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**OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
ANALYSIS/MODEL COVER SHEET**

1. OA: L
Page: 1 of: 9

Complete Only Applicable Items

2. <input checked="" type="checkbox"/> Analysis <input checked="" type="checkbox"/> Engineering <input type="checkbox"/> Performance Assessment <input type="checkbox"/> Scientific	3. <input type="checkbox"/> Model <input type="checkbox"/> Conceptual Model Documentation <input type="checkbox"/> Model Documentation <input type="checkbox"/> Model Validation Documentation
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Classification of the MGR Performance Confirmation Data Acquisition/Monitoring System

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ANL-PCA-SE-000001 REV 00

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12. Remarks:
This analysis contains To Be Verified (TBV) design input as follows: TBV-228.

The DI for this document was previously BCB000000-01717-0200-00040 REV 00.

This analysis bases the classification of Monitored Geologic Repository structures, systems and components on the criteria of proposed rule 10 CFR 63 (64 FR 8640). A review has determined that the changes made to proposed rule 10 CFR 63 by Interim Guidance Pending Issuance of New U. S. Nuclear Regulatory Commission (NRC) Regulations for Yucca Mountain, Nevada (Dyer 1999) do not impact the classifications made in this analysis.

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OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
ANALYSIS/MODEL REVISION RECORD

1. Page: 2 of: 9

Complete Only Applicable Items

2. Analysis or Model Title:
Classification of the MGR Performance Confirmation Data Acquisition/Monitoring System

3. Document Identifier (including Rev. No. and Change No., if applicable):

ANL-PCA-SE-000001 REV 00

4. Revision/Change No.	5. Description of Revision/Change
00	Initial issue. This system-specific analysis was performed to supercede the applicable portions of B00000000-01717-0200-00134 REV 01 (CRWMS M&O 1998c).

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1. PURPOSE

The purpose of this analysis is to document the Quality Assurance (QA) classification of the Monitored Geologic Repository (MGR) performance confirmation data acquisition/monitoring system structures, systems and components (SSCs) performed by the MGR Safety Assurance Department. This analysis also provides the basis for revision of YMP/90-55Q, *Q-List* (YMP 1998). The Q-List identifies those MGR SSCs subject to the requirements of DOE/RW-0333P, *Quality Assurance Requirements and Description* (QARD) (DOE 1998). Acronyms used in this analysis are defined in Attachment I.

This QA classification incorporates the current MGR design and the results of the *Preliminary Preclosure Design Basis Event Calculations for the Monitored Geologic Repository* (CRWMS M&O 1998a).

2. QUALITY ASSURANCE

This analysis is subject to the requirements of the QARD (DOE 1998) as determined by procedures QAP-2-0, *Conduct of Activities*, and NLP-3-18, *Documentation of QA Controls on Drawings, Specifications, Design Analyses, and Technical Documents. Design Basis Event Definition & Analysis/QA Classification Analysis (1.2.1.11) Activity Evaluation* (CRWMS M&O 1999a) presents the QAP-2-0 activity evaluation addressing the QA classification of MGR SSCs. This analysis is performed in accordance with procedures QAP-2-3, *Classification of Permanent Items*, and AP-3.10Q, *Analyses and Models*, and provides input to the design of SSCs included on the Q-List (YMP 1998). Unverified design inputs are identified and tracked in accordance with NLP-3-15, *To Be Verified (TBV) and To Be Determined (TBD) Monitoring System*.

3. COMPUTER SOFTWARE AND MODEL USAGE

This analysis uses no software which is required to be controlled in accordance with procedure AP-SI.1Q, *Software Management*.

4. INPUTS

4.1 PARAMETERS

The offsite radiological consequences of MGR Category 1 and 2 design basis events (DBEs), as calculated in *Preliminary Preclosure Design Basis Event Calculations for the Monitored Geologic Repository* (CRWMS M&O 1998a), are utilized in the QA classification of MGR SSCs. These results represent a conservative evaluation of MGR DBEs and the best information available. As discussed in Section 6.1 of this analysis, NUREG-1318, *Technical Position on Items and Activities in the High-Level Waste Geologic Repository Program Subject to Quality Assurance Requirements* (NRC 1998, Section 4.2(a)) allows the use of engineering judgement and conservative bounding assumptions in the QA classification of facility SSCs when data sources are limited. Also, procedure

YAP-2.7Q, *Item Classification and Maintenance of the Q-List* (Attachment 3, Section a), directs the use of the highest level of detail available to support the conclusion of the QA classification analysis. Currently, no DBEs associated with this system are identified by the preliminary DBE calculations (CRWMS M&O 1998a).

4.2 CRITERIA

The criteria used in the QA classification of MGR SSCs are provided in procedure QAP-2-3 as discussed in Section 6.1. These criteria satisfy the requirement of Section 2.2.2, *Classifying Items*, of DOE/RW-0333P (DOE 1998).

4.3 CODES, STANDARDS, AND REGULATIONS

10 CFR 20. Energy: Standards for Protection Against Radiation. January 1, 1999.

64 FR 8640. Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada. Proposed rule 10 CFR 63. February 22, 1999.

5. ASSUMPTIONS

This analysis assumes that the performance confirmation data acquisition/monitoring system functions to monitor specified MGR parameters important for determining preclosure and postclosure compliance with regulatory requirements. The system provides appropriate sensors and data gathering equipment. This assumption is based on the MGR architecture as established by *Monitored Geologic Repository Architecture* (CRWMS M&O 1999b) and MGR operations as described by *Monitored Geologic Repository Concept of Operations* (CRWMS M&O 1998b). The assumption that the function of the system and the system architecture are preliminary and subject to future enhancements is utilized in Section 6.2 to define the system design configuration and functions, and is tracked by TBV-228.

6. ANALYSIS

6.1 METHOD

The basic process for classifying MGR permanent SSCs is provided by procedure QAP-2-3. Guidance provided by procedure YAP-2.7Q is also used in this analysis. The process consists of establishing the configuration and function of MGR SSCs and identifying the effect of the SSC on MGR radiological safety. This information is then evaluated against criteria provided in QAP-2-3 to determine the QA classification of the particular item. The classification criteria are provided in the form of checklists in procedure QAP-2-3. A copy of these criteria checklists is provided in Attachment II. The following classification categories are specified by QAP-2-3 to meet the requirements of Section 2 of the QARD (DOE 1998).

Quality Level 1 (QL-1) Those SSCs whose failure could *directly* result in a condition adversely affecting public safety. These items have a high safety or waste isolation significance.

Quality Level 2 (QL-2) Those SSCs whose failure or malfunction could *indirectly* result in a condition adversely affecting public safety, or whose *direct* failure would result in consequences in excess of normal operational limits. These items have a low safety or waste isolation significance.

Quality Level 3 (QL-3) Those SSCs whose failure or malfunction would not significantly impact public or worker safety, including those defense-in-depth design features intended to keep doses ALARA (As Low As is Reasonably Achievable). These items have a minor impact on public and worker safety and waste isolation.

Conventional Quality (CQ) Those SSCs not meeting any of the criteria for Quality Levels 1, 2, or 3. Conventional quality items are not subject to the requirements of the QARD.

This analysis method is based on an iterative design-classification process where each analysis iteration is considered a final product for that phase of design. In this case, the system design and the DBE analysis are evaluated to determine which of the system's SSCs require design control under the QA program. The analysis presented in this document, therefore, will be reevaluated as necessary using a methodology appropriate to the level of DBE analysis and system design detail. This approach is consistent with NUREG-1318, *Technical Position on Items and Activities in the High-Level Waste Geologic Repository Program Subject to Quality Assurance Requirements* (NRC 1998, Section 4.2(a)), which allows engineering judgement and conservative bounding assumptions to be used in cases where data are limited.

6.2 MGR DESIGN CONFIGURATION AND ARCHITECTURE

Prior to the QA classification of MGR SSCs, the system design configuration as well as the function of system's SSCs are established. This classification analysis is based upon the system design and functions as assumed in Section 5 and the MGR Concept of Operations (CRWMS M&O 1998b). Verification of system description document (SDD) functions is tracked by TBV-228. In the process of QA classification, if two or more subsystems perform similar functions or are similarly classified, these subsystems are classified as a group under the higher level system and not listed individually.

6.3 DESIGN BASIS EVENT ANALYSIS

A preliminary analysis of MGR DBEs (CRWMS M&O 1998a) has been performed to determine the effects of internal and external events on facility radiological safety and is utilized by this analysis in the classification of MGR SSCs. The DBE analysis addresses both the DBE frequencies and dose consequences at the site boundary. This analysis utilizes the results of the DBE analysis to evaluate MGR SSCs against the classification criteria of procedure QAP-2-3.

6.4 QUALITY ASSURANCE CLASSIFICATION OF MGR SSCs

The MGR SSCs are evaluated against the criteria of QAP-2-3 to determine the item QA classification level. The results of the MGR preliminary DBE calculations (CRWMS M&O 1998a) are utilized in this evaluation.

7. CONCLUSIONS

7.1 MGR QA CLASSIFICATION

The results of this QA classification analysis are provided in Table 1. This analysis is based on current MGR system design and the preliminary DBE analysis (CRWMS M&O 1998a). As the design of the MGR proceeds and further analyses of MGR hazards are performed, this classification analysis will be reviewed for impact and revised as necessary. The MGR classification checklists included in procedure QAP-2-3 are reproduced in Attachment II. The basis for the classification evaluation is provided in Attachment III.

Table 1. Performance Confirmation Data Acquisition/Monitoring System QA Classification

	QL-1	QL-2	QL-3	CQ	TBV
Performance Confirmation Data Acquisition/Monitoring System (PCA)			X		228

7.2 IMPACT OF UNVERIFIED DATA

This analysis bases performance confirmation data acquisition/monitoring system design and configuration upon the assumption of Section 5 as tracked by TBV-228. The impact of TBV-228 on the classification of the system is expected to be minor as the major function of the system is not expected to change. Future development of draft SDDs may result in changes to the system architecture, however, this is not necessarily associated with QA classification changes. Changes in architecture will be incorporated as the SDD is prepared.

8. REFERENCES

8.1 DOCUMENTS CITED

CRWMS M&O (Civilian Radioactive Waste Management System Management and Operating Contractor) 1998a. *Preliminary Preclosure Design Basis Event Calculations for the Monitored Geologic Repository*. BC0000000-01717-0210-00001 REV 00. Las Vegas, Nevada: CRWMS M&O. ACC: MOL.19981002.0001.

CRWMS M&O 1998b. *Monitored Geologic Repository Concept of Operations*. B00000000-01717-4200-00004 REV 02. Las Vegas, Nevada: CRWMS M&O. ACC: MOL.19980810.0283.

CRWMS M&O 1998c. *Classification of the Preliminary MGDS Repository Design*. B00000000-01717-0200-00134 REV 01. Las Vegas, Nevada: CRWMS M&O. ACC: MOL.19981103.0546.

CRWMS M&O 1999a. *Design Basis Event Definition & Analysis/QA Classification Analysis (1.2.1.11) Activity Evaluation*. Las Vegas, Nevada: CRWMS M&O. ACC: MOL.19990325.0008.

CRWMS M&O 1999b. *Monitored Geologic Repository Architecture*. B00000000-01717-5700-00011 REV 02 ICN 01. Las Vegas, Nevada: CRWMS M&O. ACC: MOL.19990713.0203.

DOE (U.S. Department of Energy) 1998. *Quality Assurance Requirements and Description*. DOE/RW-0333P, Rev. 8. Washington D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: MOL.19980601.0022.

Dyer, J.R. 1999. *Interim Guidance Pending Issuance of New U. S. Nuclear Regulatory Commission (NRC) Regulations for Yucca Mountain, Nevada*. Letter from J. Russell Dyer (DOE) to D. R. Wilkins (YMP), June 18, 1999. OL&RC:AVG:1435. ACC: MOL.19990623.0026 and MOL.19990623.0027.

YMP (Yucca Mountain Site Characterization Project) 1998. *Q-List*. YMP/90-55Q, Rev. 5. Las Vegas, Nevada: Yucca Mountain Site Characterization Office. ACC: MOL.19980513.0132.

8.2 CODES, STANDARDS, AND REGULATIONS

10 CFR (Code of Federal Regulations) 20. Energy: Standards for Protection Against Radiation. January 1, 1999. Readily available.

64 FR (Federal Register) 8640. Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada. Proposed rule: 10 CFR 63. Readily available.

NRC (Nuclear Regulatory Commission) 1998. *Technical Position on Items and Activities in the High-Level Waste Geologic Repository Program Subject to Quality Assurance Requirements*. NUREG-1318. Washington, D.C.: U.S. Nuclear Regulatory Commission. Readily available.

8.3 PROCEDURES

AP-3.10Q, Rev. 0, ICN 0. *Analyses and Models*. ACC: MOL.19990225.0335.

AP-SI.1Q, Rev. 1, ICN 0. *Software Management*. ACC: MOL.19990520.0164.

NLP-3-15, Rev. 5. *To Be Verified (TBV) and To Be Determined (TBD) Monitoring System*. ACC: MOL.19981117.0148.

NLP-3-18, Rev. 04. *Documentation of QA Controls on Drawings, Specifications, Design Analyses, and Technical Document.* ACC: MOL.19960611.0170.

QAP-2-0, Rev. 5. *Conduct of Activities.* ACC: MOL.19980826.0209.

QAP-2-3, Rev. 10. *Classification of Permanent Items.* ACC: MOL.19990316.0006.

YAP-2.7Q, Rev. 1, ICN 1. *Item Classification and Maintenance of the Q-List.* ACC: MOL.19990115.0065.

9. ATTACHMENTS

Attachment I Acronyms

Attachment II MGR Classification Checklists

Attachment III MGR QA Classification

Attachment I

Acronyms

AP	Administrative Procedure
ALARA	As Low As is Reasonably Achievable
CFR	Code of Federal Regulations
CQ	Conventional Quality
CRWMS	Civilian Radioactive Waste Management System
DBE	Design Basis Event
DOE	U. S. Department of Energy
M&O	Management and Operating Contractor
MGR	Monitored Geologic Repository
NLP	Nevada Line Procedure
NRC	U. S. Nuclear Regulatory Commission
QA	Quality Assurance
QAP	Quality Administrative Procedure
QARD	Quality Assurance Requirements and Description
QL	Quality Level
SDD	System Description Document
SSCs	Structures, Systems, and Components
TBD	To Be Determined
TBV	To Be Verified
TEDE	Total Effective Dose Equivalent
YAP	YMP Administrative Procedure
YMP	Yucca Mountain Site Characterization Project

CRWMS/M&O

**Importance to Safety or Waste Isolation Evaluation
 for MGR**

QA: L

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Complete only applicable items.

MGR Quality Level 2 Checklist

Yes	No	
		<p>8. Preclosure Phase:</p> <p>2.1. Does the item function to provide control and management (i.e., collection and/or confinement) of site-generated liquid, gaseous, or solid low-level or mixed radioactive waste?</p> <p>NOTE: Systems with trace concentration of radionuclides, the failure of which could result in offsite doses less than 0.25 mrem per year, are not considered to perform radioactive waste management or control functions for the purpose of this quality level determination.</p>
		<p>2.2. Does the item provide fire detection, fire suppression, or otherwise protect the important-to-radiological safety or waste isolation functions of Quality Level 1 SSCs from the hazards of a fire?</p>
		<p>2.3. As a result of a DBE, could consequential failure of the item, which is not intended to perform a Quality Level 1 radiological safety function, prevent Quality Level 1 SSCs from performing their intended radiological safety function?</p>
		<p>2.4. Is the item required to prevent or mitigate a Category 1 DBE that could result in offsite doses greater than or equal to 25 mrem TEDE, per event, to any member of the public located on or beyond the site boundary [10 CFR 63.111(a) and 10 CFR 20.1301(a)(1)]? Category 1 DBE "per event" limits are interpreted as the sum of the normal operating dose and anticipated operational occurrences plus the consequences from any single additional low frequency Category 1 DBE. This sum is stated on an annual basis and consistent with 10 CFR 63.111(a) or 10 CFR 20.</p>
		<p>2.5. Is the item, in conjunction with an additional item or administrative control (i.e., indirect impact), required to prevent or mitigate a Category 1 DBE that could result in offsite doses greater than or equal to 100 mrem TEDE, per event, to any member of the public located on or beyond the site boundary? Category 1 DBE "per event" limits are interpreted as the sum of the normal operating dose and anticipated operational occurrences plus the consequences from any single additional low frequency Category 1 DBE. This sum is stated on an annual basis and consistent with 10 CFR 63.111(a) or 10 CFR 20.</p>
		<p>2.6. Is the item, in conjunction with an additional item or administrative control (i.e., indirect impact), required to prevent or mitigate a Category 2 DBE that could result in offsite doses greater than or equal to 5 rem TEDE, 50 rem combined deep dose equivalent and committed dose equivalent to any individual organ or tissue (other than the lens of the eye), 15 rem dose equivalent to the lens of the eye, or 50 rem shallow dose equivalent to the skin, per event, to any individual located on or beyond any point on the boundary of the site?</p>
		<p>9. Postclosure Phase:</p> <p>2.7. As a result of a DBE, could consequential failure of the item, which is not intended to perform a Quality Level 1 waste isolation function, result in:</p> <p>a. the inability of Quality Level 1 engineered barriers to perform their intended long-term waste isolation function in the postclosure phase?</p>
		<p>b. long-term changes to the hydrological characteristics of natural barriers by creating significant ponding or the possibility of drainage into the postclosure underground?</p>
		<p>c. the introduction of fluids or other materials that could adversely affect the long-term geo-mechanical characteristics of natural barriers in the postclosure phase?</p>
		<p>d. compromising the ability of the natural barriers to isolate waste in the postclosure phase?</p>
		<p>10. Do the answers to Blocks 8 and 9 qualify the item as a Quality Level 2 item?</p>

PCA

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SSC: N/A

Level 3: N/A

Level 4: N/A

PCA

QL1

PS1 QL2

PS2 QL3

PS CQ CQ

Q-List Rationale

SDD / SSC Reference: Assumption 5.0

TBVs Applicable to this Item: 228

Pre-Screen - Importance to Safety or Waste Isolation Evaluation

	Yes	No	Rationale:
PS1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	This system monitors specified MGR parameters important for determining compliance with 10 CFR 63 preclosure and postclosure performance (TBV-228). This item is indirectly relied upon to provide one of the following Important to Safety functions for radioactive wastes received or handled at the MGR: confinement or containment, criticality control, shielding, heat transfer, structural integrity, or operations support necessary for waste handling safety.
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
PS2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	This item is indirectly relied upon to provide an Important to Waste Isolation function.

Note: A Yes answer has been selected for either PS1 or PS2, therefore, the item is subject to QARD requirements. An Importance to Safety or Waste Isolation evaluation is required. Please continue with the evaluation checklists below.

QL1 - Quality Level 1: High Safety or Waste Isolation Significance

	Yes	No	Rationale:
1.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Failure of this SSC will not directly result in loss of waste package containment or criticality control.
1.2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	This SSC is not required to prevent or mitigate a Category 1 DBE that could result in offsite doses greater than or equal to 100 mrem total effective dose equivalent (TEDE).
1.3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	This SSC is not required to prevent or mitigate a Category 2 DBE that could result in offsite doses greater than or equal to 5 rem TEDE, 50 rem combined deep and committed dose equivalents to any individual organ or tissue, 15 rem to the lens of the eye, or 50 rem shallow dose equivalent to the skin.
1.4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The SSC does not perform a waste isolation function by forming part of the natural or engineered barriers. The Sample Collection System collects samples from the repository area for laboratory testing.
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

QL2 - Quality Level 2: Low Safety or Waste Isolation Significance

	Yes	No	Rationale:
2.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	This SSC does not provide control and management of site-generated radioactive or hazardous waste.
2.2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	This SSC does not perform a fire protection function.
2.3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Failure of this system as a result of a DBE does not impair the capability of QL1 High Safety Significant SSCs to perform their intended radiological safety function.

PCA

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SSC: N/A

Level 3: N/A

Level 4: N/A

PCA

QL1

PS1 QL2

PS2 QL3

PS CQ CQ

Q-List Rationale

- 2.4 This item is not required to prevent or mitigate a Category 1 DBE that could result in offsite doses greater than or equal to 25 mrem TEDE, per event, to any member of the public located on or beyond the site boundary [10 CFR 63.111(a) and 10 CFR 20.1301 (a)(1)].
- 2.5 This item, in conjunction with an additional item or administrative control (i.e., indirect impact), is not required to prevent or mitigate a Category 1 DBE that could result in offsite doses greater than or equal to 100 mrem TEDE, per event, to any member of the public located on or beyond the site boundary.
- 2.6 This item, in conjunction with an additional item or administrative control (i.e., indirect impact), is not required to prevent or mitigate a Category 2 DBE that could result in offsite doses greater than or equal to the more limiting of 10 CFR 63.111(b)(2) doses to any individual located on, or beyond, any point on the site boundary.
- 2.7 a. Failure of this system as a result of a DBE will not compromise the ability of QL1 High Waste Isolation Significant SSCs to perform their intended waste isolation function.
 b.
 c.
 d.

QL3 - Quality Level 3: Minor Safety Significance or Occupational Exposure Significance

- | Yes | No | Rationale: |
|-----|--|--|
| 3.1 | <input type="checkbox"/> <input checked="" type="checkbox"/> | This item does not function to provide an alarm to warn of significant increases in radiation levels or concentrations of radioactive materials. |
| 3.2 | <input checked="" type="checkbox"/> <input type="checkbox"/> | This item functions to monitor variables to verify that operating conditions are within technical specifications. |
| 3.3 | <input type="checkbox"/> <input checked="" type="checkbox"/> | This item is not used in MGR emergency response to provide prompt evacuation of personnel, or to monitor variables used in helping to determine the cause or consequences of DBEs (during post accident investigations). |
| 3.4 | <input type="checkbox"/> <input checked="" type="checkbox"/> | This item does not function as part of the radiological, meteorological, or environmental monitoring systems required to assess radionuclide release or dispersion following a DBE. |
| 3.5 | <input type="checkbox"/> <input checked="" type="checkbox"/> | This item is not part of the design or design objectives for keeping levels of radioactive material in effluent to unrestricted areas as low as practicable during normal operations. |
| 3.6 | <input type="checkbox"/> <input checked="" type="checkbox"/> | This item is not required to limit onsite worker doses from normal operations and during Category 1 DBEs, including planned recovery operations, to less than 10 CFR 63.111(a)(1) [10 CFR 20.1201] requirements. |