99-0000396

Department of Energy

Washington, DC 20585

February 16, 1999

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DNF SAFETY BOARD

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, N.W.
Suite 700
Washington, D.C. 20004

Dear Mr. Chairman:

Please find enclosed a copy of the "Strategy for Managing Risks at the Chemistry Metallurgy Research (CMR) Facility at Los Alamos National Laboratory." This document puts into context the latest information on risk to operation of CMR from a seismic event. It further describes the integrated strategy we are pursuing of near-term risk mitigation programs and long-term site and facility planning efforts for the CMR facility.

The document describes the activities we intend to pursue and general time period in which they will be conducted. It does not provide, however, a detailed schedule and integrated plan to carry these activities out. I have requested the Albuquerque Operations Office to develop these as soon as possible. Notional schedules and plans have been briefed to me.

Your staff was briefed late last year on the progress we were making on the development of the strategy document. We will continue to keep you and your staff informed of the progress on the activities described in the strategy and the development of the overall schedule and plan.

If you have any questions, please contact me or have your staff contact Michael Mitchell of my staff at (301) 903-3085.

Sincerely,

Gene Ives
Deputy Assistant Secretary
for Military Application and
Stockpile Management
Defense Programs

Enclosure

cc w/o enclosure:
M. Whitaker, S-3.1

99-396

STRATEGY FOR MANAGING RISKS

AT THE

CHEMISTRY METALURGY RESEARCH (CMR) FACILITY

AT

LOS ALAMOS NATIONAL LABORATORY

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IN THE MATTER OF

OFF-SITE DOSE CONSEQUENCES EXCEEDING THE EVALUATION GUIDELINE

December 18, 1998
Rev.3

PREPARED BY: ______________________

David Post, Deputy Division Leader, NMT
Los Alamos National Laboratory

REVIEWED BY: ______________________ 12/18/98

Chris Steele, DOE-LAAO

Assumed full compliance c̄ ITSRs + approval memo is ~~stated~~ required

______________________ 12/21/98

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CONCURRED BY: ______________________

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1. PURPOSE

This document is intended to clarify the existing approval conditions contained in the Management Evaluation Report (MER) of the CMR Basis for Interim Operations (BIO) and add an additional condition. This document does not change requirements previously approved with respect to the CMR BIO and the CMR interim Technical Safety Requirements (iTSRs). The BIO accident analysis of the unmitigated Limiting Seismic Event resulted in an off-site dose to the maximally exposed individual of 75.4 rem (TEDE). Because this exceeds the Evaluation Guideline (EG) of 25 rem, the building structure was deemed to be safety class. However, the seismic capacity of CMR is substantially below that required to withstand the evaluation basis earthquake and the building would collapse. Because no mitigation can be expected from the structure, the BIO and the MER require other mitigative actions be taken. Since the BIO was approved and the MER issued, LANL has discovered the existence of a small fault under the CMR building. DOE and LANL are addressing the issue of risk management at CMR through an effective, integrated strategy including near-term risk mitigation programs and long-term site and facility planning efforts. Attachment 1, entitled "Strategy for Managing Risk at the Chemistry and Metallurgy Research Building" describes these actions. Actions being taken to improve seismic risk at CMR are administrative controls directed at controlling the material at risk (MAR) in the facility and implementing a Containerization program in the facility, which uses seismically robust containers to lower the accident source term. This agreement addendum establishes an additional approval condition, i.e., the establishment of an administrative control limit for MAR.

2. REQUIREMENTS

There are no explicit requirements for DOE operations to mitigate accidental doses to the public to less than 25 rem TEDE. DOE Order 6430.1A (Chapter 2 section on siting) includes accident dose criteria for new facility sites, but this Order has been replaced by DOE Order 420.1 (Facility Safety). The draft Implementation Guide to DOE Order 420.1 explicitly defines 25 rem as the offsite EG, but similar to DOE Order 6430.1A is intended for new facility designs or major modifications to existing facilities. It can be inferred from O 420.1 and DOE Standard 3009 that offsite dose consequences should be mitigated to satisfy the EG or a justification with appropriate compensatory measures for not meeting it presented. New facilities, or older facilities undergoing modifications are expected to design systems to prevent unfiltered/unmitigated releases of hazardous materials. Older facilities are also expected to perform backfit analyses and propose upgrades to reduce exposures below the EG. Implementation of the Containerization Program Plan will provide the necessary information to ensure that risk improvement is completed over a specified time period in a cost effective manner.

3. STATEMENT OF ISSUE

The current authorization basis for CMR consists of the BIO, Interim TSRs, and the MER. Through these documents, DOE has authorized operations at CMR contingent upon approval conditions being met. The currently authorized operations allow MAR of 20.2 kg of Pu-239 equivalent throughout the building plus an additional 300 g Pu-238 in the Wing 9 hot cell operations. The BIO accident analysis assumed a leak path factor (LPF) of 1.0 for the building, a LPF of 0.2 for the hot cells, and a damage ratio for all containment of 1.0. This resulted in a source term of 178.4 g Pu-239 (eq.) and the concomitant 75.4 rem offsite exposure.

The MER conditions of approval germane to this issue are #6 and #7, repeated here:

- Within 2 months of BIO approval, the MAR limits analyzed in the BIO and a program to assure continued compliance with these limits shall be established.
- Within 3 months of BIO approval, the containerization program described in the BIO shall be defined and submitted to DOE for approval. This program must weigh the competing factors of MAR reduction in the event of seismic events, to potential increased MAR dispersion due to pressurized containers in a fire scenario, and should ***strive*** to reduce the consequences of seismic events to less than evaluation guideline values for the MEOI. (Emphasis added.)

In addition, the MER states; "For a seismic accident, a high-level commitment must be made to contain the material at risk in seismically robust containers to reduce the source term".

The Containerization Program called for in the conditions of approval calls for evaluation of containers, container configurations, and container systems for their robustness and utility by May 24, 1999. While damage ratio assessments are going to be performed, it is not certain how much source term reduction can actually be achieved. Therefore, the **mitigated** consequences of the Limiting Seismic Event could result in doses greater than 25 rem TEDE. The issue is, while DOE and LANL have accepted the risk of continued CMR operations, we do not believe it is in the best interests of the Department or the University of California to operate with potential offsite doses from accidents exceeding the EG, without taking aggressive steps to determine the minimum MAR that can effectively support CMR operations. Discussed below are Near Term and Long Term Actions to improve the seismic accident risk of CMR.

4. RISKS

The source terms and doses discussed above are derived using bounding values for airborne release fractions (ARF) and respirable fractions (RF). If average values are used to estimate these parameters then the offsite dose for the Limiting Seismic Event is below the EG (3.7 rem TEDE). The MER states that this less conservative, yet still realistic analysis is sufficient to justify continued operations on an interim basis, and when coupled with the containerization program, constitutes an acceptable risk management strategy. As shown by the analysis included in Attachment 1, CMR meets the DOE safety goal for public risk, even using the more conservative estimates of ARF and RF.

5. NEAR-TERM ACTIONS

LANL's NMT Division has instituted two compensatory measures in an attempt to reduce offsite dose consequences. The first of these is an immediate containerization program. Pending development, approval, and implementation of the permanent containerization program required by the BIO/MER, NMT proposes to use off-the-shelf containers to contain MAR where practicable. Plans currently call for using Mossler safes in the locked rooms and some laboratories and the NMT can system (Hagan cans) in enclosures. With DOE approval, this program can be implemented in 120 days.

In the second compensatory measure, NMT has imposed an administrative control limit on MAR below those levels authorized in the BIO and TSRs. This administrative control limit (ACL) was derived using the average ARF and RF values in conjunction with programmatic requirements . The facility administrative control limit is 12kg of Pu^{239} equivalent, and does not include materials in the hot cells. In the bounding case, this 12kg represents an MEOI dose of 58.1 rem for the seismic EBA. While this ACL does not ensure offsite doses below the EG, it is a good faith effort striving to reduce the MEOI dose. NMT proposes to only allow limited duration excursions above the ACL (but well below the BIO limits) based upon programmatic need and approval of the Division Director. DOE would be notified of these actions through periodic reporting.

6. LONG-TERM ACTIONS

Relative to the Limiting Seismic Event, the only long-term action currently proposed is the Containerization Program Plan.. Elements of this program call for characterizing the MAR and evaluating container configurations. During the MAR characterization effort, true proportions of material forms will be determined. This will lead to revised weighted average estimates for ARF and RF. Also, MAR levels needed for efficient operations will be defined and any MAR considered "for convenience" will be removed. In the container evaluation effort, both the utility and robustness of the containers will be determined. Estimates of damage ratio will also be prepared, which will be used to revise the accident source terms. Once fully implemented, new MAR limits and source terms will be established that may reduce the MEOI dose below the EG.

7. ALTERNATIVES

Two alternatives exist for dealing with the issue presented in Section 2. The first is to do nothing beyond that required by the MER, accepting that continued operations at CMR could have potential offsite dose consequences greater than the EG for seismic events. The second alternative is to impose an MER-like condition of approval formalizing the MAR administrative control limit concept that NMT has already instituted.

Depending on the assumptions used to compute this formal ACL, a MAR limit below the existing ACL could be established. Currently, activities at CMR are at about 80% of the ACL (or about 2 kg margin). If the limit were lowered, programmatic activities in CMR could be impacted. Certainly, no new program could be brought to the facility unless an equivalent MAR using activity is removed, and existing programs may require reprioritization.

If the MAR ACL is made a TSR-like control, DOE approval would be required before the limit is exceeded. Routine programmatic fluctuations would cause limit violations unless sufficient margin is maintained. This imposes further constraints on programmatic activities, lowering MAR available for work, decreasing efficiency, and limiting flexibility.

8. PROPOSED PATH FORWARD

CMR is fully compliant with the BIO and MER approval conditions at this time and will maintain this posture The Containerization Program described in Section 6 will have the MAR characterized and container systems evaluated, selected, and approved by DOE before June 7, 1999. In the mean time, the voluntary MAR administrative control limit will be maintained as described in Section 5. Once the Containerization Program has produced a revised estimate of offsite dose for the Limiting Seismic Event, the voluntary MAR ACL could be suspended if the MEOI dose is below the EG. Otherwise, a revised ACL should be adopted that gives adequate assurance that the EG is satisfied. The revised ACL should be adopted as part of the TSR controls.

The control mechanism should consider simplicity of the requirements and operational flexibility. The ACL must accommodate normal process variation without causing procedure or TSR violations. The programmatic impacts of adopting a formal MAR ACL will need to be assessed and approved by DOE sponsoring organizations.

9. IMPLEMENTATION SCHEDULE

The implementation schedule of the formal MAR ACL is contingent upon the results of the Containerization Program. The current Containerization Program Plan calls for revised damage ratio assessments, ARF and RF form-dependent weighting factors, and DOE approved configurations in June 1999. Full implementation of the Containerization Program Plan may provide additional information that could affect the MAR ACL.

Strategy for Managing Risk at the Chemistry and Metallurgy Research Building

I. Executive Summary

The Chemistry and Metallurgy Research Building (CMR, TA-3-29) is critical to a wide variety of nuclear materials programs supporting key DOE programs at the Los Alamos National Laboratory (LANL). Both DOE and LANL acknowledge that the site, facility, and operating conditions at CMR impact the long-term viability of the facility to safely and efficiently support these missions. DOE and LANL are addressing this issue through an effective, integrated strategy including near-term risk mitigation programs and long-term site and facility planning efforts. This document describes the current risk profile of the CMR facility and operations, presents the ongoing, planned, and potential actions to reduce these risks, and discusses the strategy to maintain the required program capabilities currently housed at CMR over the long term.

II. Introduction and Background

CMR houses numerous capabilities that are essential to a wide variety of nuclear materials programs supported by DOE/DP, EM, MD, NE, and NN. The actinide analytical chemistry and materials characterization capabilities support Stockpile Stewardship and Management projects in pit surveillance, pit manufacturing, stockpile lifetime extension, and nuclear weapons certification. Other capabilities at CMR include actinide processing and fabrication, waste characterization, nondestructive analysis, and remote handling of high radiation materials that support a variety of DOE nuclear materials management programs. Without these CMR functions, several national security, nonproliferation, and environmental management programs could not be performed in a cost-effective, compliant, and timely manner.

The CMR facility is a Category 2 nuclear facility and has been working to an outdated authorization basis for several years. As part of the efforts to continually improve the understanding of the risks of operations at CMR and to ensure that such risks are maintained within acceptable levels, DOE and LANL undertook several actions at CMR over the past eighteen months.

- Normal operations were suspended, thoroughly evaluated, and reauthorized based upon formal work control.
- Hazards associated with CMR inventories and operations were identified and analyzed.
- A spectrum of potential accidents, including external initiators and natural phenomena were analyzed.
- Safety systems and controls were identified to prevent or mitigate hazards to provide adequate protection of the public and workers.
- A Basis of Interim Operation (BIO) was issued as the facility safety authorization basis and approved by DOE.
- Technical Safety Requirements (TSRs) were identified to mitigate risks to the public.

- The CMR Upgrades project was thoroughly evaluated and re-focused to upgrade the operability and reliability of safety-related facility systems.
- A field investigation of the seismic stability of the area surrounding the CMR building was initiated.

In conjunction with the efforts above, DOE and LANL have initiated an evaluation of the current capabilities housed at CMR, the projected future programmatic requirements, and potential strategies to support these requirements over the long-term. The combined output of the programmatic analyses, facility/operations hazard analyses, and seismic analyses has resulted in a three-part approach to managing risks at CMR. This approach includes:

- Ongoing formal implementation of a plan to upgrade the safety operations at the CMR facility by implementing the Technical Safety Requirements as defined by the BIO and completing safety upgrades as part of the CMR Upgrades Project within the next two years.

- Near-term risk mitigation actions to ensure that CMR continues to operate with acceptable risk to the public and CMR workers while the two-year plan is completed.

- Identification, development and implementation of a long-term solution to support required programmatic capabilities through upgrades to the current CMR structure, relocation to other facilities, and/or construction of new facilities.

This document presents the current risk profile at CMR and discusses the status of this three-pronged risk management approach.

III. Current Risk Profile of the CMR Building

There are two primary activities which have contributed to the improved DOE and LANL understanding and quantification of the existing risk profile of the CMR Building; (1)the development and approval of the BIO, and (2) the completion of seismic studies at TA-3. These activities have defined the risks that must be addressed and the accidents that must be mitigated at CMR.

Risks as Determined by the BIO

The primary purpose of the BIO was to develop an updated, defensible safety basis for the current operations at CMR, with a more formal, defined set of controls with clear technical bases. The new, interim TSRs will be used to better focus on surveillance requirements and controls for engineered safety systems and administrative controls that are relied on to prevent or mitigate accidents. Implementation of the TSRs will be completed following a phased approach with some TSRs being implemented immediately. By implementing these TSR controls, the potential accident risks posed by CMR to the public and workers will be significantly reduced The risks posed by the CMR to both workers and the public are presented below.

Worker Risk: The BIO qualitatively assesses the risk to workers by examining the hazards present to the worker. A sample of these hazards includes explosion, fire, criticality, exposure to toxic gas, exposure to airborne radionuclides, and exposure to corrosive materials. These hazards were evaluated on a process-by-process basis during the CMR stand-down, and activities were formally released for resumption based on mitigation of those hazards.

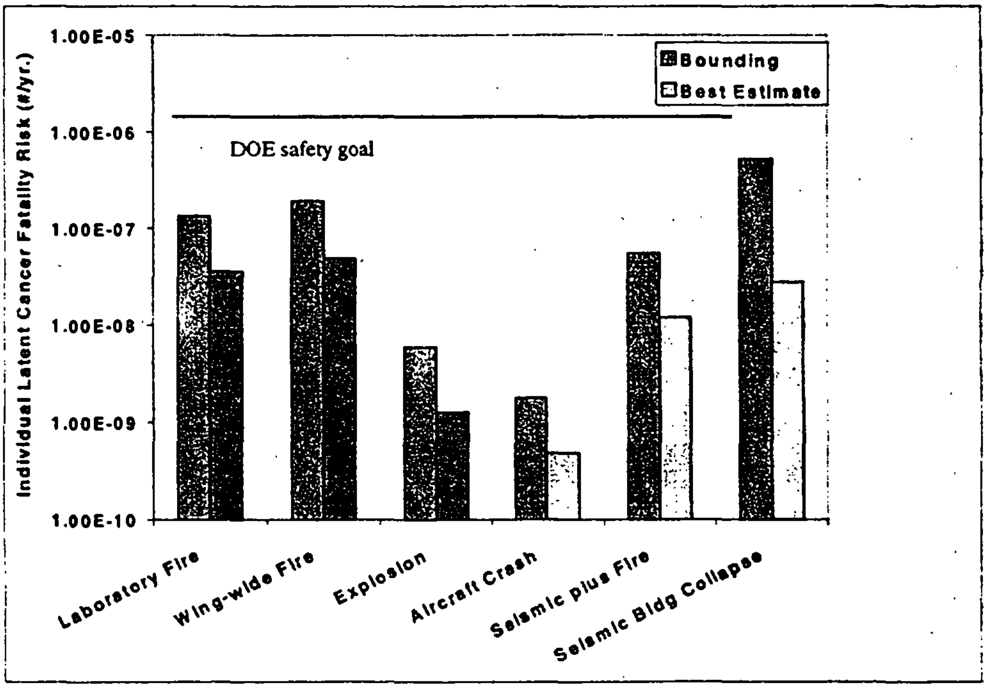
The BIO also defines safety systems and controls that either prevent or mitigate these hazards. Systems that are important to worker safety include, but are not limited to, gloveboxes and fumehoods, ventilation, continuous air monitors, flammable-gas detectors, toxic-gas detectors, material-storage containers, CMR public address systems, and emergency lighting. In addition, the BIO requirements define controls important to worker safety; examples include combustible loading limits, material limits, criticality limits, a radiation protection program, and a hazardous material program. Once fully implemented, this combination of activity reviews, systems, training, controls, and compliance to Laboratory requirements will be adequate to provide multiple layers of protection to the worker. The LANL CMR Facility Management Group is implementing a Formality of Operations Plan that will implement these layers of worker safety.

To further improve worker safety during off-normal events, Nuclear Materials Technology (NMT) Division emergency experts are currently upgrading the CMR Emergency Plan and emergency response systems similar to those used at TA-55. These systems include clear delineation of evacuation routes, placement of response equipment and supplies, training of key personnel to provide early response to chemical or medical emergencies, and training NMT managers to function as the Facility Incident Command during the initial stages of postulated emergency situations. In addition, a post resumption evacuation drill and a facility familiarization tour for off-site responders (i.e. LANL EM&R, Los Alamos Fire Department, and LANL ESH-10) has been completed at CMR. Lessons-learned from these exercises will be used to plan the next site-wide evacuation drill and several wing specific drills in the coming year.

Public Risk: The baseline risk to the public is presented by comparing the results of the BIO analysis to two measures of safety: 1) the DOE Safety Goal and 2) the Radiological Offsite Evaluation Guideline. The comparison of risks as a result of an accident at CMR to the DOE safety goal is presented in Figure 1. These results are presented in more detail in Appendix A. The comparison indicates that risks as a result of accidents for CMR are substantially below the DOE Safety Goal.

The presentation of Evaluation Basis Accidents (EBAs) offsite dose is shown in Table 1. These results are also discussed in more detail in Appendix A. EBAs are accidents that are postulated for the purpose of establishing safety requirements for safety systems. The dose for each accident is compared to the 25 rem Evaluation Guideline (EG). The comparison is used to identify safety class structures, systems or components at CMR when the dose exceeds 25 rem.

DOE has reviewed and approved the BIO subject to a number of conditions of approval as documented in CMR BIO Management Evaluation Report)[1]. These conditions include upgrading many systems and instituting a number of new controls via the interim TSRs. These actions are designed to lower the potential dose, in the event of the EBAs, and/or substantially reduce their frequency. Therefore, after these actions are implemented, some of the accidents (such as Seismic Plus Fire) will have such a low frequency that they will be Beyond Evaluation Basis Accidents[2]. For Beyond Evaluation Basis Accidents, their probability is so low that even with a potential dose above the 25 rem EG, additional safety class systems are not required. For the remaining EBAs, the goal is to design and implement controls that would keep the dose below the 25 rem EG should they occur. Based on the current data, DOE and LANL expect to meet this goal within the conditions of the BIO approval for all accidents except for the Seismic with Building Collapse EBA. One of the purposes of this paper is to examine the seismic issue and put forth alternatives to reduce the dose associated with the postulated seismic accident.



[1] Memo from Daniel Glenn to Bruce Matthews, "CMR BIO Approval Memorandum," LAM:3DG-030, August 31, 1998.

[2] For natural phenomena, such as seismic plus fire, the Beyond Evaluation Basis accident is defined as an accident with a frequency substantially below (e.g. $F*10^{-2}$) the Evaluation Basis Accident as defined in DOE-STD-1021-94. Typically accidents in this category that have a frequency below 10^{-7}/yr are considered BEBA.

Figure 1. Comparison of CMR risks to DOE safety goal.

Table 1. Offsite Dose for EBAs

Accident Scenario	Source Term To MEOI (Rem-TEDE)		CMR Facility Control Set	Mitigated Doses	
	Bounding	Best*		Bounding	Best
Wing Wide Fire	42.8	10.8	Fire Suppression System, Combustible Control Program, HEPA Filtration, Fire Alarm, Fire Barrier and Fire Protection	1.7E-2	4.2E-3
Explosion	57.3	11.7	Flammable Gas Detection, Fire Suppression System, HEPA Filtration	~ 0	~ 0
Seismic Plus Fire	218.9	40.6	Building Structure, Fire Suppression System, Combustible Control Program, HEPA Filtration, Fire Alarm, MAR control program	41.7**	2.0
Seismic Building Collapse	75.4	3.7	Building Structure, Containerization, MAR control program	41.7	2.0

* The bounding estimate represents the bounding value suggested by the data given the available physical entrainment mechanisms (such as fire). The best estimate represents the expected value suggested by the data for the given physical entrainment mechanism.

** The seismic plus fire accident now becomes the same as the seismic accident

Seismic Hazard Studies

A number of studies were initiated to investigate seismic issues at Technical Area 3 (TA-3), and a full report is expected in March 1999 (Draft Report expected December 1998). However, based on the early data, it is evident that TA-3 does contain small faults with vertical displacements in the range of 1-10 feet in 1.2-million-year-old Bandelier tuff. The small faults found include one under one wing of the CMR Building with a vertical offset of approximately seven feet. The identification, location, and possible orientation of the fault under the CMR, shown in Figure 2, is based on the following: (1) air photo interpretation; (2) high-precision mapping of faults in canyons to the south of TA-3; and (3) examination of cores taken from nine holes drilled around the CMR building. The air photos indicate a linear feature running through the CMR site from the northeast corner of the facility and away to the west-southwest.

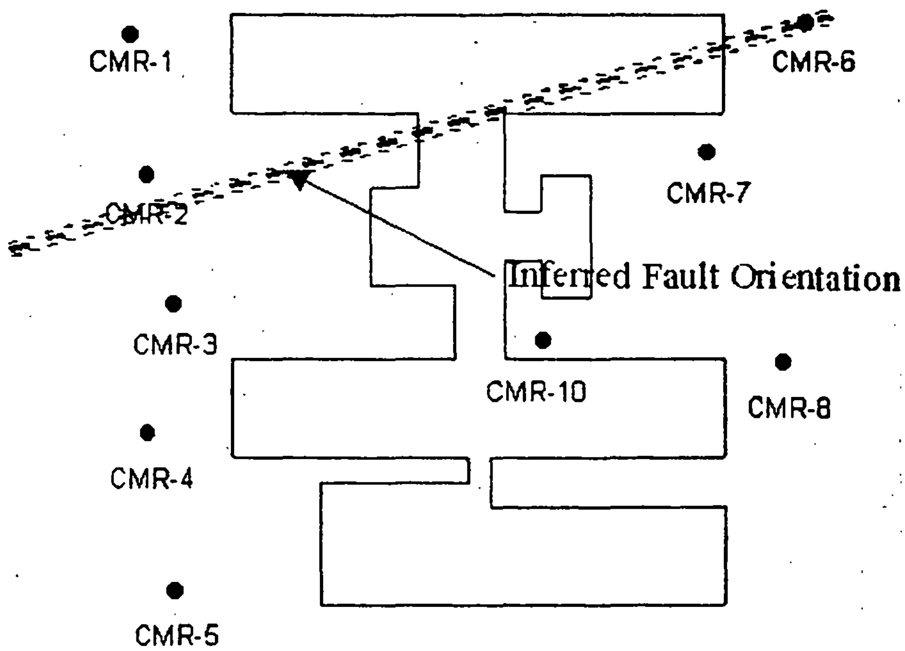


Figure 2. Plan view of CMR building with inferred location of fault.

While surface rupture can cause significant structural damage, the likelihood of an earthquake causing surface rupture on the small fault found under the CMR building is very low (once every 10,000 to 100,000 years) and not considered a public risk. On the other hand, the likelihood of seismic-induced structural failure, based on ground motion associated with an earthquake, has an approximate 500-year return period. Wings 2, 3, 4, 5, 7, and 9 of the CMR building could collapse from this ground motion. In contrast, the CMR nuclear materials storage vault is designed to survive seismic events. Additional analysis on the CMR vault, located approximately 100 feet from the closest possible point of the inferred location of the fault, confirms that it is a safe storage place for plutonium and other nuclear materials.

Supporting seismic analysis can be found in Appendix B. In summary, the discovery of the fault under the building does not significantly increase the likelihood of seismic-induced damage and thus seismic risk; however, it does impact decisions concerning upgrades and future uses for the facility. For example, while it is possible yet costly to upgrade the CMR to resist the forces/displacements caused by ground motion, facility upgrades to withstand substantial surface rupture are not considered technically feasible, and would substantially increase the complexity and costs of CMR upgrades project.. Simply stated, compliance with today's standards dictates that the current site for the CMR building would not be suitable for construction of a new nuclear facility, if one were to be built.

IV. CMR Risk Management Activities

There are three separate risk management activities to address the risks defined above. The first activity is a formal plan to implement the TSRs, and to upgrade appropriate systems. The planning, funding authorization, engineering, construction, and stringent work control and configuration management requirements to accomplish this piece of the risk management activities has been evaluated, and work has been prioritized. The second piece addresses the near-term risk reduction activities that are in progress or proposed for implementation. These activities provide risk mitigation while the formal plan to implement all TSRs, some of which depend on facility upgrades, is completed. The final activity addresses the long-term future strategy for CMR and actinide analytical chemistry at Los Alamos.

Two-Year Plan to Upgrade Safe Operations

Based on the BIO risk analyses, DOE and LANL developed a two-year plan to upgrade the safe operations at the CMR facility. The plan includes (1) implementing the Technical Safety Requirements as defined by the BIO, and (2) upgrading appropriate CMR safety systems within the CMR Upgrades project. DOE approved the BIO on August 31, 1998; the BIO identifies programs that are necessary to meet the Technical Safety Requirements and to ensure safe operations of the CMR. The TSR Implementation Plan and Schedule has been developed and submitted to DOE. This document identifies all required physical upgrades as well as programs, plans, procedures, and other risk-mitigating actions necessary to implement the BIO. The Material at Risk (MAR) Program, TSRs, Administrative Controls, and the safety class/safety significant, structures, systems, and components constitute the safety authorization basis for the CMR specified in the BIO. Based upon the balancing of acceptable risk and process need, the total amount of MAR authorized by the BIO for the CMR facility is 20.2 kg ^{239}Pu equivalent and 300 g of ^{238}Pu. These MAR limits assume the successful implementation of technical safety requirements and completion of the system improvements. A number of TSRs are being implemented immediately while full implementation of others relies on the CMR Upgrades Project. The CMR Upgrades Project is implementing engineered improvements to the facility over the next two years. The CMR Upgrades project was directed to develop facility modifications to support TSR implementation and provide for safe operations of the facility through FY2010 within the current baseline. Subprojects (listed in Appendix C) were subsequently identified, and prioritized, and are currently in various stages of development, review and execution. Most of these subprojects are already within the current CMR Upgrades project baseline. Others will be completed outside of the CMR Upgrades project or will be included within the planned modification to the project baseline. Those facility modifications that are tied to the TSR Implementation Plan, are targeted for completion within the two-year implementation plan duration. For added conservatism, the CMR fire suppression system is being evaluated for potential upgrades to improve its performance capabilities to prevent, detect, and suppress fires originating from CMR operations or accidents. The CMR Upgrades Project has prioritized subprojects to reduce transient combustible loading, replace fire protection panels, and qualify fire suppression sprinkler heads. The combustible loading was reduced to levels deemed accepted by the Management Evaluation Report (MER) by November 1, 1998. The upgrades to the fire detection panels are underway, and will be completed by February 15, 1999. Upgrades to fire suppression sprinkler heads are planned to support qualification by July 28, 1999.

A Permanent Containerization Program is being developed and planned for implementation over the next 12-16 months to address public and worker risk reduction. This program will install robust containers to provide protection of MAR under conditions of fire and/or earthquake. Under this program, all MAR, other than inventories required to be available to use in the laboratories for operations will be containerized and thereby removed from the material that could be released during a catastrophe. Implementation of the Containerization Program will be reviewed by DOE as part of the Conditions of Approval for CMR Operations.

The completion of the facility upgrades associated with the TSR Implementation Plan mitigates risks of accidents identified within the BIO. As previously stated, these engineered controls have been, or will be, designed and implemented to reduce the frequency and/or consequences of accidents. In Figure 3, the risk as calculated in the BIO prior to the implementation of upgrades is compared to the projected risk after the completion of specific upgrades associated with TSR Implementation. Implementation of the TSR upgrades over the next two years will reduce the risk sufficiently to operate the facility safely within the constraints of the BIO. Note, in Figure 3 that the containerization program does not lower the risk as much as some of the other upgrades in the CMR upgrades project. This is because risk is the product of both frequency and consequence and other upgrades reduce accident frequency more than the containerization program reduces consequence. The overall goal of the containerization program is to strive to reduce the consequences of seismic events to less than evaluation guideline values for MEOI (25 rem dose at the site boundary).

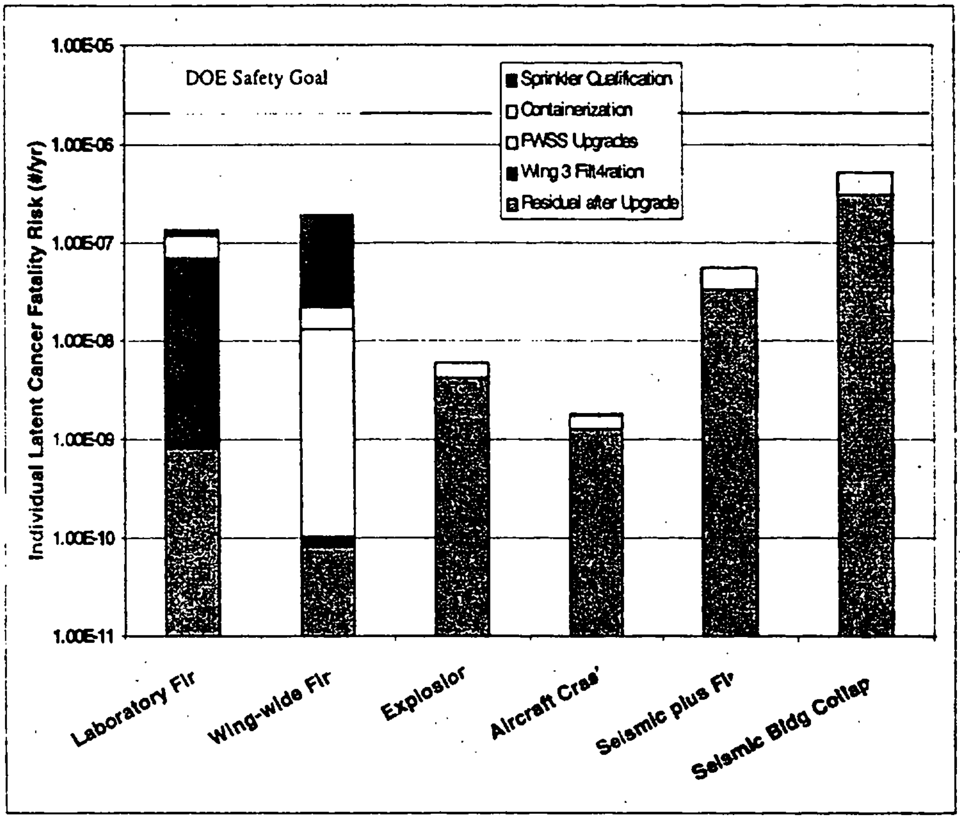


Figure 3. Reduction in risk from BIO/TSR implementation.

Near-Term Risk Reduction Actions

As reflected in the interim TSRs, administrative actions have been implemented to reduce the amount of MAR during the period that the CMR Upgrades project is engineering, constructing, and installing facility upgrades to reduce risks associated with off-site dose in the event of a catastrophic accident. These actions are intended to reduce MAR to an as-low-as-reasonably-achievable level while meeting programmatic requirements.

A potential to further reduce risk exists through the revision of work practices, operating procedures, or through shifts of programmatic workload. Four near-term options have been examined based on their potential risk reduction, cost and schedule for implementation, and impact on programmatic work. (Analysis of these four options is contained in Appendix D.) Two are already being implemented. Administrative controls to manage MAR to levels at about 50 percent of those assumed in the BIO. Development of an "Immediate Containerization" Program is also underway. While the Permanent Containerization Program is part of the two-year plan to manage risks and will require 12-16 months for full implementation, the first phase of this program has been entitled "Immediate Containerization", and is planned for implementation over the next 2-3 months. This Immediate Containerization Program will provide a significant reduction of the risk to the public of an off-site dose.

Two other near-term options are still being considered for implementation; however, a close review of cost/risk benefit is needed prior to formal implementation. These options include a reduction of sample sizes that are delivered from TA-55 to CMR (which would require additional shipments between the two locations), and the potential relocation of Sample Management Operations from CMR to TA-55.

Long-Term Risk Reduction Strategies Beyond 2010

DOE and LANL have taken action to evaluate the projected activity levels required to support known mission work. This study is expected to identify the capabilities and the associated capacities necessary to support longer-term DOE program needs. This information and the assessment of current and projected risk associated with CMR operations will enable feasibility studies and decision-making regarding how DOE will provide for continued program support over the next ten years and beyond. These efforts will be conducted over the next two years and will determine if and when a new facility is required to support DOE's missions. If a new facility is required, additional analysis will be necessary to develop and choose an appropriate alternative to safely and efficiently support long-term programmatic requirements and further define the use of the CMR facility beyond 2010. A conceptual design effort, if required, would not be initiated until at least 2001, but this would still support completion of a long-term replacement facility.

V. CMR Decision Process and Implementation

This section is intended to reflect the decision process and implementation of the approach reflected in this white paper. It is important to note that the decisions which have already been made were made because they were necessary and would not be expected to change on the basis of other aspects of the program. Any additional actions will be presented as decision packages, including benefits of the action, implications for operational efficiency and program support, and costs (including funding sources proposed, such as reprogramming or reprioritization of existing funds). In total, these actions will ensure that CMR is operating safely until the facility is either permanently upgraded, a new facility is constructed, or some other long-term action is implemented to provide for safe and effective operations in support of DOE programs.

The BIO was a necessary precursor to many of the analyses and studies which have followed, as well as to those which are still being planned. The BIO presents the best current understanding of the risk of CMR operations and those administrative, operational, or engineered activities or features that are significant in our efforts to maintain an acceptable level of risk for CMR operations. Based on the information in the BIO, DOE has already directed specific actions that must be taken by LANL to improve and/or control the level of risk associated with CMR operations, and LANL is implementing this direction. A substantial portion of these actions will be implemented through the CMR Upgrades Project. This project has been realigned to prioritize implementation of upgrades directly related to ensuring the safety or reliability (in the sense of important facility infrastructure features) of CMR operations through the year 2010. (This date was selected based on the expectation that a long-term plan to provide for future program activities of the type performed by CMR would take that long to implement.) The full implementation of these actions adequately mitigates the risks associated with CMR operations, even considering the information obtained through the recent CMR seismic study. It is expected that the implementation of the upgrades and full implementation of the BIO/MER/TSRs will take about 2 years.

Given that full implementation of the BIO/MER/TSRs will not be completed for 2 years, DOE and LANL are evaluating and implementing additional actions which have immediate benefit in improving and controlling the level of risk associated with CMR operations, or have a lasting effect in terms of reducing the material at risk in the facility (effectively increasing the margin of safety for facility). Most, if not all, of these actions will result in reduced operational efficiency, and some could have long-term implications regarding the capabilities or competencies that DOE had previously established at LANL. Thus, such actions will be evaluated thoroughly and will be proposed to DOE decision-makers with projections of costs, risk benefits, and program impacts to enable informed decisions. While some immediate actions may be ready for decisions in the near term (as soon as mid-November), actions with more permanent effects will take longer to evaluate so that they can be integrated with the development of the long-term plans for providing for CMR-like program support. Such decision packages are not anticipated prior to the last quarter of FY99.

As implied above, it is imperative that the decisions regarding CMR be based on a thorough understanding of capabilities which currently exist at that facility, and the current and future program requirements which would utilize these capabilities. As such, DOE and LANL are in the process of evaluating the CMR capabilities, the programs which currently utilize these capabilities, and the projected program demands against these capabilities. It is expected that DOE and LANL will prepare decision packages regarding the potential relocation or even elimination of some of these capabilities due to minimal demand, the existence of similar capabilities elsewhere, or other factors. As noted above, decisions of this nature have long-term ramifications, and would be evaluated with respect to both the near-term and long-term safety and program implications.

As the future program requirements are more fully established, the required capabilities and capacities for support of these requirements will also be determined. These will be translated into design requirements, as appropriate, for future construction projects (e.g., long-term upgrades to CMR or a new facility). A number of alternatives will be developed and evaluated to ensure long-term program support of the type currently provided by CMR. It is currently anticipated that feasibility studies would be conducted in FY99 and into FY00. Funding for any required conceptual design will be required starting in FY01.

All of these activities are intertwined, and have implications for site planning, NEPA documentation, and the alternatives to be considered for future program support. As such, all of these activities are being managed under one project as part of a strategy for enabling CMR decision-making to ensure safe operations now and in the future. The comprehensive project plan for this effort is still being developed and integrated in detail, and is expected to be available by the end of 1998.

VI. Summary/Conclusions

Ongoing analysis of the risks associated with operations in the 45-year old CMR building, combined with recent seismic results have led to a series of plans and actions to reduce these risks and develop a strategy to maintain the required programmatic capabilities currently housed at CMR over the long term. During the next two years, the implementation of Technical Safety Requirements combined with completion of the CMR Upgrades sub-projects will maintain CMR as a safe operating platform for DOE nuclear materials programs over the next ten years. To that end, LANL has already (1) removed excess combustible materials to reduce the impacts of fires, (2) instituted administrative controls to maintain the amount of Material At Risk at low levels, (3) started to replace fire panels to improve fire detection, and (4) implemented a formality-of-operations plan to provide multiple layers of protection for worker safety. Additionally, robust nuclear material containers, that will permit immediate and safe confinement for excess MAR, are being evaluated for use. The above actions will provide an immediate and tangible improvement to the operating safety margin at CMR.

In order to aggressively and efficiently continue to reduce risk at CMR, DOE and LANL need to ensure that the TSR upgrades are completed within the two-year period. Funding must be made available to address these high priority commitments. DOE and LANL must integrate the near-term actions with the evaluation of the seismic conditions throughout the entire TA-3 complex, develop options that meet long-term program needs, complete a total site-wide facilities improvement plan, and -- if necessary -- initiate conceptual design of a new nuclear materials facility.

Appendix A: Baseline Risk to the Public

The baseline risk to the public is presented by comparing results of the BIO to two measures of safety 1) the DOE Safety Goal and 2) the Radiological Offsite Evaluation Guideline.

Comparison to the DOE Safety Goal
One measure of risk to the public from the operation of CMR is to compare the risk of operating CMR to the DOE safety goals.

DOE policy, established in SEN-35-91, Nuclear Safety Policy[3], requires that no individual be exposed to significant additional risk to health and safety from the operation of a DOE nuclear facility beyond the risks to which members of the public are normally exposed. To that end, DOE has adopted two quantitative radiological safety goals to limit public risk associated with DOE nuclear operations. These goals are as follows:

> *The risk to an average individual in the vicinity of a DOE nuclear facility for prompt fatalities that might result from accidents should not exceed one-tenth of one percent (0.1%) of the sum of prompt fatalities resulting from other accidents to which members of the public are generally exposed. For evaluation purposes, individuals are assumed to be located within one mile of the site boundary.*

> *The risk to the population for cancer fatalities which might be attributed to operations of a DOE nuclear facility should not exceed one-tenth of one percent (0.1%) of the sum of all cancer fatality risks resulting from all other causes. For evaluation purposes, individuals are assumed to be located within 10 miles of the site boundary.*

The BIO did not identify any accidents within the CMR that would result in a prompt fatality to the public; therefore, the first safety goal was met.

For the second safety goal, a comparison was made of the risk from the Evaluation Basis Accidents presented in the BIO to the one-tenth of one percent of all cancer fatalities from all other causes. The statement of the safety goal includes references to the engineered safety features and controls to mitigate the effects of potential release. The statement reads as follows:

> *In striving to reach these goals, DOE nuclear facilities and activities shall be designed, constructed, operated, and decommissioned with a) appropriate barriers to prevent or minimize potential radioactive releases; b) engineered safety features to minimize potential releases; and c) procedural controls to mitigate the effects of potential releases. These goals shall be addressed for both new and existing facilities. Proposed modifications to existing facilities to achieve these goals shall be*

[3] U.S. Department of Energy, Nuclear Safety Policy, SEN-35-91, September 1991

prioritized along with other proposed modifications based on their safety significance.

In addition, guidance on Environmental Impact Statement generation[4] includes the following guidance:

> *Analyses generally should be based on realistic exposure conditions. Where conservative assumptions (i.e., those that tend to overstate the risk) are made, describe the conservatism, and characterize the "average" or "probable" exposure conditions if possible.*

Therefore, it is deemed appropriate to include the mitigated/controlled estimates of risk as well as the unmitigated/uncontrolled estimates. The intent of safety goal comparison is to understand a mean estimate of risk with recognition of uncertainties. As one mechanism to address uncertainties, the two source-term assumptions from the BIO are used along with mean output from the computer code used to estimate population exposures. Therefore, in addition to the bounding estimates, "best estimate" comparisons of risk were also made. As a further measure of uncertainty, 95th percentile dose estimates would be about a factor of four higher than mean estimates.

Figure A-1 shows the unmitigated/uncontrolled estimates for bounding risk (i.e., bounding source term and mean percentile dose calculations) and the "best estimate comparison of risk (i.e., best estimate source term and mean dose calculations). Comparisons for mitigated/controlled accidents are shown in Figure A-2.

[4] U.S. Department of Energy, Office of NEPA Oversight, "Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements," May 1993.

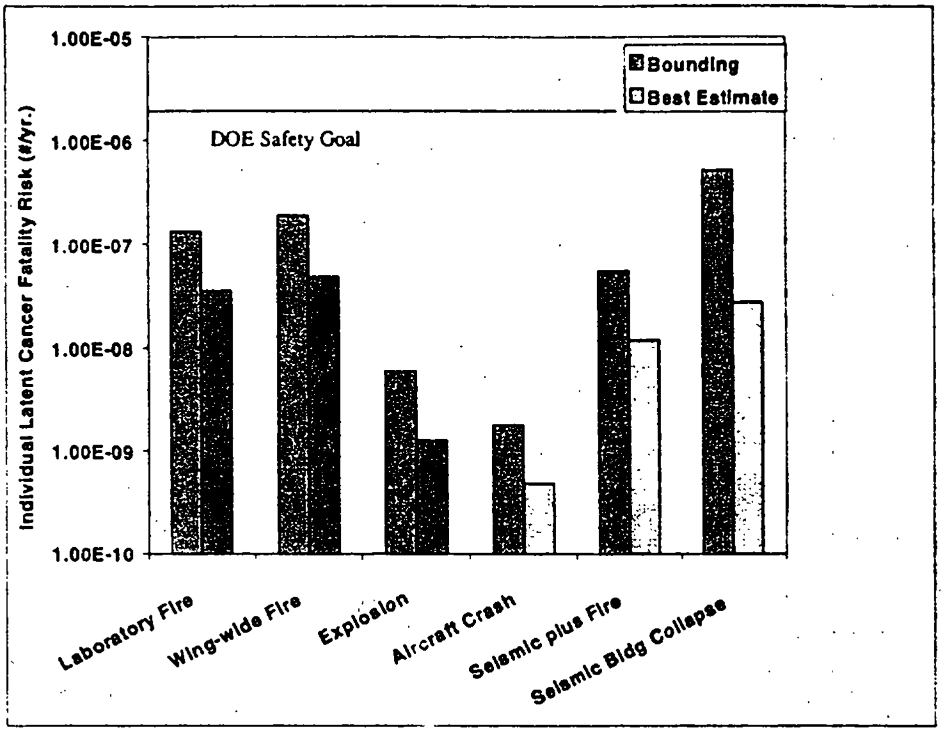


Figure A-1, Comparison of Risks to safety goal for uncontrolled/unmitigated accidents

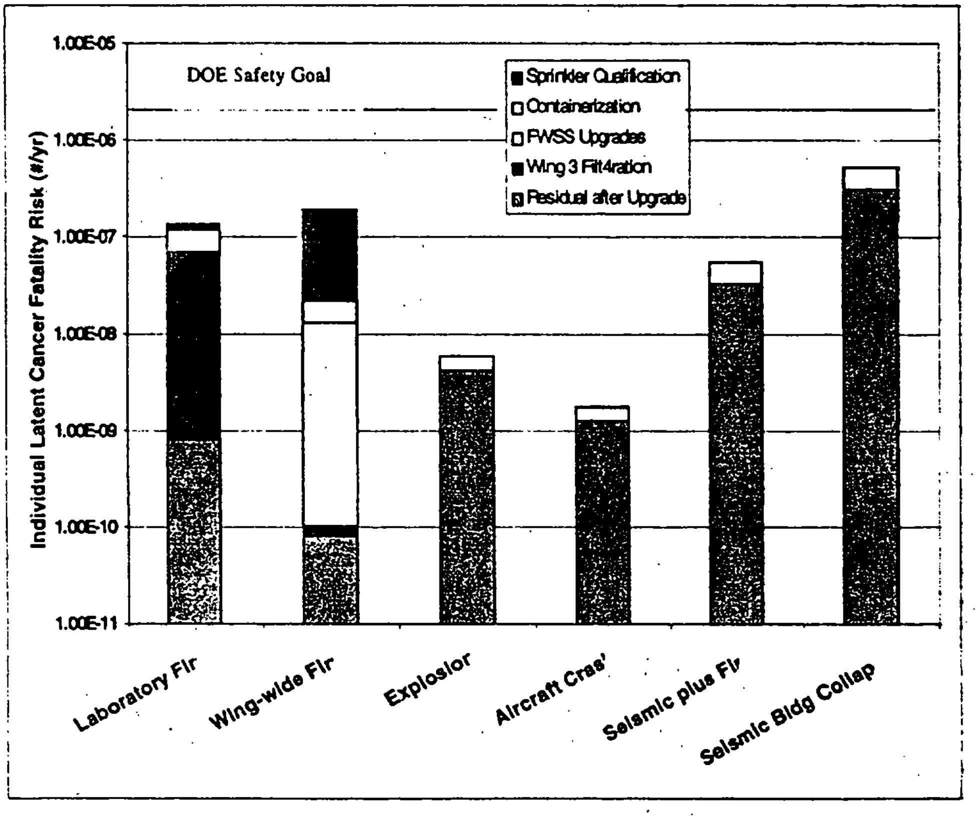


Figure A-2, Comparison of CMR Risks to DOE safety goal including new BIO controls

The following assumptions are made in the comparison:

- The risk is for CMR prior to any upgrades or implementation of TSRs (such as combustible loading, which, for example, is rapidly being improved).
- The cancer risk to an individual due to other causes is 2×10^{-3} cancer fatalities per year. This value was determined from statistics on death rates due to cancer as reported by the National Safety Council[5].
- The risk for each accident is the product of the mean latent cancer fatalities for each release, multiplied by the estimate of the accident's frequency of occurrence, divided by the estimate of population.
- The estimate of the population was that for Los Alamos County from the last census, or approximately 17,240 persons. (The increase in risk based upon a 50-mile radius was insignificant.)
- The number of latent cancer fatalities is estimated by scaling a unit release by source term for each accident.
- The atmospheric dispersion modeling is based on input used in the CMR BIO.
- A parametric modeling approach was used for atmospheric dispersion modeling. Phenomena that were varied include 1) building wake effects, 2) plume meandering, 3) short- vs. long-term releases and 4) elevated plume heights vs. ground level releases. The maximum value was chosen from the combination of runs. This analysis is based on the work of Restrepo and McClure[6]

The conclusion that can be drawn from Figure A-1 and Figure A-2 is that currently the operations at CMR are substantially below the DOE Safety Goal.

Comparison to Radiological Evaluation Guideline

Another measure of safety for CMR operations is to compare the doses obtained from the Evaluation Basis Accidents presented in the BIO to the Radiological Evaluation Guideline (EG). The EG is used as the criteria for the need to select Safety Class Systems, Structures, and Components in a Safety Analysis Report (SAR) or BIO. The EG, established in DOE 420.1 Implementation Guide, is 25-rem total effective dose equivalent at the site boundary. It is generally accepted as a value that, while not considered an acceptable public exposure, is indicative of no significant health effects for a maximally exposed offsite individual.

The dose for the Evaluation Basis Accidents is presented in Table A-1 using bounding source terms for selected accidents.

Table A.1 Offsite Dose for EBAs

[5] National Safety Council, Accident Facts, 1991 Edition, Chicago, IL, 1991

[6] Memo to Dae Chung from Restrepo and McClure, " Atmospheric dispersion modeling for comparison of BIO results to DOE Safety Goals", LANL, 1998.

Accident Scenario	Source Term To MEOI (Rem-TEDE)		CMR Facility Control Set	Mitigated Doses	
	Bounding	Best*		Bounding	Best
Wing Wide Fire	42.8	10.8	Fire Suppression System, Combustible Control Program, HEPA Filtration, Fire Alarm, Fire Barrier and Fire Protection	1.7E-2	4.2E-3
Explosion	57.3	11.7	Flammable Gas Detection, Fire Suppression System, HEPA Filtration	~ 0	~ 0
Seismic Plus Fire	218.9	40.6	Building Structure, Fire Suppression System, Combustible Control Program, HEPA Filtration, Fire Alarm, MAR control program	41.7**	2.0
Seismic Building Collapse	75.4	3.7	Building Structure, Containerization, MAR control program	41.7	2.0

* The bounding estimate represents the bounding value suggested by the data given the available physical entrainment mechanisms (such as fire). The best estimate represents the expected value suggested by the data for the given physical entrainment mechanism.

** The seismic plus fire accident now becomes the same as the seismic accident

These dose values were compared to the 25 rem EG in order to identify safety class structures, systems or components at CMR. DOE has reviewed and approved the BIO subject to a number of conditions of approval. These conditions include upgrading many systems and instituting a number of new controls via the interim TSRs. These actions will both lower the dose of the EBAs and substantially reduce their frequency. The expected result is that when these actions are implemented some of the accidents such as seismic with fire will have such a low frequency that they will no longer be considered EBAs but instead be Beyond Evaluation Basis Accidents for which the 25 rem EG no longer applies. For the remaining EBAs the expected result is that these accidents will have a dose below the 25 rem EG. This result is expected for all EBAs except for the Seismic with Building Collapse EBA. The purpose of this paper is to examine the seismic issue and put forth alternatives to reduce the dose associate with the postulated seismic accident.

Appendix B: Seismic Hazard Studies at LANL

A number studies were initiated to investigate seismic issues at LANL. With respect to TA-3, minor faults have been found, including one beneath the CMR facility. At the CMR, the total seismic hazard was evaluated, which includes vibratory ground motion and surface rupture. The following has been tentatively concluded:

- The probability of damage leading to the seismic collapse of CMR caused by ground motion is at least 20 times greater than the probability of damage leading to the seismic collapse of CMR caused by surface rupture of the fault under the CMR.
- The seismic accidents evaluated in the BIO bound the seismic risk for CMR even with the knowledge of a fault beneath the building.

Fault and Surface Rupture Studies

The surface rupture study for TA-3, is in progress and a full preliminary report is not expected until March 1999. However, it is evident that TA-3 does contain faults with vertical displacements in the range of 1-10 feet in 1.2-million-year-old Bandelier tuff. The heaviest concentration of these faults is in the southwest corner of TA-3. This concentration is believed to be defining the southern end of the Rendija Canyon fault. The faults found include one that appears to intersect the CMR site.

> The identification, location and orientation of this fault were investigated based on the following: (1) air photo interpretation; (2) high-precision mapping of faults in canyons to the south of TA-3; and (3) examination of cores taken from nine holes drilled around the CMR Building. The air photos indicate a linear feature running through the CMR site from the northeast corner of the facility and off the site to the west-southwest. The high-precision mapping effort located a fault with about 5 feet of vertical offset in Twomile Canyon to the southwest, which coincides with the southwest end of the air photo feature running through the CMR site. The examination of the cores showed that the core taken at the northeast corner (CMR-6) of the facility cut through a fault with a total vertical offset of about seven feet and that it is likely that the same fault lies between cores CMR-2 and CMR-3. The information from the cores is consistent with the air photo features. The fault shown in Figure B-1 is consistent with these findings.

While surface rupture can cause significant structural damage, the probability of an earthquake causing surface rupture on the fault found under the CMR building is very low. An earthquake that might result in permanent ground displacements capable of causing cracking in a concrete or masonry structure is estimated to be a 10,000- to 20,000-year event. An earthquake that might result in permanent ground displacements capable of causing structures to collapse is estimated to be a 33,000- to 100,000-year event.

The return periods for the above displacements are based on the results of a probabilistic fault rupture displacement study.

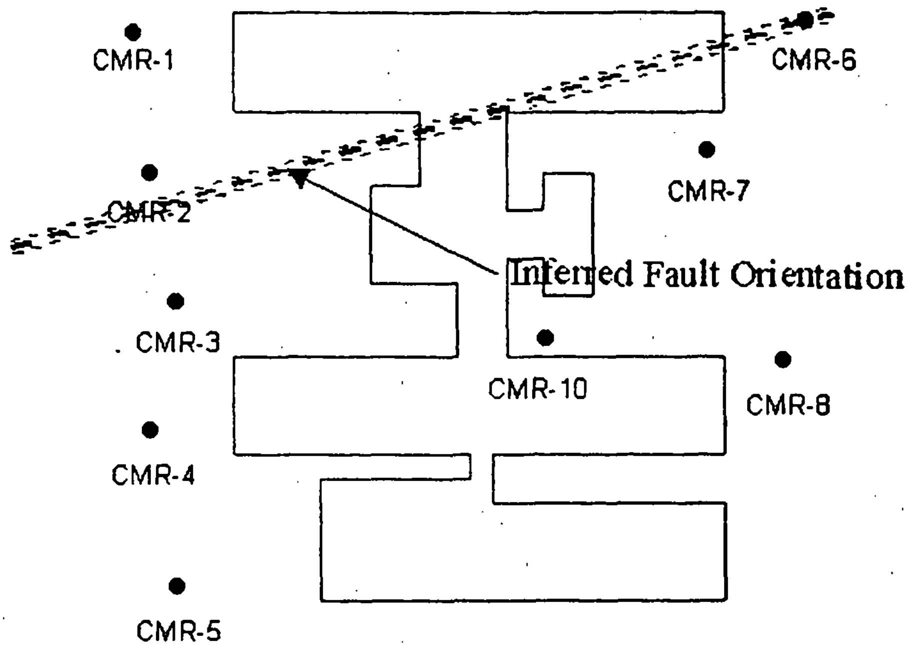


Figure B-1 – Plan view of CMR building with inferred location of fault

<u>Seismic Performance of the CMR Building</u>
As discussed in the CMR BIO, the annual probability of seismic induced structural collapse, based on ground motion associated with an earthquake, is about $2x10^{-3}$ (500 year return period) for most areas of the facility. In these areas, the median capacity of the structures is approximately 0.14g peak ground acceleration. The exception to this is the vault, which has an annual probability of seismic induced failure of about $7x10^{-5}$ (14,000-year return period) with a median capacity of about 0.75 g peak ground acceleration. The vault is located approximately 100 feet from the closest possible point of the inferred location of the fault, and based on current information would not be intersected by the fault.

The significance of this information is that ground motion resulting in a loss-of-confinement accident for most areas of the CMR Building is at a frequency that is at least 20 times greater than the frequency of surface rupture. In the BIO, the consequences of the design-basis seismic accident are assessed assuming that the CMR building, with the exception of the vault, collapses. Since the vault would not be directly affected by a surface displacement, the assumptions used in the BIO for the design-basis seismic accident are still valid even with knowledge of a fault beneath the facility.

A beyond-design-basis seismic accident is also assessed in the BIO. The consequences of this accident were identical to the design-basis accident because the assumption that most areas of the facility would collapse is the worse scenario that could occur. It was also assumed that because the vault had such a high median capacity, 0.75 g peak ground acceleration, it would survive the beyond-design-basis event.

Implications of Seismic Findings

The discovery of the fault under the building does not significantly increase the probability of seismic-induced damage; however, it has an impact on decisions concerning upgrades and future uses for the facility. From the seismic perspective, the question that must be assessed is whether or not it is prudent to upgrade the structure to resist ground-motion loads when damaging surface rupture, though a small probability, is still possible. While it is possible to upgrade to resist the forces/displacements caused by permanent ground deformation, the upgrade costs would increase substantially. It should be noted that if this site were to be considered for a new nuclear facility, the discovery of the fault would be cause for reevaluation. In addition, DOE is sensitive to the perception that might exist regarding the long-term operation of a nuclear facility, such as CMR, over a fault such as that found at this site.

Appendix C: CMR Upgrades: Currently Identified Subprojects and Drivers (Note: Some identified subprojects are not currently within the CMR Upgrades project.)

BIO/TSR Subprojects from Workshop #1

- Fire Protection Panel Replacement (TSR driven)
- Duct Wash Down (USQ driven)
- Transient Combustible Loading (TSR driven)
- Air Compressor Replacement (Operationally driven)
- Hood Wash Down (TSR Driven)
- Containerization (TSR Driven)
- Fire Suppression Upgrades (TSR Driven)
- Delta Pressure Indicators (TSR Driven)
- Wing 9 Ventilation System Upgrades (TSR Driven)
- Emergency Personnel Accountability System (Compliance Driven)
- Stack Monitors (Compliance Driven)
- Wing 9 Hot Cell Controls, including Gamma Monitors (TSR Driven)
- Wing 9 Hot Cell Shielding Improvement (TSR Driven)
- Wing 9 Hot Cell and Alpha Box Delta Pressure Indicators (TSR Driven)
- Wing 9 Hot Cell Door Enclosures (TSR Driven)
- Wing 9 Hot Cell Alpha Box HEPA Filter Installation (TSR Driven)

Additional Proposed Upgrades from Workshop #2

Recommended Upgrades Related to Public Safety Risk Reduction:

- Wing 3 Filtration Upgrades

Recommended Upgrades Related to Worker Safety Risk Reduction

- Emergency Lighting Upgrades
- Public Address System Improvements
- HVAC Testing and Balancing
- Continuous Air Monitors
- Acid Vents and Drains
- Glovebox Pigtail Connections

Recommended Upgrades Related to Facility Reliability and Operability

- Instrument and Process Air Separation
- Chiller and Controls for Chilled Water System
- Circulating Chilled Water Distribution System
- Internal Power Distribution
- Lightning Protection System Upgrades
- HVAC Controls
- HVAC Corroded Ductwork Replacement
- Selected Containment Replacement (Gloveboxes)

- Operations Center
- Sanitary Waste Lines
- System Control and Data Acquisition (SCADA)
- Wing 2 & 4 Electrical Upgrades
- Uninterruptible Power Supplies

Appendix D: Near-Term Risk Reduction Options

Options one has been implemented and option two is in the process of implementation; the other two options are being evaluated as methods of further risk reduction while the CMR Upgrades Project progresses. Options implemented or being considered include the following:

1. Administrative controls to manage MAR to levels below the 25-rem guideline
2. A containerization of MAR in robust containers to reduce release in a catastrophe
3. Sample-size reduction
4. Movement of sample management operations to TA-55

Each of the four options is examined individually below for potential risk reduction, estimated cost, and impact on programmatic work and time frame to implement.

Administrative Controls to control amounts of MAR to levels at or below EG levels.

<u>Action(s)</u>

As a part of the CMR interim TSRs, submitted in October for DOE's approval, a computer program was developed to track the amount of Material At Risk in the facility. The program is in operation at this time. Using this tool, NMT division management has instituted administrative controls and has included them in the CMR interim TSRs that will control the level of MAR at normal operating levels low enough to reduce the earthquake/fire accident consequences to doses below the DOE 420.1 Evaluation Guideline during the vast majority of facility operating time. Any operations conducted in the facility requiring MAR above the EG must be justified to the division director and specifically approved on a case-by-case basis.

Additional administrative controls are being evaluated that would require sample residues from analytical chemistry to be returned to TA-55 rapidly in order to prevent them from accumulating on the CMR MAR inventory.

<u>Risk Reduction</u>

Administrative controls restricting the amount of MAR in the facility immediately reduces consequences to below EG except for potential brief periods in which a special operation might cause a spike in MAR resulting in catastrophic accident consequences for the facility to go above the EG. Additional initiatives regarding residue management, sample size and management, and containerization will further reduce daily operational amounts of Material At Risk in the facility over time, making it easier to prevent any operational process needing to exceed the administrative control limit. The requirement for going above the EG at any time should be rare.

Cost and Schedule

Cost for implementing the computer MAR tracking software, and the administrative control for MAR is negligible. The work has been done.

The cost for prompt return of sample residues to keep daily MAR levels low will result from the requirement for many additional shipments of material between LANL sites. Each shipment involves characterizing the sample to be shipped at a cost of approximately $2K per sample. Additionally, each shipment will involve material packaging, paperwork preparation, and road closures when the material is a liquid. Each road closure will cost between $2K and $3K.

Impacts to Programs and Operations

Administrative control of Material at Risk as currently structured would pose negligible impact on current CMR operations.

Returning residues and samples as soon as possible would mean time spent characterizing samples, packaging, and arranging for numerous additional shipments. The potential impact of any slow down in ability to move residues would be a limit on the throughput of samples able to be processed.

Containerization

Action

One of the approval conditions of the CMR Basis for Interim Operations was the submission to DOE of a Containerization Program by the end of November. The program will use DOE approved "robust" containers to provide protection for Material at Risk under conditions of fire and earthquake. The program will require MAR that is not required to be out of robust containers for operational reasons, to be containerized and thereby removed from the material that could be released during a catastrophe. Several containerization options are being evaluated. They include use of Mossler safes and of Hagan containers. The former have excellent fire protection characteristics, and have been tested under severe abuse conditions. The Hagan containers contain a vent with a two-part filter that is approved for WIPP shipment drums. It is also possible that custom-designed containers will be designed, built, and qualified.

Risk Reduction

If all material currently not being analyzed could be containerized, then MAR could be reduced by about 3.5 kg. That would equate to a reduction in offsite consequences during a disaster of approximately 35% based on current average MAR loading in the facility. Since normal daily operational MAR-loading is below EG, the 35% reduction will provide significant extra margin to the MAR level equivalent to the EG for the infrequent operations that may require a spike in daily MAR in the facility.

Cost and Schedule

The cost for implementing this program would be between $200K and $300K and take between 6 and 12 months depending on the container option chosen.

Impact to Programs and Operations

Placing accountable MAR samples into larger containers for storage might pose potential safeguards issues. It could additionally pose issues of corrosion in containers exposed to liquid, acid-dissolved, sample fumes. The impact of corrosion products on analytical samples is of concern for reasons of analytical accuracy/quality. These issues will require additional study prior to implementation. Use of extensive containerization will make it harder for researchers to retrieve samples, thus causing some additional exposure to radiation and some slowing of analytical chemistry sample throughput.

Sample-Size Reduction

Action

By working closely with counterparts at TA-55, some sample sizes sent to the CMR could be reduced. The amount of material sent to CMR might be sufficient for analysis only. with backup samples remaining at TA-55. Developing new procedures utilizing smaller amounts of material could also reduce sample-size requirements.

Risk Reduction

If samples coming to CMR from TA-55 are reduced in size to just what is required for analysis, with no backup material, MAR could be reduced by as much as an additional 1.75 kg. In addition, if analysts are able to develop new analytical methods requiring smaller sample size, it is estimated that an additional 20% reduction could be achieved.

Cost and Schedule

This action will cost less than $200K to implement and could be started relatively quickly

Impacts to Programs and Operations

Extra costs will be incurred when sample analysis has to be repeated or when additional analyses are called for, because the analyst will have to request and schedule another shipment from TA-55. The delay will in general be one to two weeks.

Additional manpower and capital dollars will be required if new analytical methods are to be developed and tested. New development would take in excess of six months to design, test, and implement.

Move Sample Management to TA-55

Action

A sample management capability could be established in PF-4 at TA-55. Since sample management cannot be down for more than a few days, a complete sample management laboratory would have to be installed and ready to go at TA-55 before sample management could move out of CMR.

Risk Reduction

If sample management is moved to TA-55, MAR would be reduced by approximately 1.75 kg (approximately 18% reduction over un-containerized average daily MAR inventory). The MAR reduction for this initiative would not be realized if sample-size reduction or sample containerization per previous actions had already occurred.

Cost and Schedule

It will cost in excess of $2M to move sample management to TA-55 and would take 18-24 months.

Impacts to Programs and Operations

If done correctly, the move should not affect programs other than losing programmatic funds to make the changeover. Once the move is completed, four sample-management FTEs would be required to relocate to TA-55. Three sample-management FTEs would be required at CMR building to maintain shipment coordination, package and unpackage materials, and to provide documentation and reporting.

In addition to moving sample management, ^{238}Pu analytical chemistry operations could be moved to TA-55. Since the ^{238}Pu operation could not tolerate any down-time, a complete laboratory would have to be built and tested before a move could commence. Design of equipment, manufacturing of special gloveboxes, purchase and setting up of instrumentation, and reconfiguration for Rooms 124 and 201 would require 24-36 months. Total cost is estimated to be in excess of $4M.