR, or if not in the FSAR, provide the document.

RESPONSE:

Appendix D is provided as Subsection 9.2.7.6.

QUESTION 371.27

Model studies, performed during the Construction Permit (CP) review, indicated that the spray ponds, as designed, would be capable of providing cooling water at a temperature below the design maximum for the shutdown of both units during conditions specified in Regulatory Guide 1.27. The ability of the as built spray ponds to meet the design bases adopted at the CP must be confirmed by actual performance tests. Specifically, tests to confirm that the pond responds in a manner consistent with the model studies previously used to estimate pond performance, are needed. Commit to provide a detailed description of your test plan, procedures and analyses techniques for NRC staff review and approval prior to operation of Unit 1. The plan should recognize the availability of heat from Unit 1. Your schedule for the tests and analyses should allow for NRC staff review and approval prior to loading fuel for Unit 2.

RESPONSE:

FSAR Subsection 9.2.7.4 has been revised in response to this question.

QUESTION 371.28

You have not documented that the pressure resisting doors described on page 2.4-10 will prevent water from reaching safety-related equipment, nor have you indicated what procedures will be used to ensure that the doors will be properly closed during a flood event. You state that "prototype assemblies are tested to insure their conformance to specified performance criteria ..." Describe the performance criteria relevant to flood protection. Identify and locate on appropriate maps and figures those doors that provide flood protection. Identify the practices, technical specifications or other procedures that will insure that the doors will be properly closed during a flood event.

Alternately, if you can document that the maximum water level will be below the sill level of the doors to all safety related buildings, it may not be necessary to keep the doors shut.

RESPONSE:

See revised Subsection 2.4.2.3. The effects of flooding on the ESW pumphouse are discussed in the response to Question 371.21.

QUESTION 371.29

Determine if a groundwater dewatering system is installed, being constructed or planned at the site. Responses to items (1) through (3) are necessary only if a dewatering system is, or will be, built.

(1) Provide a description of the dewatering system, including as-built drawings showing the locations of structures, components and features of the system. Provide available information related to the design of all system components such as pumps, lateral interceptors, drainage blankets, and previous fills.

(2) Determine the extent that the dewatering system is relied upon to reduce inleakage into safety-related buildings. Document the internal water levels that cause failure of safety-related equipment.

(3) Determine if credit is given to the system for reduction of active and/or passive loads on safety-related structures or components, or on any non-safety component whose failure could affect safety-related features.

RESPONSE:

No groundwater dewatering system is installed, being constructed, or is planned at the Susquehanna SES site.

A temporary drainage system was installed for use during construction but has been abandoned and is not required for plant operation. Plant design has been based upon the assumption that there is no groundwater dewatering system around any of the Susquehanna SES structures.

QUESTION 371.30

You state on page 2.5-120 that seepage from the spray pond will be monitored using observation wells and refer to subsection 2.4.13.4. That subsection, however, does not contain the referenced discussion. It is our position that the possibility of groundwater levels above your design elevation of 665 feet MSL be addressed by a monitoring program and technical specifications. Therefore, provide the following information:

1. Provide a description of your proposed monitoring program, including maps and cross-sections showing the locations and depths of the observation wells in relation to the spray pond. Discuss the data collection program you propose, including methods of collection, schedules, and documentation. Provide details of your proposed program (described in FSAR Section 2.5.5.2.2.1) to measure actual seepage by measuring pond levels, precipitation and evaporation.

2. Discuss technical specifications and limiting conditions of operation necessary to ensure that the general health and safety of the public is not endangered if the design groundwater level below the spray pond is exceeded.

RESPONSE:

See new Subsection 2.5.5.2.2.1.1.

QUESTION 372.1

Provide any revisions to the extreme meteorological values presented in the Susquehanna Safety Analysis Report that may be necessary as a result of meteorological events occurring subsequent to 1974.

RESPONSE:

Tables 2.3-17 and 2.3-33 have been revised to include this information.

QUESTION 372.2

Tables 2.3-50 through 2.3-62 provide a precipitation wind rose for the Susquehanna site. During the winter months, the occurrence of invalid observations is quite frequent (e.g., January & February - 22%, December - 46%). To what may these invalidations be attributed? Provide a list of the periods of significant outage, including the cause, and discuss the effect of these outages on the monthly data summaries.

RESPONSE:

The frequency of invalid observations during the winter months is due to the freezing of the weighing rain gage, and/or the anemometer or wind vane. The following difficulties were noted:

November 1973 - Freezing of anemometer & wind vane
December 1973 - Freezing of anemometer & wind vane
January 1974 - Freezing of anemometer & wind vane
February 1974 - Freezing of anemometer & wind vane
December 1974 - Freezing of rain gage; freezing of anemometer & wind vane
December 1976 - Freezing of rain gage.

These outages result in a smaller data sample for the monthly summaries.

QUESTION 372.3

Information from Avoca, Penna. on the occurrence of fog was presented for a four year period concurrent with the onsite meteorological program. Provide long-term data (e.g., 30 years) for this meteorological phenomena.

RESPONSE:

The response to this question is provided in Subsection 2.3.2.1.4.

QUESTION 372.4

Atmospheric stability data are provided for Avoca based on STAR data for the period 1971-1975. Explain the rationale for selection of this 5 year period and the representativeness of this period to long-term meteorological conditions (e.g., 30 years). Describe the seasonal occurrence of Pasquill E and F stability categories which were noted to occur 24% of the year.

RESPONSE:

The response to this question is provided in Subsection 2.3.2.1.5.

QUESTION 372.5

Calendar year 1976 meteorological data were inputs to the natural draft cooling tower impact assessment model. Explain the rationale for selection of this year of data and its representativeness with respect to long-term atmospheric conditions.

RESPONSE:

The response to this question is provided in Subsection 2.3.2.2.

QUESTION 372.6

Cite references for the cooling tower impact assessment model which was used.

RESPONSE:

The response to this question is provided in Subsection 2.3.2.2.

QUESTION 372.7

For each parameter, provide the height of meteorological measurement inputs to the model used to assess the impact of the proposed Susquehanna natural draft cooling towers.

RESPONSE:

The response to this question is provided in Subsection 2.3.2.2.

QUESTION 372.8

What is the minimum distance from the onsite meteorological tower to the "deciduous trees in a gully to the south?" How tall are these trees?

RESPONSE:

The response to this question is provided in Subsection 2.3.3.1.

QUESTION 372.9

Regulatory Guide 1.23 identifies recommended accuracies of the entire meteorological data collection and reduction system; however, the specifications provided in Section 2.3.3.3 pertain only to the sensors. Provide the system accuracies for each parameter and compare these with the recommendations of Regulatory Guide 1.23.

RESPONSE:

PP&L believes that the accuracy for sensors was only identified in Regulatory Guide 1.23. Instrumentation accuracies have been presented in the FSAR.

QUESTION 372.10

Are the temperature accuracies presented in Section 2.3.3.3 of the FSAR instantaneous or time-averaged values?

RESPONSE:

The response to this question is provided in Subsection 2.3.3.3.

QUESTION 372.11

On FSAR page 2.3-18, full scale on the wind sensor is listed as 25 mph.

Describe the impact on plant operation and safety of your inability to record occurrences of wind speeds greater than 25 mph.

RESPONSE:

The inability to record occurrences of wind speeds greater than 25 mph has no impact on plant operation and safety.

QUESTION 372.12

Are the digital data recorded onto magnetic tape instantaneous or integrated one-minute time averages?

RESPONSE:

Instantaneous values are recorded on the magnetic tape.

QUESTION 372.13

Discuss the results of the calibration findings including adjustments and/or replacements of components in the data collection and recording system.

RESPONSE:

During the inspection and calibration of the equipment at the Susquehanna SES meteorological tower, all wind speed and wind direction sensors are replaced with pre-calibrated sensors. The dewcell is retreated at least semi-annually.

The translator cards and chart recorders are checked and calibrated as necessary.

As a result of the calibration, the only data which had to be corrected was the wind direction. This correction was due to the meteorological tower being straightened. All other data has not needed correction after the calibration and inspection.

QUESTION 372.14

Provide the dates and times of significant instrument outage, the causes of the outage, and the corrective action taken.

RESPONSE:

The following are the dates and times of significant instrument outage (more than 5 days), the causes of the outage, and the corrective action taken:

Instrument	Date and time of outage	Cause of outage	Corrective action taken
Wind speed 30' level	12/32/73-8 AM to 12/26/73 10 AM	System power failure	Power restored
	1/2/74-11 AM to 1/14/74-11 AM	Frozen bearings	None
	1/18/74-6 AM to 2/25/74-10 AM	Frozen and dirty bearings	Sensor replaced
	12/7/74-8 AM to 12/11/74-9 AM	Frozen and dirty bearings	Sensor replaced
	6/11/75-11 AM to 6/17/75-10 AM	Dirty bearings	Sensor replaced
	6/2/76-3 AM to 6/7/76-11 AM	Dirty bearings	Sensor replaced
	12/3/76-1 AM to 12/10/76-11 PM	Frozen sensor due to storm	None
Wind Speed 300' level	1/6/73-4 AM to 1/15/73-11 AM	Frozen bearings due to precipitation	None

	2/8/73-6 PM to 2/14/73-4 PM	Frozen bearings due to precipitation	None
	5/16/73-10 PM to 5/23/73-11 AM	Dirty bearings	Sensor replaced
	12/21/73-8 AM to 10/26/73-10 AM	System power failure	Power restored
	11/29/76-6 AM to 12/10/76-8 PM	Frozen and dirty bearings	Sensor replaced
Wind Direction 30' level	12/21/73-8 AM to 12/26/73-10 AM	System power failure	Power restored
	1/2/74-11 AM to 1/14/74-11 AM	Frozen and dirty bearings	None
	1/18/74-6 AM to 2/25/74-10 PM	Frozen and dirty bearings	Sensor replaced
	12/7/74-8 AM to 12/11/74-9 AM	Frozen and dirty bearings	Sensor replaced
	6/11/75-11 AM to 6/21/75-10 AM	Dirty bearings	Sensor replaced
	6/2/76-3 AM to 6/7/76-11 AM	Dirty bearings	Sensor replaced
Wind Direction 300' level	1/6/73-4 AM to 1/15/73-11 AM	Frozen bearings	None
	2/8/73-6 PM to 2/14/73-4 PM	Frozen bearings	None

	5/16/73-10 PM to 5/23/73-11 AM	Dirty bearings	Sensor replaced
	12/21/73-8 AM to 12/26/73-10 AM	System power failure	Power restored
	12/3/76-1 AM to 12/10/76-11 PM	Frozen and dirty bearings	Sensor replaced
Dry bulb Temperature 30' level	12/21/73-8 AM to 12/26/73-10 AM	System power failure	Power restored
Wet bulb Temperature 30' level	10/13/73-9 PM to 10/25/73-7 AM	Sensor failure	Sensor replaced
	12/21/73-8 AM to 12/26/73-10 AM	System power failure	Power restored
Delta Temperature 100'-30' levels	6/8/73-midnight to 6/14/73-11 PM	Sensor failure	Sensor replaced
	6/27/73-midnight to 7/3/73-10 AM	Sensor failure	Sensor replaced
	12/21/73-8 AM to 12/26/73-10 AM	System power failure	Power restored
	1/2/74-11 AM to 1/14/74-11 AM	Sensor failure	Sensor replaced
	1/18/74-6 AM to 2/26/74-11 AM	Sensor failure	Sensor replaced
Delta Temperature 300'-30' levels	1/1/73-midnight to 2/23/73-11 AM	Sensor failure	Sensor replaced

	6/8/73-midnight to 7/20/73-11 PM	Sensor failure	Sensor replaced
	12/21/73-8 AM to 12/26/73	System power failure	Power restored
	1/2/74-11 AM to 1/14/74-10 AM	Sensor failure	Sensor replaced
	1/18/74-6 AM to 2/26/74-11 AM	Sensor failure	Sensor replaced
Precipitation	12/21/73-8 AM to 12/26/73-10 AM	System power failure	Power restored
	12/6/74-11 AM to 12/27/74-5 PM	Ice in weighing mechanism	Ice removed from mechanism
	12/1/76-midnight to 12/31/76-11 PM	Ice in weighing mechanism	Ice removed from mechanism

QUESTION 372.15

Identify the fraction of meteorological data recorded digitally that was lost and supplemented by strip chart records.

RESPONSE:

The response to this question is provided in Subsection 2.3.3.4.

QUESTION 372.16

Provide an estimate of the root mean square and largest differences found in the comparison of strip chart and digital data for each meteorological parameter measured.

RESPONSE:

The response to this question is provided in Subsection 2.3.3.4.

QUESTION 372.17

FSAR page 2.3-21 states that if the wind speed is non-calm and the wind direction is zero, implying a calm, then the wind direction for that observation is set to north. Does this statement mean that all non-calm winds for which no direction was recorded were grouped into the north direction category? What was the frequency of occurrence of this phenomena and what impact does this have on the data summaries which were used in making relative concentration estimates?

RESPONSE:

If the wind speed is calm there can be no direction associated with that observation because the wind direction for a calm must be distributed in proportion to the wind direction frequency of the lowest non-calm wind speed class by stability class. Therefore, it was decided to identify all calm wind directions with a zero. If, however, the wind direction for an observation with a non-calm wind speed was determined to be 0°, indicating calm, this would be an error. So, for all non-calm wind speeds with a wind direction of 0° the wind direction was changed to 360° in order to avoid counting the observation as a calm. For all observations which no wind direction was recorded or was determined to be invalid the direction was "---" indicating missing or invalid data. We do not know the frequency of occurrence of this phenomena but it has no impact whatsoever on the relative concentration estimates.

QUESTION 372.18

A description of the method used to calculate hourly wind directions is provided. What are the bases for selecting the modal direction for wind speeds between calm and 3 mph? How are multi-modal occurrences of the same magnitude within the same hour treated? For wind speeds of about 3 mph, what are the differences in the resultant wind direction selected using the modal technique versus the vector analysis technique?

RESPONSE:

The text of the FSAR has been corrected to reflect the fact that all non-calm wind directions are determined by vector analysis. For calm conditions wind directions are determined by the frequency distribution of the lowest non-calm wind speed class by stability class.

QUESTION 372.19

To calculate short-term diffusion estimates, you have used a directional dependent model. This is to inform you that there are two models which may be used to evaluate atmospheric transport conditions for analysis of accidents.

Attached are a copy of our Interim Branch Technical Position concerning a model which considers horizontal plume meander and the directional dependence of dispersion conditions, air flow, and exclusion area boundaries, and a copy of our DRAFT Regulatory Guide 1.XXX, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants," 9/23/77. The model was approved for interim use by the Regulatory Requirements Review Committee on May 2, 1978. If you choose to revise your estimates based on this position, the Susquehanna Units 1 & 2 FSAR should be updated to reflect this change. To facilitate our review we request that you provide the 16 exclusion area boundary distances as described in Section C.2 of Regulatory Guide 1.XXX, if you wish to revise your exclusion area so that it is no longer circular.

RESPONSE:

PP&L does not plan on revising the Susquehanna SES exclusion area.

QUESTION 372.20

How were periods of missing data handled when making running average (e.g., 8 hour) estimates of relative concentration?

RESPONSE:

The response to this question is provided in Subsection 2.3.4.2.

QUESTION 372.21

Section 2.3.4.4 of the FSAR states that "the percentile calculations were performed using the total concentration distribution (independent of sector)," yet FSAR Tables 2.3-93 through 2.3-117 list cumulative percentile by direction. Explain further what the quoted statement means.

RESPONSE:

The response to this question is provided in Subsection 2.3.4.4.

QUESTION 372.22

FSAR Tables 2.3-115 lists a cumulative frequency totaling 138.21 percent in the SE sector. Correct this error.

RESPONSE:

For response see Revised Table 2.3-115.

QUESTION 372.23

The statement is made that "calculations were made after removing all zero values." What was the frequency of occurrence of such values and the impact of removing these values from the cumulative frequency?

RESPONSE:

The response to this question is provided in Subsection 2.3.4.4.

QUESTION 372.24

A puff advection model was used in your assessment of routine releases to derive a table (2.3-128) of terrain correction factor. Were the correction factors which were less than unity used to adjust the uncorrected straight line model?

RESPONSE:

The response to this question is provided in Subsection 2.3.5.1.4.

QUESTION 372.25

Provide a copy of the Dames and Moore Susquehanna tornado evaluation cited in Reference 2.3-18.

RESPONSE:

The above referenced document is provided to you under separate cover.

QUESTION 372.26

The hourly onsite meteorological data which you have submitted indicates that during part of the four year period, the 96m temperature reading exceeded the dew point reading by as much as 9°C during periods of precipitation. What fraction of the time did this occur? Under what conditions might this happen? During a 56 consecutive hour period in 1973 the temperature and dew point readings were identical. To what may this be attributed?

RESPONSE:

We have reviewed the data and determined that during periods of precipitation there were 240 occurrences when the dry bulb temperature was greater than the wet bulb temperature by more than 3°C. These occurrences were noted primarily between the months of April and September. A spot check of some occurrences showed that the precipitation amount was very light (.04) and isolated or it happened during the onset of a long period of precipitation. We feel that passing isolated light showers typical for the April - September period could explain the occurrences which fell into the first category. When the temperature-wet bulb differential is large and precipitation starts it will take some period of continuous precipitation until this differential becomes 3°C or less (Thus, the occurrences during the onset of a precipitation period).

We suspect that the 56-hour period when the temperature and wet bulb were identical was due to an equipment malfunction.

QUESTION 372.27

What are the delta-T intervals used in each of the joint frequency distributions presented (e.g. Tables 2.3-75 through 2.3-81)? Describe the effect on the estimation of atmospheric stability of using an interval from 30.5 to 9.6 meters versus a deeper layer as described in Regulatory Guide 1.23.

RESPONSE:

Refer to Question 372.28 for response.

QUESTION 372.28

FSAR Tables 2.3-75 through 2.3-81 are joint frequency distribution summaries for winds measured at the 9.6 meter level. We have compiled joint frequency distributions for a delta-T interval from 30.5 to 9.6 meters from the hourly data tape which you provided. For some stability classes there are significant differences. Therefore, provide a detailed description of the procedure used to derive the joint frequency distributions which appear in the Susquehanna FSAR. Were these distributions generated from a data tape identical to the tape which was supplied to us or were the data in some other form (e.g., more significant digits, different units)?

RESPONSE:

As discussed in Subsection 2.3.3.6 of the FSAR, the primary delta-T interval was from 31.5 ft. to 300 ft. If these data were missing or invalid, data from the 31.5 ft. to 100 ft interval were used. If both sets of data were missing or invalid, there was no stability classification for that observation. The stability classifications used are as follows:

Pasquill Category	NRC REG 1.23 (°C/100 m)	ΔT°C/270 ft.	ΔT°C/70 ft.
A	<-1.9	<-1.6	<-0.4
B	-1.9 to -1.7	-1.6 to -1.4	-0.4
C	-1.7 to -1.5	-1.3 to -1.2	-0.3
D	-1.5 to -0.5	-1.1 to -0.5	-0.2 to -0.1
E	-0.5 to 1.5	-0.4 to 1.2	0 to 0.3
F	1.5 to 4.0	1.3 to 3.3	0.4 to 0.9
G	>4.0	>3.3	>0.9

Since the interval between 30.5 and 9.6 meters is rather small the stability range is significantly compressed with 5 stability classes falling in a 1.3°C range. With so small a range one would expect to find more values at the ends of the stability classification scale if this were used as the primary delta-T interval.