QA: QA

Civilian Radioactive Waste Management System
Management & Operating Contractor

Radiation Access Zone and Ventilation Confinement Zone Criteria for the MGR Surface Facilities

TDR-WHS-NU-000001

Revision 00

September 2000

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REVISION RECORD/HISTORY OF CHANGE PAGE

Revision	Description of Revision and Reason For Change(s)	Date
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CONTENTS

TABLES

ACRONYMS

ALARA	As-Low-As-is-Reasonably Achievable
ANSI	American National Standard Institute
ANS	American Nuclear Society
AP	Administrative Procedure
CBS	Carrier Preparation Building System
CPB	Carrier Preparation Building
CQ	Commercial Quality
CRWMS	Civilian Radioactive Waste Management System
DBE	design basis event
DC	disposal container
DOE	U.S. Department of Energy
ERDA	Energy Research and Development Administration
HBS	Waste Handling Building System Designation
HEPA	high-efficiency particulate air
hr	hour
HVAC	heating, ventilation, and air-conditioning
LLW	low-level waste
M&O	Management and Operating Contractor
MGR	Monitored Geologic Repository
mrem/hr	milli-rem per hour
QA	Quality Assurance
QAP	Quality Administrative Procedure
QARD	Quality Assurance Requirements and Description
QL	quality level
RAZ	Radiation Access Zone
rem	roentgen equivalent man
SDD	System Description Documents
Sv	Sievert
SWW	Standard Workweek

TBD	To Be Determined
TBV	To Be Verified
TEDE	Total Effective Dose Equivalent
TVS	Waste Treatment Building Ventilation System
μ	micro
VCZ	Ventilation Confinement Zone
WHB	Waste Handling Building
WPRC	Waste Package Remediation Cell
WTB	Waste Treatment Building

1. OBJECTIVE

The objectives of this technical report are to:

1. Establish the criteria for Radiation Access Zone (RAZ) designation.
2. Establish the criteria for the Ventilation Confinement Zone (VCZ) designation.

The scope will be to formulate the RAZ and VCZ zoning designation for the Monitored Geologic Repository (MGR) surface facilities and to apply the zoning designations to the current Waste Handling Building (WHB), Waste Treatment Building (WTB), and Carrier Preparation Building (CPB) configurations.

2. QUALITY ASSURANCE

The work presented in this document has been prepared in accordance with Office of Civilian Radioactive Waste Management approved program document AP-3.11Q, *Technical Reports,* and with the Development Plan for *Radiation Access Zone (RAZ) and Ventilation Confinement Zone Designation for the MGR Surface Facilities* (CRWMS M&O 2000b) developed under AP-2.13Q, *Technical Product Development Planning.*

An *Activity Evaluation for Waste Handling Systems and Facility Design,* (Work Packages 24012392M2 and 24012403M2) (CRWMS M&O 1998) has been performed in accordance with QAP-2-0, *Conduct of Activities,* and has determined that this report is subject to the requirements of the *Quality Assurance Requirements and Description* (QARD) (DOE 2000). In addition, review of the following classification of permanent items, which were prepared in accordance with QAP-2-3, *Classification of Permanent Items*, has been performed:

- *Classification of MGR Waste Handling Building System* (CRWMS M&O 1999a)
- *Classification of MGR Waste Handling Building Ventilation System* (CRWMS M&O 1999d)
- *Classification of the MGR Waste Treatment Building Ventilation System* (CRWMS M&O 1999b)
- *Classification of the MGR Carrier Preparation Building System* (CBS) (CRWMS M&O 1999c)

Table 2-1 presents the quality assurance (QA) classification assignments. Based on Table 2-1, items addressed in this report are to be considered "Q" items and, as specified in AP-3.11Q, *Technical Reports*, this report is subject to QA controls.

As required by AP-SV.1Q, *Control of the Electronic Management of Data*, the methods used to control the electronic management of data were accomplished in accordance with the controls specified in the development plan for this document.

Table 2-1. QA Classification Assignments

System	Structure, System, and Component	QA Classification
HBS – Confinement Ventilation System	Ventilation equipment, ductwork	Quality Level (QL)-2
HBS – Non-confinement Ventilation System	Ventilation equipment, ductwork	Commercial Quality (CQ)
HBS – WHB System	WHB Foundations and Structures	QL-1
CBS – CPB System	Carrier Preparation Building	CQ
TVS – Confinement Ventilation System	Ventilation equipment, ductwork	QL-2
TVS – Non-Confinement Ventilation System	Ventilation equipment, ductwork	CQ

Use of any data from this report for input into documents supporting procurement, fabrication, or construction is required to be controlled as to be verified (TBV) in accordance with AP-3.15Q, *Managing Technical Product Inputs*: "This document may be affected by technical product input information that requires confirmation. Any changes to the document that may occur, as a result of completing the confirmation activities will be reflected in subsequent revisions. The status of the input information quality may be confirmed by review of the Document Input Reference System database."

3. METHOD

3.1 RADIATION ACCESS ZONE METHODOLOGY

The following method will be used in establishing the criteria for RAZ designation for the MGR Surface Facilities:

1. Provide basis for defining radiation access zones.
2. Provide definitions for uncontrolled areas and controlled-access areas.
3. Describe Total Effective Dose Equivalent (TEDE).
4. Describe standard workweek (SWW).
5. Calculate the full-time-occupancy dose rate based on the TEDE and the SWW.
6. Establish RAZ criteria based on full-time-occupancy dose rate determined in the previous step.

3.2 CONTAMINATION CONFINEMENT SYSTEM METHODOLOGY

The following method will be used in establishing the criteria for contamination confinement systems for the MGR Surface Facilities:

1. Identify the functional areas that comprise the facility.
2. Evaluate the functional areas' occupancy, environmental requirements, and potential for contamination.

3. Configure a contamination confinement system comprised of physical barriers and ventilation system, which are based on occupancy, functions, and potential for contamination.
4. Perform hazard and safety analysis for normal operation, off-normal conditions and for project specified Design Basis Events (DBEs).

3.3 NON-CONFINEMENT SYSTEM METHODOLOGY

The following method will be used in establishing the criteria for ventilation of non-confinement systems for the MGR Surface Facilities:

1. Identify the functional areas that comprise the facility.
2. Establish the absence of contamination.

4. DESIGN INPUTS

4.1 DESIGN PARAMETERS

4.1.1 Data/Technical Input Parameters

Table 4-1 lists the data/technical input parameters used in this technical report.

Table 4-1. Data/Technical Input Parameters

No.	Parameter	Value	Source
1	SWW	40 hours/week = 5 days/week x 8 hours/day	See Assumption 4.3.1.2. Used in Section 6.1.
2	Work Weeks per Year	50	See Assumption 4.3.1.3. Used in Section 6.1.
3	TEDE	500 mrem per year	See Assumption 4.3.1.1. Used in Section 6.1.
4	Conversion factor: rem to sievert	100 rem = 1 sievert	DTN: MO9812SCCT5RAD.000. Used in Section 6.1.

4.2 CRITERIA

4.2.1 Radiation Access Zone Criteria

4.2.1.1 The system shall be designed in accordance with the Project's as low as is reasonably achievable (ALARA) program goals and the applicable guidelines in *Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will be As Low As Is Reasonably Achievable* (Regulatory Guide 8.8).

Basis: CRWMS M&O 2000c, Section 1.2.2.1.6
Used in Section 6.1.3.

4.2.2 Ventilation Confinement Zone Criteria

4.2.2.1 The WHB structure, systems, and components shall be designed to provide confinement of radioactive materials under normal operations, anticipated operational occurrences, and DBE conditions they are required to withstand.

Basis: CRWMS M&O 2000d, Section 2.1
Used in Section 6.2.4.1.

4.2.2.2 The entire facility shall be compartmentalized through physical barriers. These barriers and associated ventilation system make-up the confinement system.

Basis: ANSI/ANS-57.7-1988, Section 6.6
Used in Section 6.2.4.2.

4.2.2.3 The confinement zones classification and compartmentalization shall be based on consideration of the type, quantity, physical and chemical form, and packaging of the nuclear materials handled in the facility.

Basis: ANSI/ANS-57.7-1988, Section 6.6
Burchsted et al. 1979, Section 2.2.2
Used in Section 6.2.3.1.

4.2.2.4 The building layout shall be designed to control personnel access to areas of potential contamination.

Basis: ANSI/ANS-57.7-1988, Section 5.7.2 and 6.7.2.2
Used in Section 6.2.4.2 and 6.2.4.4.

4.2.2.5 A confinement zone classification shall be assigned to each area in the facility after confirmed by analysis. These confinement zones classification shall consider the potential for radioactive and hazardous airborne contaminants in the space during normal operation, off-normal conditions, and DBEs.

Basis: CRWMS M&O 2000d, Table 4
Used in Section 6.2.3.

4.2.2.6 There are numerous standards and regulatory documents addressing ventilation confinement zonings using various terminology. Table 4-2 was developed to correlate these documents based on engineering judgement and general characteristics of confinement.

Basis: *Waste Handling Building Ventilation System Description Document* (CRWMS M&O 2000d), ERDA 76-21 (Burchsted et al. 1979), ANSI/ANS-57.7, and ANSI/ANS-57.9 for confinement zoning classification.

Used in Table 4-2, Table 6-2, and Table 7-2.

Table 4-2. Confinement Zoning Classification

Contamination Characteristics	WHB Ventilation SDD[1]	ERDA 76-21	ANS 57.7 & 57.9[2]
Normally Contaminated	Primary Confinement	Zone I	Unit/Process Subsystem
High Potential	Secondary Confinement	Zone II	Unit/Process Subsystem
Low Potential, Normally Clean	Tertiary Confinement	Zone III	Main Building Subsystem
No Potential/Clean	Non-Confinement	Zone IV	Personnel Building Subsystem

[1] Project standard.
[2]The ventilation subsystem is based on the level of potential for airborne contamination.

4.3 ASSUMPTIONS

4.3.1 Radiation Access Zone Assumptions

4.3.1.1 It is assumed that areas of the MGR Surface Facilities, which are full time occupied, will be designed to a dose rate of 0.25 mrem/hr or 500 mrem per year.

Basis: Shielding design dose rate.
Used in Table 4-1, and Section 6.1.3.

4.3.1.2 It is assumed that an operator is occupationally exposed to radiation 8 hours per day, 5 days per week, or 40 hours per week.

Basis: Normal or standard workweek from Bechtel Nevada Corporation 1997, Article 18. Used in Table 4-1, and Sections 6.1.4, 6.1.5.

4.3.1.3 It is assumed that WHB operations are based on a 50-week annual work schedule.

Basis: Normal conduct of operations and operating philosophy in U.S. Department of Energy (DOE) nuclear facilities in order to schedule maintenance intervals for major equipment items and operations.

Used in Table 4-1 and Sections 6.1.4, 6.1.5.

4.3.2 Ventilation Confinement Zone Assumptions

4.3.2.1 No major assumption was used in this report that will affect its result or conclusion. However, this assumption will be revised and developed as design work progresses.

5. USE OF COMPUTER SOFTWARE

Software used in the development of this report was limited to standard commercial software (Excel and Microsoft Word) provided by the Yucca Mountain Project and loaded on standard workstation computers. As standard office automation software, this software is exempt from qualification under the requirements of AP-SI.1Q, *Software Management*. No macros or software routines were used or developed to perform this work.

6. DESIGN ANALYSIS

6.1 RADIATION ACCESS ZONE DESIGNATION ANALYSIS

The method used in establishing the criteria for RAZ designation for the MGR Surface Facilities is listed in Section 3.1.

6.1.1 Provide Basis for Defining Radiation Access Zones

Building layout is an important factor in controlling personnel exposure by regulating the flow of personnel and material. Proper layout can eliminate casual or transient exposure to radiation fields by segregating heavily used corridors and normally occupied workstations from the areas of high radiation and contamination exposure. The layout should effectively limit occupational

dose to areas where the performance of an assigned task requires some degree of radiation exposure (Munson et al. 1988, Section 5.1.3, page 5.5).

6.1.2 Provide Definitions for Uncontrolled Areas and Controlled-Access Areas

Two major types of areas are included in any nuclear facility: uncontrolled areas and controlled-access areas. Uncontrolled areas are normally places that public access is restricted but where direct radiation exposure is not necessary for job performance (Munson et al. 1988, page 5.5). Controlled-access areas are normally those areas controlled for purposes of radiation protection (Munson et al. 1988, page 5.6).

The two types of controlled access areas are contingent areas and radiation access areas. Contingent areas are corridors that are adjacent to, or connect with, areas that contain radioactive materials, change rooms, emergency decontamination facilities, or special offices for radiation workers. Contingent areas should contain offices only to the extent that such space is essential to support radiological work, steps should be taken to preclude unnecessary occupancy. Direct radiation doses in contingent areas should result only from the intermittent transfer of radioactive materials (Munson et al. 1988, page 5.6).

Radiation access areas, the second type of controlled access area, are areas in which direct exposure to radiation can occur. There are generally four types of radiation areas:

1. General operation (i.e., operating corridors) and laboratory (i.e., health physics offices)
2. Process operation (i.e., cask inspection/cask preparation)
3. Remote operation (i.e., operating corridors adjacent to hot cells)
4. No personnel access (i.e., high/very high radiation areas)

No personnel access areas include areas with high dose rates such as the Assembly Handling Cell(s), Disposal Container (DC) Load Cell(s), DC Decontamination Cell(s), DC Handling Cell, Loaded DC Staging Cell, DC Transporter Loading Cell, and Canister Transfer Cell. Unauthorized and unmonitored entry is forbidden in these areas with high radioactive material present and the design features shall prevent the unauthorized entry of personnel (Munson et al. 1988). Physical controls are required to limit doses when these areas are occupied. These physical controls can consist of:

1. Removing the high radiation sources from the area.
2. Verifying warning lights and alarms to high radiation areas are operational.
3. Interlocks on doors are operational.
4. Providing remote surveillance of No Personnel Access areas.
5. Requiring Special Work Permits for entry into No Personnel Access areas.

6.1.3 Describe Total Effective Dose Equivalent

The system shall be designed in accordance with the Project's ALARA program goals and the applicable guidelines in *Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will be As Low As Is Reasonably Achievable* (Regulatory Guide 8.8). (Criteria 4.2.1.1)

Based on Assumption 4.3.1.1, it is assumed that areas of the MGR Surface Facilities, which are occupied full time, will be designed to a dose rate of 0.25 mrem/hr. This is equivalent to the shielding design dose rate.

6.1.4 Describe Standard Workweek

The SWW is based on the following:

- Assumption 4.3.1.2 states that a SWW is 40 hours/week = 5 days/week, 8 hours/day.
- Assumption 4.3.1.3 states that WHB operations are based on a 50-week annual work schedule.

6.1.5 Calculation

The full-time-occupancy dose rate, assuming that an operator is occupationally exposed to radiation 40 hours week (Assumption 4.3.1.2) for 50 weeks per year (Assumption 4.3.1.3), is:

$$500 \frac{mrem}{yr} \times \frac{1}{50} \frac{yr}{weeks} \times \frac{1}{40} \frac{weeks}{hr} = 0.25 \frac{mrem}{hr}$$

Based on the above exposure rate, the RAZ categories proposed for the MGR Surface Facilities are shown in Table 6-1. The first column of Table 6-1 lists the RAZ Category. The second column of Table 6-1 lists the exposure rate in mrem per hour for each applicable RAZ. The third column of Table 6-1, lists the access time allowed or occupancy time that an operator could be in the RAZ and not exceed the design dose rate limit of 500 mrem per year.

Table 6-1. Proposed RAZ Category with Access Time

RAZ	Dose Rate (μSv per hour)[1]	Dose Rate (mrem per hour)	Access Time Allowed Hours per Year[2]
Uncontrolled Area			
Zone 0	0.5	0.05	>2000
Controlled Area			
Zone 1	<2.5	<0.25	2000 to 500
Zone 2	>=2.5 to <20	>=0.25 to <2.0	500 to 250
Zone 3	>=20 to <100	>=2.0 to <10.0	250 to 50
Zone 4	>=100 to <500	>=10.0 to <50.0	50 to 10
Zone 5	>=500	>=50.0	<10

RAZ	Dose Rate (μSv per hour)[1]	Dose Rate (mrem per hour)	Access Time Allowed Hours per Year[2]
[1]Conversion: ((mrem/hr)/(1000 mrem/rem)/(100 rem/Sv))*1x10^6 μSv/Sv = μSv/hr (MO9812SCCT5RAD.000) [2]Total Hours per Year based on the Dose Rate from Column 3.			

The following discussion supports the RAZ categories listed in Table 6-1.

The Hanford Site Radiological Control Manual, HSRCM-1, December 9, 1994, Section 7.4 (Keen et al. 1994) establishes the following relationship that will be employed as the final design criteria for a new facility:

$$(H_{xi} \times R_i)/N_x <= 500 \text{ mrem (5mSv) per year}$$

Where the summation is over the i-th different category zones that are established throughout the new facility, H_{xi} is the total number of hours per year that all persons in craft or skill group x will spend in the i-th radiation zone whose design intensity is R_i mrem per hour and N_x is the number of members in the operating and maintenance crew who belong to craft or skill group x.

The equation above can be applied during preliminary design of the facility as soon as the size of the operating and maintenance crew is established. This technique will reveal any gross imbalances in dosage received by different groups that might otherwise be overlooked. These imbalances are expected to occur only if any unusually high demand for radiation work is indicated for a particular craft or skill group.

The RAZ categories shown in Table 6-1 are the same as in Keen et al. 1994, which shows the shield design criteria based on the zone category, access time allowed, and the maximum exposure rate (uSv per hour).

6.2 VENTILATION CONFINEMENT ZONE ANALYSIS

6.2.1 Purpose

The purpose of this section is to establish the criteria for the VCZ designation of the confinement system for the MGR Surface Facilities. This document will provide guidance for determining the VCZ classification for the MGR Surface Facilities in the absence of a safety and hazard analysis.

6.2.2 Requirements

The requirements or criteria for the VCZ are listed in Section 4.2.2.

6.2.3 Methodology

6.2.3.1 The basic process for classifying the VCZ of an area is to identify the function of the area, establish the potential for contamination by safety and hazard analysis, and identify the VCZ from Table 7-2.

6.2.3.2 In the absence of quantitative calculations of radioactive contaminants for safety and hazard evaluation, the preliminary VCZ will be based on past experience on similar applications, and engineering judgement of qualitative potential for radioactive contaminants in the facility during normal operations.

6.2.3.3 A safety and hazard analysis report for normal operation, off-normal conditions and DBEs will be done to confirm and finalize the confinement zoning classification for the examples shown in Table 6-2.

6.2.4 Analysis

6.2.4.1 The MGR Surface Facilities are nonreactor nuclear facilities and their operation involves handling, packaging, and remediation of spent nuclear fuel and high level waste contained in various forms of appropriate canisters and casks prior to storage and disposal. Some of the operations in the facility will involve handling bare fuel. A possible breach of the containers can also occur during handling in case of a DBE. A confinement capability will be designed into the facility to control the spread of airborne radioactive contaminants.

6.2.4.2 The WHB, WTB, and CPB are provided with physical barriers appropriate to its ventilation confinement classification and are provided with proper airlocks and accesses to minimize spread of airborne radioactive contamination.

6.2.4.3 The qualitative analysis of each area will be derived from the functional description of various areas through their associated System Description Documents (SDDs). The SDDs will provide an understanding on the handling of nuclear materials in order to arrive to a sound engineering judgement on the potential for radioactive contamination.

6.2.4.4 All other areas not described in the SDDs that provide functional support to the main areas will also be analyzed for potential of airborne radioactive contamination. Their adjacency as well as type of access to areas with potential of airborne radioactive contamination will be taken into consideration.

6.2.4.5 As the design maturity progresses, a safety and hazard analysis report will be done to reevaluate and finalize the confinement zoning classification for off-normal conditions and DBEs.

6.2.5 Applicability

The assignment of VCZ classification in Attachment I will be based on Table 7-2, as reproduced here, and examples and rationale as shown in Table 6-2 below.

Table 6-2. VCZ Definition/Examples/Rationale

Confinement Zone Classification	Definition	Functional Areas	Rationale
Primary Confinement	Areas where radioactive materials or contamination is present during normal operations.	Assembly Handling Cell Waste Package Remediation Cell (WPRC)	. Bare fuel transferred in Assembly Handling Cell. . Waste package opened (remediated) in WPRC.
Secondary Confinement	Areas where contamination levels are potentially high, or become contaminated from an abnormal event.	DC Load Cell DC Handling Cell Canister Handling Cell Canister Transfer Cell DC Decontamination Cells	. Sources contained inside DC that is not yet sealed and therefore subject to abnormal event that could expose bare fuel. . Possible drop causing breach of a canister.
Tertiary Confinement	Areas where potential for contamination is very low.	Cask Preparation Pool Area Operating Gallery Hot Support Areas WTB Process Area	. Fuel inside cask. Cask being prepared (lid unbolting, cool-down, etc.) for insertion into transfer area. . Water in the pool provides the confinement barrier for fuel assemblies. . Possible breach of physical barrier through utility penetrations. . Material handled and processed is low level waste.
Non-confinement	Areas with no potential for contamination.	Carrier Bay; CPB Cold Support Areas Offices	. Fuel inside sealed cask. . Areas administratively isolated from the confinement areas and never expected to be contaminated.

6.3 ZONE CRITERIA APPLICATION

Attachment I shows the application of the RAZ Criteria as determined in Section 6.1, and the VCZ Criteria as determined in Section 6.2.

7. CONCLUSIONS

The first objective of this technical report was to establish the criteria for RAZ design. For the MGR Surface Facility design, the RAZ criteria are shown in Table 7-1.

Table 7-1. RAZ Criteria

RAZ	Dose Rate (μSv per hour)[1]	Dose Rate (mrem per hour)	Access Time Allowed Hours per Year[2]
Uncontrolled Area			
Zone 0	0.5	0.05	>2000
Controlled Area			
Zone 1	<2.5	<0.25	2000 to 500
Zone 2	>=2.5 to <20	>=0.25 to <2.0	500 to 250
Zone 3	>=20 to <100	>=2.0 to <10.0	250 to 50
Zone 4	>=100 to <500	>=10.0 to <50.0	50 to 10
Zone 5	>=500	>=50.0	<10

[1]Conversion: ((mrem/hr)/(1000 mrem/rem)/(100 rem/Sv))*1x10^6 μSv/Sv = μSv/hr (MO9812SCCT5RAD.000)
[2]Total Hours per Year based on the Dose Rate from Column 3.

During the MGR design, these RAZ designations along with the anticipated exposure duration should ensure that radiation exposure to operating personnel are ALARA and less than 500 mrem per year.

The second objective of this technical report was to establish the criteria for VCZ design. For the MGR Surface Facility design, the VCZ criteria are shown in Table 7-2.

Use of any data from this report for input into documents supporting procurement, fabrication, or construction is required to be controlled as TBV in accordance with AP-3.15Q, *Managing Technical Product Inputs*: "This document may be affected by technical product input information that requires confirmation. Any changes to the document that may occur, as a result of completing the confirmation activities will be reflected in subsequent revisions. The status of the input information quality may be confirmed by review of the Document Input Reference System database."

Table 7-2. VCZ Criteria

Confinement Zone Classification	Contamination Characteristic	Definition
Primary	Normally Contaminated	Areas where radioactive materials or contamination is present during normal operation
Secondary	High Potential	Areas where contamination levels are potentially high or could become contaminated from abnormal event
Tertiary	Low Potential, Normally Clean	Areas where potential for contamination is very low
Non-confinement	No Potential, Clean	Areas where there is no potential for contamination

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8.3 SOURCE DATA, LISTED BY DATA TRACKING NUMBER

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ATTACHMENT I

APPLICATION OF ZONING CRITERIA

CONTENTS

Page

TABLES

Page

1. PURPOSE

The purpose of this attachment is to show the application for the RAZ Criteria established in Section 6.1 of the main document and the VCZ criteria established in Section 6.2 of the main document. Column 1 of Table I-1 contains the room number designation (CRWMS M&O 2000a, Figure 1 – Figure 8).

Note: Many rooms in Table I-1 indicate multiple RAZ. This is due to the fact that radiation sources (i.e., cask, and filters) may be present in the room, therefore decreasing the allowable access time.

Column 2 of Table I-1 contains the description of the room listed in column 1 of Table I-1 (CRWMS M&O 2000a, Figure 1). The next six columns of Table I-1 are the RAZ designations for the WHB/WTB, based on the RAZ criteria established in Section 6.1 of the main document. The next four columns of Table I-1 contain the VCZ designations for the WHB/WTB, based on the VCZ criteria established in Section 6.2 of the main document.

Table I-1. MGR Surface Facilities Radiation Access and Ventilation Confinement Zones

Room #	Description	Radiation Access Zone						Ventilation Confinement Zone			
		0	1	2	3	4	5	P	S	T	N
H-010	Regulated Change Room	X									X
H-011	Radiation Protection Portal	X									X
H-012	Personnel Decontamination Room	X									X
H-013	Personnel Radiation Protection Equipment Storage	X									X
H-014	Health Physics Office	X									X
H-015A	Protective Clothing/Storage	X									X
H-015B	Protective Clothing/Storage	X									X
H-016A	Change Room	X									X
H-016B	Change Room	X									X
H-017A	Coverall Storage	X									X
H-017B	Coverall Storage	X									X
H-018A	Supervisor Office	X									X
H-018B	Supervisor Office	X									X
H-019	Equipment Maintenance Room	X									X
H-019b	Instrument Maintenance Shop	X									X
H-020	Pool Treatment Equipment Room		X	X					X		
H-040	Vacuum Pump Room		X	X						X	
H-050	Corridor Basement		X							X	
H-051	Corridor Basement		X							X	
H-052	Corridor Basement		X							X	
H-053	Corridor Basement		X							X	
H-054	Corridor Basement		X							X	

Room #	Description	Radiation Access Zone						Ventilation Confinement Zone			
		0	1	2	3	4	5	P	S	T	N
H-075	Pipe Chase		X	X					X		
H-083	Pool Treatment Equipment Room		X						X		
H-084A	Heat Exchanger Room		X	X					X		
H-084B	Heat Exchanger Room		X	X					X		
H-085	Corridor		X							X	
H-086	Vestibule		X							X	
H-100A	Carrier Bay		X	X	X	X					X
H-100B	Cask Transfer Corridor		X	X	X	X					X
H-100C	Access Corridor		X	X	X	X					X
H-100D	Vestibule		X								X
H-100E	Vestibule		X								X
H-100F	Vestibule		X								X
H-101A	Cask Airlock		X	X	X	X					X
H-101B	Cask Airlock		X	X	X	X					X
H-101D	Airlock		X	X	X	X					X
H-101E	Airlock		X	X	X	X					X
H-101F	Airlock		X	X	X	X					X
H-101G	Airlock		X	X	X	X					X
H-101H	Airlock		X	X	X	X					X
H-101J	Airlock		X	X	X	X					X
H-102A	Cask Preparation/Decontamination (A)				X	X				X	
H-102A2	Cask Preparation/Decontamination (A)				X	X				X	
H-102B	Cask Preparation/Decontamination (B)				X	X				X	
H-102B2	Cask Preparation/Decontamination (C)				X	X				X	
H-103A	Pool Area w/160 Ton Crane		X	X						X	
H-103A1	Pools, Staging and Cask Unload (water)						X				
H-103B	Pool Area w/160 Ton Crane		X	X						X	
H-103B1	Pools, Staging and Cask Unload (water)					X	X				
H-103C	Canister Transfer Cell, Lower Room			X	X	X	X		X		
H-103D	Canister Storage						X		X		
H-104A	Incline Transfer (water)						X				
H-104B	Incline Transfer (water)						X				
H-104C	Off-normal Canister Transfer Tunnel						X		X		
H-105A	DC Load			X	X	X	X		X		
H-105B	DC Load			X	X	X	X		X		
H-106A	DC Decontamination				X	X	X		X		
H-106B	DC Decontamination				X	X	X		X		

Room #	Description	Radiation Access Zone						Ventilation Confinement Zone			
		0	1	2	3	4	5	P	S	T	N
H-107A	Airlock (Canister Transfer System)			X	X						X
H-108A	Cask Preparation and Decontamination			X	X					X	
H-110	DC Handling Cell w/85 Ton Crane			X	X	X	X		X		
H-111	DC Transporter Loading Cell			X	X	X	X			X	
H-112	DC Transporter Airlock			X	X	X	X				X
H-113	Loaded DC Staging			X	X	X	X		X		
H-114	WP Remediation & Decontamination Cell		X	X	X	X	X	X			
H-115	Airlock			X	X						X
H-116	Contaminated Equipment/Staging Room			X	X					X	
H-116A	Corridor		X								X
H-117	Empty DC Preparation		X								X
H-118A	Operating Galleries		X							X	
H-118B	Operating Galleries		X							X	
H-118C	Operating Galleries		X							X	
H-118E	Operating Galleries		X							X	
H-118F	Operating Galleries		X							X	
H-118G	Operating Galleries		X							X	
H-118H	Operating Galleries		X							X	
H-M118B	Utility Corridor (Between Op Gal Levels)		X							X	
H-M118C	Utility Corridor (Between Op Gal Levels)		X							X	
H-119	Waste Handling Operations Center	X									X
H-120	Contaminated Equipment Decontamination Room		X							X	
H-120A	Staging (Hot Support)		X								X
H-120B	Corridor	X									X
H-121	Shipping and Receiving Welder	X									X
H-122	Maintenance Equipment Storage	X									X
H-123	Tool Storage	X									X
H-124	Maintenance Shop			X							X
H-125	Low-level Waste (LLW) Collection and Packaging	X									X
H-126	Forklift Staging and Servicing	X									X
H-127	Access Corridor	X								X	
H-128	Access Corridor	X								X	
H-129	Calibration Shop	X									X
H-130A	Security Portal	X									X
H-130B	Security Portal	X									X
H-131	Security Alarm Station	X									X
H-132A	Offices	X									X
H-132B	Offices	X									X

Room #	Description	Radiation Access Zone						Ventilation Confinement Zone			
		0	1	2	3	4	5	P	S	T	N
H-133A	Health Physics Laboratories	X									X
H-133B	Health Physics Laboratories	X									X
H-134A	Laboratory Technician Offices	X									X
H-134B	Laboratory Technician Offices	X									X
H-134C	Laboratory Technician Offices	X									X
H-134D	Laboratory Technician Offices	X									X
H-135	Laboratory Material Storage	X									X
H-136	First Aid Room/Office	X									X
H-137	Operations Lunchroom	X									X
H-138	Janitor Closet	X									X
H-139	Entry Lobby	X									X
H-140A	Supervisor Office	X									X
H-140B	Supervisor Office	X									X
H-141	Plant Operations Manager Office	X									X
H-142A	QA/Quality Control Operations Office	X									X
H-142B	QA/Quality Control Operations Office	X									X
H-143A	Operations Staff Offices	X									X
H-143B	Operations Staff Offices	X									X
H-143C	Operations Staff Offices	X									X
H-143D	Operations Staff Offices	X									X
H-144	Staff Support-Open Offices	X									X
H-145A	Secretarial Offices	X									X
H-145B	Secretarial Offices	X									X
H-146A	DOE Manager Office	X									X
H-146B	DOE Manager Office	X									X
H-147A	DOE Staff Offices	X									X
H-147B	DOE Staff Offices	X									X
H-147C	DOE Staff Offices	X									X
H-147D	DOE Staff Offices	X									X
H-148	DOE Staff Support – Secretarial	X									X
H-149	DOE Staff Support – Clerical	X									X
H-150	Conference Room	X									X
H-151	Document Room	X									X
H-152	Copy Room	X									X
H-153	Storage Room	X									X
H-154A	Rest-rooms, Women	X									X
H-154B	Rest-rooms, Men	X									X
H-155	Lunchroom	X									X
H-156	Janitor Closet	X									X
H-157	Cold Support Area Heating, Ventilation, and Air-conditioning (HVAC)	X									X

Room #	Description	Radiation Access Zone						Ventilation Confinement Zone			
		0	1	2	3	4	5	P	S	T	N
H-159	Tool Storage	X									X
H-160	Maintenance Material Storage	X									X
H-161A	HEPA (high-efficiency particulate air) Filter Storage	X									X
H-161B	HEPA Filter Storage	X									X
H-162	Janitor Closet	X									X
H-163	Shipping/Receiving	X									X
H-164	Waste Staging	X									X
H-165	Gas Bottle Storage	X									X
H-167A	Fire Riser	X									X
H-167B	Fire Riser	X									X
H-167C	Fire Riser	X									X
H-167D	Fire Riser	X									X
H-167E	Fire Riser	X									X
H-167F	Fire Riser	X									X
H-167G	Fire Riser	X									X
H-168	Electrical Distribution	X									X
H-169A	Emergency Generators	X									X
H-169B	Emergency Generators	X									X
H-170	Communication Room	X									X
H-171	Tertiary Confinement Exhaust		X	X						X	
H-171A	Electrical Distribution HVAC Room	X									X
H-171B	Stack Monitor Equipment Room		X								X
H-171C	Stack Monitor Equipment Room		X								X
H-172A	Safety Electrical Equipment Room	X									X
H-172B	Safety Electrical Equipment Room	X									X
AREA	Hot Support		X	X							X
H-180	Void Space		X								X
H-181	Access Corridor	X									X
H-182	Access Corridor	X									X
H-183	Fuel Storage Pool Area		X							X	
H-183A	Pool Storage (water)						X		X		
H-183B	Pool Storage (water)						X		X		
H-183C	Pool Storage (water)						X		X		
H-183D	Pool Storage (water)						X		X		
H-183E	Non-Standard Pool (water)						X		X		
H-183F	Pool Transfer Tunnel (water)						X		X		
H-183G	Pool Transfer Tunnel (water)						X		X		
H-183H	Non-Standard Assembly Pool Tunnel (water)		X						X		
H-183J	Non-Standard Fuel Handling Room		X							X	
H-183K	Vestibule		X								X
H-192	Corridors & Hallways		X								X

Room #	Description	Radiation Access Zone						Ventilation Confinement Zone			
		0	1	2	3	4	5	P	S	T	N
H-193	Hot Support		X	X							X
H-200	Tertiary Confinement Supply		X								X
H-201	Tertiary Confinement Recirculating		X	X						X	
H-203	Welder Maintenance Bay w/15 Ton Crane		X	X							X
H-204	Hydronic Equipment		X	X							X
H-205A	Assembly Handling Cell			X	X	X	X	X			
H-205B	Assembly Handling Cell			X	X	X	X	X			
H-205C1	Off-Normal Canister Handling Cell					X	X		X		
H-205C	Canister Transfer Cell w/65 Ton Crane					X	X		X		
H-206A	Assembly Handling Cell Crane Maintenance Bay				X	X			X		
H-206B	Assembly Handling Cell Crane Maintenance Bay				X	X			X		
H-207A	Operating Galleries		X							X	
H-207B	Operating Galleries		X							X	
H-207C	Operating Galleries		X							X	
H-207D	Operating Galleries		X							X	
H-207F	Operating Galleries		X							X	
H-207G	Operating Galleries		X							X	
H-207H	Operating Galleries		X							X	
H-207I	Operating Galleries		X							X	
H-207J	Operating Galleries		X							X	
H-208A	Welder Airlock			X	X	X				X	
H-208B	Welder Airlock			X	X	X				X	
H-208C	Welder Airlock			X	X	X				X	
H-208D	Welder Airlock			X	X	X				X	
H-208E	Welder Airlock			X	X	X				X	
H-208F	Welder Airlock			X	X	X				X	
H-208G	Welder Airlock			X	X	X				X	
H-208H	Welder Airlock			X	X	X				X	
H-209A	Canister Transfer Cell Crane Maintenance Bay			X	X					X	
H-211	Welder Material Storage		X								X
H-213	Welder Maintenance Hot Shop		X	X						X	
H-217	Airlock		X								X
H-218	Access Corridor		X								X
H-219	Access Corridor		X								X
H-220	Airlock		X								X
H-221	Access Corridor		X								X
H-223	Vestibule		X								X
H-224	Access Corridor		X								X

Room #	Description	Radiation Access Zone						Ventilation Confinement Zone			
		0	1	2	3	4	5	P	S	T	N
H-225	Access Corridor		X								X
H-226	Access Corridor		X								X
H-227	Access Corridor		X								X
H-228	Vestibule		X								X
H-267C	Fire Riser	X									X
H-267D	Fire Riser	X									X
H-267E	Fire Riser	X									X
H-267F	Fire Riser	X									X
H-293	Corridor (1st Floor, Cold Support)		X								X
H-294	Corridor (1st Floor, Cold Support)		X								X
H-295	Corridor (1st Floor, Cold Support)		X								X
H-296	Corridor (1st Floor, Cold Support)		X								X
H-300	Primary/Secondary Confinement Supply		X								X
H-301	DC Handling Cell Crane Maintenance Bay		X	X	X				X		
H-301A	Crane Maintenance Bay		X	X	X					X	
H-301B	Crane Maintenance Bay		X	X	X					X	
H-302	Regulated Change Room		X								X
H-303	Airlock		X								X
H-304	Vestibule		X								X
H-305	Regulated Change Room		X								X
H-306	Access Corridor		X								X
H-307	Airlock		X								X
H-308A	Emergency Confinement Supply Room		X								X
H-308B	Emergency Confinement Supply		X								X
H-309	Access Corridor		X								X
H-310	Vestibule		X								X
H-312	Vestibule		X								X
H-313	Vestibule		X								X
H-314	Corridor		X								X
H-315	Corridor		X								X
H-316	Corridor		X								X
H-317	Vestibule		X								X
H-367G	Fire Riser	X									X
H-383A	Pool Building Tertiary Confinement Supply		X								X
H-383B	Pool Building Tertiary Confinement Exhaust		X							X	
H-400	Primary Secondary Confinement Exhaust		X	X						X	
H-400A	Primary Normal Exhaust Room		X	X						X	
H-400B	Emergency Confinement Exhaust		X	X						X	
H-400C	Emergency Confinement Exhaust		X	X						X	

Room #	Description	Radiation Access Zone						Ventilation Confinement Zone			
		0	1	2	3	4	5	P	S	T	N
H-400E											
H-401A	Access Corridor		X							X	
H-401B	Access Corridor		X							X	
H-401C	Access Corridor		X							X	
H-401D	Access Corridor		X								X
H-401E	Corridor		X							X	
H-401F	Corridor		X							X	
H-402	Assembly and Canister Transfer System w/50 Ton Crane		X	X	X					X	
H-403	DC Handling and WPRC Transfer System w/50 Ton Crane		X							X	
H-404	Airlock		X								X
H-405	Regulated Change Room		X								X
H-406	Airlock		X								X
H-407	Airlock		X								X
H-501	Stairways		X								X
H-502	Stairways		X								X
H-503	Stairways		X								X
H-504	Stairways		X								X
H-505	Stairways		X								X
H-506	Stairways		X								X
H-507	Stairways		X								X
H-508	Stairways		X								X
H-509	Stairways		X								X
H-510	Stairways		X								X
H-511	Elevators		X								X
H-512	Elevators		X								X
H-513	Elevators		X								X
H-514	Stairways		X								X
H-515	Elevators		X								X
H-516	Elevators		X								X
H-517	Elevators		X								X
	Waste Treatment Building										
T-101	Solid LLW Processing		X	X	X					X	
T-102	Chemical Liquid LLW Processing			X	X					X	
T-103	Recyclable Liquid LLW Processing			X	X					X	
T-104	Mixed and Hazardous Waste Staging		X							X	
	Facility Support Area										
	Security										
T-105	Security Portal		X								X
T-106	Security Portal		X								X
T-107	Office		X								X
	Operations										

Room #	Description	Radiation Access Zone						Ventilation Confinement Zone			
		0	1	2	3	4	5	P	S	T	N
T-108	Parts Storage		X								X
T-109	Men's Change Room	X									X
T-110	Women's Change Room	X									X
T-111	Coverall Storage Room	X									X
T-112	Lunchroom	X									X
T-113	(A, B) Janitor Closet	X									X
T-114	Forklift Staging		X								X
T-115	Shipping/Receiving		X								X
	Administration										
T-116	Office	X									X
T-117	Supervisor Office	X									X
T-118	Supervisor Office	X									X
T-119	Plant Manager Office	X									X
T-120	Plant Management Office	X									X
T-121	Staff Support – Open Office	X									X
T-122	Health Physics Office	X									X
T-123	QA Office	X									X
T-124	Inventory Control Office	X									X
T-125	Copy/Storage Room	X									X
T-126	Instrument Calibration	X									X
T-127	Fire Riser	X									X
T-128	Communication Room	X									X
T-129	Forklift Corridor		X								X
T-200	Facility Support Area HVAC Room		X								X
T-201	Process Area HVAC Supply		X								X
T-202	Process Area HVAC Exhaust		X							X	
T-203	Electrical Power Distribution	X									X
T-204	Electrical Switchgear	X									X