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REGION V

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Licensee: Pacific Gas and Electric Company
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San Francisco, California 95106

Facility Name: Diablo Canyon Nuclear Power Plant

Inspection at: Diablo Canyon Nuclear Power Plant, San Luis Obispo County, California

Inspection Conducted: June 3-7, 1985, and discussions held with the licensee by telephone on June 17 and 18, 1985

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Summary:

Inspection on June 3-7 and June 17 and 18, 1985 (Report No. 50-275/85-24)

Areas Inspected: An announced appraisal of the Emergency Response Facilities (ERFs) was conducted to determine if the licensee has successfully implemented the requirements in Supplement 1 to NUREG 0737 and the regulations. The appraisal covered the Technical Support Center (TSC), Operational Support Center (OSC), Emergency Operations Facility (EOF), as well as instrumentation, supplies, and equipment for these facilities. The appraisal involved approximately 370 hours onsite by six NRC inspectors and three contractor team members. The appraisal was performed using draft Revision 5 of IE Inspection Procedure 82212.

Results: No deficiencies or violations of NRC requirements were identified. A number of items for improving the licensee's program have been identified in the report.

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DETAILED ERF EVALUATION

1.0 Technical Support Center (TSC)

1.1. Physical Facilities

1.1.1 Design, Location and Structure

The Diablo Canyon Power Plant (DCPP) TSC is located within the plant site protected area at the 104' elevation on the west side of the Unit 2 Turbine building. Since the Control Rooms (CR) for units 1 and 2 are common, the TSC would serve either unit during an emergency. The TSC is physically located near the CR; however, due to the installation of a temporary barrier, a slightly indirect route is currently being utilized between the two facilities. The only security control point (key card reader) between the CR and the TSC using the normal route is at the entrance to the CR. There are three of these control points using the indirect route. It should be noted that the appraisal team experienced difficulties with the card reader system (i.e., some card readers would not accept all key cards). Licensee personnel disclosed that efforts are underway to replace the card reader system with a new one. In the meantime, an alternative method such as calling security or (tailgating) could be used to pass security control points in an emergency. This problem will be alleviated once the temporary barrier is dismantled.

The TSC has been designed to have the same habitability as the CR. TSC personnel are protected from gamma radiological hazards by concrete shielding that is designed to limit the integrated dose under post accident conditions to 2.5 rem. The shielding consists of 16-24" thick walls, a 12" thick floor, a 20" thick roof and steel bulkhead type doors. Special labyrinths were also installed at each doorway to preclude significant radiation streaming into the TSC. The TSC has also been provided with its own ventilation system that includes high efficiency air particulate (HEPA) and charcoal filtration. Under accident conditions the air supply to the TSC is manually transferred to the CR pressurization system which maintains the TSC at a positive pressure. The air supply from the CR room ventilation system including the ductwork, redundant ventilation fans and filter units for the TSC are designed to meet seismic 1 criteria. The fans are powered from the 480 volt vital power supply. The cooling system for the TSC is powered from normal or vital power; however, the system utilizes a normal water supply. The availability of this water supply during an emergency (i.e., loss of offsite power) should be evaluated. The air intake to the TSC is monitored for particulates, iodine and noble gases. Audio and visual alarms have been installed in the TSC to alert personnel of adverse conditions. A check of this alarm system during the appraisal demonstrated its operability. In addition, each of the rooms within the TSC was observed to have direct reading ionization chambers and alarms installed. Dedicated portable monitoring equipment consisting of friskers and ionization chambers were available in lockers located in the Command Center and dose assessment area of the TSC.

The TSC has been designed to the Hosgri seismic criteria, which is substantially more conservative than the State of California uniform building code. The TSC consists of five rooms each encompassing approximately 625 square feet. The total useable space available in each room is much less than 625 square feet due to equipment storage space. The staff estimates the total useable space to be approximately 1500 square feet. This appears to be adequate for the estimated 15 to 30 people expected to be in the TSC during an emergency. The adequacy of the TSC size has been verified by the licensee during previous exercises. The rooms of the TSC are aligned in the following sequence; Command Center, Operations Center, Dose Assessment/Radiological Center, Records Office, and NRC Office. This straight line configuration, although not optimal, is adequate for performing the TSC function. The staff recognizes that reconfiguration would be infeasible at this time, but does recommend that a TSC intercom be installed to improve traffic and communication flow.

1.1.2 Equipment and Supplies

The TSC has been provided with an excellent range of plant records, procedures and drawings. A complete set of plant aperture cards is available in the section of the TSC that is devoted to providing documentation support. Two card readers are available to read aperture cards and make hard copies. Several dedicated lockers are used to store procedures, records and hard copy drawings. During emergencies the TSC Records Office is staffed with plant personnel familiar with the document library system. Documents are located either manually or by using the computer locater system. The system is part of the overall PG&E publication system, in that it has records of all publications, records, and drawings whether they are stored in the plant, TSC, EOF, OSC, or the corporate office in San Francisco. The system is linked to the central computer in San Francisco via the PG&E microwave link. System access time was adequate during both of the location tests posed by the NRC inspector. One test demonstrated the ability of the licensee to locate and produce a seldom used manual that was available in one of the maintenance shops. The other test involved a manual for a motor operated valve in a safety related system. This manual was available in the TSC and produced in a timely manner. The computer system for the microwave link was subject to data error and scatter, in that several entries had to be entered twice due to character deletion, or extra characters being added which resulted in an error message saying that an invalid entry had been made. However, this problem appeared minor in nature and did not introduce an unreasonable delay in determining the location of manuals requested.

Although the contents of the publication lockers in the TSC Records Office are sequentially coded so they can be readily located within an individual locker, it was suggested that PG&E consider marking the outside of the lockers with the general contents of each locker to facilitate picking the correct locker to start with.

Various radiological equipment and supplies are also maintained in lockers within the TSC. Dose rate equipment provides the capability to monitor TSC dose rates, radiological concentrations in air and levels of personnel and surface contamination. The appraisal disclosed that the equipment was in proper calibration and that batteries were in good working condition. Supplies of direct reading dosimeters up to 5R and a dosimeter charger were also available in the TSC lockers. Should a dosimeter of higher range be required, according to individuals in the TSC, they would be requested from access control in the OSC. A locker in the TSC was also noted to contain 5 self contained breathing apparatus (SCBA) units and 5 spare tanks along with protective clothing and supplies.

The procedure (EP-EF-5) for maintaining emergency supplies in the TSC, EOF, and OSC was reviewed. The supplies and equipment described for each area were reviewed for adequacy to support the assigned emergency roles of each of the functional spaces. Maintenance/ surveillance procedures and records, prescribed in the individual procedures, were compared with the actual records of inventories conducted by the emergency planning personnel. Storage location/lockers were inspected and spot checks for accessibility, useability and availability of required supplies were performed. The equipment and supplies in the TSC appeared to be adequate to support the anticipated TSC roles. The records indicated the inventory had been performed as scheduled and that discrepancies noted were tracked and corrected in a timely fashion. Spot checks of storage lockers indicated the inventories accurately reflected the storage lockers contents. Storage areas were generally clean and orderly.

As a suggestion for improvement, it is recommended that an inventory sheet, possibly laminated, be attached to the outside of each locker to provide a quick reference as to the locker's contents. This would also serve to make missing supplies more apparent to anyone viewing the locker's contents.

1.1.3 Communication Systems

The licensee has provided multiple systems and redundancies for transmitting and receiving information between various Emergency Response Facilities (ERF) and offsite agencies during emergencies. The systems have been described in section 7.2.1 of the licensee's Emergency Plan (EP). The communication systems were inspected during this appraisal and during previous routine inspections. Inspection findings have been documented in Inspection Report Numbers 50-275/81-33, 50-323/81-19 and 50-275/84-23. The communication capabilities were also examined during the October 30, 1984 emergency preparedness exercise and documented in Inspection Report No. 50-275/84-29. In addition to confirming the communication capabilities, the appraisal staff verified that tests of the communication systems have been completed in accordance with emergency procedure EF-5, Revision 6, "Emergency Equipment, Instruments and Supplies". Although alternate communications methods exist the telephone system has been equipped with a battery and a battery charger to ensure continued operation during a loss of offsite power. The licensee has experienced some difficulties involving radiocommunications with in-plant field teams. Several "dead spots" have been discovered throughout the plant. To ensure reliable communications with in-plant emergency teams, a management decision has been made to designate the telephone system as the primary method of emergency communication and radios as the backup. A sufficient number of telephones are located throughout the plant. Necessary phone numbers are also provided to the emergency team before their departure. Radios will still be issued to the in-plant emergency teams, but only for backup communications.

1.1.4 Power Supplies

The normal power supply to most TSC loads is manually selectable from Unit 1 or Unit 2 via a manual bus transfer switch in the switchgear room. Unit busses feeding this switch have redundant sources of power. A second manual bus transfer switch selects between the "normal" TSC supply (Unit Nos. 1 or 2) and the alternate supply. The alternate supply can be fed from several sources which include the auxiliary transformer, the 230 KV bus, or one of five diesel generators. Two diesel generators are available for each plant and one cross connect diesel is capable of supplying either plant.

Interviews with plant emergency planning personnel disclosed they had identified computer problems in the TSC when the diesel generators were supplying TSC power. It was not apparent that any action was in progress or planned to solve this problem. It is recommended that this apparent problem be investigated, quantified and evaluated for appropriate action. Power conditioning might be appropriate.

Also, counting equipment in TSC counting room appears to be powered from a non vital power source with no backup source of power. The counting room on the 85' level also appears to be powered from this same non vital power. Although the mobile laboratory or Cal Poly might provide a secondary backup for counting, mobility could be severely restricted during a major release. It is recommended that a backup power source for the plant counting equipment be considered.

1.1.5 Conclusion

Based on the findings in section 1.1, this portion of the licensee's program meets the requirements of Supplement 1 to NUREG-0737. However, the following item requires licensee action and will be classified as an "open" item which will be tracked by the Region.

a. Consider the installation of an intercom system in the TSC to improve the flow of communications. (85-24-01)

The following items are suggested for improving the program:

(1) Evaluate the availability of the water supply to the TSC cooling system under emergency conditions.

(3) Investigate problems observed with the computers in the TSC when the diesels are supplying power. In addition, consider the need for a backup power supply for the counting lab and the backup counting lab in the TSC.

(3) Consider labeling the outside of lockers in the TSC with their contents to facilitate locating needed equipment.

1.2 Information Management

1.2.1 Variables and Parameters

The licensee has installed two computerized systems to provide operators and TSC personnel with an emergency response data acquisition system (ERFDS) to determine the safety status of the plant, and a dose assessment system for determining the potential for actual exposures to the public (EARS). Plant information is provided to the ERFs by ERFDS. The operation of this system is described in a plant procedure (OP-B-10). The major hardware is located in the TSC and consists of dual and single Tanberg 3000 recorders, a Gulton AP-20 label printer, a Compudas computer, a ADM 31 video monitor, a line printer, and a Tektronix CRT and a Tektronix hard copy unit. During power operation the ERFDS system records 451 channels (247 analog, 204 digital) of plant variables. About 10 channels are preselected as "event" channels. If the parameters on any one of the event channels exceed a certain value, the ERFDS recording system will automatically select another tape to capture the event. About two hours of pre-event data will be contained on the ejected tapes and five hours of post event data. Any plant parameter that is processed by the ERFDS system can be read, recorded and trended on a real time basis. The trended value can be recorded for later playback. The parameters selected for ERFDS inputs appeared to be adequate to display required variables to support the operation of the response facilities.

A review was conducted of the licensee's submittal on Regulatory Guide (RG) 1.97, Revision 3, variable status and the two systems mentioned above. From this review it was determined that the variables available would reasonably support the operation of the ERFs during the range of anticipated emergencies at the plant. The licensee had compiled a matrix showing instrument and range required, the plant instrumentation proposing to meet the requirement, and the instrument read out locations. Exceptions or deviations to the R.G. 1.97, Revision 3, variables included the following; narrow range containment level, accumulator isolation valve position, containment sump temperature and liquid holdup tank volume levels. However, from the appraisal and the review of the exceptions where parameters are not available in the TSC, it was determined that this information would be reasonably achievable through dedicated communicators, closed circuit television cameras located in the CR or both.

1.2.2 ERFDS

The ERFDS was designed and implemented to facilitate overall plant safety status evaluation. ERFDS is described in the enclosure to the August 2, 1983 letter (PG&E Letter No. DCL-85-183) from J. O. Schuyler, to the NRC (D. G. Eisenhut, Director, Division of Licensing) and in the enclosure to the September 4, 1984 letter (PG&E Letter No. DCL-84-299) from J. O. Schuyler, to the NRC (G. W. Knighton, Chief Licensing Branch No. 3). ERFDS was supplied by Babcock and Wilcox and configured as a distributed computer system. The ERFDS consists of a number of microcomputers each performing a limited function. The primary functions are: data acquisition; data storage; data routing; computations; data reporting; graphic generation and display; and data retrieval. Specific microcomputers in the ERFDS which perform the functions just listed are the data handler computers, the SPDS computers, display computers and recall computers.

The data handler computer is a Zilog Z-80 based unit which routes 247 analog (range) and digital (2-state) sensor data to display and safety parameter display microcomputers. One complete data set (digital and analog) is collected and stored every second.

The SPDS microcomputers route user-selected data to a Motorola 6802 based microcomputer controlled video generator. User-selected plant safety parameter data sets are video displayed on IDT 19" color cathode ray tubes (CRTs) in the CR, the TSC and the EOF. This color video allows rapid evaluation of plant parameters through the display of color coded graphics or color coded status trees (i.e., out of limit sensors or critical status tree paths that are plotted green for normal or red for a critical status). Typical variables which can be selected to review include; reactivity, reactor core cooling and heat removal from a primary system, reactor coolant system integrity, and containment conditions.

The Recall microcomputer systems routinely store sensor data to a Tanberg TDC 3000 cartridge tape unit. One complete sensor set is stored on a tape cartridge every second. Data is stored sequentially to one of four 2.5 megabyte magnetic tape cartridges. After the last cartridge is filled with sensor data, storage is directed to the first cartridge and data is overwritten on the tape cartridge units. Approximately eight hours of historical data is available at any time. By manually changing cartridges, data storage may also be performed continuously.

A display microcomputer system provides plant sensor information to be printed on a line printer, displayed on a CRT terminal, or trend-plotted on a Tektronix 4006 graphics terminal with hard copy device. For each nuclear power plant unit (Nos. 1 and 2) there are 2 SPDS computers, 2 data handlers, 1 master receiver, and 2 displays located in the TSC. In addition there are 2 SPDS and 1 display for each unit located in the EOF.

Data transmissions to the peripherals for the ERF microcomputers are 9600 baud for TSC devices and 1200 baud for EOF devices. Reliability of the communications using serial link (RS 232C or RS 422) is not checked (parity or checksum tested) for all cases. It is recommended that the licensee develope a method for verification of data communication correctness. The data acquisition sub system (composed of output from signal conditioners, signal multiplexers, data handlers and master receivers) provides class 1E isolation. Fiber optic cables were installed between the remote multiplexers and sub-multiplexers (those muxes communicating directly from the master receivers). This provides isolation and prevents electromagnetic line interference.

Error conditions in microcomputer sub systems are displayed on the front consoles of each system. At the time of this ERF appraisal information on reliability for ERFDS was not available. NUREG 0737 Supplement 1 requires that safety parameter data systems operate reliably. NUREG 0696 states that ERF monitoring and reporting systems should show reliability (availability) greater than or equal to 99%. The licensee needs to evaluate the ERFDS system to demonstrate its reliability.

1.2.3 Emergency Assessment and Response System (EARS)

EARS supports the emergency radiological assessment and protective action recommendation functions assigned to the TSC. This computer-based system is described in the Pacific Gas and Electric EARS manual (Rev. 3) dated May 1, 1985, "Emergency Assessment and Response System (EARS) and Output Tables Description", by E. C. Shih. EARS consists of a Hewlett Packard Model 1000 CPU multi-tasking computerized system and a HR-9845 micro processor that serves as an intelligent work station connected to the HP-1000. The EARS data collection system polls informational data from the stations, the 62 in-plant radiation monitors and the onsite and offsite pressurized ionization chambers. The data is collected every 15 minutes, and hourly averaged data is stored into their respective yearly data bases. The HP-95 work station microcomputers provide printed or plotted information either received from the HP-1000 or manually entered. The HP-9845 are UPS supplied and are viewed as critical components of the EARS system. The Hewlett Packard 1000 is not UPS powered but has an auto restart capability after power loss. The EARS system reliability was determined to be adequate based on discussions with the system manager.

1.2.4 Display Interface

The TSC has a variety of display devices. These include cathode ray tube (CRT) displays, status boards, textual printouts and graphic printouts. In addition, information can be gathered from the CR by use of a closed circuit television system.

The CRT based systems include a Babcock and Wilcox supplied system for displaying plant operations data and a dose assessment system. The ERFDS system includes 2 major sub-systems, e.g. the Safety Parameter Display System and the Recall System. The ERFDS displays are generally readable and understandable. However the SPDS displays are very distracting because of the way dynamic data is updated. Each data point is updated at approximately 2 second intervals, however all data is not updated at the same 2 second intervals i.e., updates are not simultaneous. The resulting effect is distracting, this effect makes specific data difficult to focus on and read. The licensee should evaluate a method to improve the readability of this display if possible. In addition, the TSC has no direct control over the SPDS displays, - they are "slaved" to the CR displays. Since the function of the TSC is to provide a technical overview and augmentation, the staff recommends that the SPDS terminals in the TSC be provided with a control function so the TSC staff will have the flexibility to call up any SPDS displays they are interested in. By releasing the TSC terminals from the "slave" status the probability of a common mode error (CR/TSC) may also be reduced.

The TSC contained a number of status boards for radiological status, plant conditions and sequence of events, as well as a sign in board and a large format telephone list with the number of key positions and offices. Status boards were easy to read for most work stations and were considered adequate.

The TSC also contains a closed circuit television system for surveillance of CR indicators and annunciators. It consists of ten pan/tilt/zoom cameras for reading panel indications and 2 wide angle fixed cameras for an overview of the Unit 1 and 2 CRs. The output from this system is very good and should allow the TSC operations staff the ability to follow parameters that may not be displayed on the ERFDS or the SPDS systems. This system could also be utilized to confirm SPDS readings if there was some doubt about the validity of this data.

The Emergency Assessment and Response System (EARS), provides both CRT and graphic hardcopy displays via HP-9845C terminals. Displays are easy to identify, read, and understand. User interaction is facilitated by the use of programmable function keys. No areas of improvement were identified by the appraisal staff.

1.2.5 Dose Assessment

The dose assessment capabilities in the TSC and CR are provided through an integrated computerized system of software and hardware (EARS) and a backup, manual system. EARS uses a computerized environmental model to calculate and project radiation doses from radioactive material released in gaseous effluents during an accident. For this calculation source terms and meteorological information may be derived from actual monitor readings using an automatic controller program (EARAUT), or may be keyed manually into the program using a manual controlled program (EARMAN). Doses to the whole body from plume exposure, to the thyroid from inhalation of radioiodines, and from ground shine resulting from the deposition of radioparticulates are available. Doses that result from ingestion of contaminated food stuffs are not available on EARS. The backup manual method is a hand calculational method that uses dedicated forms to aid in the calculation. Additionally dose calculations may be based on samples taken by licensee teams in the field which can be quickly dispatched. For purposes of evaluating monitoring team data, a mobile van equipped with a Nuclear Data ND-66 NAI and intrinsic GE-LI detectors is available. Also, there are 9 permanent airborne particulate and iodine environmental monitors, 35 TLDs and 12 PICs available in the field to measure environmental radiation.

1.2.5.1 Source Term

The descriptive variables and calculational methods used at DCPP are adequate to determine source term from potential leakage pathways. Additional source term information and calculations are described in plant procedures EP-RB-9, "Calculation of Release Rate and Integrated Release," and RB-12, "Mid and High Range Plant Vent Radiation Monitors". Core damage assessment is described in EP-RB-14, "Core Damage Assessment Procedure". This procedure allows a calculated comparison of core damage based on default source terms for core damage in excess of design based accidents to measure data from plant instrumentation.

The EARS in the automatic or manual mode is the primary means for determining source terms, with the manual calculation method prescribed in RB-9 used when the automatic and manual methods are not available.

Both EARS and RB-9 consider 13 mini-scenarios for source term determination. In RB-9 these scenarios represent the various postulated accidents that have been analyzed in the FSAR, and are addressed in a series of summary sheets with both the "design basis" and the "expected" case variables which were assumed in the FSAR analysis being considered.

The procedure (RB-9) considers three basic release paths: (1) Plant Vent, (2) Steam Dump/Safety Release Valves, and (3) Containment. The procedure is sectioned as follows: (1) noble gas and iodine release rate determination using plant radiation monitors (form 69-6920); (2) noble gas, iodine and particulate release rate determination for a steam generator tube rupture (Form 69-11105); and (3) noble gas and iodine release rate determination based on containment high range monitor indication (Form 69-10555).

Various effluent monitors and flow meters are utilized as inputs to EARS and manual computations. These are summarized by location on Attachment B to this report.

Additionally the Fuel Handling Building contains 2 Area Radiation Monitors (ARMs), 1 (channel no. 58) is for the new fuel area and 1 (channel no. 59) is for the spent fuel pool area. Both have readouts located in the CR, but nowhere else. There is no separate flow indicator for the fuel handling building exhaust flow. Exhaust enters the main plant vent where it is monitored for activity and the total flow is measured after mixing with other exhaust flows. Specific exhaust flow from the fuel handling building is estimated based on which of the three building vent fans is in operation, each fan having a total rated capacity of 35,750 standard cubic feet per minute.

There are 12 pressurized ion chambers (PICs) located onsite and in the outlying landward sectors, locations being keyed to population density. These PICs normally read into EARS. In the event of a problem with EARS, they may be read locally by the field monitoring teams and the information relayed by phone or radio.

Alternatively the PIC input signals to EARS can be redirected (by wiring jumpers) to another HP-1000 computer if such is available. For computational purposes a containment leakage rate of approximately 1.8 cfm (0.1% of total containment free volume for 24 hours) were assumed the first day (FSAR design basis accident) and reducing to 0.05% of total containment free volume for 24 hours thereafter. Procedures provide for using the best available information in lieu of default values, should current information be available.

It was noted in procedure RB-9, Form 69-11105, page 2 of 5, that the equation for converting steam flow in lbs/hour to cc/sec contains a conversion factor (3.3) but does not specify the pressure or steam density at which the factor is correct. An engineering calculation identified the factor as being the steam pressure corresponding to the steam pressure relief valve setting. This is also provided in procedure R-2 where a similar equation is used. Similarly, the engineering basis is not provided. It is recommended that this pressure information be added to the procedures. The 13 mini scenarios used in EARS and in the summary sheets for manual calculations also do not extend to low probability, high risk accidents such as 100% fuel melt. It is recommended that the inclusion of such additional scenarios be considered. It is further recommended that consideration be given to hard wiring of PIC input to EARS through a switch which is in turn hard wired to 1 or more HP-1000 computers. This would allow a timely shift to a backup computer for readout in the event that the normal EARS computer is down. It is recognized that the flexibility to be gained from such a change may be only minimally cost effective.

Fuel damage assessments are made using EP-RB-14, Core Damage Assessment Procedure, as a reference. This procedure provides the methodology to determine the extent of core damage that may have resulted from an accident. The procedure provides methods that divide the classification of fuel damage into categories of 1) no fuel damage, 2) fuel cladding damage, 3) fuel overheat, and 4) fuel melt. For the last three categories the procedure permits a rough estimate of damage as a proportion of core radionuclide inventories that have been released to the reactor coolant or containment atmosphere. The preliminary assessment relies on plant parameters and containment parameters to quantify the damage. The long term assessment depends upon the availability of coolant and containment air samples. A method of comparing expected versus measured results is provided.

Source terms may also be determined in the event of building effluent monitor failure, from grab samples of the gaseous effluent streams. Constituent radionuclide determination of these samples may be performed either in plant or at the TSC counting lab using an Intrinsic Germanium Detector and a gamma spectrometer. This system identifies gamma peaks in the 40 kev to 2 Mev range with high resolution. Coupling these radionuclide concentrations with the building ventilation flow rates, the source term may be computed.

1.2.5.2 Meteorology

The meteorological information directly accessible to the TSC is either from the primary or backup meteorological towers. From the primary tower data is recorded on wind direction and speed at 10 and 76 meter levels; vertical temperature difference between 10 and 46 meter levels and between 10 and 76 meter levels; sigma theta at 10 and 76 meter levels; temperature at the 10 meter level; and precipitation near ground level. On the backup tower, data is recorded on wind direction and speed at 10 and 60 meter levels, vertical temperature difference recorded between the 10 and 60 meter levels; sigma theta at the 10 and 60 meter levels; temperature at the 10 meter level and precipitation near ground level. In the event that neither the primary nor the backup data are accessible or operable, a portable mast with sensors to measure wind direction, wind speed and temperature will be placed in service. Also nearby weather information can be obtained from the National Weather Service at either Redwood City or Los Angeles.

Meteorological data acquisition in the TSC is available from a printer which displays 15 minute averages of meteorological data for either of the towers, primary or backup, selected from the CR or from EARS.

EARS uses a variable trajectory segmented Gaussian plume model for a ground level release with data based on meteorological measurements at one of the tower locations. The plume model does not incorporate terrain affected air flow regimens but does include temporal variations in plume position. Together the meteorological variables and calculational methods do not provide an adequate characterization of the dispersion of effluents to a distance of at least ten miles from the plant during a southwesterly wind condition. During this condition the model would predict plume transport directly across the mountains northwest of the plants, whereas the actual transport is likely to be up or down the coast. The licensee has collected good quality onsite meteorogical data with better than 90% joint recovery of wind speed, wind direction, and temperature gradient with heighth (as a measure of atmospheric stability). However, the licensee has not demonstrated the reliability of the delivery of this data to the ERFs.

1.2.5.3 Computerized Dose Assessment

EARS has the capability to estimate and project doses and dose rates at up to 6 fixed distances, plus the end point of the plume travel in the direction of plume travel. Additionally calculations will be made at receptor locations programmed in the data file that lie within the radial distance equivalent to plume travel distance. EARS will calculate whole body and thyroid doses and dose rates from submersion in a radioactive gas cloud, and whole body exposure from ground deposition of particulate radionuclides. The calculations made at receptor locations are compared to plant protective action guides and the appropriate action (e.g., evacuation, sheltering, etc.) and the basis for such actions are written into the record. All releases are appropriately treated as ground level releases. The EARS program is capable of providing calculations within a 15 minute time interval. To aid in determining the extent and range of potential exposure, EARS presents the results of the plume travel calculation in the form of a plume overlay on a computerized map of the plant site for either a ten or a fifty mile radius. To calculate doses, EARS uses a library of 23 noble gasses, radioiodines, and radioparticulates. Source terms are provided either by direct effluent monitor readings, by specification of one of the FSAR design basis type accidents, or by manual input of source terms. Similarly meteorological data is provided by monitors or manual input.

EARS has been validated in a two phase program. Phase number one identified problems and improvements that would be made to the EARS program. Phase two validated the resulting changes. During the appraisal an independent, partial validation was performed on EARS. Calculations in EARS tended to overestimate whole body doses because of the models used. EARS assumes a semi-infinite cloud of gas rather than one of finite dimensions. EARS calculations on thyroid doses is more exact. Some differences also exist in the mix of radionuclides between EARS and the appraisal validation tool, however, the uncertainty in these dose estimates will be appropriately factored into decision making. An independent comparison of the dispersion portion of the EARS model to a standard model is being made.

Personnel in the EOFs Unified Dose Assessment Center (UDAC) have the primary responsibility for using field monitoring data to refine previous dose projections. This data may also be used to calculate potential doses from the ingestion of contaminated food stuffs. However, EARS does not compute ingestion doses. Instead, EARS computes exposure to ground deposition. The dose rates from exposure to contaminated ground can be used to deploy radiological monitoring teams. It is recommended that a routine be developed and incorporated into EARS to calculate the doses that would be received from the ingestion of contaminated food products.

1.2.6 Conclusion

Based on the findings in Section 1.2, this portion of the licensee's program meets the requirements in Supplement 1 to NUREG-0737. However, the following items require licensee action and will be classified as "open" items which will be tracked by the Region.

a) The Emergency Response Facility Data System should be evaluated to assure that the SPDS operates reliably to meet the intent of Supplement 1 to NUREG-0737. NUREG 0696 states that Emergency Response Facility monitoring and reporting equipment should show a reliability greater than or equal to ninety nine percent. (85-24-02)

b) Provide the TSC SPDS system with a control function. (85-24-03)

c) Verify the reliability (availability) to deliver meteorological data to the ERFs from the onsite meteorological monitoring systems. (85-24-04)

The following items are suggested for improving the program:

1) Develop a method to verify the correctness of data transmissions for the ERF microcomputers.

2) Improve the readability of the SPDS displays by minimizing the distractions due to data changes.

3) Modify procedure RB-9 to incorporate the appropriate pressure or steam density basis for a steam flow conversion factor from lbs/hour to cc/sec.

4) Modify EARS to incorporate low probability severe accident source terms and the calculation for doses received from the ingestion of contaminated food products.

5) Consider hardwiring the PICs to EARS to ensure a timely shift to backup computers for readout should the normal EARS computer fail.

6) Vertical temperature differences from the primary meteorological tower are determined by subtracting one temperature from the other, rather than the more common practice, which is used on the backup tower, of measuring differences in resistance temperature detector outputs directly and then converting this output to a temperature difference. A justification is needed to demonstrate conformance of these primary tower measurements with the accuracy criteria contained in RG 1.97, Rev. 3 or a modification to the system should be made.

7) Consider the inclusion of spatial distributions of airflow within 10 miles of the plant in the EARS model.

1.3 Functional Capability

1.3.1 Operations and Control Room Support

The functional capability of the TSC was evaluated by presenting a NRC developed accident scenario to key members of the licensee's staff normally assigned to the facility during an emergency. Licensee personnel responded to the postulated circumstances by describing their actions and how the equipment and supplies available in the TSC would be used. The evaluation showed that the TSC would be adequately staffed and capable of performing the assigned functions. According to emergency procedure EF-1, Revision 5, "Activation and Operation of the Technical Support Center", the TSC is considered ready for activation when staffed to "acceptable minimum levels". Specific emergency response personnel have not been identified. The appraisal staff discussed this matter with the Plant Manager and were informed that the TSC would not be formally activated until emergency response personnel covering all of the major functional areas were present. It was also observed during the walkthroughs that although a dedicated communicator was used between the CR and the TSC, an open communications line was not maintained. A ringdown circuit was used which allows for rapid communications but results in constant ringing of the telephone at both stations. A review of exercise comments from the 1984 Emergency Preparedness Exercise indicated that the ringdown circuit resulted in 20 to 25 ringdowns which posed a distraction both in the TSC and the CR. It is recommended that an open line (preferably headsets) be considered to reduce noise level and distractions during an emergency.

The CR acting as the main switchboard for the station during off hours was also discussed during walkthroughs. This, according to emergency planning personnel, would continue in an emergency until the TSC was activated and the offsite calls could be directed to TSC and handled by the Emergency Liaison Coordinator. Adequate manning by Shift Clerks would prevent licensed operators from being distracted by outside calls during an emergency, however, CR tasking during an emergency should not include handling routine calls from outside the station.

The responsibilities for dose projections/assessments and protective action recommendations are transferred to the EOF after the interim EOF staff (plant personnel) had been relieved by the long term Corporate Emergency Response Organization (CERP). The TSC retains the responsibility to make offsite notifications, however periodic updates to the county will be made from the EOF after it has been activated.

The TSC is provided with a dedicated ring-down line between the TSC and the CR, the OSC, and the EOF. It is a designated, identifiable phone and its use should assure that adequate communications will be maintained.

1.3.2 Conclusion

Based on these findings this portion of the licensee's program meets the requirements of supplement 1 to NUREG 0737. The following items are suggested for improving the program.

1) Consider using an open line (preferably headsets) between the CR and TSC to reduce noise levels and distractions during an emergency.

2) Consider removing the CR from the flow of routine phone calls (acting as a switchboard) for the station during off hours.

2.0 Operational Support Center (OSC)

2.1 Physical Facilities

2.1.1 Design Location and Habitability

The Operational Support Center (OSC) consists of the Chemistry and Radiation Protection Access Control and the cold machine shop areas, including the locker room and break room, and is located on the plant 85' elevation entrance to the Auxillary Building. During normal work hour emergencies, requiring OSC activation, personnel not engaged in the emergency would report to pre-assigned assembly locations in accordance with emergency procedure G-4, "Personnel Accountability and Assembly". Personnel designated for immediate response will report to the OSC. During off hours personnel would either be directed to report to the OSC or, if not given a specific emergency response location, would initially report to the Security Building lunch room for further instructions.

The OSC does not have any special shielding or ventilation systems for minimizing radiation exposure, consequently, personnel in this area may be evacuated under certain conditions. Should evacuation become necessary, personnel required for emergency response would be relocated to a "safe" area such as the counting area in the TSC where they could perform their emergency functions. Personnel not immediately necessary to the emergency response function may be relocated offsite to other areas such as the PG&E Information Center.

The size and layout of the OSC appeared adequate as an assembly point for plant operation support personnel. The nearby areas will provide temporary space during accountibility activities. The OSC layout has a designated staging area for operations personnel briefing and dispatch. Prior to performing their tasks, operation teams would dress up, receive dosimetry at access control and then report to the access control hallway for a briefing by the OSC Supervisor. The access control hallway contained status boards and plant drawings that showed radiation exposure levels for certain areas of the plant. These drawings would be useful and could provide an emergency team with information on radiation levels that may be encountered, and help with finding the safest route to their objective. In addition there are numerous other status boards which contain information on emergency team status, plant status, survey results, and personnel location. During a tour of the cold machine shop area, no emergency lighting fixtures were observed. Although there was an adequate supply of flashlights and hand held lanterns available for use in the cold machine shop, it is recommended that the licensee consider the installation of a few well placed DC powered spotlights to provide lighting until hand held lanterns and flashlights can be distributed. The emergency lighting in the access control portion of the OSC appeared adequate.

2.1.2 Equipment and Supplies

The OSC does not maintain separate supply lockers that are reserved solely for emergency use but relies on the proximity to the access control and the cold machine shop to provide necessary supplies. The access control portion of the OSC contains an adequate supply of respiratory protection equipment, protective clothing, potassium iodide, radiation monitoring instruments, personnel dosimetry and other supplies available for emergency use, because the area is normally used for staging area for entry into the radiologically controlled area of the plant. The radiological equipment available provides a capability to measure anticipated dose rates under accident conditions and levels of contamination as well as collect samples of airborne activity. First aid and decontamination supplies are also located in this area. The cold machine shop houses a tool crib that should be sufficient to support anticipated OSC functions. The hot machine shop has an additional supply of resources that could be accessed in an emergency. Support supplies, i.e., paper, pencils, markers, flashlights, etc., may be more appropriately set aside in an "emergency use only" locker in the OSC to insure that they are available when needed. Although it is probable that such material can be located in surrounding offices, the initial stages of an emergency when timely response is needed may not be the proper time to dispatch manpower to locate such support supplies.

2.1.3 Communications

The communication systems existing in the OSC have been addressed in Section 1.1.3 above. The appraisal staff verified that communication capabilities were as described in the licensee's Emergency Plan. This appraisal disclosed that radios will no longer be used as the primary communication link by plant emergency teams. This matter has also been addressed in Section 1.1.3.

2.1.4 Functional Capability

The functional capability of the OSC was evaluated by presenting an NRC developed accident scenario to key members of the licensee's staff normally assigned to the facility during an emergency. Licensee personnel responded to the postulated circumstances by describing the actions that would be taken and demonstrating how equipment and supplies available in the OSC would be used. From this evaluation it appeared that the OSC would be adequately staffed and capable of performing its assigned function. The ability of the OSC to interface with all onsite activities in performing its function appeared adequate. However, it was noted during the walkthroughs and procedural reviews that the staffing necessary to support the declaration of OSC activation was not defined in procedures. Interviews indicated that at least one OSC Supervisor and an Emergency Maintenance Coordinator felt that the OSC was operational when communications were established, even though the OSC was not yet capable of providing a maintenance or repair team to support the emergency. It is recommended that minimum staffing requirements be determined and proceduralized to meet the requirement that the OSC be capable of providing support when activated. In addition, the licensee should consider placing the OSC supervisor in the conference room located upstairs in the cold machine shop. This would relieve the congestion observed in the OSC supervisor's office and provide some space for reviewing plant drawings.

2.1.5 Conclusion

Based on the above findings, this portion of the licensee's program meets the requirements of Supplement 1 to NUREG-0737. However, the following items are suggested for improving the program:

1) Proceduralize minimum staffing requirements for activation of the OSC.

2) Install DC powered emergency lighting in the cold machine shop area.

3) Set aside an area for dedicated emergency support supplies.

4) Station the OSC Supervisor in the conference room located upstairs in the cold machine shop.

3.0 Emergency Operations Facility (EOF)

3.1 Physical Facilities

3.1.1 Design Location and Habitibility

The EOF is a 2 story building of approximately 14,000 square feet co-located with the county Emergency Operations Center. The EOF is located 11.7 miles northeast of the Diablo Canvon Power Plant. The EOF occupies the second floor or that structure and the county Emergency Operation Center is located on the first floor. The structure was built in accordance with the State of California uniform building code and was designed to accommodate 114 people. The area designated as the EOF comprises approximately 3,000 square feet of usable space, which appears to be more than adequate to accommodate the 25 to 50 PG&E staff expected to man the EOF. The layout of the EOF appears adequate to facilitate communication and traffic flow. The Recovery Manager's office is such that he is centrally located in the EOF to facilitate necessary communication flow. This centrally located position also provides for good visual contact to improve the coordination of radiological and environmental assessments for the determination of protective action recommendations. In addition, an open balcony provides the capability for direct visual and voice contact with the state and county. Because the location of the EOF is 11.7 miles from the site, there are no special requirements for habitability or for a backup EOF.

3.1.2 Equipment and Supplies

The EOF is more than adequately equipped to perform its intended function. Inventory procedures and methods are as described for the TSC and appear to be adequate to maintain support equipment and supplies for the EOF at required levels. Records and drawings are similar to the TSC and are discussed in Section 1.1.2. Backup engineering and technical support for the TSC and CR that would require extensive plant drawings and records, would be readily available from the PG&E Corporate offices in San Francisco. Should reactor technical support be required in excess of support available in the TSC, the PG&E Corporate engineering groups would be utilized. Communication links and hard copy transfer capabilities exist to transfer needed records and drawings between the TSC, EOF and the Corporate Offices.

Radiological equipment located at the EOF included, an Eberline E-140 survey meter equipped with an HP-210 probe, an Engler air sampler with a supply of cartridges, and a (PIC) pressurized ion chamber located directly outside the building tied into the EARs system. The monitoring equipment was observed to be operable and within calibration. This equipment should be adequate to measure contamination levels and to check the habitability of the EOF.

3.1.3 Communication and Transportation

The Emergency Operations Facility utilizes the same communication systems previously discussed in Section 1.1.3 above. However, notification of the Corporate Emergency Response Organization is not accomplished using the normal emergency response notification system (RANS). At the "unusual event" classification, the individual designated as the Recovery Manager is notified via telephone or pager, however, the corporate staff does not respond to the EOF until the "alert" classification. Transportation options available to the corporate staff include charter plane, company owned planes and automobile. In addition the licensee has signed contracts with carriers at airports in the Oakland, San Francisco, and Concord areas to charter individuals to the San Luis Obispo Airport.

3.1.4 Power Supply

The EOF has normal and emergency power supplying all vital functions in the building. The first floor of the building is dedicated to county use and serves as the 911 emergency dispatch area, County Sheriff's Watch Commanders office, County Command and Control Center for non-nuclear emergencies, and other uses. The second floor of the building is the EOF. In case of a primary power supply failure, the building is equipped with a 100 KW diesel generator with a 1000 gallon (5 day) fuel supply based on full load operation. The diesel fuel tank is located underground with a locked fill connection. The diesel control panel is also locked to prevent tampering. The diesel is equipped with an automatic start and automatic transfer feature which makes manual action on a loss of power unnecessary. The diesel start feature is powered from batteries. The building has a separate battery room and an installed uninterruptible power supply which supplies vital equipment in the event of normal and diesel power supply failures. The systems supplied by the backup batteries and uninterruptible power supply are the 911 Dispatch Center, EARS, ERFDS, and SPDS systems.

All duplex outlets in the EOF are coded as to the power source feeding them. White (Ivory) outlets are normal power, red outlets will have diesel backup upon a loss of power, orange outlets are powered from the uninterruptible power supply/batteries with a normal building ground, and yellow outlets are powered from the uninterruptible power supply/batteries with a separate earth ground. The latter of this group is used for computer applications to reduce the possibility of stray signals/spikes causing a loss of data. All equipment in the EOF was checked to verify it was powered from appropriate sources.

Lighting power panels were checked to determine sources of power to overhead lighting. The building is split with one-half the lighting in any given space being fed from a different power panel. NRC inspectors observed the tripping of selected breakers to verify wiring and emergency lighting to critical areas within the EOF.

The diesel preventive maintenance program and records were examined. The starting of the diesel was observed. The battery room and uninterruptible power supply was inspected. Adequate spare parts for the uninterruptible power supply were on hand with PG&E and contractor support available for emergency maintenance. Based on records, documentation reviews, and observations, the building power system and maintenance program appear to be adequate to support a highly reliable power source during normal and emergency operations.

During walkthroughs to determine which outlets vital equipment was being supplied from, it was noted that the particular plugs from various equipment were not marked as to which outlets (red, white, yellow, orange) the equipment should be plugged into. It was recommended that equipment be marked with a tag or a like color identification to insure that the equipment was not unplugged and plugged back into the wrong outlet, during evolutions such as cleaning where janitorial personnel might be unplugging and plugging in vacuum cleaners throughout the building.

3.1.5 Conclusion

Based on the above findings this portion of the licensee's program meets the requirements of Supplement 1 to NUREG 0737.

The following item is suggested for improving the program.

1) Consider tagging equipment to indicate which type (color) of power outlet is used.

3.2 Information Management

3.2.1 Variables and Parameters

The EOF has the same level of support with respect to RG 1.97 variables as the TSC with most variables being available except as noted in section 1.2.1 above. It is also noted that the EOF SPDS has more flexibility than the TSC SPDS in that fixed screens can be independently selected from the EOF with no effect on the TSC or CR SPDS screens. Other information available to support the EOF is essentially the same as described for the TSC and is adequate to support the EOF function. The communication system and data transfer methods would allow adequate coordination and interfacing with respect to data transfer.

3.2.2 Information Systems

The EOF includes display devices similar to those used in the TSC i.e., ERFDS terminals, EARS terminals, status boards, and textual and graphic computer printouts. The EOF does not contain a closed circuit television system for CR surveillance. The EOF does have some additional hard copy capability not available to the TSC e.g., a panafax copier and several xerographic copiers. Status boards in the EOF are consistent with those used in the TSC. Site maps and overlays are also consistent with those in the TSC. All are easy to read and understand.

3.2.3 Dose Assessment

All of the dose assessment capabilities that are available in the TSC are also available in the EOF through the EARS computer capabilities. Since personnel in the Unified Dose Assessment Center (which includes representatives from state and local government agencies) use the same model that the TSC uses, the licensee's model is consistent with that used by offsite authorities. The EOF will be staffed with both Corporate and National Weather Service meteorologists. In addition to the capabilities at the TSC, radiological services and information are available such as, wind profiles from doppler acoustic sounders, meteorological forecasts, and the capability to make adjustments to EARS dose projections. The UDAC also performs a manual calculation of dose rates for comparison with the results of the EARS computerized calculation. This is the only instance of manual data processing expected to be done at the EOF. This cross check should provide some assurance and reliability of results.

The EARS data acquisition and dose projection system plus the availability of additional meteorological data, and the presence of two meteorologists in the EOF, appear to provide the maximum capability for meteorological evaluations required for dose assessment and protective action decisionmaking. In addition the EOF is backed up by a staff meteorologist at the PG&E Corporate office. Suggested areas for improvement are the same as those stated in Section 1.2.

3.2.4 Conclusion

Based on the above findings, this portion of the licensee's program meets the requirements of Supplement 1 to NUREG 0737.

3.3 Function Capability

3.3.1 Technical and Logistical Support

Offsite vendor contracts to provide reactor technical support were available. Notification procedures included INPO as required notification, which would provide an additional source of technical support. Support agreements for medical, fire protection, laboratory, lodging, meals, and other logistic issues associated with responding to both short term and long term requirements were in place where needed. The extent of the utility integration with state and county agencies in the operation of the EOF and the response to emergencies provides for excellent coordination and the ability to acquire additional support in a timely manner. Having the EOF as a shared facility with the county Sheriff's Department and 911 dispatcher located on the 1st floor facilitates the transfer of personnel, equipment, and supplies during emergency conditions.

3.3.2 Staffing and Capabilities

An NRC developed scenario and walkthroughs were used to determine how the EOF would function during emergency conditions. The availability and locations of key equipment, procedures, supplies, and other necessary material were pointed out by plant personnel which facilitated later discussions between inspectors and plant personnel in specific appraisal areas. Individuals in the EOF responded to the postulated circumstances by describing the actions that would be taken and by demonstrating how equipment and supplies in the EOF would be used. The evaluation showed that the EOF would be adequately staffed and capable of performing its assigned functions. In addition there appeared to be an excellent interface between PG&E and county and state personnel in the formulation of an environmental monitoring program and protective action decisionmaking.

3.3.3 Conclusion

Based on the above findings this portion of the licensee's program meets the requirements of Supplement 1 to NUREG 0737.

4.0 Exit Interview

On June 7, 1985 an exit interview was held with the licensee for the purpose of discussing the preliminary findings of the appraisal. Those licensee personnel who attended the meeting have been identified in Attachment A to this report. In addition to the NRC team leader and the appraisal team, the exit interview was attended by Mr. R. Van Neil, Section Chief, Emergency Preparedness, Headquarters, and Mr. M. Mendonca, Senior Resident Inspector. The licensee was informed that no significant deficiencies or violations of NRC requirements were identified during appraisal. The licensee was also informed that a number of "open items" were identified during the appraisal and these items would be tracked to their final resolution through the normal inspection process. The following items were specifically addressed at the exit interview.

a. The licensee has not evaluated the reliability of the SPDS system to meet the intent of Supplement 1 to NUREG 0737.

b. The licensee needs to evaluate the model used for dose assessment and incorporate the results of terrain that may effect this model. In addition there has been no evaluation performed on the reliability of meteorological data transferred from the base of the tower to the CR.

c. The licensee needs to examine their emergency kits. The kits observed in the training building required two battery powered air samplers (according to procedure EF-5); however, the inspection revealed 1 battery powered air sampler with a dead battery and one other air sampler that was DC powered but without battery.

The NRC team leader also informed the licensee that recommendations for improving specific areas addressed during the appraisal were identified and would be documented in the appraisal report.

Attachment A

Persons Contacted

*R. Thornberry, Plant Manager
*W. Fujimoto, Supervising Nuclear Engineer
*J. Boots, Chemistry and Radiation Protection Manager
*R. Powers, Senior Chem Radiation Engineer
*E. Kendall, Nuclear Generation Engineer
*W. Kelly, Regulatory Compliance
*R. Garalli, Senior Systems Analyst
*W. Keyworth, Senior Power Production Engineer
*C. Cox, Emergency Planning Engineer
*G. Johnson, Computer Engineering
*M. Gisclon, Assistant Plant Manager
*T. Martin, Training Manager
*A. Dame, Senior Instructor
*S. Joiner, Emergency Planner
*J. Gilfore, Training Instructor
*T. Mack, Senior Nuclear Engineer
C. Meyers, Records Analyst
L. Womack, Engineering Manager
J. Molden, Operations Training Supervisor
R. Garacci, Senior Chem and Radiation Protection Systems Analyst
D. Unger, Chem and Rad Protection Engineer
R. Fisher, Senior Power Production Engineer (Operations)
R. Nanniga, Senior Power Production Engineer (Maintenance)
P. Steiner, Nuclear Generation Engineer, Emergency Planning
E. Kendle, Nuclear Generation Engineer, Licensing
D. Oatley, Senior Engineer, Nuclear Operations Support
J. Townsend, Assistant Plant Superintendent
P. Beckham, Nuclear Generation Engineer
P. Steiner, Emergency Planning Engineer
*R. Thuillier, Meteorologist
*E. Waage, Nuclear Generation Engineer
P. Girard, Emergency Planning
D. Duke, Engineer, Nuclear Operations Support
H. Shaw, Engineer, Mechanical and Nuclear Engineering
B. Peterson, I&C Engineer
D. Bauer, Electrical Engineer
G. Zocker, Electrical Engineer
R. Kohout, Emergency Services Supervisor
D. Micklush, Maintenance Manager
*W. Ryan, Mechanical Maintenance Supervisor

*Denotes persons present at the exit interview.

Attachment B

Number of Monitors	Type of Monitors	Monitor Identification Number
Containment		
1	Area Monitors (low)	R02
1	Air Particulate Monitor	R11
1	Radioactive GAs Monitor	R12
2	Area Radiation Monitor (Hi Range)	R30/31
1	Purge Air Exh. Flow Monitor	FT700
Plant Vent		
1	Radioactive Gas Monitors	R14(A/B)
2	Iodine Monitors	R24/32
2	Particulate Monitors	R28(A/B)
1	High Radiation Gross Gamma Monitor	R29
1	Noble Gas Monitor	R33
1	ALARA Monitor	R34
1	Iodine Grab Sample and ALARA Monitor	R35
1	Flow Monitor	FM12
Steam System		
4	Noble Gas Monitors (one each steam line)	R-71, 72, 73, 74
1	Air Ejector Radiation Monitor	R15
1	After Condenser Vent Flow Monitor	FIT55
1	Steam Generator Blowdown Effluent (Monitor)	R23
1	Steam Generator Blowdown Flow Monitor	FM75
1	Steam Generator Blowdown Gross Activity Monitor	R27
Miscellaneous		
1	Oily Water Seperator Effluent Monitor	R03
1	Liquid Waste Discharge Effluent Monitor	R18
1	Gas Decay Tank Radiation Gas Monitor	R22
1	Liquid Radwaste to Discharge Tunnel Flow Monitor	FM243
1	CW Pumps Discharge Flow Monitor	FM107
1	OWS Pressure Pump Suction Flow Monitor	FM251
1	Waste Transfer Pump Discharge Monitor	R16