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PG&E Letter DCL-16-101

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

10 CFR 50.90

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Response to NRC Request for Additional Information Regarding License Amendment Request 15-03, "Application of Alternative Source Term"

References:

1. PG&E Letter DCL-15-069, License Amendment Request 15-03, "Application of Alternative Source Term," dated June 17, 2015 (ADAMS Accession No. ML15176A539)
2. PG&E Letter DCL-15-105, "Supplement to License Amendment Request 15-03, 'Application of Alternative Source Term,'" dated August 31, 2015 (ADAMS Accession No. ML15243A363)
3. PG&E Letter DCL-16-061, "Supplement to License Amendment Request 15-03, 'Application of Alternative Source Term,'" dated June 9, 2016 (ADAMS Accession No. ML16169A264)
4. PG&E Letter DCL-16-090, "Supplement to License Amendment Request 15-03, 'Application of Alternative Source Term,'" dated September 15, 2016
5. E-mail from NRC Project Manager Balwant K. Singhal, "Request for Additional Information - License Amendment Request for Implementation of Alternative Source Term (CAC Nos. MF6399 and MF6400)," dated September 7, 2016 (ADAMS Accession No. ML16251A091)

Dear Commissioners and Staff:

License Amendment Request (LAR) 15-03, "Application of Alternative Source Term," was submitted by Pacific Gas and Electric Company (PG&E) in Reference 1 and supplemented by PG&E in References 2, 3, and 4.

In Reference 5, the NRC requested additional information required to complete the review of LAR 15-03. PG&E responses to the requests for additional information are provided in the Enclosure to this letter.

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The Enclosure includes the following attachments:

- Attachment 1 – Diablo Canyon Power Plant Technical Assessment Prepared by WECTEC Global Project Services Inc. (WECTEC) - Implementation of Alternative Source Terms, Summary of Dose Analyses and Results, Revision 4. This attachment replaces Revision 3 of the Technical Assessment, submitted in Reference 3.
- Attachment 2 – Updated Final Safety Analysis Report (UFSAR) Markup Pages for License Amendment Request 15-03, Application of Alternative Source Term. This attachment provides, for information only:
  - Pages 2.1-2 through 2.1-4 for UFSAR Section 2.1
  - Pages 2.3-23 through 2.3-44, and Tables 2.3-145, 2.3-145A, 2.3-146, 2.3-147, 2.3-148, and 2.3-149 for UFSAR Section 2.3.
  - Pages 15.5-2 through 15.5-7, 15.5-42, 15.5-43, 15.5-99, 15.5-100, 15.5-114, 15.5-115, 15.5-121, 15.5-122, 15.5-130, 15.5-131, 15.5-141, 15.5-142, and Tables 15.5-23B and 15.5-83 for UFSAR Section 15.5.
- Attachment 3 – Data files in support of the RAI responses of the Enclosure.

This information does not affect the results of the technical evaluation or the no significant hazards consideration determination previously transmitted in References 1, 2, and 4.

PG&E makes no new or revised regulatory commitments (as defined by NEI 99-04) in this letter.

If you have any questions, or require additional information, please contact Mr. Hossein Hamzehee at (805) 545-4720.

I state under penalty of perjury that the foregoing is true and correct.

Executed on October 6, 2016.

Sincerely,

James M. Welsch
Vice President, Nuclear Generation

e1d7/4418/50705089
Enclosure
cc: Diablo Distribution
cc/enc: Kriss M. Kennedy, NRC Region IV Administrator
Christopher M. Newport, NRC Senior Resident Inspector
Gonzalo L. Perez, Branch Chief, California Department of Public Health
Balwant K. Singal, NRR Project Manager

Pacific Gas and Electric Company (PG&E) Response to NRC Request for Additional Information (RAI) Regarding Diablo Canyon Power Plant (DCPP) License Amendment Request (LAR) 15-03, "Application of Alternative Source Term"

EN-113 Atmospheric Dispersion Model

NRC RAI-1

EN-113 Input Card 7: Please clarify the text in the fifth bulleted item under Section 5.1 (Paragraph 8) of the Technical Assessment as well as the parallel discussion in Subsection 2.3.5.2.1 of the Updated Final Safety Analysis Report (UFSAR) and elsewhere as appropriate to include the terrain adjustment factors (TAFs) applied to the U1/U2 (Low Population Zone (LPZ)) model run.

PG&E Response

Section 5.1 of the Technical Assessment as well as the parallel discussion in Subsection 2.3.5.2.1 of the proposed UFSAR markup has been updated to reflect the use of a TAF of 1.25, which was used in the calculation of the annual average χ/Q values for the Units 1 and 2 LPZ. This value is based on the default values presented for open TAF values as a function of distance in Figure 4.2 of NUREG/CR 2858.

NRC RAI-2:

EN-113 Input Card 8: Please clarify any related discussions in the UFSAR and Technical Assessment to explain how the building cross-sectional area was determined (including the domed-portion of the containment structure).

PG&E Response

Section 5.1 of the Technical Assessment as well as the parallel discussion in Subsection 2.3.5.2.1 of the proposed UFSAR markup has been updated to provide additional details regarding the use of the containment building height, along with a building cross-sectional area in developing the annual average χ/Q values in the LPZ model.

The enhancement of vertical turbulence (sector averaging eliminates the horizontal component) is only a function of building height, which has been credited for the containment (i.e., 66.5 meters is based on the height of the containment structure above grade, 218 feet (ft)).

The building wake effect cross sectional area of 2744.5 square meters (m^2) is based on the geometry of the containment building. The containment building area that has an effect on the dispersion of the releases is its entire cross-sectional area. The containment building has a radius of 73 ft and is shaped like a cylinder from the base at elevation (El) 85 ft to an El of 230 ft. It is essentially a hemisphere shape from elevation 230 ft to 303 ft. The cross-sectional area is calculated as the sum of the cylinder and hemisphere:

Cylinder: (230 ft - 85 ft) x (2 x 73 ft) = 21,170 ft^2

Hemisphere: [π x (303 ft- 230 ft)^2] / 2 = 8,370.8 ft^2 (conservative approximation)

Total containment cross-sectional area = 21,170 ft^2 + 8,370.8 ft^2 = 29,540.8 ft^2 / (10.76365 ft^2 / m^2) = 2,744.5 m^2.

The drawing supporting the above assessment is listed below and enclosed in the Attachment 3 data disc:

- Drawing Number 443115, Sheet 1. Revision 10

NRC RAI-3a

EN-113 Input Card 10: Please clearly identify in the UFSAR and Technical Assessment the cross-sectional area of the containment buildings input to the dispersion modeling analyses in support of the submittal for offsite dispersion parameters (X/Q) calculations at the exclusion area boundary (EAB) and LPZ and for applicable onsite X/Q calculations at the air intakes and points of ingress/egress for the Control Room (CR) and Technical Support Center (TSC).

PG&E Response

Refer to responses to NRC RAI-2 (under the heading EN-113 Atmospheric Dispersion model) and NRC RAI-4 (under the heading ARCON96 Atmospheric Dispersion model) for discussions associated with cross-sectional area calculations for offsite dispersion parameters calculations (i.e., EAB and LPZ) and for onsite χ/Q calculations (i.e., the CR and TSC), respectively.

NRC RAI-3b

EN-113 Input Card 10: Please confirm whether the value of 2745 square meter (sq-m) rather than 1600 sq-m represents a change to the current licensing basis for offsite and onsite dispersion modeling analyses.

PG&E Response

UFSAR Section 2.3.4.7, Meteorological Computers, discusses the primary and backup meteorological computer including the equations used to compute centerline χ/Q values, and notes that the minimum cross-sectional area for the reactor building is set at 1600 m^2. This default value is conservative compared to the as-calculated minimum cross-sectional area for the reactor building of 2,744.5 m^2 discussed in response to NRC RAI-2 (under the heading EN-113 Atmospheric Dispersion model). The proposed markup for UFSAR Section 2.3.4.7 clarifies that the value used by the computer is conservative and that the as-calculated cross-sectional area for the reactor building, as used in support of establishing dose consequences in the licensing basis analyses, is 2,744.5 m^2.

NRC RAI-4

<u>EN-113 Input Card 11:</u> Update the UFSAR and Technical Assessment with additional information that describes the basis and location of the offshore EAB receptors. These updates should also include a table or tables that list the modeled distances to the EAB from the nearest edge of the respective containment buildings for DCPP, Units 1 and 2, and for all sixteen direction sectors consistent with the cited guidance in Regulatory Position C.1.2 of Regulatory Guide (RG) 1.145, Revision 1, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants," (ADAMS Accession No. ML003740205).

PG&E Response

Section 5.1 of the Technical Assessment as well as the parallel discussion in Section 2.3.5.2.1 of the proposed UFSAR markup have been updated to describe the basis and location of the offshore EAB receptors. A tabular list of the "modeled" distances to the EAB from the nearest edge of the respective containment buildings for both Units 1 and 2 and for all 16 direction sectors are provided in the attached Tables 5.1-2 of the Technical Assessment and UFSAR Table 2.3-145A. Refer to the response to NRC RAI-5a (under the EN-113 Atmospheric Dispersion model) for additional detail.

As shown in UFSAR Figure 2.1-2, on land, the DCPP EAB is marked by a farm type fence. As demonstrated by the table presented in the response to NRC RAI-5a, the location of the "as modeled" continuous EAB over the ocean is based on an extension of the arc (shown in UFSAR Figure 2.1-2 in the northern direction) over the water until it once again touches the shoreline, at which point the EAB follows the shoreline until it intersects with the farm type fence that defines the EAB on land in the southern direction.

The above approach in defining the EAB over the water is conservative since it remains well within the 2000-yard radius offshore security zone maintained by the U.S. coast guard in the south-southeast clockwise through the west-northwest direction sectors.

NRC RAI-5a

<u>EN-113 Other Potential EN-113 Modeling Analysis Issues:</u> Please include the sector-specific X/Q values from the U1 (EAB) and U2 (EAB) model runs in the Technical Assessment table or tables that list the sector-specific distances to the EAB relative to both units (see the earlier Question 4 pertaining to EN-113 Input Card 11). Please provide a comparable table for the sector-specific 0.5% X/Q values based on the U1/U2 (LPZ) model run at the uniform LPZ receptor distance for all sectors.

PG&E Response

Section 5.1 of the Technical Assessment has been updated to include the following sector-specific 0.5 percent 0-2 hour χ/Q values from the U1 (EAB), U2 (EAB), and LPZ model runs, as well as the sector-specific distances to the EAB relative to both units. In response to NRC RAI-5c (under the heading EN-113 Atmospheric Dispersion model),

the sixteen sector-dependent annual average χ/Q values from the U1/U2 (LPZ) model run is also provided.

Units 1 & 2 - EAB/LPZ Sector Dependent Distances & Atmospheric Dispersion Factors						
Downwind Sector	Unit 1 EAB		Unit 2 EAB		Unit 1/2 LPZ*	
	0-2 hr χ/Q (sec/m^3)	Distance (m)	0-2 hr χ/Q (sec/m^3)	Distance (m)	0-2 hr χ/Q (sec/m^3)	Annual Average χ/Q (sec/m^3)
S	7.77E-05	830	9.46E-05	730	4.73E-06	3.85E-08
SSW	8.39E-05	830	1.02E-04	730	4.99E-06	3.92E-08
SW	1.12E-04	780	1.22E-04	740	6.20E-06	4.69E-08
WSW	1.04E-04	780	1.04E-04	780	5.80E-06	3.66E-08
W	1.47E-04	750	1.38E-04	780	8.17E-06	4.43E-08
WNW	2.02E-04	750	1.89E-04	780	1.38E-05	7.81E-08
NW	2.50E-04	750	2.17E-04	830	2.00E-05	1.31E-07
NNW	2.17E-04	750	1.88E-04	830	1.49E-05	8.83E-08
N	1.46E-04	730	1.19E-04	830	7.19E-06	4.70E-08
NNE	1.16E-04	730	9.53E-05	830	4.76E-06	3.03E-08
NE	9.99E-05	740	8.51E-05	820	4.28E-06	2.60E-08
ENE	9.25E-05	740	7.88E-05	820	3.89E-06	2.50E-08
E	8.75E-05	890	9.00E-05	870	4.99E-06	3.35E-08
ESE	1.52E-04	890	1.56E-04	870	1.33E-05	1.02E-07
SE	1.92E-04	920	2.09E-04	850	1.89E-05	2.03E-07
SSE	1.12E-04	830	1.29E-04	730	6.75E-06	6.44E-08

* LPZ distance (all sectors) = 9650 m (6 miles)

NRC RAI-5b

EN-113 Other Potential EN-113 Modeling Analysis Issues: Please update Section 2.1 of the UFSAR, where appropriate, with additional information that describes the location of the 2000-yard radius offshore Security Zone in relation to the EAB receptors, also located offshore in at least the south-southeast clockwise through the west-northwest direction sectors.

PG&E Response

The proposed markup of UFSAR Section 2.1.2.1.3 has been updated to describe the 2000-yard radius offshore Security Zone in relation to the EAB receptors also located offshore in the south-southeast clockwise through the west-northwest direction sectors.

Refer to the response to NRC RAI-4 (under the heading EN-113 Atmospheric Dispersion model) for additional detail.

NRC RAI-5c

EN-113 Other Potential EN-113 Modeling Analysis Issues: Please include the 5-percent overall site 0-2 hour X/Q values from the U1 (EAB), U2 (EAB), and U1/U2 (LPZ) model runs, the intermediate, short-term X/Q values (i.e., 2-8 hours, 8-24 hours, 1-4 days, and 4-30 days) from the U1/U2 (LPZ) model run, and the sixteen sector-dependent annual average X/Q values from the U1/U2 (LPZ) model run in the appropriate table or tables of the Technical Assessment that list the sector-specific distances to the EAB and LPZ relative to both units.

PG&E Response

Section 5.1 of the Technical Assessment has been updated to include the following 5 percent overall site 0-2 hours X/Q values for the Unit 1 (EAB) and the Unit 2 (EAB), and the intermediate, short-term χ/Q values (i.e., 2-8 hours, 8-24 hours, 1-4 days, and 4-30 days) from the Unit 1/Unit 2 (LPZ):

EAB/ LPZ 5-Percent Overall Site Atmospheric Dispersion Factors					
	X/Q (sec/m^3)				
	0 - 2 hrs	2 - 8 hrs	8 - 24 hrs	1 - 4 days	4 - 30 days
Unit 1 EAB	1.89E-04				
Unit 2 EAB	1.88E-04				
Unit 1/Unit 2 LPZ	1.46E-05	7.20E-06	5.06E-06	2.35E-06	7.81E-07

Refer to the response provided to NRC RAI 5a (under the heading EN-113 Atmospheric Dispersion model) for the sixteen sector-dependent annual average χ/Q values from the Unit 1/Unit 2 (LPZ) model run.

ARCON96 Atmospheric Dispersion Model

NRC ARCON96 RAI-1

Please update the Technical Assessment and UFSAR, as appropriate, with a thorough explanation of the approach used, including X/Q modeling results at the TSC receptors for MSSV, 10% ADV, and MSLB release scenarios, determination of the ratios of these results to the X/Q values estimated at the LPZ, and a relative comparison of the estimated doses based on these ratios to the doses for the assumed controlling LOCA scenario. Also, please provide ARCON96 model input and output files for these additional model runs.

PG&E Response

The Technical Assessment and the proposed UFSAR markup for Section 15.5 have

been updated to address the inhalation and submersion doses in the TSC due to airborne releases following the design basis non-LOCA events listed below:

1. Fuel Handling Accident in the Fuel Building or Containment (FHA)
2. Locked Rotor Accident (LRA)
3. Control Rod Ejection Accident (CREA)
4. Main Steam Line Break (MSLB)
5. Steam Generator Tube Rupture (SGTR)
6. Loss-of Load (LOL) Event

TSC Non-LOCA Atmospheric Dispersion Factors

Atmospheric dispersion factors (χ/Qs) were developed from all of the Units 1 or 2 environmental release points associated with Non-Loss of Coolant Accident (LOCA) events (i.e., the Main Steam Safety Valves (MSSVs), 10 percent Atmospheric Dispersion Valves (ADVs), MSLB location, Equipment Hatch, and the Fuel Handling Building (FHB)), to TSC receptors (i.e., the TSC normal intake, and the Center of the TSC roof which is used for unfiltered inleakage).

In the interest of model simplification, the Unit 1 & 2 MSLB locations were also used to represent the Unit 1 and Unit 2 MSSVs and 10 percent ADVs. This approach is acceptable since these release points are essentially co-located, but the MSLB location releases have the lowest elevation and is therefore the closest to the TSC.

When the χ/Q values associated with the MSLB location to TSC receptors were applied to the MSSVs / 10 percent ADVs, they were reduced by a factor of 5 to address the high vertical velocity discharge for the first 10.73 hours of the accident. This is consistent with the approach used in the DCPP CR dose consequence analyses.

Since the DCPP control room ventilation system (CRVS) pressurization intake also serves the TSC during CRVS Mode 4 operation, the CR Mode 4 χ/Qs applicable to the non-LOCA environmental release points listed above are also applicable to the TSC. Similar to the CR dose model, credit is taken for a factor of 4 reduction in the CR/TSC Mode 4 χ/Qs due to the availability of redundant safety related radiation monitors at each CR pressurization intake location, and the associated capability of initial selection of the less contaminated intake.

Table 5.2-4 of the Technical Assessment has been updated to include the atmospheric dispersion factors applicable to the TSC normal intake and the center of the TSC roof from environmental releases due to non-LOCA events. The ARCON96 model input and output files developed for the above non-LOCA accidents are enclosed in the Attachment 3 data disc.

Dose Consequences in the TSC due to Non-LOCA events

A simplified approach was utilized to conservatively estimate the 30-day integrated inhalation and submersion doses in the TSC for each of the non-LOCA events.

The analysis utilized the LPZ dose model documented for each of the non-LOCA events to predict the associated dose consequences at the "TSC location" by adjusting the χ/Qs and the breathing rates. Specifically, the χ/Q values in the RADTRAD files that develop the LPZ doses were replaced with χ/Q values applicable to the center of the TSC roof (note: the EAB files were used for the FHA since environmental releases are terminated in 2 hours). In addition, the breathing rates used in the LPZ models were changed to 3.5E-04 cubic meters per second (m^3/s) for the duration of the accident. This approach is excessively conservative since it is reflective of an operator located on the roof of the TSC, without taking credit for either the TSC ventilation systems or the TSC structure.

The above approach to demonstrate that the TSC dose is less than that reported for the LOCA was successful for all of the accidents listed above with the exception of the MSLB and the containment leakage scenario of the CREA.

The 30-day integrated dose following the MSLB and the CREA (containment releases scenario) were developed using the full activity transport model, inclusive of the TSC envelope and ventilation / filtration system. In the case of the CREA, the RADTRAD file that developed the CREA dose consequences in the CR was updated to replace the CR compartment with a TSC compartment. For the MSLB, the RADTRAD files used to establish the dose consequences at the site boundary were updated to include a TSC compartment.

PG&E has concluded that the dose consequences in the TSC due to the FHA, the SGTR, the LRA, the LOL, and the CREA (secondary release scenario) are bounded by the dose reported for the LOCA; i.e., 4.1 rem, total effective dose equivalent (TEDE). This conclusion is based on conservative simplistic evaluations that did not credit the TSC structure / ventilation system.

The dose consequences in the TSC following a MSLB and CREA (containment release scenario) were developed taking credit for the TSC structure / ventilation system, and are estimated to be 0.7 rem TEDE and 4 rem TEDE, respectively. These dose estimates are also bounded by the value reported for the LOCA, i.e., 4.1 rem TEDE.

NRC ARCON96 RAI-2

Please annotate any tables in the UFSAR and Technical Assessment to indicate the unit from which a bounding X/Q was obtained and used as input to a dose calculation for a given release scenario.

PG&E Response

The information requested by the NRC (i.e., the unit from which the bounding χ/Q value was obtained and used as input to a dose calculation for a given release point) is currently available in notes to the following tables in Chapter 7 of the Technical Assessment. These tables provide the accident-specific on-site χ/Q values for each release-receptor combination utilized to estimate the dose consequences in the CR and TSC:

Table 7.2-5 - CR χ/Q values (LOCA)
Table 7.2-6 - TSC χ/Q values (LOCA)
Table 7.3-3 - CR χ/Q values (FHA)
Table 7.4-2 - CR χ/Q values (LRA)
Table 7.5-2 - CR χ/Q values (CREA)
Table 7.6-2 - CR χ/Q values (MSLB)
Table 7.7-3 - CR χ/Q values (SGTR)
Table 7.8-2 - CR χ/Q values (LOL)

NRC ARCON96 RAI-3a

Please update any related discussions in the UFSAR and Technical Assessment to correct: the 95th-percentile 10-meter wind speed value to be consistent with the guidance in Note 13 at Paragraph 1 (Sentence 3) of Regulatory Position C.6 of RG 1.194, "Atmospheric Relative Concentrations for Control Room Radiological Habitability Assessments at Nuclear Power Plants," June 2003 (ADAMS Accession No. ML031530505).

PG&E Response

PG&E agrees that the intent of the 95th-percentile criterion of Regulatory Position C.6 of RG 1.194 is to conservatively account for wind speeds that would be restrictive to plume rise and that higher wind speeds would reduce plume rise, even though the controlling χ/Q values are based on the low wind speeds and very stable conditions associated with the 5^{th} percentile highest χ/Q value. Given that the 95th-percentile high wind speed values for the 10-m and 76-m levels are 11.0 m/sec and 12.1 m/sec, respectively, the exit velocity to wind speed ratios are 8.6 (94.9 m/sec to 11.0 m/sec) and 7.8 (94.9 m/sec to 12.1 m/sec) for the 10-m and 76-m tower levels, respectively.

Related discussions in the proposed markup of UFSAR Section 2.3.5.2.2 and Section 5.2 of the Technical Assessment have been updated to reflect the 95th-percentile criterion of Regulatory Position C.6 of RG 1.194. Refer to response

NRC RAI-3c (under the heading ARCON96 Atmospheric Dispersion model) for the updates to the UFSAR and Technical Assessment.

NRC ARCON96 RAI-3b

Please update any related discussions in the UFSAR and Technical Assessment to correct the ratios of the expected vertical velocity of MSSV and 10% ADV releases to corrected 95th percentile 10-meter (m) wind speed.

PG&E Response

Please refer to response to NRC RAI-3a (under the heading ARCON96 Atmospheric Dispersion model) for the updates to the UFSAR and Technical Assessment.

NRC ARCON96 RAI-3c

Please update any related discussions in the UFSAR and Technical Assessment to correct the corrected 95th percentile 10-m wind speed as it appears to have been used in estimating enhancement to plume rise of the MSSV and 10% ADV releases (see Sentence 4 under the heading "Energetic Releases" in Subsection 2.3.5.2.2 of the UFSAR mark-up provided by the letter dated December 17, 2015 and in Section 5.2 of the Technical Assessment), the ratio of the expected vertical velocity.

PG&E Response

Section 5.2 of the Technical Assessment under the bulleted item titled Energetic Releases has been updated as follows:

> "Energetic releases: The 95th-percentile high wind speed values for the 10-m and 76-m levels are 11.0 and 12.1 m/sec, respectively. The vertical exit velocity of the releases from the MSSVs and 10% ADVs, to wind speed ratios are 94.9 m/sec to 11.0 m/sec (i.e., 8.6) and 94.9 m/sec to 12.1 m/sec (i.e., 7.8) for the 10-m and 76-m tower levels over the 5-year meteorological data base. The large vertical velocities of the MSSV and 10% ADV releases (ranging from 98.9 - 94.9 m/sec), and orientation relative to the CR intakes, preclude any down-washing of the releases by the aerodynamic effects of the containment buildings such that the control room normal intake of the same unit as the release (e.g., Unit 1 MSSV/10% ADV releases to Unit 1 CR normal intake) is not contaminated. Moreover, since the horizontal distance is only 1.5 meters, this short distance precludes the releases from reaching the control room normal intakes of the same unit given the height of the MSSV and 10% ADV releases (i.e., 27.1 and 26.5 meters, respectively) relative to the height of the CR normal intakes (i.e., 22 meters). Plume rise calculations indicate that the MSSV and ADV release heights will be enhanced by 2 meters at the 95th percentile wind speed of 11.0 m/sec and 12.1 m/sec for the 10-m and 76-m tower levels, respectively, due to the large vertical velocities of the releases. Thus, for purposes of estimating dose consequences, it is appropriate to use the χ/Q associated with the normal

CR intake of the opposite unit for releases from the MSSVs / 10% ADVs as the worst case CR normal intake location."

The related discussion in the proposed markup of UFSAR Section 2.3.5.2.2 has also been updated accordingly.

NRC ARCON96 RAI-3d

Given the effects of wind shear and the stated elevations of the release points for the MSSVs and 10% ADVs, confirm the appropriateness of using unadjusted wind speed data from the 10-m level of the onsite Met tower to determine the 95th-percentile wind speed value or provide the technical basis for and propose adjustments to the resulting value or other alternative approach

PG&E Response

Please refer to response to NRC RAI-3a (under the heading ARCON96 Atmospheric Dispersion model).

NRC ARCON96 RAI-4

Please update the UFSAR and Technical Assessment by identifying the cross-sectional areas of the Containment Buildings, Refueling Water Storage Tanks, and Fuel Handling Buildings for DCPP, Units 1 and 2, as input to the ARCON96 dispersion modeling analysis (and for the Containment Buildings in the case of the EN-113 modeling analysis). Also, update the Technical Assessment by explaining how the respective cross-sectional areas were determined (e.g., identification of the applicable structures or portions of structures considered, building dimensions (e.g., width, height, and, if applicable, the method of handling portions of irregularly-shaped structures), and cross-references to the applicable plant drawings on which the preceding information is based). This information represents part of (or change to) the licensing basis associated with dispersion analyses that support the LAR and needs to be clearly stated.

PG&E Response

The cross-sectional areas of the Containment Buildings, RWSTs, and FHBs for DCPP Units 1 and 2 as input to the ARCON96 dispersion modeling analysis are based on the geometry of the site buildings as discussed below:

Containment Building: The containment building area that has an effect on the dispersion of the releases is its entire cross-sectional area. The containment has a radius of 73 ft and is shaped like a cylinder from the base at El 85 ft to an elevation of 230 ft. It is a hemisphere shape from El 230 ft to 303 ft. As discussed earlier in the response to NRC RAI-2 (under the heading EN-113 Atmospheric Dispersion model), the total containment cross-sectional area is estimated to be 2,744.5 m^2.

Fuel Handling Building (FHB): The highest elevation of the FHB is 190 ft. The elevation of the containment penetration area leakage releases is 140 ft. The FHB elevation

relative to these release points is 190 ft – 140 ft = 50 ft. The diagonal length of the FHB is measured to be approximately 114 ft. This width is conservative in that the FHB is contained within a larger structure that could have been considered in this calculation. Therefore, the conservative cross-sectional area is given by:

(50 ft) x (114.2 ft) = 5,710 ft^2 / (10.76365 ft^2 / m^2) = 530.4 m^2.

The drawings supporting the above assessment are listed below and are enclosed in the Attachment 3 data disc:

- Drawing 57732, Sheet 1, Revision 17
- Drawing 101942, Sheet 3, Revision 35

Refueling Water Storage Tank (RWST): The RWST roof elevation is 173 ft and the grade elevation at the RWST is 115 ft. The RWST height relative to local grade is 173 ft – 115 ft = 58 ft. The diameter of the RWST is approximately 40 ft. Therefore, the cross-sectional area of the RWST is given by:

(58 ft) x (40 ft) = 2,320 ft^2 / 10.76365 ft^2 / m^2) = 215.5 m^2.

The drawings supporting the above assessment are listed below and enclosed in the Attachment 3 data disc:

- Drawing 663071, Sheet 129, Revision 6
- Drawing 508917, Sheet 1, Revision 9

The above information has been included in the Technical Assessment. The proposed markup of UFSAR Section 2.3.2.5.2.2 has been updated to include the cross-sectional areas of the Containment Buildings, RWSTs, and FHBs for DCPP Units 1 and 2 used as input to the ARCON96 dispersion modeling analysis.

NRC ARCON96 RAI-5

Subsection 2.3.5.2.2 (Paragraph 1) of the UFSAR mark-up provided by the letter dated December 17, 2015, indicates that input data to the ARCON96 dispersion model consists, in part, of "various receptor parameters (e.g., distance and direction from release to control room air intake...)". Please correct the statement in the referenced UFSAR subsection (and Technical Assessment, if applicable) regarding the proper direction orientation between receptor locations and release points to be entered into the ARCON96 dispersion model input files (i.e., from the receptor to the release point).

PG&E Response

Section 5.2 of the Technical Assessment as well as the parallel discussion in Subsection 2.3.5.2.2 of the proposed UFSAR markup have been modified to reflect the proper direction orientation between receptor locations and release points to be entered into the ARCON96 dispersion model input files (i.e., from the receptor to the release point) as follows:

"Input data consist of: hourly on-site meteorological data; release characteristics (e.g., release height, building area affecting the release); and various receptor parameters (e.g., distance and direction from the control room air intake to the release point, and intake height)."

NRC ARCON96 RAI-6

The NRC staff notes a minor discrepancy from its review of the revised ARCON96 dispersion model input files. Specifically, a building area of 2744.5 sq-m is listed for Case 9 of the summary in the Technical Assessment titled "Unit 1 MSSVs / 10% ADVs / MSL Break Releases to CR Receptors". The NRC staff believes that that entry should be "0.0" consistent with the entries for Cases 1 and 17 under that summary table and the entries for Cases 6, 14, and 22 under the comparable summary table for Unit 2. For consistency with the other cases identified above, please correct the typographical error in the Technical Assessment for the building area entered for case 9 by changing it to "0.0" from "2744.5" sq-m.

PG&E Response

The typographical error in the building area specified for Case 9 of the summary in the Technical Assessment titled "Unit 1 MSSVs / 10% ADVs / MSL Break Releases to CR Receptors" has been corrected to reflect "0.0."

ATTACHMENT 2

Diablo Canyon Power Plant
Updated Final Safety Analysis Report Markup
(For Information Only)

and 3,898,400 meters N. Figure 2.1-1 locates the site on a map of western San Luis Obispo County.

2.1.2.1.2 Site Description

The site boundary and the location of principal structures are shown in Figure 2.1-2. A portion of the site is bounded by the Pacific Ocean.

The DCPP site consists of approximately 750 acres of land located near the mouth of Diablo Creek. 165 acres of the DCPP site are located north of Diablo Creek; this acreage is owned by Pacific Gas and Electric Company (PG&E). The remaining 585 acres are located adjacent to and south of Diablo Creek. It was purchased in 1995 by Eureka Energy Company (Eureka), a wholly owned subsidiary of PG&E.

All coastal properties located north of Diablo Creek, extending north to the southerly boundary of Montana de Oro State Park and reaching inland approximately 1.5 mile has been owned by PG&E since 1988. Coastal properties located south of Diablo Creek and also reaching inland approximately 1.5 mile has been owned by Eureka since 1995. Prior to 1995, PG&E leased the property from the owner, Luigi Marre Land and Cattle Company. In 1988, PG&E purchased approximately 4500 acres located north of the DCPP site. This section of land consists of approximately 5 miles of coastline and reaches inland approximately 1.5 mile. Except for the DCPP site, the approximately 4500 acres are encumbered by a grazing lease that expires in the year 2000.

There are no plans for development of the property, most of which is within the area subject to the California Coastal Act of 1976. Any development plans would be subject to approval by a discretionary land use permitting process. In 1988 the San Luis Obispo County Planning Department was given authority by the California Coastal Commission to interpret the Act and incorporate it into the County of San Luis Obispo's General Plan, which included the right to issue coastal land use permits. Because it is a discretionary permitting process, the County of San Luis Obispo has the authority to require development projects to be approved by the California Coastal Commission rather than obtaining final approval by the County of San Luis Obispo, Board of Supervisors.

In addition, portions of the coastal property have been listed in the National Register of Historic Places pursuant to the "National Historic Preservation Act of 1966" as a place of historic significance due to the presence of numerous Native American remains and scientific data potential.

2.1.2.1.3 Exclusion Area Control

PG&E has complete authority to determine all activities within the site boundary and this authority extends to the mean high water line along the ocean. On land, the site boundary, the boundary of the exclusion area (as defined in 10 CFR 100), and the boundary of the unrestricted area (as defined in 10 CFR 20) are shown in Figure 2.1-2.

Minimum distances from potential release points for radioactive materials to the unrestricted area boundary and to the mean high water line are also shown in Figure 2.1-2.

The definition of unrestricted area has been expanded over that in 10 CFR 20.1003. The unrestricted area boundary may coincide with the exclusion (fenced) area boundary, as defined in 10 CFR 100.3, but the unrestricted area does not include areas over water bodies. The concept of unrestricted areas, established at or beyond the site boundary, is utilized in the Technical Specifications limiting conditions for operation to keep levels of radioactive materials in liquid and gaseous effluents as low as is reasonably achievable (ALARA), pursuant to 10 CFR 50.36a.

On land, there are no activities unrelated to plant operation within the exclusion area; it is not traversed by public highway or railroad. Normal access to the site is from the south by private road (PG&E road easement) that is fenced and posted by PG&E.

PG&E has the right, within the DCPP site, to use excavated materials during the construction of the plant (considering that PG&E obtains all permitting required by regulatory agencies prior to excavation). It is unclear legally if the owner retains all mineral rights. Whatever mineral rights an owner may retain, the owner cannot exercise any such rights in a manner that would interfere with PG&E's rights. Any proposed mining operation (including but not limited to excavation, drilling, and blasting) that would be conducted close enough to the plant to threaten the structural integrity of its foundations will be carefully reviewed and PG&E will take whatever steps it deems necessary to ensure that: (a) the health and safety of the public is not jeopardized, and (b) the operation of the plant is not disrupted. Any entry by the lessee onto the land is subject to PG&E's safety rules and regulations, as is the right to restrict the use of buildings and other structures, and to exclude persons therefrom to the extent necessary to comply with nuclear reactor site criteria.

The mineral rights within the 165 acre PG&E portion of the DCPP site are owned by PG&E, but there is no information suggesting that the land contains any commercially valuable minerals other than for use as borrow materials.

The offshore area (below the mean high water line) is not under PG&E's control. Due to the natural rough and precipitous conditions of the offshore area at Diablo Cove and near its southerly boundary, as shown in the aerial photograph, Figure 2.1-3, the area could only be occupied with great difficulty. (Some of these rocks have since been incorporated into the breakwater.) There is no history of public access to these rocks.

For the offshore area, the modeled distances to the EAB over the ocean are based on an extension of the arc (shown in UFSAR Figure 2.1-2 in the northern direction) over the water until it touches the shore line. From this point, the EAB follows the shore line until it intersects with the farm type fence that defines the EAB on land in the southern section. The approach in defining the EAB over the water is conservative since it remains well within the 2000-yard radius offshore security zone maintained by the U.S.

coast guard in the south-southeast clockwise through the west-northwest direction sectors

HISTORICAL INFORMATION BELOW IS SHOWN IN ITALICS

The Captain of the Port of Los Angeles-Long Beach, under the authority of 33 U.S.C. Section 1226 and Section 1231, has established a Security Zone in the Pacific Ocean, from surface to bottom, within a 2,000-yard radius of DCPP centered at position 35 12' 23"N, 120 51' 23" W (Datum 83). No person or vessel may enter or remain in this Security Zone without the permission of the Captain of the Port Los Angeles-Long Beach. This Security Zone will be enforced by representatives of the Captain of the Port of Los Angeles-Long Beach, San Luis Obispo County Sheriff, and DCPP Security.

2.1.2.1.4 Population and Population Distribution

PG&E has reviewed the original population totals and projections within the 50-mile radius of the plant. The following population data are based on the 2000 census and on projections based on estimates prepared by the State of California Department of Finance. The portion of California that lies within 50 miles of the site is relatively sparsely populated, having approximately 424, 013 residents in 2000. A circle with a 50-mile radius includes most of San Luis Obispo County, about one-third of Santa Barbara County, and a minor, sparsely-populated portion of Monterey County. About 55 percent of the area within the 50-mile circle is on land, the balance being on the Pacific Ocean.

The 2000 census population of this region is very close to that projected in the original Final Safety Analysis Report (FSAR), and subsequent projections by the Department of Finance are similarly close to earlier projections. Table 2.1-1 shows population trends of the State of California and of San Luis Obispo and Santa Barbara Counties. Table 2.1-2 shows the growth since 1960 of the principal cities within 50 miles of the site. Table 2.1-3 lists all communities within 50 miles having a population of 1000 or more, gives distance and direction from the site, and gives the 2000 population.

2.1.2.1.4.1 Population Within 10 Miles

In 1980, approximately 16,760 persons resided within 10 miles of the site. The 1990 census counted approximately 22,200 residents within the same 10 miles. The 2000 census counted approximately 23,661 residents within the same 10 miles. As in 1980, the nearest residence is about 1-1/2 miles north-northwest of the site and two persons occupy this dwelling. There are 9 permanently inhabited dwellings, for about 17 residents, within 5 miles of the plant. The population within the 6-mile radius, used in the emergency plan, is estimated to be 100.

Figure 2.1-4 shows the 2000 population distribution within a 10-mile radius wherein the area is divided into 22-1/2° sectors, with part circles of radii of 1, 2, 3, 4, 5, and 10 miles. Figures 2.1-5 and 2.1-6 show projected population distributions for 2010 and 2025,

(4) 60 –10-m temperature difference

(5) the sum of the aspirator currents

(6) battery monitor voltage

The dataloggers scan their inputs every 2 seconds (450 samples per 15 minutes). The following tests are performed to determine the validity of the meteorological sensor data:

(1) If the wind direction standard deviation (calculated using the Yamartino method) is less than 1, the wind data are considered invalid. (Appendix 2.3F of Reference 27 presents the historical Wind Direction Deviation Computation at Diablo Canyon and its reference has been retained to provide a continuity of understanding.

(2) If the 15-minute average wind speed is greater than 0.75 mph and the difference between the peak wind speed and the average wind speed is less than 0.3, then the wind speed data are considered invalid.

(3) If the wind speed is greater than 100 mph or less than 0 mph, that 2-second sample is invalid. If more than 150 samples are invalid (i.e., less than 10 minutes worth of good data), then the 15-minute wind speed data are invalid.

(4) If more than 150 delta temperature samples are greater than 21 or less than -15, then the 15-minute temperature difference data are invalid.

(5) If more than 150 dew point samples are greater than the 10-m temperature by 2 degrees, then the 15-minute dew point data are invalid.

(6) If more than 150 aspirator samples are out of a specified range, then both the 15-minute aspirator value and the associated temperature value are invalid.

2.3.4.7 Meteorological Computers

The primary meteorological computer resides in the primary meteorological facility and the backup meteorological computer is located in the TSC. The primary computer communicates with the primary datalogger, the Unit 1 TRS, the EARS server, and the backup meteorological tower computer. The backup meteorological computer communicates with the backup datalogger, the Unit 2 TRS, the EARS server, and the primary tower computer. Meteorological data are also available on the Unit 1 and Unit 2 PPCs via their respective TRS.

Each computer receives data from its respective datalogger on a 15-minute basis and sends its data set to the other computer. Each computer then calculates χ/Q, sigma Y, and sigma Z for 10 distances for both the primary and backup data sets. The primary computer sends both data sets to the Unit 1 TRS server and the EARS system. The backup computer sends both data sets to the Unit 2 TRS server and the EARS system.

Along with the 15-minute data set, each computer receives error flags, which are assigned to the appropriate data values, and these error flags are also sent to the PPCs and the EARS system. In this manner, the correct data quality is propagated through the entire system (datalogger, meteorological computer, PPC, and EARS).

The equation used to compute centerline χ/Q values is based on lateral fluctuations of wind direction (σA) for horizontal spread, and vertical temperature gradient (ΔT) for vertical spread of the plume for all daytime cases when the 10-meter speeds are not less than 1.5 m/sec. Nighttime cases in the same wind speed class are treated in accordance with the method of Mitchell and Timbre (Reference 19) as outlined in Table 2.3-144. For speeds less than 1.5 m/sec at the 10-meter level, both lateral and vertical spread of the plume are determined by the vertical temperature gradient. Estimates of both lateral and vertical plume dimensions are determined from the procedures described by Sagendorf (Reference 15).

Equations used to determine χ/Q are:

$$\frac{\chi}{Q} = \frac{1}{\bar{u}(\pi \sigma_y \sigma_z + CA)} \qquad (2.3\text{-}1)$$

$$\frac{\chi}{Q} = \frac{1}{\bar{u}(3\pi \sigma_y \sigma_z)} \qquad (2.3\text{-}2)$$

$$\frac{\chi}{Q} = \frac{1}{\pi \bar{u} + \sum_y \sigma_z} \qquad (2.3\text{-}3)$$

where:

$\frac{\chi}{Q}$ is the relative concentration (sec/m^3)

π is 3.14159

$\bar{u}$ is the wind speed at the 10-meter level (m/sec)

$\sigma_y \sigma_z$ are the lateral and vertical cloud dimensions, respectively, as a function of downwind distance. The vertical cloud dimension has an upper limiting value of 1000 m or the product (T_m) (H_m), whichever is less. T_m is a multiplier that is used as a simple substitute for the multiple reflection term and is approximately 0.8 (References 5 and 12)

H_m is the monthly average mixing layer depth for the four time periods of the day which were derived from Holzworth (Reference 6); data are given in Table 2.3-3.

A is the minimum cross-sectional area of the reactor building (1600 m^2). This default value of 1600 m^2 used for the cross-sectional area is conservative. The calculated cross-sectional area for the reactor building as used in support of establishing dose consequences in licensing basis analyses, is 2,744.5 m^2.

C is constant (0.5)

$\sum_y$ = $M\sigma_y$ - at distances less than 800 m;

at distances greater than or equal to 800 m -

$$\sum_y = (M-1)(\sigma_y)_{800m} + \sigma_y$$

M is a correction factor for meandering and assumes the following values for speeds less than 2 m/sec:

Stability	$\bar{u} \leq 2$ m/sec M	2 m/sec$<\bar{u}\leq$6 m/sec M
A,B,C	1	1
D	2	$(\bar{u}/6)^{-0.631}$
E	3	$(\bar{u}/6)^{-1.00}$
F	4	$(\bar{u}/6)^{-1.262}$
G	6	$(\bar{u}/6)^{-1.631}$

If both values at all levels are invalid, temperature differences (ΔT) are used to determine both lateral and vertical stability categories regardless of wind speed. When this occurs, the dispersion equation used contains the plume meandering correction term. The applicable correction term M for the specific stability and wind speed is that derived from Figure 3 of Regulatory Guide 1.145, Revision 1 (Reference 22), page 1.145-9.

During neutral (D) or stable (E, F, G) stability conditions when 10-m wind speed is less than 6 m/sec, horizontal plume meander is considered. This process consists of

comparing the values from Equations 1 and 2, and selecting the higher value. This value is then compared with the value from Equation 3 and the lower value of these selected for χ/Q value. During all other meteorological conditions, plume meander is not considered. The appropriate χ/Q value in these cases is the higher value calculated from Equations 1 and 2.

The dispersion model described above is a generic model and was not developed specifically for the DCPP site. Certain factors specific to the DCPP site bear upon the use and interpretation of the modeling output. Analysis and treatment of such site-specific factors are presented in Appendix 2.3H of Reference 27.

2.3.4.8 Power Supply For Meteorological Equipment

Power for the main meteorological instrumentation building is supplied from Unit 1 480-V non-Class 1E bus. This source is supplied through a transfer switch and will automatically switch to Unit 2 480-V non-Class 1E bus if a failure occurs on the Unit 1 bus. The microprocessor and the meteorological sensors are backed up by an 8-hour battery source to prevent any problems during switching and maintain a continuous database.

The backup meteorological instrumentation is supplied with ac power from the underground Unit 2 12-kV startup bus. In case of an ac power failure, batteries supply emergency power for up to 1 week. During battery backup, the temperature system aspirators are not powered, thereby invalidating temperatures.

If the measurement systems are being operated on battery power, ΔT measurement is inactivated due to inability to aspirate the temperature shields. In this case, χ/Q values are based on lateral fluctuations of wind direction (σ_A) for both horizontal and vertical spread of the plume. Nighttime stability categories are adjusted, however, in accordance with the method of Mitchell and Timbre (Reference 19) as outlined in Table 2.3-144.

Should both automated tower systems become inoperative, a portable battery-powered meteorological system is available for deployment and use in providing χ/Q values for input to dose-calculation algorithms as described in the Emergency Plan and outlined in Appendix 2.3I of Reference 27. Translation of χ/Q values to centerline and plume-spread estimates may be accomplished in accordance with procedures in the same Appendix 2.3I of Reference 27. (Appendix 2.3I of Reference 27 is historical in nature; however, reference to it has been retained to provide a continuity of understanding. Current procedures meet the requirements of Regulatory Guide 1.145, Revision 1 (Reference 22)).

2.3.5 SHORT-TERM (ACCIDENT) DIFFUSION ESTIMATES

2.3.5.1 Historical Diffusion Estimates

HISTORICAL INFORMATION IN ITALICS BELOW NOT REQUIRED TO BE REVISED.

2.3.5.1.2 Objective

Estimates of dilution factors that apply at distances of 0.8 to 80 kilometers downwind from DCPP are shown in Table 2.3-41 for each wind direction sector. These dilution factors represent the distribution of χ/Q value within each wind direction sector at the various downwind distances.

2.3.5.~~2~~1.2 Calculations

The cumulative probability distribution of the dilution factor at the distances noted above were computed using one of the diffusion models shown below for centerline dispersion estimates from a ground level release. These are defined as:

$$\frac{\chi}{Q} = \frac{1}{\bar{u}\left(\pi \sigma_y \sigma_z + CA\right)} \qquad (2.3\text{-}4)$$

$$\frac{\chi}{Q} = \frac{1}{3\pi \bar{u} \sigma_y \sigma_z} \qquad (2.3\text{-}5)$$

$$\frac{\chi}{Q} = \frac{1}{\pi \bar{u} \sum \sigma_y \sigma_z} \qquad (2.3\text{-}6)$$

where:

χ	=	*ground level centerline concentration, curies/cubic meter*
Q	=	*source emission rate, curies/second*
σ_y	=	*standard deviation of the lateral concentration distribution, meters*
σ_z	=	*standard deviation of the vertical concentration distribution, meters*
$\bar{u}$	=	*mean wind speed, meters/second*
C	=	*building wake shape factor, 0.5*
A	=	*minimum cross-sectional area of the reactor building, 1600 m^2*
Σ_y	=	*$f(\sigma y)$ = meander correction factor*

A complete description of the models and their selection for use is included in Reference 18.

The year-to-year variation in the frequency of occurrence of conditions producing high χ/Q values is small, so that data from one complete year are representative of the site.

In fact, the addition of the second year's data from October 1970 through March 1971 and April 1972 through September 1972, resulted in a change in percentage frequency for the combined F and G categories of only 0.1 percent. Frequency distributions for joint probabilities using the 2-year length of record are given in Tables 2.3-29 through 2.3-40. The wind speed values are in miles per hour and the values in the tables refer to the midpoint of each of the following class intervals: 0-3, 4-7, 8-12, 13-18, 19-24, and greater than 24. The rows are labeled with the wind direction at the midpoint of each 22.5° interval. The 1-year gap (April 1971 through March 1972) in the period of record, October 1970 through September 1972, resulted from an unauthorized bivane modification.

Frequency distributions of wind speed and wind direction classified into seven stability classes as defined by the vertical temperature gradient are shown in Tables 2.3-21 through 2.3-28. The column headings are labeled in terms of mean hourly wind speed in miles per hour. The six wind speed categories are as follows: 1-3, 4-7, 8-12, 13-18, 19-24, and 25-55. The rows are labeled with the wind direction at the midpoints of 22.5° intervals. Table 2.3-28 shows the number of observations in each of the seven stability classes (Pasquill A through G) for the period of record July 1, 1967, through October 31, 1969, when the mean hourly wind speed is less than 1 mph. The wind data were measured at the 76 meter level, and the vertical temperature difference measurements are the 76 meter level minus the 10 meter level.

The radius of the low population zone (LPZ) at DCPP has been established to be 6 miles. Cumulative frequency distributions of atmospheric dilution factors at each 22.5° intersection with a 10,000-meter radius (slightly greater than 6 miles) for the period May 1973 through April 1975 are presented in Table 2.3-41, Sheets 7, 8, 9 and 10. Each data set used to compile the frequency distribution is comprised of averages taken over 1 hour, 8 hours, 16 hours, 3 days, or 26 days, using overlapping means updated at 1-hour increments as specified by the NRC.

Because of overlapping means, a 1 hour χ/Q is included in several observation periods: for example, an hourly χ/Q is included in 624 estimates of the 26-day averages. As a result, a single hourly measurement may influence the value of over 5 percent of the observations. Since overlapping means are used in the distributions, the data are not independent and no assumption of normality can be made. These data show χ/Q estimates from the 25th through the 100th percentile levels for each of the averaging periods.

2.3.5.2 Design Basis Radiological Analysis Dispersion Factors

2.3.5.2.1 Exclusion Area Boundary and Low Population Zone Atmospheric Dispersion Factors

Atmospheric dispersion factors (i.e., χ/Qs) are calculated at the EAB and LPZ for post-accident environmental releases originating from Unit 1 and Unit 2. These χ/Qs are applicable to all dose consequence analyses documented in Section 15.5 with the

exception of the tank rupture events. The methodology used for the tank rupture accidents is discussed in Section 15.5.5.2 and the associated χ/Qs are reported in Table 15.5-3.

The applicable methodology is identified in Regulatory Guide 1.145, Revision 1 (Reference 22). The methodology is implemented by executing the CB&I computer program "Atmospheric Dispersion Factors" EN-113 (Refer to Section 15.5.8.10 for a description of computer program EN-113) using a continuous temporally representative 5-year period of hourly meteorological data from the onsite meteorological tower (i.e., January 1, 2007 through December 31, 2011). EN-113 calculates χ/Q values for the various averaging periods using hourly meteorological data related to wind speed, wind direction, and stability class.

Equations used to determine the χ/Q's are as follows:

$$\chi/Q_1 = \{(u)[(\pi)(\sigma_y)(\sigma_z) + (A/2)]\}^{-1} \quad (2.3\text{-}7)$$

$$\chi/Q_2 = [(u)(3\pi)(\sigma_y)(\sigma_z)]^{-1} \quad (2.3\text{-}8)$$

$$\chi/Q_3 = [(u)(\pi)(\Sigma_y)(\sigma_z)]^{-1} \quad (2.3\text{-}9)$$

where:

χ/Q = relative concentration (sec/m^3);
σ_y, σ_z = horizontal and vertical dispersion coefficients, respectively, based on stability class and horizontal downwind distance (m);
u = wind speed at the 10-meter elevation (m/sec);
A = cross-sectional building area (m^2);
Σ_y = $(M)(\sigma_y)$ for distances of 800 meters or less; and
Σ_y = $[(M-1)(\sigma_{y800m}) + \sigma_y]$ for distances greater than 800 meters with M representing the meander factor in Reference 22, Figure 3.

Per Regulatory Guide 1.145, Revision 1, χ/Q_1 and χ/Q_2 values are calculated by EN-113 and the higher value selected. This value is then compared to the χ/Q_3 value calculated by EN-113, and the smaller value is then selected as the appropriate value.

The EAB distances for the sixteen 22.5°-azimuth downwind sectors are derived from Figure ~~2.3-2~~2.1-2, taking into consideration a 45-degree azimuth sector centered on each 22.5°-azimuth sector as described in Regulatory Guide 1.145, Revision 1, Regulatory Position C.1.2. The EAB χ/Q values for the radiological releases from each unit are conservatively based on the EAB distances from the outer edge of each containment building.

As shown in UFSAR Figure 2.1-2, on land, the DCPP EAB is marked by a farm type fence. As demonstrated by Table 2.3-145A, the location of the "as modeled" continuous EAB over the ocean is based on an extension of the arc (shown in UFSAR Figure 2.1-2

in the northern direction) over the water until it once again touches the shore line, at which point it follows the shoreline till it intersects with the farm type fence that defines the EAB on land in the southern direction.

The above approach in defining the EAB over the water is conservative since it remains well within the 2000-yard radius offshore security zone maintained by the U.S. coast guard in the south-southeast clockwise through the west-northwest direction sectors.

An LPZ distance of 6 miles (9,654 meters) is used in the analysis. The use of one LPZ distance in all downwind directions from the center of the site for all release points is reasonable given the magnitude of this distance relative to the separation of the release point locations from one another ~~(refer to Figure 2.3-5)~~.

The containment building cross-sectional area along with the containment building height is used for the annual average χ/Q calculations (used as input to develop the accident χ/Q values at the LPZ using Regulatory Guide 1.145 methodology). The applicable methodology for the annual average χ/Q calculations is identified in Regulatory Guide 1.111, Revision 1, Regulatory Position C.1.c (Reference 28). These annual average χ/Q values are used to calculate the intermediate averaging time χ/Q values for the periods of 2-8 hours, 8-24 hours, 1-4 days, and 4-30 days by logarithmic interpolation.

The enhancement of vertical turbulence (sector averaging eliminates the horizontal component) is only a function of building height, which has been credited for the containment (i.e., 66.5 meters is based on the height of the containment structure above grade (i.e., 218 feet).

The building wake effect cross sectional area of 2744.5 m^2 is based on the geometry of the containment building. The containment building area that has an effect on the dispersion of the releases is its entire cross-sectional area. The containment has a radius of 73 ft and is shaped like a cylinder from the base at El 85 ft to an elevation of 230 ft. It is essentially a hemisphere shape from El 230 ft to 303 ft. The cross-sectional area is calculated as the sum of the cylinder and hemisphere.

The following conservative assumptions are made for these calculations:

- Releases are treated as point sources;
- Releases are treated as ground-level as there are no release conditions that are sufficiently high to escape the aerodynamic effects of the plant buildings;
- The distances from the Unit 1 and Unit 2 releases are determined from the closest edge of the containment buildings to the EAB;
- The plume centerline from each release is transported directly over the receptor; and
- The terrain adjustment factor (TAF) used in the calculation of the annual average χ/Q values for the EAB and LPZ models are 4.0 and 1.25, respectively, and are based on the default open TAF values presented as a function of distance in Figure 4.2 of

NUREG/CR 2858.~~A terrain recirculation factor of 4 is used in the calculation of the annual average χ/Q values~~

- ~~and no~~ R~~r~~adioactive decay or plume depletion due to deposition is not considered.

Table 2.3-145A provides the sixteen sector-specific 0.5% 0-2 hour X/Q values from the Unit 1 EAB, Unit 2 EAB and LPZ model runs, the sixteen sector-dependent annual average X/Q values from the U1/U2 (LPZ) model run, and the sector-specific distances to the EAB relative to both units

Table 2.3-145B provides the 5-percent overall site 0-2 hour X/Q values for the U1 (EAB) and the U2 (EAB), and the intermediate, short-term X/Q values (i.e., 2-8 hours, 8-24 hours, 1-4 days, and 4-30 days) from the U1/U2 (LPZ)

The highest EAB and LPZ χ/Q values from among all 22.5°-downwind sectors for each release/receptor combination and accident period are summarized in Table 2.3-145. EAB χ/Q values are presented for releases from Unit 1 and Unit 2, while the LPZ χ/Q values are applicable to both units. ~~The 0.5% sector dependent χ/Q values are presented with the worst case downwind sector indicated in parentheses.~~

2.3.5.2.2 On-Site Atmospheric Dispersion Factors

The control room and technical support center χ/Q values for radiological releases from Unit 1 and Unit 2 are calculated using the NRC "**A**tmospheric **R**elative **CON**centrations in Building Wakes" (ARCON96) methodology as documented in NUREG/CR-6331, Revision 1 (Reference 29). Input data consist of: hourly on-site meteorological data; release characteristics (e.g., release height, building area affecting the release); and various receptor parameters (e.g., distance and direction from ~~release to~~the control room air intake to the release point and intake height). Refer to Section 15.5.8.11 for a description of computer program ARCON96).

A continuous temporally representative 5-year period of hourly on-site meteorological data from the DCPP onsite meteorological tower (i.e., January 1, 2007 through December 31, 2011) is used for the ARCON96 analysis. Each hour of data, at a minimum, has a validated wind speed and direction at the 10-meter level and a temperature difference between the 76- and 10-meter levels. This period of data is temporally representative and meets the requirements of Safety Guide 23, February 1972 (Reference 21).

The ARCON96 modeling follows the ground level release requirements of Regulatory Position C.3 of Regulatory Guide 1.194, June 2003 (Reference 30) relative to determination of: (1) release height (i.e., ground-level vs. elevated); (2) release type (i.e., diffuse vs. point); and (3) configuration of release points and receptors (i.e., building cross-sectional area, release heights, line-of-sight distance between release and receptor locations, initial diffusion coefficients etc.).

The cross-sectional areas of the Containment Buildings, Refueling Water Storage Tanks, and Fuel Handling Buildings for DCPP Units 1 and 2 as input to the ARCON96 dispersion modeling analysis are based on the geometry of the site buildings as discussed below:

Containment Building (CB): The CB area that has an effect on the dispersion of the releases is its entire cross-sectional area. The containment has a radius of 73 ft and is shaped like a cylinder from the base at El 85 ft to an elevation of 230 ft. It is a hemisphere shape from El 230 ft to 303 ft. The cross-sectional area is the sum of the cylinder and hemisphere. As discussed earlier in UFSAR section 2.3.5.2.1, the total containment cross-sectional area is estimated to be = 2,744.5 m^2.

Fuel Handling Building (FHB): The highest elevation of the FHB is 190 ft. The elevation of the containment penetration area leakage releases is 140 ft. The FHB elevation relative to these release points is 190 ft – 140 ft = 50 ft. The diagonal length of the FHB is measured to be approximately 114 ft. This width is conservative in that the FHB is contained within a larger structure that could have been considered in this calculation. Therefore, the conservative cross-sectional area is given by:

(50 ft) x (114.2 ft) = 5,710 ft^2 / (10.76365 ft^2 / m^2) = 530.4 m^2.

Refueling Water Storage Tank (RWST): The RWST roof elevation is 173 ft and the grade elevation at the RWST is 115 ft. The RWST height relative to local grade is 173 ft – 115 ft = 58 ft. The diameter of the RWST is approximately 40 ft. Therefore, the cross-sectional area of the RWST is given by:

(58 ft) x (40 ft) = 2,320 ft^2 / 10.76365 ft^2 / m^2) = 215.5 m^2.

Releases are assumed to be ground-level as none of the release points meet the definition of an elevated release as required by Regulatory Position C.3.2.2 of Regulatory Guide 1.194, June 2003 (i.e., do not meet the requirement to be at a minimum 2.5 times the height of plant buildings).

Only the containment building edge releases are treated as diffuse sources as the releases occur from the entire surface of the building. In these cases, initial values of the diffusion coefficients (sigma y, sigma z) are determined in accordance with the requirements in Regulatory Guide 1.194, June 2003 Regulatory Position C.3.2.4. Release and receptor locations are applied in accordance with Regulatory Guide 1.194, June 2003 Regulatory Position C.3.4 requirements for building geometry and line-of-site distances ~~(refer to Figure 2.3-5)~~.

The following recommended default values from Regulatory Guide 1.194, June 2003, Table A-2, are judged to be applicable to DCPP:

Wind direction range = 90 degrees azimuth;

Wind speed assigned to calm = 0.5 m/sec;

Surface roughness length = 0.20 m; and

Sector averaging constant = 4.3 (dimensionless)

The following assumptions are made for χ/Q calculations:

- The plume centerline from each release is transported directly over the control room or technical support center air intake/receptor (conservative);
- The distances from the Unit 1 and Unit 2 containment building surfaces to the receptors are determined from the closest edge of the containment buildings and the release/receptor elevation differences are set to zero (conservative);
- The applicable structure relative to quantifying building wake effects on the dispersion of the releases is based on release/receptor orientation relative to the plant structures;
- The releases from the Unit 1 and Unit 2 containment building surfaces are treated as diffuse sources;
- All releases are treated as ground level as there are no release conditions that merit categorization as an elevated release (i.e., 2.5 times containment building height) at this site (conservative); and
- The χ/Q value from the accident release point to the center of the control room boundary at roof level is utilized for control room in-leakage since the above χ/Q can be considered an average value for in-leakage locations around the control room envelope. The χ/Q from the accident release point to the center of the control room boundary at roof level is also utilized for control room ingress/egress. The outer doors to the control room are located at approximately the middle of a) the east side (i.e., auxiliary building side) wall of the control room and b) the west side (i.e., turbine building side) wall of the control room. Similarly, the χ/Q from the accident release point to the center of the TSC at its roof level is utilized for TSC in-leakage since the above χ/Q can be considered an average value for in-leakage locations around the TSC building envelope.

Summarized below are some of the other salient aspects of the control room and technical support center χ/Q analyses, as applicable.

<u>Control Room Receptors within 10-meters of Release</u>

Regulatory Guide 1.194, June 2003, Regulatory Position C.3.4 recommends that ARCON96 methodology not be used for analysis at distances less than about 10 meters. However, as an exception to Regulatory Guide 1.194, June 2003, Regulatory Position C.3.4 the ARCON96 methodology has been applied for two

cases when the distance from the release to the receptor is less than 10 meters. The distances in question (i.e., 9.4 meters for Unit 1 containment building to Unit 1 control room normal intake and 7.8 meters for Unit 2 containment building to Unit 2 control room normal intake) is considered acceptable since the dominating factors in the calculation are building cross-sectional area and plume meander, not the normal atmospheric dispersion coefficients.

<u>Control Room Receptors at 1.5-meters from Release</u>

Since the Unit 1 and Unit 2 MSSVs, 10% ADVs, and MSLB release points are located within 1.5 meters line-of-sight distance from the affected unit's control room normal intake, this near-field distance is considered outside of the ARCON96 application domain. Although ARCON96 is capable of estimating near-field dispersion, the 1.5-meter line-of-sight distance from the releases to the receptors is much less than the 10-meter distance recommended as the minimum applicable distance in Regulatory Position C.3.4 of Regulatory Guide 1.194, June 2003. Thus no χ/Qs are developed for the above release point / receptor combinations.

<u>Energetic Releases</u>

The 95th-percentile high wind speed values for the 10-m and 76-m levels are 11.0 and 12.1 m/sec, respectively. The vertical exit velocity of the releases from the MSSVs and 10% ADVs, to wind speed ratios are 94.9 m/sec to 11.0 m/sec (i.e., 8.6) and 94.9 m/sec to 12.1 m/sec (i.e., 7.8) for the 10-m and 76-m tower levels over the 5-year meteorological data base.~~The vertical velocity of the MSSV and 10% ADVs releases is at least 95 times larger than the 95th percentile wind speed of 1 m/sec and approximately 5 times larger than the highest observed 10-meter wind speed (i.e., 18.9 m/sec) within the 5-year meteorological data base.~~ The large vertical velocities of the MSSV and 10% ADVs releases, ranging from 94.9 to 98.9 m/sec, and orientation relative to the CR intakes, preclude any down-washing of the releases by the aerodynamic effects of the containment buildings such that the control room normal intake of the same unit as the release (e.g., Unit 1 MSSV/10% ADVs releases to Unit 1 CR normal intake) is not contaminated.~~ given that the horizontal distance is only 1.5 meters.~~ Moreover, since the horizontal distance is only 1.5 meters, this short distance precludes the releases from reaching the control room normal intakes of the same unit given the height of the MSSV and 10% ADVs releases (i.e., 27.1 and 26.5 meters, respectively) relative to the height of the CR normal intakes (i.e., 22 meters). Plume rise calculations indicate that the MSSV and ADV release heights will be enhanced by ~~11~~2 meters at the 95th percentile wind speed of 11.0 m/sec and 12.1 m/sec for the 10-m and 76-m tower levels, respectively,~~1 m/sec~~ due to the large vertical velocities of the releases. Thus, for purposes of estimating dose consequences, it is appropriate to use the χ/Q associated with the normal control room intake of the opposite unit for releases from the MSSVs / 10% ADVs as the worst case control room intake location.

Vertically-Oriented Energetic Releases

Regulatory Position C.6 of Regulatory Guide 1.194, June 2003 establishes the use of a deterministic reduction factor of 5 applied to ARCON96 χ/Q values for energetic releases from steam relief valves or atmospheric dump valves. These valves must be uncapped and vertically-oriented and the time-dependent vertical velocity must exceed the 95th-percentile wind speed at the release point height by at least a factor of 5. Since the DCPP MSSVs and 10% ADVs are vertically oriented / uncapped and will have a vertical velocity of at least 94.9 m/sec for the first 10.73 hours of the accident, the reduction factor of 5 is clearly applicable to the DCPP MSSV and 10% ADVs releases. Note that since χ/Q values are averaged over the identified period (i.e., 0-2 hours, 2-8 hours, 8-24 hours, etc.), and the vertical velocity has been estimated to occur for 10.73 hours, application of the factor of 5 reduction is not appropriate for χ/Q values applicable to averaging periods beyond the 2-8 hours averaging period. For assessment of an environmental release between 8 to 10.73 hours, continued use of the 2-8 hour χ/Q, with the factor of 5 reduction, is acceptable and conservative.

Dual Intakes

The Unit 1 and Unit 2 control room pressurization air intakes which also serve the technical support center, may be considered dual intakes for the purpose of providing a low contamination intake regardless of wind direction for any of the release points since the two control room pressurization air intakes are never within the same wind direction window; defined as a wedge centered on the line of sight between the release and the receptor with the vertex located at the release point. The size of the wedge for each release-receptor combination is 90 degrees azimuth with the use of ARCON96, as described in Regulatory Position C.3.3.2 of Regulatory Guide 1.194, June 2003.

Redundant Radiation Monitors

Per Regulatory Guide 1.194, June 2003, Regulatory Position C.3.3.2.3, based on the dual intake design of the control room pressurization intakes, and the availability of redundant PG&E Design Class I radiation monitors at each pressurization intake (which provide the capability of initial selection of the cleaner intake and support the expectation that the operator will manually make the proper intake selection throughout the event), allows the χ/Q values applicable to the more favorable control room pressurization intake ~~can~~to be reduced by a factor of 4 and utilized to estimate the dose consequences.

PG&E Design Class II Lines Connecting to PG&E Design Class I Plant Vent

The 16 inch PG&E Design Class II gland seal steam exhauster line and the 2-inch PG&E Design Class II gas decay tank vent line connects to the PG&E Design Class I plant vent. In addition, the plant vent expansion joint may experience a

tear during a seismic event, however the plant vent will remain intact and functional.

a) The gland seal steam 16 inch exhauster line connects to the plant vent at El 144'-6" (Centerline) on the North-East side / South–East side of the Unit 1 and Unit 2 containments, respectively. The 2-inch gas decay tank vent line connects to the plant vent at El 137'-6" on the North-East side / South–East side of the Unit 1 and Unit 2 containments, respectively. It has been determined that should a failure occur due to a seismic event, it would occur at the interface of this line and the plant vent.
b) The plant vent expansion joint is located at El 155.83' North-East side / South–East side of the Unit 1 and Unit 2 containments, respectively. As discussed earlier, the plant vent expansion joint may experience a tear during a seismic event.

An assessment of the potential release locations identified above indicates that the χ/Q values developed for the plant vent are either conservative or representative of these potential release points.

Release points and receptor locations are provided in Figure 2.3-5, while Table 2.3-146 provides the release point / receptor combinations that were evaluated. Tables 2.3-147 and 2.3-148 provide the control room χ/Q values for the individual release point-receptor combinations for Unit 1 and Unit 2, respectively.

The χ/Q values selected for use in the dose consequence analyses are intended to support bounding analyses for an accident that occurs at either unit. They take into consideration the various release points-receptors applicable to each accident in order to identify the bounding χ/Q values and reflect the allowable adjustments and reductions in the values as discussed earlier and further summarized in the notes of Tables 2.3-147 and 2.3-148.

Table 2.3-149 presents the χ/Q values for the individual post-~~LOCA~~accident release point TSC receptor combinations for Unit 1 and Unit 2 applicable to the TSC normal intake and the center of the TSC boundary at roof level (considered an average value for potential TSC unfiltered in-leakage locations around the envelope). In the interest of model simplification, the Unit 1 & 2 Main Steam Line (MSL) Break locations were also used to represent the Unit 1 and Unit 2 Main Steam Safety Valves (MSSVs) and 10 percent Atmospheric Dump Valves (ADVs). This approach is acceptable since these release points are essentially co-located, but the MSL Break location releases have the lowest elevation and is therefore the closest to the TSC. The Unit 1 and Unit 2 control room pressurization air intakes also serve the TSC during the emergency mode. Thus, the χ/Qs presented in Tables 2.3-147 and 2.3-148 for the control room pressurization intakes inclusive of the credit for dual intake design and ability to select the more favorable intake are also applicable to the TSC.

2.3.6 LONG-TERM (ROUTINE) DIFFUSION ESTIMATES

HISTORICAL INFORMATION IN ITALICS BELOW NOT REQUIRED TO BE REVISED.

2.3.6.1 Objective

Annual relative concentrations (χ/Q) were estimated for distances out to 80 kilometers from onsite meteorological data for the period May 1973 through April 1975. These relative concentrations are presented in Table 2.3-2; they were estimated using the models described in Reference 18. The same program also produces cumulative frequency distributions for selected averaging periods using overlapping means having hourly updates. For critical offsite locations, measured lateral standard deviations of wind direction, σ_A, and bulk Richardson number, R_i, were used as the stability parameters in the computations. The meteorological input data were measured at the 10 meter level of the meteorological tower at DCPP site. Annual averaged relative concentrations calculated by the above methods are presented in Table 2.3-4.

2.3.6.2 Calculations

The meteorological instrumentation that was used to obtain the input data for the previously discussed relative concentration calculations at DCPP site is described in Section 2.3.4. Procedures for obtaining annual averaged relative concentrations are described in detail in Reference 15.

2.3.6.3 Meteorological Parameters

The following assumptions were used in developing the meteorological input parameters required in the dispersion model:

(1) There is no wind direction change with height

(2) Wind speed changes with height can be estimated by a power law function where the exponent, P, varies with stability class and is assigned the following values:

Pasquill Stability Class	*Exponent (P)*
A & B	*0.10*
C	*0.15*
D	*0.20*
E	*0.25*
F & G	*0.30*

If more than five hourly observations are missing in any 24-hour period, the estimated 24-hour concentration value is not included in the analyses.

Meteorological data collected at DCPP site are representative of atmospheric conditions along a Pacific coastal area having a complex terrain near the shoreline. Use of these data in estimating downwind relative concentrations results in realistic estimates as shown in the report by Cramer and Record (Reference 1). This field program included ground level concentration measurements out to a distance of about 20 kilometers. All concentration measurements were approximated by near-neutral through unstable stability classifications, even though both vertical and lateral turbulence measurements, σ_E *and* σ_A *in Table 3.1 of Reference 1, indicated several stable regimes.*

Even during the nighttime periods when extreme stability may be expected, the relative concentrations in the area were characteristic of unstable lapse rates. Actual average temperature differences over the height of the tower for these trials, given in Table 2.3-142, show a high percentage of test periods with stable lapse rates. Five nighttime trials having light and variable winds were included; three were near ground level (8 meters) and two were elevated (76 meters) releases. Temperature gradient measurements indicated three of these trials having near-neutral and two with stable lapse rates, yet the measured ground level concentrations were at least two orders of magnitude less than the predicted peak concentrations for those stabilities. In fact, the diffusion rates, as shown in Figure 3-3 of Reference 1, based on measured ground level concentrations, were typical of those expected for extreme instability.

Results of this series of diffusion trials conducted at DCPP site have yielded considerable insight into the dispersal capabilities of a coastal site. They indicate that use of direct turbulence measurements and the split sigma approach to independently predict lateral and vertical cloud growth yield realistic estimates of site dilution factors without including any corrections or recirculation.

2.3.7 CONCLUSIONS

HISTORICAL INFORMATION IN ITALICS BELOW NOT REQUIRED TO BE REVISED.

The principal conclusions reached as the result of the analysis of the data obtained during the onsite meteorological measurement program at DCPP site are listed below:

(1) Northwesterly wind directions with wind speeds averaging 10 to 15 mph can be expected to occur approximately 50 percent of the time.

(2) Wind directions within a 22.5° sector that persist for periods of 8 hours or longer will occur 3 to 4 percent of the time.

(3) Less than 4 percent of the total observations at the 25 foot level at Station E refer to the joint occurrence of mean wind speeds of 2 mph or less, onshore wind directions (southeast through west-northwest measured clockwise), and moderately stable and/or extremely stable thermal stratifications.

(4) *Despite the prevalence of the marine inversion and the northwesterly wind flow gradient along the California coast in the dry season, the long-term accumulation of plant emissions, released routinely or accidentally, in any particular geographical area downwind from the plant is virtually impossible. Pollutants injected into the marine inversion layer of the coastal wind regime are transported and dispersed by a complex array of land-sea breeze regimes that exist all along the coast wherever canyons or valleys indent the coastal range. Because of the complexities of the wind circulation in these regimes and their fundamental diurnal nature, the net result is a very effective and wide daily dispersal of any pollutants that are present in the marine coastal air.*

2.3.8 SAFETY EVALUATION

2.3.8.1 General Design Criterion 11, 1967 – Control Room

Wind speed, wind direction, and differential air temperature measurements from the primary and backup meteorological towers are provided to control room personnel to respond to abnormal meteorological conditions in order to maintain safe operational status of the plant. The data are retrieved continually and provided to the PPC. High ambient air temperature is annunciated on the main control board.

2.3.8.2 General Design Criterion 12, 1967 – Instrumentation and Control Systems

Meteorological monitoring instrumentation is provided for DCPP Unit 1 and Unit 2 to provide meteorological conditions as discussed in Section 2.3.4.

2.3.8.3 Meteorology Safety Function Requirements

(1) Calculation of Atmospheric Dispersion

Calculation of atmospheric dispersion as discussed in Section 2.3.4.7 is based on methodology in Sagendorf (Reference 15) and Regulatory Guide 1.145, Revision 1.

2.3.8.4 Safety Guide 23, February 1972 – Onsite Meteorological Programs

As discussed in Section 2.3.4, the ~~preoperational~~ meteorological data collection program was designed and has been updated continually to meet the requirements of Safety Guide 23, February 1972.

2.3.8.5 Regulatory Guide 1.97, Revision 3 – Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident

Wind speed, wind direction, and estimation of atmospheric stability indication in the control room provide information for use in determining the magnitude of the release of radioactive materials and in continuously assessing such releases during and following an accident (refer to Table 7.5-6 for a summary of compliance to Regulatory Guide 1.97, Revision 3).

2.3.8.6 Regulatory Guide 1.111, March 1976 – Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors

The pre-operational values of dilution factor and deposition factor used in the calculation of annual average offsite radiation dose are discussed in Section 11.3.7. The values of deposition rate were derived from Figure 7 of Regulatory Guide 1.111, March 1976, for a ground-level release.

2.3.8.7 Regulatory Guide 1.111, Revision 1, July 1977 – Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors

The annual average relative concentration values are developed for each sector, at the outer LPZ boundary distance for that sector, using the method described in Regulatory Position C.1.c of Regulatory Guide 1.111, Revision 1. These values are used to calculate the intermediate averaging time χ/Q values at the LPZ for the periods of 2-8 hours, 8-24 hours, 1-4 days, and 4-30 days following the postulated accident. This information is used as input to develop the accident χ/Q values at the LPZ using Regulatory Guide 1.145, Revision 1 methodology. Refer to Section 2.3.5.2.

2.3.8.8 Regulatory Guide 1.145, Revision 1, February 1983 – Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants

The short-term atmospheric dispersion factors applicable to the exclusion area boundary and the low population zone for post-accident accident releases from Unit 1 and Unit 2 are calculated using methodology applicable to "ground level" releases provided in Regulatory Guide 1.145, Revision 1. Refer to Section 2.3.5.2.

2.3.8.9 Regulatory Guide 1.194, June 2003 – Atmospheric Relative Concentrations for Control Room Radiological Habitability Assessments at Nuclear Power Plants

The control room and technical support center atmospheric dispersion factors for radiological releases from Unit 1 and Unit 2 are calculated using methodology outlined in Regulatory Positions C.1 through C.3, and the adjustment factor for vertically orientated energetic releases from steam relief valves and atmospheric dump valves allowed by Regulatory Position C.6, and NRC ARCON96 methodology as documented in NUREG/CR-6331, Revision 1. Refer to Section 2.3.5.2.

2.3.8.~~7~~10 NUREG-0737 (Item III.A.2), November 1980 – Clarification of TMI Action Plan Requirements

Item III.A.2 - Improving Licensee Emergency Preparedness–Long-Term:

As discussed in Section 2.3.4, the primary and backup meteorological data are available in the control room and emergency response facilities via the TRS servers and EARS, in accordance with NUREG-0654, Revision 1, November 1980.

As discussed in Section 2.3.4, the measurement subsystems consist of a primary meteorological tower and a backup meteorological tower. The primary meteorological computer and the backup meteorological computer communicate with each other, the EARS and also with the TRS server. Primary and backup meteorological data are available on the PPCs via the TRS servers and thus in the control room and emergency response facilities.

Item III.A.2.2 - Meteorological Data: NUREG-0737, Supplement 1, January 1983:

Table 7.5-6 and Section 2.3.8.5 summarize DCPP conformance with Regulatory Guide 1.97, Revision 3. Wind direction, wind speed, and estimation of atmospheric stability are categorized as Type E variables, based on Regulatory Guide 1.97, Revision 3. The PPC is used as the indicating device to display meteorological instrument signals. In addition, Type E, Category 3, recorders are located in the meteorological towers.

2.3.8.~~8~~11 IE Information Notice 84-91, December 1984 – Quality Control Problems of Meteorological Measurements Programs

In addition to the primary meteorological towers, a supplemental meteorological measurement system is provided in the vicinity of the plant site in order to meet IE Information Notice 84-91. As discussed in Section 2.3.4.5, this supplemental measurement system consists of three Doppler SODAR and seven tower sites located as indicated in Figure 2.3-4. The primary and secondary meteorological towers in conjunction with the supplemental system adequately predict the meteorological conditions at the site boundary (800 meters) and beyond.

2.3.9 REFERENCES

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TABLE 2.3-145
EXCLUSION AREA BOUNDARY AND LOW POPULATION ZONE ATMOSPHERIC DISPERSION FACTORS

	χ/Q (sec/m^3)				
Receptor	0 - 2 hours	2 - 8 hours	8 - 24 hours	1 - 4 days	4 - 30 days
Unit 1 EAB (NW)	2.50E-04	-	-	-	-
Unit 2 EAB (SSE)	2.3017E-04	-	-	-	-
Unit 1/2 LPZ NW)	2.1200E-05	9.268.94E-06	6.2614E-06	2.6772E-06	7.868.48E-07

Notes:

1:. An EAB χ/Q value of 2.5E-04 sec/m^3 is used for radiological dose calculations from all release points.

2. The 0.5% sector dependent X/Q values are presented in Table 2.3-145A, with the maximum value applicable to all sectors being presented above in Table 2.3-145 and used to establish dose consequences. The worst-case downwind sector for the 0-2 hour period for all receptors is northwest. For Unit 1/2 LPZ the worst case sector for periods 2-8 hours and longer is southeast.The 0.5% sector dependent χ/Q values are presented with the worst case downwind sector indicated in parentheses.

TABLE 2.3-145A
UNITS 1 & 2 - EAB/LPZ SECTOR DEPENDENT DISTANCES & ATMOSPHERIC DISPERSION FACTORS

Downwind Sector	Unit 1 EAB		Unit 2 EAB		Unit 1/2 LPZ*	
	0-2 hr X/Q (sec/m^3)	Distance (m)	0-2 hr X/Q (sec/m^3)	Distance (m)	0-2 hr X/Q (sec/m^3)	Annual Average X/Q (sec/m^3)
S	7.77E-05	830	9.46E-05	730	4.73E-06	3.85E-08
SSW	8.39E-05	830	1.02E-04	730	4.99E-06	3.92E-08
SW	1.12E-04	780	1.22E-04	740	6.20E-06	4.69E-08
WSW	1.04E-04	780	1.04E-04	780	5.80E-06	3.66E-08
W	1.47E-04	750	1.38E-04	780	8.17E-06	4.43E-08
WNW	2.02E-04	750	1.89E-04	780	1.38E-05	7.81E-08
NW	2.50E-04	750	2.17E-04	830	2.00E-05	1.31E-07
NNW	2.17E-04	750	1.88E-04	830	1.49E-05	8.83E-08
N	1.46E-04	730	1.19E-04	830	7.19E-06	4.70E-08
NNE	1.16E-04	730	9.53E-05	830	4.76E-06	3.03E-08
NE	9.99E-05	740	8.51E-05	820	4.28E-06	2.60E-08
ENE	9.25E-05	740	7.88E-05	820	3.89E-06	2.50E-08
E	8.75E-05	890	9.00E-05	870	4.99E-06	3.35E-08
ESE	1.52E-04	890	1.56E-04	870	1.33E-05	1.02E-07
SE	1.92E-04	920	2.09E-04	850	1.89E-05	2.03E-07
SSE	1.12E-04	830	1.29E-04	730	6.75E-06	6.44E-08

* LPZ distance (all sectors) = 9650 m (6 miles)

TABLE 2.3-145B
EAB/ LPZ 5-PERCENT OVERALL SITE ATMOSPHERIC DISPERSION FACTORS

	X/Q (sec/m^3)				
	0 - 2 hrs	2 - 8 hrs	8 - 24 hrs	1 - 4 days	4 - 30 days
Unit 1 EAB	1.89E-04	-	-	-	-
Unit 2 EAB	1.88E-04	-	-	-	-
Unit 1/Unit 2 LPZ	1.46E-05	7.20E-06	5.06E-06	2.35E-06	7.81E-07

TABLE 2.3-146
ON-SITE ATMOSPHERIC DISPERSION FACTOR EVALUATION POST-ACCIDENT RELEASE POINT / RECEPTOR COMBINATIONS

Release Points

1. Unit 1 Containment Building Edge
2. Unit 2 Containment Building Edge
3. Unit 1 Plant Vent
4. Unit 2 Plant Vent
5. Unit 1 Refueling Water Storage Tank (RWST) Vent[1]
6. Unit 2 RWST Vent[1]
7. Unit 1 Containment Penetration (GE Area)
8. Unit 2 Containment Penetration (GE Area)
9. Unit 1 Containment Penetration (GW/FW Area)
10. Unit 2 Containment Penetration (GW/FW Area)
11. Unit 1 Fuel Handling Building
12. Unit 2 Fuel Handling Building
13. Unit 1 Equipment Hatch
14. Unit 2 Equipment Hatch
15. Unit 1 Main Steam Safety Valves (MSSVs)
16. Unit 2 MSSVs
17. Unit 1 10% Atmospheric Dump Valves
18. Unit 1 10% Atmospheric Dump Valves
19. Unit 1 Main Steam Line Break Location
20. Unit 2 Main Steam Line Break Location

On-Site Receptors

1. Unit 1 Control Room Normal Intake
2. Unit 2 Control Room Normal Intake
3. Unit 1 Control Room Emergency Intake
4. Unit 2 Control Room Emergency Intake
5. Control Room Center (i.e., In-leakage)
6. TSC Normal Intake[2]
7. TSC Center[2](i.e., In-leakage)

Notes:

1. χ/Q values for RWST releases to the control room normal intakes are not needed for the dose calculations since the normal intakes are isolated prior to releases occurring from the RWST vent.
2. The Unit 1 & 2 MSL break locations are also used to represent the Unit 1 and Unit 2 MSSVs and 10% ADVs. This approach is acceptable since these release points are essentially co-located, but the MSLB location releases have the lowest elevation and is therefore the closest to the TSC ~~χ/Q values developed only for the LOCA (i.e., release points 1 through 10)~~.

TABLE 2.3-147
UNIT 1 CONTROL ROOM INTAKE AND CENTER ATMOSPHERIC DISPERSION FACTORS (SEC/M^3)

Release Point and Receptor	0-2 Hour	2-8 Hour	8-24 Hour	1-4 Day	4-30 Day
Unit 1 Containment Building Edge to Unit 1 Control Room (CR) Normal Intake	1.44E-03	7.03E-04	3.00E-04	3.06E-04	3.04E-04
Unit 1 Containment Building Edge to Unit 2 CR Normal Intake	6.41E-04	3.51E-04	1.49E-04	1.49E-04	1.36E-04
Unit 1 Containment Building Edge to Unit 1 CR Emergency Intake[4]	4.09E-04	2.31E-04	9.54E-05	8.61E-05	7.04E-05
Unit 1 Containment Building Edge to Unit 2 CR Emergency Intake[4]	1.57E-04	7.82E-05	2.57E-05	2.71E-05	2.32E-05
Unit 1 Containment Building Edge to CR Center	9.21E-04	4.38E-04	1.77E-04	1.80E-04	1.67E-04
Unit 1 Plant Vent to Unit 1 CR Normal Intake	1.67E-03	1.22E-03	4.93E-04	4.89E-04	4.36E-04
Unit 1 Plant Vent to Unit 2 CR Normal Intake	9.08E-04	6.53E-04	2.69E-04	2.62E-04	2.38E-04
Unit 1 Plant Vent to Unit 1 CR Emergency Intake[4]	5.56E-04	3.33E-04	1.29E-04	1.11E-04	8.34E-05
Unit 1 Plant Vent to Unit 2 CR Emergency Intake[4]	2.22E-04	1.47E-04	5.44E-05	5.52E-05	4.45E-05
Unit 1 Plant Vent to CR Center	1.25E-03	9.08E-04 ~~8.93E-04~~	3.61E-04 ~~3.47E-04~~	3.65E-04 ~~3.46E-04~~	3.17E-04 ~~2.98E-04~~
Unit 1 Containment Penetration (GE Area) to Unit 1 CR Normal Intake	6.59E-03	2.81E-03	1.16E-03	1.07E-03	8.31E-04
Unit 1 Containment Penetration (GE Area) to Unit 2 CR Normal Intake	2.07E-03	1.13E-03	3.73E-04	3.78E-04	3.05E-04
Unit 1 Containment Penetration (GE Area) to Unit 1 CR Emergency Intake[4]	3.67E-04	2.31E-04	9.02E-05	8.38E-05	6.42E-05
Unit 1 Containment Penetration (GE Area) to Unit 2 CR Emergency Intake[4]	2.39E-04	1.20E-04	4.27E-05	4.22E-05	3.39E-05
Unit 1 Containment Penetration (GE Area) to CR Center	3.01E-03	1.33E-03	5.43E-04	4.93E-04	4.01E-04
Unit 1 Containment Penetration (GW/FW Area) to Unit 1 CR Normal Intake	4.86E-03	3.43E-03	1.35E-03	1.37E-03	1.25E-03
Unit 1 Containment Penetration (GW/FW Area) to Unit 2 CR Normal Intake	1.35E-03	9.79E-04	3.86E-04	3.84E-04	3.46E-04
Unit 1 Containment Penetration (GW/FW Area) to Unit 1 CR Emergency Intake[4]	8.05E-04	5.32E-04	2.12E-04	1.86E-04	1.40E-04
Unit 1 Containment Penetration (GW/FW Area) to Unit 2 CR Emergency Intake[4]	2.40E-04	1.53E-04	4.83E-05	5.20E-05	4.41E-05
Unit 1 Containment Penetration (GW/FW Area) to CR Center	2.55E-03	1.80E-03	7.17E-04	7.13E-04	6.50E-04
Unit 1 RWST Vent to Unit 1 CR Emergency Intake[4,5]	3.24E-04	1.83E-04	6.94E-05	6.82E-05	5.57E-05
Unit 1 RWST Vent to Unit 2 CR Emergency Intake[4,5]	1.88E-04	9.18E-05	3.40E-05	3.28E-05	2.69E-05
Unit 1 RWST Vent to CR Center[5]	1.01E-03	4.26E-04	1.85E-04	1.62E-04	1.31E-04

TABLE 2.3-147 (Continued)
UNIT 1 CONTROL ROOM INTAKE AND CENTER ATMOSPHERIC DISPERSION FACTORS (SEC/M^3)

Release Point and Receptor	0-2 Hour	2-8 Hour	8-24 Hour	1-4 Day	4-30 Day
Unit 1 MSSVs to Unit 1 CR Normal Intake [1, 2]	N/A	N/A	N/A	N/A	N/A
Unit 1 MSSVs to Unit 2 CR Normal Intake [3]	4.05E-03	2.65E-03	1.02E-03	1.02E-03	8.95E-04
Unit 1 MSSVs to Unit 1 CR Emergency Intake [3, 4]	4.52E-04	2.86E-04	1.14E-04	1.01E-04	7.82E-05
Unit 1 MSSVs to Unit 2 CR Emergency Intake[3, 4]	2.75E-04	1.49E-04	4.79E-05	5.02E-05	4.14E-05
Unit 1 MSSVs to CR Center[3]	1.23E-02	7.28E-03	2.21E-03	2.43E-03	2.06E-03
Unit 1 10% ADVs to Unit 1 CR Normal Intake[1, 2]	N/A	N/A	N/A	N/A	N/A
Unit 1 10% ADVs to Unit 2 CR Normal Intake[3]	4.06E-03	2.66E-03	1.03E-03	1.02E-03	9.03E-04
Unit 1 10% ADVs to Unit 1 CR Emergency Intake[3, 4]	4.52E-04	2.86E-04	1.14E-04	1.01E-04	7.82E-05
Unit 1 10% ADVs to Unit 2 CR Emergency Intake[3, 4]	2.75E-04	1.50E-04	4.82E-05	5.03E-05	4.15E-05
Unit 1 10% ADVs to CR Center[3]	1.23E-02	7.34E-03	2.22E-03	2.45E-03	2.08E-03
Unit 1 MSL Break Location to Unit 1 CR Normal Intake[1]	N/A	N/A	N/A	N/A	N/A
Unit 1 MSL Break Location to Unit 2 CR Normal Intake	4.07E-03	2.86E-03	1.11E-03	1.10E-03	9.70E-04
Unit 1 MSL Break Location to Unit 1 CR Emergency Intake[4]	4.30E-04	2.89E-04	1.14E-04	1.00E-04	7.63E-05
Unit 1 MSL Break Location to Unit 2 CR Emergency Intake[4]	2.74E-04	1.54E-04	4.98E-05	5.12E-05	4.20E-05
Unit 1 MSL Break Location to CR Center	1.14E-02	7.05E-03	2.19E-03	2.37E-03	1.98E-03
Unit 1 FHB to Unit 1 CR Normal Intake	6.68E-03	-	-	-	-
Unit 1 FHB to Unit 2 CR Normal Intake	2.69E-03	-	-	-	-
Unit 1 FHB to Unit 1 CR Emergency Intake[4]	3.28E-04	-	-	-	-
Unit 1 FHB to Unit 2 CR Emergency Intake[4]	2.39E-04	-	-	-	-
Unit 1 FHB to CR Center	3.54E-03	-	-	-	-
Unit 1 Equipment Hatch to Unit 1 CR Normal Intake	2.43E-02	-	-	-	-
Unit 1 Equipment Hatch to Unit 2 CR Normal Intake	2.67E-03	-	-	-	-
Unit 1 Equipment Hatch to Unit 1 CR Emergency Intake[4]	4.32E-04	-	-	-	-
Unit 1 Equipment Hatch to Unit 2 CR Emergency Intake[4]	2.45E-04	-	-	-	-
Unit 1 Equipment Hatch to CR Center	5.06E-03	-	-	-	-

Notes (Refer to Section 2.3.5.2 for additional detail):

1. ARCON96 based χ/Q s are not applicable for these cases given that the horizontal distance from the source to the receptor is 1.5 meters (which is much less than the 10 meters required by ARCON96 methodology).

2. Due to the proximity of the release from the MSSVs/10% (ADVs, to the normal operation control room intake of the affected unit, and due to the high vertical velocity of the steam discharge from the MSSVs/10% ADVs, the resultant plume from the MSSVs/10% ADVs will not contaminate the control room normal intake of the affected unit.

3. For releases from the MSSVs and 10% ADVs (they are uncapped / vertically oriented, have a high vertical velocity discharge for the first 10.73 hours of the accident), a χ/Q reduction factor of 5 is applicable to the values listed above until t=10.73 hrs. Since χ/Q values are averaged over the identified period (i.e., 0-2 hours, 2-8 hours, 8-24 hours, etc.), and the vertical velocity has been estimated only up to 10.73 hours, application of the factor of 5 reduction is not appropriate for χ/Q values applicable to averaging periods beyond the 2-8 hours averaging period. For assessment of an environmental release between T= 8 to 10.73 hours, continued use of the 2-8 hour χ/Q with the factor of 5 reduction is acceptable and slightly conservative.

4. The more favorable χ/Q value presented above for the control room pressurization Intakes is further reduced by a factor of 4 to address the "dual intake" credit and the capability of initial selection of the cleaner intake and expectation that the operator will manually make the proper intake selection throughout the event.

5. χ/Q values for RWST releases to the control room normal intakes are not needed for the dose calculations since the normal intakes are isolated prior to releases occurring from the RWST vent.

TABLE 2.3-148
UNIT 2 CONTROL ROOM INTAKE AND CENTER ATMOSPHERIC DISPERSION FACTORS (SEC/M^3)

Release Point and Receptor	0-2 Hour	2-8 Hour	8-24 Hour	1-4 Day	4-30 Day
Unit 2 Containment Edge to Unit 2 CR Normal Intake	1.99E-03	9.59E-04	4.60E-04	4.04E-04	3.20E-04
Unit 2 Containment Edge to Unit 1 CR Normal Intake	6.89E-04	3.85E-04	1.66E-04	1.41E-04	1.08E-04
Unit 2 Containment Edge to Unit 1 CR Emergency Intake[4]	1.66E-04	1.05E-04	4.19E-05	3.73E-05	2.93E-05
Unit 2 Containment Edge to Unit 2 CR Emergency Intake[4]	3.78E-04	1.47E-04	5.99E-05	5.87E-05	4.90E-05
Unit 2 Containment Edge to CR Center	1.09E-03	5.49E-04	2.47E-04	2.12E-04	1.70E-04
Unit 2 Plant Vent to Unit 1 CR Normal Intake	1.49E-03	9.29E-04	3.80E-04	3.16E-04	2.21E-04
Unit 2 Plant Vent to Unit 1 CR Normal Intake	7.79E-04	4.80E-04	1.98E-04	1.65E-04	1.15E-04
Unit 2 Plant Vent to Unit 1 CR Emergency Intake[4]	2.02E-04	1.27E-04	5.11E-05	4.20E-05	3.15E-05
Unit 2 Plant Vent to Unit 2 CR Emergency Intake[4]	5.61E-04	2.91E-04	1.16E-04	1.02E-04	8.03E-05
Unit 2 Plant Vent to CR Center	1.11E-03~~1.12E-03~~	6.96E-04~~6.99E-04~~	2.82E-04	2.35E-04~~2.34E-04~~	1.66E-04~~1.68E-04~~
Unit 2 Containment Penetration (GE Area) to Unit 2 CR Normal Intake	6.60E-03	3.01E-03	1.17E-03	1.20E-03	1.01E-03
Unit 2 Containment Penetration (GE Area) to Unit 1 CR Normal Intake	2.08E-03	1.38E-03	5.62E-04	4.76E-04	3.59E-04
Unit 2 Containment Penetration (GE Area) to Unit 1 CR Emergency Intake[4]	2.26E-04	1.57E-04	6.15E-05	5.47E-05	4.08E-05
Unit 2 Containment Penetration (GE Area) to Unit 2 CR Emergency Intake[4]	3.74E-04	1.67E-04	6.72E-05	6.14E-05	5.08E-05
Unit 2 Containment Penetration (GE Area) to CR Center	3.09E-03	1.83E-03	7.22E-04	6.74E-04	5.35E-04
Unit 2 Containment Penetration (GW/FW Area) to Unit 2 CR Normal Intake	3.45E-03	1.14E-03	4.70E-04	4.42E-04	2.93E-04
Unit 2 Containment Penetration (GW/FW Area) to Unit 1 CR Normal Intake	1.20E-03	6.21E-04	2.49E-04	2.09E-04	1.41E-04
Unit 2 Containment Penetration (GW/FW Area) to Unit 1 CR Emergency Intake[4]	2.26E-04	1.59E-04	6.50E-05	5.36E-05	3.96E-05
Unit 2 Containment Penetration (GW/FW Area) to Unit 2 CR Emergency Intake[4]	8.08E-04	4.07E-04	1.43E-04	1.42E-04	1.14E-04
Unit 2 Containment Penetration (GW/FW Area) to CR Center	2.19E-03	1.16E-03	4.56E-04	3.83E-04	2.58E-04
Unit 2 RWST Vent to Unit 1 CR Emergency Intake[4,5]	1.90E-04~~1.89E-04~~	1.29E-04~~1.17E-04~~	5.00E-05~~4.52E-05~~	4.57E-05~~4.30E-05~~	3.49E-05~~3.40E-05~~
Unit 2 RWST Vent to Unit 2 CR Emergency Intake[4,5]	3.17E-04	1.40E-04	5.64E-05	5.12E-05	4.16E-05
Unit 2 RWST Vent to CR Center[5]	1.05E-03	5.55E-04	2.12E-04	2.12E-04	1.72E-04

TABLE 2.3-148 (Continued)
UNIT 2 CONTROL ROOM INTAKE AND CENTER ATMOSPHERIC DISPERSION FACTORS
(SEC/M^3)

Release Point and Receptor	0-2 Hour	2-8 Hour	8-24 Hour	1-4 Day	4-30 Day
Unit 2 MSSVs to Unit 1 CR Normal Intake [3]	3.80E-03	2.36E-03	9.80E-04	8.00E-04	5.99E-04
Unit 2 MSSVs to Unit 2 CR Normal Intake[1,2]	N/A	N/A	N/A	N/A	N/A
Unit 2 MSSVs to Unit 1 CR Emergency Intake[3,4]	2.79E-04	1.87E-04	7.33E-05	6.50E-05	4.89E-05
Unit 2 MSSVs to Unit 2 CR Emergency Intake[3,4]	4.39E-04	2.14E-04	7.68E-05	7.54E-05	6.09E-05
Unit 2 MSSVs to CR Center[3]	1.19E-02	7.90E-03	3.22E-03	2.68E-03	2.05E-03
Unit 2 10% ADVs to Unit 1 CR Normal Intake[3]	3.82E-03	2.36E-03	9.86E-04	8.01E-04	6.01E-04
Unit 2 10% ADVs to Unit 2 CR Normal Intake[1,2]	N/A	N/A	N/A	N/A	N/A
Unit 2 10% ADVs to Unit 1 CR Emergency Intake[3,4]	2.77E-04	1.88E-04	7.35E-05	6.49E-05	4.89E-05
Unit 2 10% ADVs to Unit 2 CR Emergency Intake[3,4]	4.39E-04	2.14E-04	7.68E-05	7.54E-05	6.09E-05
Unit 2 10% ADVs to CR Center[3]	1.19E-02	7.94E-03	3.23E-03	2.70E-03	2.05E-03
Unit 2 MSL Break Location to Unit 1 CR Normal Intake	3.75E-03	2.37E-03	1.00E-03	7.93E-04	5.81E-04
Unit 2 MSL Break Location to Unit 2 CR Normal Intake[1]	N/A	N/A	N/A	N/A	N/A
Unit 2 MSL Break Location to Unit 1 CR Emergency Intake[4]	2.72E-04	1.88E-04	7.40E-05	6.42E-05	4.80E-05
Unit 2 MSL Break Location to Unit 2 CR Emergency Intake[4]	4.29E-04	2.19E-04	7.73E-05	7.57E-05	6.11E-05
Unit 2 MSL Break Location to CR Center	1.08E-02	7.22E-03	3.00E-03	2.44E-03	1.83E-03
Unit 2 FHB to Unit 1 CR Normal Intake	2.68E-03	-	-	-	-
Unit 2 FHB to Unit 2 CR Normal Intake	6.68E-03	-	-	-	-
Unit 2 FHB to Unit 1 CR Emergency Intake[4]	2.45E-04	-	-	-	-
Unit 2 FHB to Unit 2 CR Emergency Intake[4]	3.23E-04	-	-	-	-
Unit 2 FHB to CR Center	3.61E-03	-	-	-	-
Unit 2 Equipment Hatch to Unit 1 CR Normal Intake	2.47E-03	-	-	-	-
Unit 2 Equipment Hatch to Unit 2 CR Normal Intake	2.48E-02	-	-	-	-
Unit 2 Equipment Hatch to Unit 1 CR Emergency Intake[4]	2.46E-04	-	-	-	-
Unit 2 Equipment Hatch to Unit 2 CR Emergency Intake[4]	4.26E-04	-	-	-	-
Unit 2 Equipment Hatch to CR Center	5.09E-03	-	-	-	-

Notes (Refer to Section 2.3.5.2 for additional detail):

1 ARCON96 based χ/Qs are not applicable for these cases given that the horizontal distance from the source to the receptor is 1.5 meters (which is much less than the 10 meters required by ARCON96 methodology).

2 Due to the proximity of the release from the MSSVs/10% ADVs, to the normal operation control room intake of the affected unit, and due to the high vertical velocity of the steam discharge from the MSSVs/10% ADVs, the resultant plume from the MSSVs/10% ADVs will not contaminate the control room normal intake of the affected unit.

3 For releases from the MSSVs and 10% ADVs (they are uncapped / vertically oriented, have a high vertical velocity discharge for the first 10.73 hours of the accident), a χ/Q reduction factor of 5 is applicable to the values listed above until t=10.73 hrs. Since χ/Q values are averaged over the identified period (i.e., 0-2 hours, 2-8 hours, 8-24 hours, etc.), and the vertical velocity has been estimated only up to 10.73 hours, application of the factor of 5 reduction is not appropriate for χ/Q values applicable to averaging periods beyond the 2-8 hours averaging period. For assessment of an environmental release between T= 8 to 10.73 hours, continued use of the 2-8 hour χ/Q with the factor of 5 reduction is acceptable and slightly conservative.

4. The more favorable χ/Q value presented above for the control room pressurization Intakes is further reduced by a factor of 4 to address the "dual intake" credit and the capability of initial selection of the cleaner intake and expectation that the operator will manually make the proper intake selection throughout the event.

5. χ/Q values for RWST releases to the control room normal intakes are not needed for the dose calculations since the normal intakes are isolated prior to releases occurring from the RWST vent.

TABLE 2.3-149
UNITS 1 AND 2 TECHNICAL SUPPORT CENTER INTAKE AND CENTER ATMOSPHERIC DISPERSION FACTORS (SEC/M^3)

Release Point and Receptor	0-2 Hour	2-8 Hour	8-24 Hour	1-4 Day	4-30 Day
UNIT 1					
Unit 1 Containment Building Edge to TSC Normal Intake	2.45E-04	1.16E-04	4.08E-05	4.17E-05	3.48E-05
Unit 1 Containment Building Edge to TSC Center	2.74E-04	1.31E-04	4.80E-05	4.70E-05	4.00E-05
Unit 1 Plant Vent to TSC Normal Intake	3.04E-04	1.76E-04	6.82E-05	6.21E-05	5.20E-05
Unit 1 Plant Vent to TSC Center	3.41E-04	1.94E-04	7.63E-05	6.61E-05	5.62E-05
Unit 1 RWST Vent to TSC Normal Intake	2.48E-04	1.15E-04	4.52E-05	4.11E-05	3.40E-05
Unit 1 RWST Vent to TSC Center	2.76E-04	1.23E-04	5.00E-05	4.53E-05	3.65E-05
Unit 1 Containment Penetration (GE Area) to TSC Normal Intake	3.51E-04	1.61E-04	6.43E-05	5.89E-05	4.83E-05
Unit 1 Containment Penetration (GE Area) to TSC Center	4.05E-04	1.80E-04	7.26E-05	6.60E-05	5.37E-05
Unit 1 Containment Penetration (GW/FW Area) to TSC Normal Intake	4.44E-04	2.48E-04	8.04E-05	8.31E-05	6.68E-05
Unit 1 Containment Penetration (GW/FW Area) to TSC Center	5.61E-04	2.93E-04	1.00E-04	9.86E-05	8.16E-05
Unit 1 MSL Break Location to TSC Normal Intake[1,2]	5.05E-04	2.34E-04	8.95E-05	8.50E-05	6.94E-05
Unit 1 MSL Break Location to TSC Center[1,2]	6.03E-04	2.70E-04	1.07E-04	1.00E-04	8.16E-05
Unit 1 FHB to TSC Normal Intake	3.77E-04	1.68E-04	6.74E-05	6.09E-05	5.06E-05
Unit 1 FHB to TSC Center	4.21E-04	1.87E-04	7.84E-05	6.91E-05	5.57E-05
Unit 1 EH to TSC Normal Intake	4.19E-04	1.93E-04	7.41E-05	7.03E-05	5.76E-05
Unit 1 EH to TSC Center	4.93E-04	2.16E-04	8.73E-05	8.03E-05	6.55E-05
UNIT 2					
Unit 2 Containment Building Edge to TSC Normal Intake	5.31E-04	1.97E-04	8.36E-05	8.25E-05	6.72E-05
Unit 2 Containment Building Edge to TSC Center	5.39E-04	2.01E-04	8.73E-05	8.78E-05	6.84E-05
Unit 2 Plant Vent to TSC Normal Intake	5.47E-04	2.27E-04	1.03E-04	8.46E-05	6.68E-05
Unit 2 Plant Vent to TSC Center	5.41E-04	2.09E-04	9.67E-05	7.95E-05	6.43E-05

Unit 2 RWST Vent to TSC Normal Intake	3.52E-04	1.46E-04	6.12E-05	5.66E-05	4.63E-05
Unit 2 RWST Vent to TSC Center	3.61E-04	1.48E-04	6.30E-05	5.80E-05	4.69E-05
Unit 2 Containment Penetration (GE Area) to TSC Normal Intake	5.22E-04	2.21E-04	9.14E-05	8.61E-05	6.71E-05
Unit 2 Containment Penetration (GE Area) to TSC Center	5.49E-04	2.24E-04	9.60E-05	8.85E-05	7.05E-05
Unit 2 Containment Penetration (GW/FW Area) to TSC Normal Intake	1.71E-03	7.07E-04	2.98E-04	2.76E-04	2.21E-04
Unit 2 Containment Penetration (GW/FW Area) to TSC Center	1.76E-03	7.16E-04	3.01E-04	2.84E-04	2.28E-04
Unit 2 MSL Break Location to TSC Normal Intake[1,2]	9.00E-04	4.17E-04	1.83E-04	1.52E-04	1.22E-04
Unit 2 MSL Break Location to TSC Center[1,2]	1.01E-03	4.62E-04	1.93E-04	1.71E-04	1.38E-04
Unit 2 FHB to TSC Normal Intake	4.88E-04	2.10E-04	8.65E-05	8.05E-05	6.24E-05
Unit 2 FHB to TSC Center	5.26E-04	2.19E-04	9.19E-05	8.55E-05	6.83E-05
Unit 2 EH to TSC Normal Intake	6.97E-04	2.92E-04	1.23E-04	1.14E-04	8.75E-05
Unit 2 EH to TSC Center	7.44E-04	3.03E-04	1.28E-04	1.19E-04	9.42E-05

Notes:

1. The MSL Break location release X/Q values are used to conservatively represent releases from either the MSSVs, the 10% ADVs or the MSL break location since these release points are essentially co-located, but the MSL Break location releases have the lowest elevation and is therefore the closest to the TSC.

2. When these χ/Q values are used for the MSSVs and 10% ADVs (which are uncapped / vertically oriented and have a high vertical velocity discharge for the first 10.73 hours of the accident), a χ/Q reduction factor of 5 is applicable to the values listed above until t=10.73 hrs. Since χ/Q values are averaged over the identified period (i.e., 0-2 hrs, 2-8 hrs, 8-24 hrs, etc), and the vertical velocity has been estimated only up to 10.73 hrs, application of the factor of 5 reduction is not appropriate for χ/Q values applicable to averaging periods beyond the 2-8 hrs averaging period. For assessment of an environmental release between T= 8 to 10.73 hrs, continued use of the 2-8 hr χ/Q (with the factor of 5 reduction) is acceptable and conservative.

15.5.1 DESIGN BASES

The following regulatory requirements, including Code of Federal Regulations (CFR) 10 CFR Part 100, General Design Criteria (GDC), Safety Guides, and Regulatory Guides are applicable to the DCPP radiological consequence analyses presented in this Chapter. They form the bases of the acceptance criteria and methodologies as described in the following Sections:

(1) 10 CFR Part 100, "Reactor Site Criteria"

(2) 10 CFR 50.67, "Accident Source Term"

(3) General Design Criterion 19, 1971 1999 "Control Room"

(4) Regulatory Guide 1.4, Revision 1, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors"

(5) Safety Guide 7, March 1971, "Control of Combustible Gas Concentrations in Containment"

(6)(5) Safety Guide 24, March 1972, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Pressurized Water Reactor Radioactive Gas Storage Tank Failure"

(7) Safety Guide 25, March 1972, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors"

(8)(6) Regulatory Guide 1.183, July 2000, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors"

(9) Regulatory Guide 1.195, May 2003, "Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light-Water Nuclear Power Reactors"

15.5.1.1 List of Analyzed Accidents

The following table summarizes the accident events that have been evaluated for radiological consequences. The table identifies the applicable UFSAR Section describing the analysis and results for each event, the offsite/onsite locations and applicable dose limits, and the radiological analysis and isotopic core inventory codes used.

Accident Event	FSAR Section	Boundary	Dose Limit	Radiological Analysis Code(s)	Isotopic Core Inventory Code(s)
CONDITION II					

Accident Event	FSAR Section	Boundary	Dose Limit	Radiological Analysis Code(s)	Isotopic Core Inventory Code(s)
Loss of Electrical Load (LOL)	15.5.10	EAB and LPZ Control Room TSC~~EAB and LPZ~~ ~~Thyroid~~ ~~Whole Body~~	~~300 rem~~ ~~25 rem~~2.5 rem TEDE 5 rem TEDE 5 rem TEDE	RADTRAD 3.03~~EMERALD~~	SAS2 / ORIGEN-S~~EMERALD~~
<u>CONDITION III</u>					
Small Break LOCA (SBLOCA)	15.5.11	EAB and LPZ Control Room~~EAB and LPZ~~ ~~Thyroid~~ ~~Whole Body~~	2.5 rem TEDE ~~300 rem~~ ~~25 rem~~ 5 rem TEDE	N/A Refer to Section 15.5.23~~EMERALD~~	N/A Refer to Section 15.5.23~~EMERALD~~

Accident Event	FSAR Section	Boundary	Dose Limit	Radiological Analysis Code(s)	Isotopic Core Inventory Code(s)
Minor Secondary System Pipe Breaks	15.5.12	EAB and LPZ ~~EAB and LPZ~~ ~~Thyroid~~ ~~Whole Body~~	2.5 rem TEDE ~~300 rem~~ ~~25 rem~~	N/A Refer to Section 15.5.18~~N/A~~ ~~Refer to~~ ~~Section 15.5.12~~	N/A Refer to Section 15.5.18~~N/A~~ ~~Refer to~~ ~~Section 15.5.12~~
Inadvertent Loading of a Fuel Assembly	15.5.13	EAB and LPZ ~~EAB and LPZ~~ ~~Thyroid~~ ~~Whole Body~~	2.5 rem TEDE ~~300 rem~~ ~~25 rem~~	N/A Refer to Section 15.5.13	N/A Refer to Section 15.5.13
Complete Loss of Forced Reactor Coolant Flow	15.5.14	EAB and LPZ ~~EAB and LPZ~~ ~~Thyroid~~ ~~Whole Body~~	2.5 rem TEDE ~~300 rem~~ ~~25 rem~~	N/A Refer to Section 15.5.~~14~~10	N/A Refer to Section 15.5.~~14~~10
Under-Frequency	15.5.15	EAB and LPZ ~~EAB and LPZ~~ ~~Thyroid~~ ~~Whole Body~~	2.5 rem TEDE ~~300 rem~~ ~~25 rem~~	N/A Refer to Section 15.5.10~~EMERALD~~	N/A Refer to Section 15.5.10~~EMERALD~~
Single Rod Cluster Control Assembly Withdrawal	15.5.16	EAB and LPZ ~~EAB and LPZ~~ ~~Thyroid~~ ~~Whole Body~~	2.5 rem TEDE ~~300 rem~~ ~~25 rem~~	N/A Refer to Section 15.5.23~~EMERALD~~	N/A Refer to Section 15.5.23~~EMERALD~~
CONDITION IV					
Large Break LOCA (LOCA)	15.5.17	EAB and LPZ Control Room TSC~~EAB and LPZ~~ ~~Thyroid~~ ~~Whole Body~~ ~~Control Room~~ ~~Thyroid~~ ~~Whole Body~~	25 rem TEDE 5 rem TEDE 5 rem TEDE ~~300 rem~~ ~~25 rem~~ ~~30 rem~~ ~~5 rem~~	RADTRAD 3.03 PERC2~~EMERALD~~ ~~LOCADOSE~~	SAS2 / ORIGEN-S~~EMERALD~~ ~~ORIGEN-2~~

Accident Event	FSAR Section	Boundary	Dose Limit	Radiological Analysis Code(s)	Isotopic Core Inventory Code(s)
Main Steam Line Break (MSLB)	15.5.18	EAB and LPZ Pre-Accident Iodine Spike ~~Thyroid~~ ~~Whole Body~~ Accident-initiated Iodine Spike ~~Thyroid~~ ~~Whole Body~~ Control Room TSC ~~Thyroid~~ ~~Whole Body~~	~~300~~ 25 rem TEDE ~~25 rem~~ ~~30 rem~~ 2.5 rem TEDE ~~30 rem~~ 5 rem TEDE 5 rem TEDE	RADTRAD 3.03~~LOCADOSE~~	SAS2 / ORIGEN-~~SORIGEN-2~~
Main Feedwater Line Break (FWLB)	15.5.19	EAB and LPZ Pre-Accident Iodine Spike Accident-initiated Iodine Spike ~~EAB and LPZ~~ ~~Thyroid~~ ~~Whole Body~~	25 rem TEDE 2.5 rem TEDE ~~300 rem~~ ~~25 rem~~	N/A Refer to Section 15.5.18~~9~~	N/A Refer to Section 15.5.1~~9~~8

Accident Event	FSAR Section	Boundary	Dose Limit	Radiological Analysis Code(s)	Isotopic Core Inventory Code(s)
Steam Generator Tube Rupture (SGTR)	15.5.20	EAB and LPZ Pre-Accident Iodine Spike Accident-initiated Iodine Spike Control Room TSC EAB and LPZ Pre-Accident Iodine Spike Thyroid Whole Body Accident-initiated Iodine Spike Thyroid Whole Body Control Room Thyroid Whole Body	 25 rem TEDE 2.5 rem TEDE 5 rem TEDE 5 rem TEDE 300 rem 25 rem 30 rem 2.5 rem 30 rem 5 rem	RADTRAD 3.03RADTRAD	SAS2 / ORIGEN-SEMERALD-NORMAL
Locked Rotor Accident (LRA)	15.5.21	EAB and LPZ Control Room TSCEAB and LPZ Thyroid Whole Body Control Room Thyroid Whole Body	2.5 rem TEDE 5 rem TEDE 5 rem TEDE 300 rem 25 rem 30 rem 5 rem	RADTRAD 3.03EMERALD	SAS2 / ORIGEN-SEMERALD
Fuel Handling-Accident (FHA) Fuel Handling Area	15.5.22.1	EAB and LPZ Control Room TSCEAB and LPZ Control Room	6.3 rem TEDE 5 rem TEDE 5 rem TEDE 0.063 Sv TEDE (6.3 rem) 0.05 Sv TEDE (5 rem)	RADTRAD 3.03LOCADOSE	SAS2 / ORIGEN-SORIGEN-2

Accident Event	FSAR Section	Boundary	Dose Limit	Radiological Analysis Code(s)	Isotopic Core Inventory Code(s)
~~Fuel Handling Inside Containment~~	~~15.5.22.2~~	~~EAB and LPZ~~ ~~Thyroid~~ ~~Whole Body~~ ~~Control Room~~ ~~Thyroid~~ ~~Whole Body~~	 ~~75 rem~~ ~~6 rem~~ ~~30 rem~~ ~~5 rem~~	~~LOCADOSE~~	~~ORIGEN-2~~
Control Rod Ejection Accident (CREA)	15.5.23	EAB and LPZ Control Room TSC~~EAB and LPZ~~ ~~Thyroid~~ ~~Whole Body~~ ~~Control Room~~ ~~Thyroid~~ ~~Whole Body~~	6.3 rem TEDE 5 rem TEDE 5 rem TEDE ~~300 rem~~ ~~25 rem~~ ~~30 rem~~ ~~5 rem~~	RADTRAD 3.03~~EMERALD~~	SAS2 / ORIGEN-S~~EMERALD~~
Waste Gas Decay Tank Rupture	15.5.24	EAB and LPZ Thyroid Whole Body	 300 rem 25 rem	EMERALD	EMERALD
Liquid Holdup Tank Rupture	15.5.25	EAB and LPZ Thyroid Whole Body	 300 rem 25 rem	LOCADOSE	EMERALD
Volume Control Tank Rupture	15.5.26	EAB and LPZ Thyroid Whole Body	 300 rem 25 rem	EMERALD	EMERALD

15.5.1.2 Assumptions associated with Loss of Offsite Power

The assumptions regarding the occurrence and timing of a Loss of Offsite Power (LOOP) during an accident are selected with the intent of maximizing the dose consequences. A LOOP is assumed for events that have the potential to cause grid perturbation.

i. The dose consequences of the LOCA, MSLB, SGTR, LRA, CREA and LOL event are evaluated with the assumption of a LOOP concurrent with reactor trip.

ii. The assumption of a LOOP related to a postulated design basis accident which leads to a reactor trip does not directly correlate to an FHA. Specifically, a FHA does not directly cause a reactor trip and a subsequent LOOP due to grid instability; nor can a LOOP be the initiator of a FHA. Thus the FHA dose consequence analyses are evaluated without the assumption of a LOOP.

In addition, in accordance with current DCPP licensing basis, the non-accident unit is assumed unaffected by the LOOP.

~~1,023,000 lbm, respectively) and are therefore bounding since total dose is proportional to total steam release.~~

~~For the design basis case, it was assumed that the plant had been operating continuously with 1 percent fuel cladding defects and 1 gpm primary-to-secondary leakage. For the expected case calculation, operation at 0.2 percent defects and 20 gallons per day to the secondary was assumed. In both cases, leakage of water from primary to secondary was assumed to continue during cooldown at 75 percent of the pre-accident rate during the first 2 hours and at 50 percent of the pre-accident rate during the next 6 hours. These values were derived from primary-to-secondary pressure differentials during cooldown.~~

~~It was also conservatively assumed for both cases that the iodine partition factor in the steam generators releasing steam was 0.01, on a mass basis. In addition, to account for the effect of iodine spiking, fuel escape rate coefficients for iodines of 30 times the normal operation values given in Table 11.1-8 were used for a period of 8 hours following the start of the accident. Other detailed and less significant modeling assumptions are presented in Reference 4.~~

~~The resulting potential exposures from this type of accident are summarized in Table 15.5-9 and are consistent with the parametric analyses presented in Figures 15.5-2 through 15.5-5.~~

15.5.10.3 Conclusions

It can be concluded from the results discussed that the occurrence of any of the events analyzed in Section 15.2 (or from other events involving insignificant core damage, but requiring atmospheric steam releases) will result in insignificant radiation exposures and are bounded by the LOL event.

Additionally, the analysis demonstrates that the acceptance criteria are met as follows:

(1) The radiation dose to ~~the whole body and to the thyroid of~~ an individual located at any point on the boundary of the exclusion area for the ~~two-hours~~any 2-hour period ~~immediately~~ following the onset of the postulated fission product release is within 0.025 Sv (2.5 rem) TEDE ~~are insignificant~~ as shown in Table 15.5-9.

(2) The radiation dose to ~~the whole body and to the thyroid~~ of an individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), is within 0.025 Sv (2.5 rem) TEDE ~~are insignificant~~ as shown in Table 15.5-9.

~~(2)~~(3) The radiation dose to an individual in the control room for the duration of the accident is within 0.05 Sv (5 rem) TEDE as shown in Table 15.5-9.

In accordance with current licensing basis, the TSC design has been evaluated for the LOCA. The dose consequences in the TSC due to airborne radioactivity releases from the LOL is bounded by the dose reported for the LOCA in Section 15.5.17. The atmospheric dispersion factors applicable to the TSC are presented in Table 15.5-83.

15.5.11 RADIOLOGICAL CONSEQUENCES OF A SMALL-BREAK LOCA

15.5.11.1 Acceptance Criteria

The radiological consequences of a small-break loss-of-coolant-accident (SBLOCA) shall not exceed the dose limits of 10 CFR ~~100.11~~ 50.67, and will meet the dose acceptance criteria of Regulatory Guide 1.183, July 2000 as outlined below:

Regulatory Guide 1.183 does not specifically address Condition III scenarios. However, per Regulatory Guide 1.183, Section 1.2.1, a full implementation of AST allows a licensee to utilize the dose acceptance criteria of 10 CFR 50.67 in all dose consequence analyses. In addition, Section 4.4 of Regulatory Guide 1.183 indicates that for events with a higher probability of occurrence than those listed in Table 6 of Regulatory Guide 1.183, the postulated EAB and LPZ doses should not exceed the criteria tabulated in Table 6. Thus, the dose consequences at the EAB and LPZ will be limited to the lowest value reported in Table 6, i.e., a small fraction (10%) of the limit imposed by 10 CFR 50.67.

<u>EAB and LPZ Dose Criteria</u>

(1) An individual located at any point on the boundary of the exclusion area for any 2-hour period following the onset of the postulated fission product release shall not receive a radiation dose in excess of 0.025 Sv (2.5 rem) TEDE.

(2) An individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), shall not receive a total radiation dose -in excess of 0.025 Sv (2.5 rem) TEDE.

~~i. An individual located at any point on the boundary of the exclusion area for the two hours immediately following the onset of the postulated fission product release shall not receive a total radiation dose to the whole body in excess of 25 rem or a total radiation dose in excess of 300 rem to the thyroid from iodine exposure.~~

~~ii. An individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), shall not receive a total radiation dose to the whole body in excess of 25~~

As noted in Section 5.0, because of the proximity of the MSSVs/10% ADVs to the control room normal intake of the affected unit, and because the releases from the MSSVs/10% ADVs have a vertically upward discharge, it is expected that the concentrations near the normal operation control room intake of the affected unit (closest to the release point) will be insignificant. Therefore, prior to switchover to CRVS Mode 4 pressurization, only the unaffected unit's control room normal intake is assumed to be contaminated by releases from the MSSVs/10% ADVs.

The bounding atmospheric dispersion factors applicable to the radioactivity release points / control room receptors applicable to a MSLB at either unit are provided in Table 15.5-34B. The χ/Q values presented in Table 15.5-34B take into consideration the various release points-receptors applicable to the MSLB to identify the bounding χ/Q values applicable to a MSLB at either unit, and reflect the allowable adjustments / reductions in the values as discussed in Chapter 2.3.5.2.2 and summarized in the notes of Tables 2.3-147 and 2.3-148.

The bounding control room dose following a MSLB at either unit is presented in Table 15.5-34. ~~The methodology selected for performing the radiological assessment follows NRC SRP 15.1.5, "Steam System Piping Failures Inside and Outside of Containment (PWR)," Revision 2, 1981. Using an accident-induced leak rate of 10.5 gpm (at room temperature conditions) in the faulted SG, calculations using the LOCADOSE computer program demonstrate that the offsite doses are within 10 percent of 10 CFR 100.11 limits and control room doses are within GDC 19, 1971 limits.~~

~~The resultant doses from the MSLB event using an accident-induced leak rate of 10.5 gpm are listed below. The limiting case is the accident initiated iodine spike as the thyroid dose at the EAB is at the 30 rem limit.~~

15.5.18.3 Conclusions

The analysis demonstrates that the acceptance criteria are met as follows:

(1) The radiation dose to an individual located at any point on the boundary of the exclusion area for any 2-hour period following the onset of the postulated fission product release is within 0.25 Sv (25 rem) TEDE for a pre-existing accident iodine spike case and 10% of the 10 CFR 50.67 limit for the accident initiated iodine spike case as shown in Table 15.5-34.

(2) The radiation dose to an individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), is within 0.25 Sv (25 rem) TEDE for a pre-existing accident iodine spike case and 10% of the 10 CFR 50.67 limit for the accident initiated iodine spike case as shown in Table 15.5-34.

(3) The radiation dose to an individual in the control room for the duration of the accident is within 0.05 Sv (5 rem) TEDE as shown in Table 15.5-34.

In accordance with current licensing basis, the TSC design has been evaluated for the LOCA. The dose consequences in the TSC due to airborne radioactivity releases from the MSLB is bounded by the dose reported for the LOCA in Section 15.5.17. The atmospheric dispersion factors applicable to the TSC are presented in Table 15.5-83.

(1) An individual located at any point on the boundary of the exclusion area for the two hours immediately following the onset of the postulated fission product release shall not receive a total radiation dose in excess of the 10 CFR 100.11 dose limits for the whole body and the thyroid for the pre-existing iodine spike case and 10 percent of the 10 CFR 100.11 dose limits for the whole body and the thyroid for the accident-initiated iodine spike case as shown in Section 15.5.18.2.1.

(2) An individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), shall not receive a total radiation dose in excess of the 10 CFR 100.11 dose limits for the whole body and the thyroid for the pre-existing iodine spike case and 10 percent of the 10 CFR 100.11 dose limits for the whole body and the thyroid for the accident-initiated iodine spike case as shown in Section 15.5.18.2.1.

(3) In accordance with the requirements of GDC 19, 1971, the dose to the control room operator under accident conditions shall not be in excess of 5 rem whole body or its equivalent to any part of the body (i.e., 30 rem thyroid and beta skin, Reference 51) for the duration of the accident for both the pre-existing and the accident-initiated iodine spike cases as shown in Section 15.5.18.2.1.

As noted in Section 15.5.18.2.1, the above dose estimates reflect the OSGs and an accident induced leak rate of 10.5 gpm. The limiting case is a thyroid dose at the EAB which corresponds to the dose limit of 30 rem for an accident-initiated iodine spike. These dose estimates bound the doses with the RSGs which cannot credit Alternate Repair Criteria (ARC) for the steam generator tubes as the OSGs do.

15.5.19 RADIOLOGICAL CONSEQUENCES OF A MAJOR RUPTURE OF A MAIN FEEDWATER PIPE

15.5.19.1 Acceptance Criteria

The radiological consequences of a major rupture of a main feedwater pipe (referred to herein as a feedwater line break (FWLB)) shall not exceed the dose limits of 10 CFR

secs (i.e., 219 + 28.2 + 10). The 2 second SIS processing time occurs in parallel with diesel generator sequencing and is therefore not included as part of the delay.

iii. In accordance with DCPP licensing basis, the CRVS normal operation dampers of the non-accident unit are not affected by the LOOP and are isolated at t=231 secs (i.e., 219 + 2 secs signal processing time + 10 sec damper closure time).

Control Room Atmospheric Dispersion Factors

As noted in Section 2.3.5.2.2, because of the proximity of the MSSVs/10% ADVs to the control room normal intake of the affected unit, and because the releases from the MSSVs/10% ADVs have a vertically upward discharge, it is expected that the concentrations near the normal operation control room intake of the affected unit (closest to the release point) will be insignificant. Therefore, prior to switchover to CRVS Mode 4 pressurization, only the unaffected unit's control room normal intake is assumed to be contaminated by releases from the MSSVs/10% ADVs.

The bounding atmospheric dispersion factors applicable to the radioactivity release points / control room receptors applicable to a SGTR at either unit are provided in Table 15.5-64B. The χ/Q values presented in Table 15.5-64B take into consideration the various release points-receptors applicable to the SGTR to identify the bounding χ/Q values applicable to a SGTR at either unit, and reflect the allowable adjustments / reductions in the values as discussed in Chapter 2.3.5.2.2 and summarized in the notes of Tables 2.3-147 and 2.3-148.

The bounding control room dose following a SGTR at either unit is presented in Table 15.5-64.

15.5.20.3 Conclusions

The analysis demonstrates that the acceptance criteria are met as follows:

(1) The radiation dose to an individual located at any point on the boundary of the exclusion area for any 2-hour period following the onset of the postulated fission product release is within 0.25 Sv (25 rem) TEDE for a pre-existing accident iodine spike case and 10% of the 10 CFR 50.67 limit for the accident initiated iodine spike case as shown in Table 15.5-64.

(2) The radiation dose to an individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), is within 0.25 Sv (25 rem) TEDE for a pre-existing accident iodine spike case and 10% of the 10 CFR 50.67 limit for the accident initiated iodine spike case as shown in Table 15.5-64.

(3) The radiation dose to an individual in the control room for the duration of the accident is within 0.05 Sv (5 rem) TEDE as shown in Table 15.5-64.

In accordance with current licensing basis, the TSC design has been evaluated for the LOCA. The dose consequences in the TSC due to airborne radioactivity releases from the SGTR is bounded by the dose reported for the LOCA in Section 15.5.17. The atmospheric dispersion factors applicable to the TSC are presented in Table 15.5-83

~~(1) An individual located at any point on the boundary of the exclusion area for the two hours immediately following the onset of the postulated fission product release shall not receive a total radiation dose in excess of dose guidelines of SRP, Section 15.6.3, Revision 2 (i.e., the 10 CFR 100.11 dose limits for the whole body and the thyroid for the pre-existing iodine spike case and 10 percent of the 10 CFR 100.11 dose limits for the whole body and the thyroid for the accident-initiated iodine spike case) as shown in Table 15.5-71.~~

~~(2) An individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), shall not receive a total radiation dose in excess of the dose guidelines of SRP, Section 15.6.3, Revision 2 (i.e., 10 CFR 100.11 dose limits for the whole body and the thyroid for the pre-existing iodine spike case and 10 percent of the 10 CFR 100.11 dose limits for the whole body and the thyroid for the accident-initiated iodine spike case) as shown in Table 15.5-71.~~

~~(3) In accordance with the requirements of GDC 19, 1971, the dose to the control room operator under accident conditions shall not be in excess of 5 rem whole body or its equivalent to any part of the body (i.e., 30 rem thyroid and beta skin, Reference 51) for the duration of the accident for both the pre-existing and the accident-initiated iodine spike cases as shown in Table 15.5-74.~~

~~As noted in Section 15.5.20.2, the above dose estimates reflect the RSGs and are within 10 CFR 100.11 limits. The SGTR analysis accepted by the NRC based on OSGs is the EAB zero to two hour thyroid dose of 30.5 rem for the accident-initiated iodine spike analysis case. This dose exceeds the SRP 15.6.3 allowable guideline value of 30 rem by 0.5 rem. However, the NRC found the 30.5 rem value acceptable in a letter to PG&E, dated February 20,2003, "Issuance of Amendment: RE: Revision to Technical Specification 1.1, 'Definitions, Dose Equivalent 1-131,' and Revised Steam Generator Tube Rupture and Main Steam Line Break Analyses."~~

As noted in Section 2.3.5.2.2, because of the proximity of the MSSV/10% ADVs to the control room normal intake of the affected unit and because the releases from the MSSVs/10% ADVs have a vertically upward discharge, it is expected that the concentrations near the normal operation control room intake of the faulted unit (closest to the release point) will be insignificant. Therefore, only the unaffected unit's control room normal intake is assumed to be contaminated by a release from the MSSVs/10% ADVs.

The bounding atmospheric dispersion factors applicable to the radioactivity release points / control room receptors applicable to an LRA at either unit are provided in Table 15.5-42B. The χ/Q values presented in Table 15.5-42B take into consideration the various release points-receptors applicable to the LRA to identify the bounding χ/Q values applicable to a LRA at either unit, and reflect the allowable adjustments / reductions in the values as discussed in Section 2.3.5.2.2 and summarized in the notes of Tables 2.3-147 and 2.3-148.

The bounding control room dose following a LRA at either unit is presented in Table 15.5-42.

15.5.21.3 Conclusions

~~By comparing the activity releases following a locked rotor accident, given in Table 15.5-41, with the activity releases calculated for a LBLOCA, given in Tables 15.5-13 and 15.5-14, it can be concluded that any control room exposures following a locked rotor accident will be well below the GDC 19, 1971, criterion level.~~

~~Additionally, the analysis demonstrates that the acceptance criteria are met as follows:~~
The analysis demonstrates that the acceptance criteria are met as follows:

(1) The radiation dose to an individual located at any point on the boundary of the exclusion area for any 2-hour period following the onset of the postulated fission product release is within 0.025 Sv (2.5 rem) TEDE as shown in Table 15.5-42.

(2) The radiation dose to an individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), is within 0.025 Sv (2.5 rem) TEDE as shown in Table 15.5-42.

(3) The radiation dose to an individual in the control room for the duration of the accident is within 0.05 Sv (5 rem) TEDE as shown in Table 15.5-42.

In accordance with current licensing basis, the TSC design has been evaluated for the LOCA. The dose consequences in the TSC due to airborne radioactivity releases from the LRA is bounded by the dose reported for the LOCA in Section 15.5.17. The atmospheric dispersion factors applicable to the TSC are presented in Table 15.5-83

(1) The radiation dose to the whole body and to the thyroid of an individual located at any point on the boundary of the exclusion area for the two hours immediately following the onset of the postulated fission product release are well below the dose limits of 10 CFR 100.11 as shown in Table 15.5-42.

(2) The radiation dose to the whole body and to the thyroid of an individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), are well below the dose limits of 10 CFR 100.11 as shown in Table 15.5-42.

(3) Since the activity releases from the locked rotor accident given in Table 15.5-41 are less than those from a LBLOCA (see Table 15.5-13 and 15.5-14), any control room dose which might occur would be well within the established criteria of GDC 19, 1971 and discussed in Section 15.5.17.

15.5.22 RADIOLOGICAL CONSEQUENCES OF A FUEL HANDLING ACCIDENT

The procedures used in handling fuel in the containment and fuel handling area are described in detail in Section 15.4.5. In addition, design and procedural measures provided to prevent fuel handling accidents are also described in that section, along with a discussion of past experience in fuel handling operations. The basic events that could be involved in a fuel handling accident are discussed in that section, and the following discussion evaluates the potential radiological consequences of such an accident.

The assumption of a LOOP related to a postulated design basis accident which leads to a reactor trip does not directly correlate to an FHA. Specifically, a FHA does not directly cause a reactor trip and a subsequent LOOP due to grid instability; nor can a LOOP be the initiator of a FHA. Thus the FHA dose consequence analyses are evaluated without the assumption of a LOOP.

15.5.22.1 Fuel Handling Accident In The Fuel Handling Area

15.5.22.1.1 Acceptance Criteria

The radiological consequences of a FHA in the Fuel Handling Building (FHB) or in the Containment shall not exceed the dose limits of 10 CFR 50.67, as modified by Regulatory Guide 1.183, July 2000 and outlined below:

EAB and LPZ Dose Criteria

As discussed in Section 15.5.1.2, when crediting CRVS Mode 4, the FHA dose consequence analyses is not required to address the potential effects of a LOOP. Thus delays associated with diesel generator sequencing are not addressed.

Therefore, the time delay between the arrival of radioactivity released due to a DBA FHA at both the control room normal Intakes (assumed to be instantaneous) and CRVS Mode 4 operation is estimated to be the sum total of the monitor response time (20 secs), the signal processing time (2 Secs) and the damper closure time (10 secs) for a total delay of 32 seconds.

Delayed FHA:

It is recognized that the response time for radiation monitors are dependent on the magnitude of the radiation level / energy spectrum of the airborne cloud at the location of the detectors, which in turn are dependent on the fuel assembly decay time. Thus an additional case is considered for each of the two FHA scenarios described above (i.e., a FHA in the FHB and a FHA in Containment) when determining the dose to the control room operator; i.e., a case that reflects a delayed FHA at Fuel Offload or a FHA during Reload, occurring at a time when the fuel has decayed to such an extent that the radiation environment at the control room normal intake radiation monitors is just below the setpoint; thus the control room remains in normal operation mode and CRVS Mode 4 is not initiated.

The analyses determined that the dose consequences of a DBA FHA bound that associated with the delayed FHA for both the FHA in the FHB and the FHA in the containment.

The bounding atmospheric dispersion factors applicable to the radioactivity release points / control room receptors applicable to an FHA at either location, and at either unit, are provided in Table 15.5-47B. The χ/Q values presented in Table 15.5-47B take into consideration the various release points-receptors applicable to the FHA to identify the bounding χ/Q values applicable to a FHA at either unit and at either location, and reflect the allowable adjustments / reductions in the values as discussed in Section 2.3.5.2.2 and summarized in the notes of Tables 2.3-147 and 2.3-148.

The bounding control room dose following a FHA at either location and at either unit is presented in Table 15.5-47.

15.5.22.~~1.~~3 Conclusions

The analysis demonstrates that the acceptance criteria are met as follows:

~~(1) An individual located at any point on the boundary of the exclusion area for any two hour period following the onset of the postulated fission product release shall not receive a total radiation dose in excess of 0.063 Sv (6.3 rem) total effective dose equivalent (TEDE) as shown in Table 15.5-47.~~

(2) An individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), shall not receive a total radiation dose in excess of 0.063 Sv (6.3 rem) total effective dose equivalent (TEDE) as shown in Table 15.5-47.

(3) The dose to the control room operator under accident conditions shall not be in excess of 0.05 Sv (5 rem) total effective dose equivalent (TEDE) for the duration of the accident as shown in Table 15.5-47.

The analysis demonstrates that the acceptance criteria are met as follows:

(1) The radiation dose to an individual located at any point on the boundary of the exclusion area for any 2-hour period following the onset of the postulated fission product release is within 0.063 Sv (6.3 rem) TEDE as shown in Table 15.5-47.

(2) The radiation dose to an individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), is within 0.063 Sv (6.3 rem) TEDE as shown in Table 15.5-47.

(3) The radiation dose to an individual in the control room for the duration of the accident is within 0.05 Sv (5 rem) TEDE as shown in Table 15.5-47.

In accordance with current licensing basis, the TSC design has been evaluated for the LOCA. The dose consequences in the TSC due to airborne radioactivity releases from the FHA is bounded by the dose reported for the LOCA in Section 15.5.17. The atmospheric dispersion factors applicable to the TSC are presented in Table 15.5-83

15.5.22.2 Fuel Handling Accident Inside Containment

15.5.22.2.1 Acceptance Criteria

(1) The radiological consequences of a fuel handling accident inside containment shall not exceed the dose limits of 10 CFR 100.11 as outlined below:

i. An individual located at any point on the boundary of the exclusion area for the two hours immediately following the onset of the postulated fission product release shall not receive a total radiation dose to the whole body in excess of 6 rem or a total radiation dose in excess of 75 rem to the thyroid from iodine exposure.

pressure response analysis for a 2 inch SBLOCA shows that the 3 psig setpoint for Containment High Pressure is reached in 150 seconds after the SBLOCA. As indicated earlier, releases to the containment following a CREA are through a faulted control rod drive mechanism housing. The control rod shaft diameter is 1.840 inches and the RCCA housing penetration opening is 4 inches in diameter. Based on the above and for the purposes of conservatism, the time to generate the Containment High Pressure SIS following a CREA is assumed to be double the value applicable to the 2 inch SBLOCA, or 300 seconds.

Based on the above, following a CREA,

a. An SIS will be generated at t = 300 sec following a CREA.
b. The CRVS normal intake dampers of the accident unit start to close after a 28.2 second delay due to delays associated with diesel generator loading onto the 4kv buses. The control room dampers are fully closed 10 secs later, or at t=338.2 secs (i.e., 300 + 28.2 + 10). The 2 second SIS processing time occurs in parallel with diesel generator sequencing and is therefore not included as part of the delay.
c. In accordance with DCPP licensing basis, the CRVS normal operation dampers of the non-accident unit are not affected by the LOOP and are isolated at t=312 secs (i.e., 300 + 2 secs signal processing time + 10 sec damper closure time).

Control Room Atmospheric Dispersion Factors:

As noted in Section 2.3.5.2.2, because of the proximity of the MSSV/10% ADVs to the control room normal intake of the affected unit and because the releases from the MSSVs/10% ADVs have a vertically upward discharge, it is expected that the concentrations near the normal operation control room intake of the faulted unit (closest to the release point) will be insignificant. Therefore, prior to switchover to CRVS Mode 4 pressurization, only the unaffected unit's control room normal intake is assumed to be contaminated by a release from the MSSVs/10% ADVs.

The bounding atmospheric dispersion factors applicable to the radioactivity release points / control room receptors applicable to a CREA at either unit are provided in Table 15.5-52B. The χ/Q values presented in Table 15.5-52B take into consideration the various release points-receptors applicable to the CREA to identify the bounding χ/Q values applicable to a CREA at either unit, and reflect the allowable adjustments / reductions in the values as discussed in Chapter 2.3.5.2.2 and summarized in the notes of Tables 2.3-147 and 2.3-148.

The bounding control room dose following a CREA at either unit is presented in Table 15.5-52.

15.5.23.3 Conclusions

The analysis demonstrates that the acceptance criteria are met as follows:

(1) The radiation dose to an individual located at any point on the boundary of the exclusion area for any 2-hour period following the onset of the postulated fission product release is within 0.063 Sv (6.3 rem) TEDE as shown in Table 15.5-52.

(2) The radiation dose to an individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), is within 0.063 Sv (6.3 rem) TEDE as shown in Table 15.5-52.

The radiation dose to an individual in the control room for the duration of the accident is within 0.05 Sv (5 rem) TEDE as shown in Table 15.5-52 ~~comparing the activity releases following a rod ejection accident, given in Table 15.5-51, with the activity releases calculated for a LOCA, given in Tables 15.5-13 and 15.5-14, it can be concluded that any control room exposures following a rod ejection accident will be well below the GDC 19, 1971, criterion level.~~

~~Additionally, the analysis demonstrates that the acceptance criteria are met as follows:~~

~~(1) The radiation dose to the whole body and to the thyroid of an individual located at any point on the boundary of the exclusion area for the two hours immediately following the onset of the postulated fission product release are well below the dose limits of 10 CFR 100.11 as shown in Table 15.5-52.~~

~~(2) The radiation dose to the whole body and to the thyroid of an individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), are well below the dose limits of 10 CFR 100.11 as shown in Table 15.5-52.~~

~~(3) Since the activity releases from the rod ejection accident given in Table 15.5-51 are less than those from a LBLOCA (see Table 15.5-13 and 15.5-14), any control room dose which might occur would be well below the established criteria of GDC 19, 1971, and discussed in Section 15.5.17.~~

In accordance with current licensing basis, the TSC design has been evaluated for the LOCA. The dose consequences in the TSC due to airborne radioactivity releases from the CREA is bounded by the dose reported for the LOCA in Section 15.5.17. The atmospheric dispersion factors applicable to the TSC are presented in Table 15.5-83

15.5-23B LOSS OF COOLANT ACCIDENT Control Room Limiting Atmospheric Dispersion Factors (sec/m^3)					
Release Location / Receptor	0-2 hr	2-8 hr	8-24 hr	24-96 hr	96-720 hr
<u>Control Room Normal Intakes</u>					
Plant Vent Release					
- Affected Unit Intake	1.67E-03	-----	-----	-----	-----
- Non-Affected Unit Intake	9.08E-04	-----	-----	-----	-----
Containment Penetration Areas					
- Affected Unit Intake	6.60E-03	-----	-----	-----	-----
- Non-Affected Unit Intake	2.08E-03	-----	-----	-----	-----
<u>Control Room Infiltration</u>					
Plant Vent	1.25E-03	9.08E-04	3.61E-04	3.65E-04	3.17E-04
Containment Penetration Areas	3.09E-03	1.83E-03	7.22E-04	7.13E-04	6.50E-04
RWST Vent	1.05E-03	5.55E-04	2.12E-04	2.12E-04	1.72E-04
<u>Control Room Pressurization Intake</u>					
Plant Vent	5.55E-05	3.68E-05	1.36E-05	1.38E-05	1.11E-05
Containment Penetration Areas	6.00E-05	3.98E-05	1.63E-05	1.37E-05	1.10E-05
RWST Vent	4.75E-05	3.23E-05	1.25E-05	1.14E-05	8.73E-06

<u>Note 1</u>: Release from the Containment penetration areas (i.e., areas GE or GW & FW): applicable to containment leakage and ESF system leakage that occurs in the Containment Penetration Area

<u>Note 2</u>: Release from Plant Vent: applicable to ESF system leakage that occurs in the Auxiliary building, MEDT releases, RHR Pump Seal Failure Release and Containment Vacuum/Pressure Relief Line Release

<u>Note 3</u>: The selection of the χ/Q values for the release points/ receptors listed above are intended to provide bounding dose estimates for an event at either unit:

TABLE 15.5-83

NON-LOCA EVENTS

Technical Support Center Limiting Atmospheric Dispersion Factors (sec/m^3)

Receptor - Release Point	0-2hr	2-8 hr	8-10.73hr	10.73-30hr	
MSLB					
TSC NOP Intake - Faulted SG (Break Location)	9.00E-04	-----	-----	-----	
TSC NOP Intake - Intact SG (MSSVs/10% ADVs)	1.80E-04	-----	-----	-----	
TSC Inleakage - Faulted SG (Break Location)	1.01E-03	4.62E-04	1.93E-04	1.93E-04	
TSC Inleakage - Intact SG (MSSVs/10% ADVs)	2.02E-04	9.24E-05	9.24E-05	-----	
CR/TSC Pressurization Intake - Faulted SG (Break Location)	-----	4.70E-05	1.85E-05	1.85E-05	
CR/TSC Pressurization Intake - Intact SG (MSSVs/10% ADVs)	-----	9.40E-06	9.40E-06	-----	
SGTR / LRA / LOL / CREA (Secondary Side Release Scenario)					
TSC Center of Roof – MSSVs/10% ADVs	2.02E-04	9.24E-05	9.24E-05	-----	
FHA					
TSC Center of Roof - Equipment Hatch	7.44E-04	-----	-----	-----	
Receptor - Release Point	0-2hr	2-8 hr	8-24hr	1-4 days	4-30 days
CREA (Containment Release Scenario)					
TSC NOP Intake – Containment Leakage	1.71E-03	-----	-----	-----	-----
TSC Inleakage - Containment Leakage	1.76E-03	7.16E-04	3.01E-04	2.84E-04	2.28E-04
CR/TSC Pressurization Intake – Containment Leakage	-----	3.98E-05	1.63E-05	1.37E-05	1.10E-05

Note1: The selection of the χ/Q values for the release points/ receptors listed above are intended to provide bounding dose estimates for an event at either unit

- Except as noted below for the CREA Containment leakage release point to the CR/TSC Pressurization Intakes, the χ/Q values for U2 release points are bounding for all TSC receptors (i.e., the TSC NOP Intake, the TSC Center of Roof (also used for TSC Inleakage) and the CR/TSC Pressurization Intakes). Releases from the containment penetration areas are based on the Unit 2 GW/FW area release point.
- Releases from the containment penetration areas to the CR/TSC pressurization intakes are based on the Unit 2 GW/FW area releases to the Unit 1 CR/TSC intake for the 2-24 hrs time period, from the Unit 2 GE area releases to the Unit 1 CR/TSC intake for the 1-4 day time period and from the Unit 1 GW/FW area releases to the Unit 2 CR/TSC intake for the 4-30 day time period.

Note 2: The χ/Q values presented above for MSSVs / 10% ADVs reflect a factor of 5 reduction to address the high vertical velocity discharge for the first 10.73 hours of the accident

Note 3: The χ/Q values presented above for the CR/TSC pressurization intake reflect a factor of 4 reduction to address the availability of redundant safety related radiation monitors at each CR/TSC pressurization intake location, and the associated capability of initial selection of the less contaminated intake

Enclosure
Attachment 3
PG&E Letter DCL-16-101

ATTACHMENT 3

Data Disc