E.3 Design/Construction Working Group

William Kennedy
03/19/97 05:20 PM

To: James Beyer@CRWMS
cc: Michael Voegele@CRWMS, Robert Sandifer@CRWMS, Robert Law@CRWMS, Daniel McKenzie@CRWMS, Dean Stucker@CRWMS, Russell Baumeister@CRWMS, Paul Harrington@CRWMS, Glenn Milligan@CRWMS
Subject: Design/Construction objectives for Enhanced Characterization

The Design/Construction working group met on March 19, 1997 to develop design and construction objectives for the proposed Enhanced Characterization of the Repository Block.
Attached are the results of that meeting.

ECRB-OB

OBJECTIVES FOR ENHANCED CHARACTERIZATION OF REPOSITORY BLOCK

DESIGN OBJECTIVES	CRITERIA (C) & ASSUMPTIONS (A)
1. BETTER DEFINITION OF TSw3 LOCATION/CHARACTER (PARTICULARLY IN SOUTHWEST QUADRANT)	C - PROVIDE ENHANCED STRUCTURE MAP A - COLLECT BY DRILLHOLE
2. BETTER DEFINITION OF STRUCTURE & THICKNESS OF UNDERLYING ZEOLITIZED UNITS	C - PROVIDE ENHANCED STRUCTURE MAP A - COLLECT BY DRILLHOLE
3. LOCATION/CHARACTER OF SOLITARIO CANYON FAULT/SPLAYS	C - PROVIDE LOCATION & ORIENTATION A - COLLECT BY NORTH END CROSS-DRIFT OR CROSS-DRIFT AND HORIZONTAL DRILLHOLES
4. DEFINITION/TUNNELING CHARACTERISTICS OF LOWER TSw2 SUB-UNITS	C - OBTAIN ROCKMASS CHARACTER A - COLLECT BY TUNNELING
5. "PROVE OUT" NORTHERN EXPANSION AREAS	A - 300 m EXPANSION OK WITH CURRENT DATA ADDITIONAL 700 m POTENTIAL EXPANSION WITH NEW DATA
a) LARGE HYDRAULIC GRADIENT	A - COLLECT BY DRILLHOLE
b) SECOND PENETRATION OF DHW STRUCTURE	A - COLLECT BY CROSSDRIFT
c) BETTER DEFINE FRACTURE ORIENTATIONS	A - COLLECT BY CROSSDRIFT
6. MAINTAIN EMPLACEMENT DRIFT ORIENTATION FLEXIBILITY	C - CROSSDRIFT NOT IN PLANE OF EMPL DRIFTS C - CROSSDRIFT USABLE IN REPOSITORY LAYOUT
7. CONFIRM PREFERRED EMPLACEMENT DRIFT ORIENTATION	A - CONFIRM BY CROSSDRIFT TUNNELING
8. COMPLY WITH APPLICABLE REGULATIONS: 10CFR960 SITING CRITERIA OF ≥200 m COVER	A - ONLY THOSE PORTIONS OF A CROSSDRIFT DIRECTLY OVERLYING EMPL AREA MUST COMPLY; ACCESS RAMP DOES NOT

OBJECTIVES FOR ENHANCED CHARACTERIZATION OF REPOSITORY BLOCK

CONSTRUCTION OBJECTIVES	CRITERIA (C) & ASSUMPTIONS (A)
1. DEMONSTRATE COST EFFECTIVE CONSTRUCTION APPROACH	C - TUNNEL SIZED TO AVAILABLE TBM, WITHIN DESIGN RANGES C - USE AVAILABLE RESOURCES C - DECOUPLE TBM & MAPPING; LIMIT VISITORS A - CONST'N COST BASIS WILL BE ENHANCED
2. DEMONSTRATE EFFECTIVE VENTILATION/DUST CONTROL	A - INCREASED USE OF DUST CONTROL WATER ALLOWED ON TBM
3. DEMONSTRATE INTEGRATED ES&H APPROACH	C - CLEAR UNDERSTANDING OF ES&H/ESFDR REQ'TS (eg OSHA vs MSHA) A - DESIGN REQ'TS SAME AS CONST'N REQ'TS
4. IMPLEMENT A PERFORMANCE BASED APPROACH TO DESIGN/CONST'N INCLUDING A CONSTRUCTION BASED TBM CONFIGURATION	C - REQUIRES DIE/SAFETY INTEGRATION A - REQ'TS/CONTROLS WILL BE PERFORMANCE BASED, WHERE "WHAT" NOT "HOW" IS SPECIFIED
5. TEST "STATE OF THE ART" MECHANICAL EXCAVATORS	A - IN ALCOVES AND MAYBE STARTER TUNNEL

William Kennedy
04/02/97 02:42 PM

To: Robert Law@CRWMS, Daniel McKenzie@CRWMS, Glenn Milligan@CRWMS, Dean Stucker@CRWMS, Russell Baumeister@CRWMS, Paul Harrington@CRWMS
cc: James Beyer@CRWMS, Mitchell Brodsky@CRWMS, MacKaye Smith@CRWMS, Ralph Dresel@CRWMS, Ned Elkins@CRWMS, Peter Hastings@CRWMS, Jim Houseworth@CRWMS, Ken Ashe@CRWMS, Ralph Rogers@CRWMS
Subject: Design/Construction Working Group Meeting

The Design/Construction Working Group (WG) will meet on Friday, April 04, 1997 in Conference Room # 630 from 8:00 to 11:00 am. The purpose of the meeting is to identify potential benefits associated with each of the criteria (originally listed as objectives by our WG) compiled by the Design/Construction WG. See the Attachment (CRITCRWK.WP) in Beyer's lotus note below for the latest ECRB criteria list.

In addition to listing potential benefits, we will also make a first cut at filling out the ECRB Development Summary data sheets (see Attachment ECRB.WP6 for example filled out by Bob Sandifer) for each Design/Construction criteria.

WG members who cannot attend this meeting should send a representative. People on the cc list are invited to the meeting, but need not send a representative if they do not attend.


ECRB.W

To: Robert Sandifer, Richard Snell, Jean Younker, Larry Hayes, Doug Chandler, Michael Voegele, Jerri Adams, Vince Iorii, Dennis Williams, Scott Wade, Marshall Bishop, Mike Cline, Ken Ashe, Ned Elkins, Peter Hastings, Jim Houseworth, William Kennedy
cc: Mark VanDerPuy, Jeff Skov, Ralph Rogers
From: James Beyer
Date: 04/02/97 11:20:20 AM
Subject: ECRB Criteria Validation

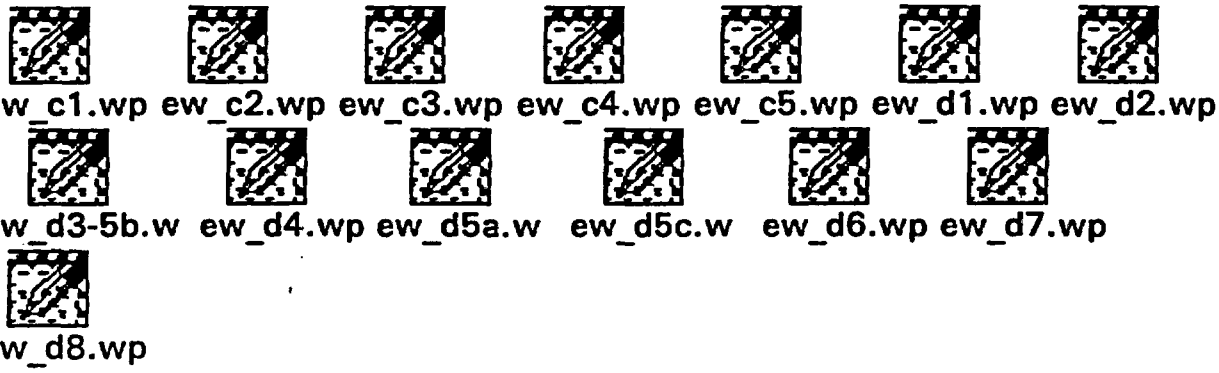
The attached file contains the latest on the ECRB Criteria List as a result of this morning's Committee meeting. For those of you who attended yesterday's meeting, several comments were made this morning. These comments resulted in the redlines you now see in the list. I have also done the cross-walk back to the original compiled Working Group lists.

If you have any further comments, questions or concerns related to the attached criteria list, please let me know by 8:00am tomorrow (4/3). If I have not received any comments by that time, the criteria list will be considered final.


CRITCRWK

To: James Beyer
cc: Robert Law, Daniel McKenzie, Paul Harrington, Russell Baumeister, Glenn Milligan, Dean Stucker
From: William Kennedy
Date: 04/04/97 04:04:26 PM
Subject: ECRB Development Summaries

Jim, here are the ECRB development summary sheets with the "Benefits" columns filled in based on the Design/Construction WG meeting held this morning. As I indicated on the phone, these should be considered "works-in-progress" and will likely be modified as work on remaining columns continues.



ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #33 [C1] ...demonstrating a cost effective construction approach	Will provide experience base for alternative approaches Can maintain ECRB schedule for VA support Will improve "fidelity" of some attributes of the TSLCC for repository Should result in lower unit excavation costs with attendant political benefits			

ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #34 [C2] ...demonstrating effective ventilation and hazardous minerals/dust control	May show that effective dust mitigation measures obviate need for respirators Provide confidence that repository can be constructed within compliance limits Effective dust control will be strongly tied to overall cost-effectiveness of the operation Provides opportunity to try alternative dust control methodologies			

ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #35 [C3] ...demonstrating an integrated environment, safety and health approach	An integrated ES&H approach will lead to a safer workplace and a more cost-effective operation Increased confidence & "baseline" information will be obtained regarding the development of a repository approach to ES&H.			

ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #36 [C4] ...implementing a performance based approach to design and construction, including a construction based TBM configuration	Provide an advance rate projection for the future repository TBM excavation work that is more aggressive (thus, less expensive) than what will be assumed based on the 5-mile loop excavation experience. Dust control requirements/concerns fully addressed prior to any repository construction. Increased confidence in the repository TSLCC. Opportunity available for a more effective, construction-based Hazards Analysis	Preferred Source: -TBM Excavation in repository block (not required to be in emplacement horizon) with TBM configured to YMP needs. Alternative Sources: -Use data from 5-mile loop excavation experience. -Use data from other similar excavation on other tunnel projects.	Excavated ground should be as close as possible to the ground expected in the repository excavation. This will assure that the machine configuration that would maximize the advance rate for the repository excavation is clearly defined. Also, the dust control features would similarly be optimized.	Schedule imposed on the enhanced repository block characterization will require that the TBM acquisition, upgrading, and mobilization be done in approximately 7 months. This will likely preclude a contractor from acquiring a new machine built specifically to our requirements. Rather, a used machine probably currently under the control of the contractor will be modified as much as practical to meet our requirements. The risk is that the machine may not totally meet all our requirements. However, it is more likely that the modified machine will be close enough to get the vast majority of confirmatory information needed.

ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #37 [C5] ...testing "state of the art" mechanical excavators	May increase confidence in the applicability of various non-TBM mechanical excavation processes in TSw2. Current repository concept involves some amount of non-TBM mechanical excavation. Could provide a better basis for estimating costs for repository development			

ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #23, #24 [D1] ...the spatial distribution of thermal and geomechanical properties of the repository horizon ...the location and continuity of stratigraphic contacts in the expanded repository block	Provide a better definition of TSw3 location and character, particularly in the southwest quadrant of the repository block. TSw3 bounds the repository layout in the SW. Better definition would help reduce uncertainty as to actual amount of usable area Could provide additional information on the presence / amount of Erionite in lower reaches of TSw2			

ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #18 [D2] ...the distribution and continuity of zeolitization	Provide a better definition of structure and thickness of underlying zeolitized units. Zeolite distribution (location, thickness, and depth below repository) can influence repository design (heat distribution and magnitude) Zeolites are a potentially significant natural barrier, and better definition may lead to reduced reliance upon Engineered Barriers			

ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #2 [D3] ...unexposed faults Criteria #3 [D3, D5B] ...hydrologic properties, fracture properties and geotechnical properties in and near faults	Will reduce uncertainty regarding the overall repository layout. (Current layout assumes no major structure between the Ghost Dance Fault and the Solitario Canyon Fault Location of SCF and its splays currently forms the boundary of the repository block in the NW. More accurate location information at repository depth will reduce uncertainty Examination of splay(s) may result in addition (or reduction) of suitable emplacement area First penetration of Drill Hole Wash structure showed little impact to design. A second penetration could confirm, or alter, this finding			

ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #23 [D4] ...the spatial distribution of thermal and geomechanical properties of the repository horizon	Only the top of the TSw2 has been seen in the ESF. Cross-block information would yield design information on the construct ability of the lower sub-units. Design parameters regarding the behavior of the rock mass in the lower sub-units will reduce uncertainty in the design			

ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #20 [D5A] ...the location and origin of the large hydraulic gradient north of the repository block	Significant additional emplacement area may be available to the north of the current layout. The presence/nature of the large hydraulic gradient must be investigated to allow this area to be considered as usable emplacement space			

ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #1 [D5C] ...fracture variability	Emplacement drift orientation may be driven, at least in part, by the fracture orientation. No information is currently in hand regarding orientation and spacing of dominant fracture sets in the lower sub-units			

ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #31 [D6] ...maintaining emplacement drift orientation flexibility	Maintenance of repository flexibility regarding emplacement drift orientation is critical until data are available on which to base a decision on orientation. A CD would contribute significantly to the required data base, but could itself destroy flexibility if placed within the plane of the repository. Primary benefit is the continued ability to utilize all potentially available emplacement area, without characterization-induced area losses			

ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #32 [D7] ...confirming a preferred emplacement drift orientation	Observation of dominant fracture spacings and orientations will allow a more solid basis for drift orientation decisions Fracture data in lower sub-units will confirm, or provide a basis to change, the current drift orientation. Current data are limited to upper-most repository sub-unit Drift orientation decision could impact repository costs related to TBM productivity			

ENHANCED REPOSITORY BLOCK CHARACTERIZATION
DEVELOPMENT SUMMARY

CRITERIA	BENEFITS	PREFERRED SOURCE, ALTERNATIVE SOURCES	RATIONALE	RISKS
Criteria #42 [D8] ...ensuring that additional drifts or excavations do not violate the 200 meter overburden disqualifying condition of 10 CFR Part 960 [960.4-2-5(d)]	Project position is needed on the applicability of the 200 meter cover criterion to non-emplacement areas A defined criterion is needed to allow siting of the cross-drift			

William Kennedy
04/30/97 03:03 PM

To: James Beyer@CRWMS
cc:
Subject: ECRB Configuration Ranking

Jim

This attachment includes my proposed corrections (redlined).

Bill

To: Ken Ashe, Ned Elkins, Peter Hastings, Jim Houseworth, William Kennedy
cc: Ralph Rogers
From: James Beyer
Date: 04/30/97 10:38:18 AM
Subject: ECRB Configuration Ranking

Please provide any corrections that you may have to intitial configuration compilation that I did. I know Bill indicated he had some that I didn't get.

Thanks

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
E-W Cross drift, central block above repository horizon	2(TS2), 36(C1), 37(C2), 38(C3), 39(C4), 8(PA) 1(D5C), 23(D4), 35(D7)	1(TS1), 6(TS6), 25(TS25), 15(PA)				

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E-W Cross drift, central block at repository horizon	1(TS1), 2(TS2), 10(TS10), 15(TS15), 23(TS23), 32(TS), 36(C1), 37(C2), 38(C3), 39(C4), 2(PA15), 8(PA)	6(TS6), 25(TS25), 15(PA)	34(D6)			

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E-W Cross drift, central block below repository horizon	2(TS2), 36(C1), 37(C2), 38(C3), 39(C4), 8(PA)	1(TS1), 6(TS6), 25(TS25), 2(PA15), 15(PA), 1(D5C), 23(D4), 35(D7)				

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E-W Cross drift, northern block above repository horizon	2(TS2), 6(TS6), 23(TS23), 36(C1), 37(C2), 38(C3), 39(C4), 2(D3), 3(D3 & D5B), 23(D4), 1(D5C), 8(PA) 35(D7)	1(TS1), 5(TS5), 25(TS25), 12(PA1), 15(PA)	47(D8)			

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E-W Cross drift, northern block at repository horizon	6(TS6), 10(TS10), 23(TS23), 36(C1), 37(C2), 38(C3), 39(C4), 2(PA15), 8(PA)	1(TS1), 5(TS5), 25(TS25), 12(PA1), 15(PA)	34(D6) 47(D8)			

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E-W Cross drift, southern block above repository horizon	2(TS2), 23(TS23), 36(C1), 37(C2), 38(C3), 39(C4), 23(D4), 1(D5C), 8(PA), 35(D7)	1(TS1), 25(TS25), 15(PA)				

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	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
E-W Cross drift, southern block at repository horizon	23(TS23), 36(C1), 37(C2), 38(C3), 39(C4), 2(PA15), 8(PA)	1(TS1), 25(TS25), 15(PA)	34(D6)			

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
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E-W Cross drift, southern block below repository horizon	2(TS2), 23(TS23), 36(C1), 37(C2), 38(C3), 39(C4), 8(PA)	1(TS1), 25(TS25), 23(D4), 1(D5C), 2(PA15), 15(PA) 35(D7)				

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	Preferred Source Available/ Individual WG Development Summary Cross Reference2	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
E-W Cross drift, central block above repository horizon w/ loop down to Calico Hills	2(TS2),17(TS17), 18(TS18), 19(TS19), 36(C1), 37(C2), 38(C3), 39(C4), 5(PA), 8(PA) 1(D5C), 23(D4), 35(D7)	1(TS1), 6(TS6), 25(TS25), 15(PA), 17(PA10)				

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E-W Cross drift, central block at repository horizon w/ loop down to Calico Hills	1(TS1), 2(TS2), 3(TS3), 7(TS7), 8(TS8), 9(TS9), 10(TS10), 11(TS11), 12(TS12), 15(TS15), 17(TS17), 18(TS18), 19(TS19), 23(TS23), 32(TS), 36(C1), 37(C2), 38(C3), 39(C4), 2(PA15), 5(PA), 8(PA)	6(TS6), 25(TS25), 15(PA), 17(PA10)	34(D6)			

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E-W Cross drift, central block below repository horizon w/ loop down to Calico Hills	2(TS2),17(TS17), 18(TS18), 19(TS19), 36(C1), 37(C2), 38(C3), 39(C4), 5(PA), 8(PA)	1(TS1), 6(TS6), 25(TS25), 2(PA15), 15(PA), 17(PA10) 1(D5C), 23(D4), 35(D7)				

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E-W Cross drift, northern block at repository horizon w/ loop down to Calico Hills	2(TS2), 6(TS6), 7(TS7), 8(TS8), 10(TS10), 11(TS11), 12(TS12), 23(TS23), 36(C1), 37(C2), 38(C3), 39(C4), 2(PA15), 5(PA), 8(PA)	1(TS1), 3(TS3), 5(TS5), 25(TS25), 12(PA1), 15(PA), 17(PA10)	34(D6) 47(D8)			

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ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
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E-W Cross drift, southern block above repository horizon w/ loop down to Calico Hills	2(TS2), 23(TS23), 36(C1), 37(C2), 38(C3), 39(C4), 23(D4), 1(D5C), 5(PA), 8(PA), 18(PA12), 35(D7)	1(TS1), 25(TS25), 15(PA), 17(PA10)				

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Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
E-W Cross drift, southern block below repository horizon w/ loop down to Calico Hills	2(TS2), 23(TS23), 36(C1), 37(C2), 38(C3), 39(C4), 5(PA), 8(PA), 18(PA12)	1(TS1), 25(TS25), 23(D4), 1(D5C), 2(PA15), 15(PA), 17(PA10), 35(D7)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Cross drift alcoves and subsurface boreholes, northern	6(TS6), 10(TS10), 11(TS11), 12(TS12), 37(C2), 40(C5), 20(D5A)	4(TS4), 13(TS13), 14(TS14), 24(TS24), 3(PA14), 12(PA1), 15(PA)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Cross drift alcoves and subsurface boreholes, central	10(TS10), 11(TS11), 12(TS12), 15(TS15), 37(C2), 40(C5)	4(TS4), 6(TS6), 13(TS13), 14(TS14), 24(TS24), 3(PA14), 15(PA)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Cross drift alcoves and subsurface boreholes, southern	37(C2), 40(C5), 18(PA12)	14(TS14), 24(TS24), 23(D1), 24(D1), 3(PA14), 15(PA)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Existing Thermal Test Facility	29(PA8)					

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Existing Ghost Dance Fault Alcoves	3(PA14), 12(PA1), 15(PA)	27(PA6), 28(PA7)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
3-D Seismic from surface and ESF		2(TS2), 2(D3), 3(D3 & D5B)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Horizontal borehole from Solitario Canyon	3(TS3), 13(TS13)					

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Northern crest borehole to water table	4(TS4), 5(TS5), 13(TS13), 14(TS14), 24(TS24), 25(TS25), 18(D2), 5(PA), 9(PA2), 17(PA10), 19(PA10), 22(PA3)	6(TS6), 18(TS18), 19(TS19), 23(TS23), 21(PA3)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Southern crest borehole to water table	4(TS4), 14(TS14), 18(TS18), 24(TS24), 25(TS25), 23(D1), 24(D1), 5(PA), 9(PA2), 17(PA10), 19(PA10), 22(PA3)	19(TS19), 23(TS23), 18(PA12), 21(PA3)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Paired WT holes across middle of Solitario Canyon Fault	16(TS16)	19(TS19)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Borehole west of Solitario Canyon Fault		15(TS15)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Borehole near WT-17		16(TS16), 19(TS19)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Additional testing in G2 (existing) and WT-24(planned)	20(TS20), 22(TS22), 20(D5A), 20(PA13)	21(TS21)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Southern Testing Complex (near WT-17)	21(TS21), 21(PA3), 22(PA3)	16(TS16), 19(TS19), 22(TS22)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
G-hole in Crater Flats		21(TS21)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
WT-23		20(TS20)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Laboratory testing	27(TS), 29(TS), 30(TS), 26(PA5), 27(PA6), 28(PA7), 30(PA11), 26A(PA)	29(PA8)				

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
OPTIMIZATION OF CONFIGURATION
INITIAL COMPILATION OF CONFIGURATION ELEMENTS

Configuration Element	Investigative Criteria Satisfied		Applicable Controls/Requirements Criteria WG Development Summary Cross Reference			Rationale Summary
	Preferred Source Available/ Individual WG Development Summary Cross Reference	Alternate Source Available/ Individual WG Development Summary Cross Reference	Criteria Number	Sheet Number	Description	
Testing in SD-6	18(D2), 23(D1), 24(D1)	17(PA10), 21(PA3)				

E.4 Licensing/Regulatory Working Group

Ken Ashe
03/20/97 07:17 PM

To: James Beyer@CRWMS
cc: Terry Crump@CRWMS, Robert Murray@CRWMS, April Gil@CRWMS
Subject: Our comments (redline strikeout) on the objective statement

Jim,

I have attached our proposed enhancements to the objective statement for the ECRB task.

If you have any questions or need additional information, please let me know.

OBJECTIV.W

Thanks!!!

Revisions to Objectives Statement

Objective:

Develop a recommended approach for the enhanced site characterization effort ~~incorporating an east-west drift~~. The approach should address work that will increase ~~enhance~~ scientific understanding of the behavior of the site, as well as ~~enhance~~ amplify understanding of engineering; construction; health and safety; cost; and regulatory and performance aspects of the potential repository. The study should consider the relationship between ongoing characterization activities, particularly how the current programs could complement and be complemented by the enhanced characterization effort. The approach should identify data needs that would support more rigorous compliance demonstrations for the siting criteria, design criteria, performance objectives, and Safety Analysis Report content requirements in the disposal regulations (10 CFR Part 60), while avoiding limitations on characterization activities listed in 10 CFR 60.15(c). It should also address potential efficiencies in the enhanced program by providing for ~~combining the drift with other~~ additional or subsequent characterization efforts. It should reflect the latest scientific understanding of the behavior of the site. The extent to which enhancements in the program can strengthen the data supporting the Viability Assessment also should be considered; however, the enhanced characterization program cannot constrain the data for Viability Assessment.

Ken Ashe
03/25/97 11:55 AM

To: James Beyer@CRWMS
cc: Terry Crump@CRWMS, Robert Murray@CRWMS, April Gil@CRWMS
Subject: ECRB Regulatory Criteria

Jim,

I have attached a file with the criteria the Licensing/Regulatory working group developed for the enhanced characterization of repository block planning effort.

LIC-CRIT.

If you have any questions or need additional information, please let me know.

Thanks!!!!!!

e) Regulatory and performance Criteria

1. Are there location, layout, or test program specific considerations for ~~an east-west drift~~ enhanced characterization ~~that can enhance understanding of the site relative to~~ to ensure that additional drifts or excavations do not violate the 200 meter overburden disqualifying condition of 10 CFR Part 960? [960.4-2-5(d)] [Note: There should be no need to enhance understanding relative to this condition; we know the surface topography. This criterion should only make sure that the project is careful to keep any new diggings below 200m. Compare underground surveying data to surface elevations. Shafts, boreholes, and their seals are excluded from this condition.]

2. Are there location, layout, or test program specific considerations ~~for an east-west drift~~ that can enhance the understanding of the site relative to necessary controls to limit impacts to the waste isolation characteristics of the site?

3. Are there location, layout, or test program specific considerations for an enhanced program that could strengthen the understanding of the site relative to the performance confirmation requirements in 10 CFR Part 60 to show that conditions have not varied beyond the limits assumed for design and to show that conditions are within the limits assumed for design? [The notion is to determine whether construction of the enhanced characterization facility(s) could provide facilities or opportunities to collect additional baseline data that could be used in compliance demonstrations for the performance confirmation requirements.]

4. Are there location, layout, or test program specific considerations for an enhanced program that can strengthen the understanding of the site relative to the requirements for underground records in 10 CFR 60.72 such that construction of another drift during site characterization could fulfill level of detail requirements (TBD) needed to satisfy some of the construction records requirements?

5. Are there location, layout, or test program specific considerations for the enhanced program that might compromise the ability to demonstrate compliance with the requirements of 10 CFR 60.15 regarding minimization of disturbances that could compromise repository system performance?

6. Could the additional data collected from the enhanced program compromise the ability to demonstrate compliance with the siting criteria in 10 CFR 60.122 that require demonstrations that potentially adverse conditions that are present have been adequately investigated and adequately evaluated. [The point here is that data that has not been fully evaluated and integrated into descriptions and models of site features and processes could provide the basis for regulatory agencies or intervenors to question the adequacy and sufficiency of evaluations supporting the VA or the site recommendation, or of compliance demonstrations provided in the License Application.]

7. Are there location, layout, or test program specific considerations for the enhanced program that might be considered as beginning construction of the geologic repository operations area without a construction authorization as identified in 10 CFR Part 60.3? [The point here is that we can not begin "construction on the repository" until we get a Construction Authorization.]

8. Are there location, layout, or test program specific considerations for enhanced characterization to minimize any significant adverse environmental impacts identified in comments on the Site Characterization Plan or in the Environmental Assessment? [NWPA Sec. 113(a)]

9. Are there location, layout, or test program specific considerations for enhanced characterization that demonstrate that the data are required for evaluation of the suitability of the site for an application to be submitted to the NRC for a construction authorization or for compliance with NEPA? [NWPA Sec. 113(c)(1)]

10. Are there location, layout, or test program specific considerations for enhanced characterization to ensure that radioactive materials will not be used at the site without the NRC's concurrence that the use is necessary? [NWPA Sec. 113(c)(2)]

11. Are there location, layout, or test program specific considerations for enhanced characterization such that projected environmental impacts in the affected area can be mitigated to an acceptable degree, taking into account programmatic, technical, social, economic, and environmental factors? [960.5-2-5(a) and (d)]

Ken Ashe
04/01/97 08:36 AM

To: James Beyer@CRWMS
cc:
Subject: ECRB Criteria Comments

Jim,

Seems that 25, 34 and 39 could be lumped into one criteria (all dealing with ventilation issues)?

The Regulatory criteria (#42 - 50) should be grouped by topic. Suggest this start with waste isolation and general concerns (46, 47). Next, the environmental issues (49, 50). Finally, the construction issues (48, 44, 45, 42). I think #43 could be deleted - it's the same as #46 without the cite for 60.15.

So - delete 43 and re-order the others: 46, 47, 49, 50, 48, 44, 45, 42.

Ken Ashe
04/07/97 12:07 PM

To: James Beyer@CRWMS
cc:
Subject: enhanced drift criteria

Jim,

Here is our best shot at the Benefits, rationale, risks, etc....


LIC_SUM.

If you have any questions let me know.

Enhanced Repository Block Characterization Development Summary for Licensing Items				
Criteria	Potential Benefits	Preferred Source/ Alternative Source	Rationale	Risks
47: Collecting further data to enhance the ability to demonstrate compliance with 10 CFR 60.122 which requires demonstrations that potentially adverse conditions that are present have been adequately investigated and adequately evaluated.	• Increase confidence in representativeness of site characterization data.• Provide additional data to characteriza the site features and processes. • Corroborate site characterization data. • Collect data that was excluded by focused program. • Characterize pathways away from repository.	Drift and drilling	Drilling and drifting are complementary; drilling provides broader areal coverage, and drifting provides details on in-drift conditions.	• All data collected may not be evaluated. This could provide the basis for intervenors to question the adequacy of evaluations of existing PACs (10 CFR 60.122(c)). • Contradictory or inconsistent data may be collected. Such data would have to be explained or a basis provided for excluding it from further consideration. • Contradictory or inconsistent data would complicate demonstrations of representativeness of all data.
50: Projected environmental impacts in the affected area that can be mitigated to an acceptable degree, taking into account programmatic, technical, social, economic, and environmental factors [960.5-2-2(a) & (d)].	None. Further characterization can only increase, not decrease impacts. However, impacts appear to be negligible.	No preference	Choice of source/alternative has no impact on criterion.	Minimal.
44: The performance confirmation requirements in 10 CFR Part 60 to show that conditions have not varied beyond the limits assumed for design and to show that conditions are within the limits assumed for design.	• Compliance with requirements. • Increased data for performance confirmation baseline. Potentially easier to show that conditions are within limits assumed for design. Contradictory or inconsistent data could be used to advantage because it would be identified, described, and evaluated prior to performance confirmation. • Increased confidence in performance confirmation program and demonstrations. • The applicability of this item is questionable since the data from the enhanced program would likely be limited to development of the performance confirmation baseline.	Drifting augmented by some drilling or horizontal drilling in the repository horizon.	More drifting would provide additional information for baseline on in-drift conditions; drilling would provide enhanced baseline on thermal, mechanical, and hydrologic conditions in and around the potential repository.	• Delays establishing performance confirmation baseline. • Data may not be completely evaluated thereby providing the basis for intervenors or regulators to question the adequacy of the evaluation of PACs in the LA. • Contradictory or inconsistent data that would cause revisions of the descriptions and models of site features and processes.

Enhanced Repository Block Characterization Development Summary for Licensing Items				
43: Limiting impacts to major natural features that may be important to site performance	None. Further excavation or drilling can only increase impacts, however small they may be.	Drifting only.	Drifting is slightly preferred to surface-based drilling for this criterian because of perceived potential for surface boreholes to create fast pathways for water flow.	• If surface-based drilling is pursued, the potential for creating preferential water pathways must be evaluated and defended; decisions to drill must be based on an assessment that the value of the information from drilling is greater than the cost of potential imaccts to the site. Such an assessment is not easy to perform and may be challenged. • Additional data could compromise demonstrations required by 10 CFR 60.122(a)(2).
46: Limiting, during site characterization, impacts to waste isolation, construction-to-test and test-to-test interference, and other requirements derived from 10 CFR 60.15(c)	None. Further excavation or drilling can only increase impacts, however small they may be.	Drifting is slightly preferred to drilling for impacts on waste isolation; no preference for other criteria.	Drifting is slightly preferred to surface-based drilling for this criterian because of perceived potential for surface boreholes to create fast pathways for water flow.	• The risk of a challenge based on 10 CFR 60.15(c) is minimal as long as due care is taken to coordinate drift and borehole locations with the current conceptual design. However, the design is subject to change, and flexibility to make changes in repository layout will become increasingly limited as additional drifting and drilling are performed.
42: Ensuring that additional drifts or excavations do not violate the 200 m overburden disqualifying condition of 10 CFR 960.4-2-5(d).	None.	No preference.	Choice of source will have no impact on whether waste is emplaced 200 m or more below the ground surface.	Negligible.
45: The requirements for Underground records in 10 CFR 60.72 such that construction of another drift during site characterization could fulfill level of detail requirements needed to satisfy some of the construction records requirements.	None. Regulatory requirement applies to construction phase not site characterization phase. This item should be deleted.	No preference	Choice of source has no impact on criterion.	• Negligible.

Enhanced Repository Block Characterization Development Summary for Licensing Items				
48: Beginning construction of the geologic repository operations without a construction authorization as required in 10 CFR 60.3(b)	None.	Slight preference for drilling.	Drilling is less likely than drifting to be perceived to consitiute unauthorized repository construction.	• Inapropriate or careless description of the enhanced characterization could compromise compliance with 10 CFR 60.3(b). • Intervenors could bring legal actions, but based on brief conversations with counsel, it is unlikely that this is a real problem.
49: Minimizing any significant adverse environmental impacts identified in comments on the Site Characterization Plan or in the Environmental Assessment [NWPA Sec. 113(a)].	None. Further excavation or drilling can only increase environmental impacts.	No preference.	Neither drilling or drifting will have significant environmental impacts.	• Minimal.

E.5 Design, Construction & Testing Controls and Requirements Working Group

Peter Hastings
03/18/97 05:58 PM

To: Jeff Skov@CRWMS, Robert Wemheuer@CRWMS, Jim Houseworth@CRWMS, Richard Peck@CRWMS, Bob Morgan@CRWMS, Gary Teraoka@CRWMS, Jerri Adams@CRWMS, Tom Fortner@CRWMS, Scott Wade@CRWMS, Robert Barton@CRWMS, James Compton@CRWMS, Doug Chandler@CRWMS
cc: Robert Sandifer@CRWMS, Michael Voegele@CRWMS, James Beyer@CRWMS, David Seamans@CRWMS, Ken Ashe@CRWMS, Ned Elkins@CRWMS, William Kennedy@CRWMS
Subject: Enhanced Repository Characterization

Many of you will be receiving a call from David Seamans, my admin asst, to set up the kickoff meeting for the "Design, Construction, and Testing Controls & Requirements" working group, an element of the Enhanced Repository Characterization planning effort that was begun yesterday. In case you have not yet heard, this is the evolution of the "East-West Drift" effort, and will plan the additional drift and testing program between now and the end of FY98 (completion of excavation). The integrated 90-day planning effort is working on a schedule that will provide a series of inputs, to ultimately culminate in a CR for the conduct of this additional work. The group consists of a series of 5 working groups: Testing, PA, Licensing & Regulatory, Design & Construction, and ours, reporting to a single planning committee with the assistance of a Project Engineering group who will facilitate the integration of budget and schedule issues.

I still need names of reps from Jerri Adams, Doug Chandler, Richard Peck, and Bob Morgan, as indicated, but the makeup of our working group thus far is as follows:

DIE	Jeff Skov (Bob Wemheuer backup)
PA	Jim Houseworth
ESFDR/ConOps	Gary Teraoka
S&H	TBD (Chandler)
Institutional	TBD (Adams)
EA	TBD (Morgan)
DOE/QA	TBD (Peck)
DOE/AML	Bob Barton (Jim Compton backup)
DOE/AMAAM	Tom Fortner
DOE/AMESH	Scott Wade

The charter of this working group is to provide input to the 90-day planning effort. We have a very aggressive schedule, which I'll review with you at our meeting. Our first action - due Thursday 20 March - is input to the draft objectives for enhanced characterization. The point of departure for this first action item is review and commentary of the Voegele draft objective/criteria paper that I will forward as soon as I get an electronic copy. In it, Mike has attempted to lay out a preliminary set of objectives for the enhanced characterization effort. We were strongly encouraged by Sandifer, Voegele, Brocoum, Adams, etc. to spend the first efforts in this planning "outside the box." That is, we need to do a hard scrub of the preliminary objectives, see if we can think of any more, decide what the real critical critieria are for making a decision on how to conduct this exercise, and be creative in proposing alternatives. Nothing is cast in concrete yet with regards to the additional excavation, boreholes, alcoves, etc. Our kickoff meeting will primarily be spent discussing the objectives.

If you can't make the meeting, please get with me separately so I can go over what we will discuss.

Peter Hastings
03/19/97 11:21 AM

To: Jeff Skov@CRWMS, Robert Wemheuer@CRWMS, Jim Houseworth@CRWMS, Richard Peck@CRWMS, Bob Morgan@CRWMS, Gary Teraoka@CRWMS, Tom Fortner@CRWMS, Scott Wade@CRWMS, Robert Barton@CRWMS, James Compton@CRWMS, Mike Pochowski@CRWMS, John Fisher@CRWMS
cc: Jerri Adams@CRWMS, Doug Chandler@CRWMS, Richard Wagner@CRWMS, Robert Sandifer@CRWMS, Michael Voegele@CRWMS, James Beyer@CRWMS, David Seamans@CRWMS, Ken Ashe@CRWMS, Ned Elkins@CRWMS, William Kennedy@CRWMS
Subject: Enhanced Repository Characterization

Our working group membership has evolved somewhat since last night. The group thus far is:

DIE	Jeff Skov (Bob Wemheuer backup)
PA	Jim Houseworth
ESFDR/ConOps	Gary Teraoka
S&H	Mike Pochowski
Institutional	John Fisher
EA	TBD (Morgan)
DOE/QA	TBD (Peck)
DOE/AML	Bob Barton (Jim Compton backup)
DOE/AMAAM	Tom Fortner
DOE/AMESH	Scott Wade

As indicated, I still need names of reps from Richard Peck and Bob Morgan.

As I promised in my last note, please find below an advance electronic copy of the document we're using as our point of departure for defining objectives for the enhanced characterization effort. Please review as much as you can before our meeting this afternoon, and be prepared to discuss. Once again, if you can't make the meeting (meeting announcement being sent separately by David Seamans), please contact me to discuss this document and the input we're looking from from each team member. Thanks.


CRIT1.W

September 5, 1997 mdv
Rev 1 (Rogers, Kalia)CRIT1.WPD

Draft Notes on a
Process to Evaluate the Location and Scope of Enhancements
to the Site Characterization Program Incorporating an East-West Drift:

In the development of the 1996 and 1997 Long Range Plans, site characterization workscope was prioritized, based on performance assessment, model development, and design needs. While an east-west drift through the block was recognized as having the potential to provide valuable information, the project technical staff considered the information that could be provided by this drift to be of less value to the development of the Viability Assessment Products than that which could be obtained through other tests. Given limited funding, the decision was made to delay the east-west drift until after the Viability Assessment. The Project scientists have understood that given constant and limited funding, certain lower priority activities could only be undertaken at the expense of the higher priority activities. Despite ongoing criticism from the NWTRB, the Project scientists have consistently maintained that the work comprising the current test program was providing data of higher priority than that which could be obtained from an east-west drift. Recently, the repository Consulting Board expressed a position favoring multiple drifts to establish the western boundary of the potentail repository block.

The DOE finds itself in a position to be able to expend additional funds to enhance the site characterization program. A study has been authorized to initiate the required planning activities to implement an enhanced characterization of the repository block that addresses a new drift within the ESF traversing the block in an east-west orientation.

Objective:

Develop a recommended approach for the enhanced site characterization effort incorporating an east-west drift. The approach should address work that will enhance scientific understanding of the behavior of the site, as well as enhance understanding of engineering; construction, health and safety; cost; and regulatory and performance aspects of the potential repository. The study should consider the relationship between ongoing characterization activities, particularly how the current programs could complement and be complemented by the enhanced characterization effort. It should also address potential efficiencies in the enhanced program by combining the drift with other characterization efforts. It should reflect the latest scientific understanding of the behavior of the site. The extent to which enhancements in the program can strengthen the data supporting the Viability Assessment also should be considered; the enhanced characterization program cannot constrain the date for Viability Assessment.

It is critical that the project be able to articulate the basis for selection of the preferred alternative

Evaluation Criteria:

To select the appropriate location, work scope and relationship to other associated site characterization tests, the project will evaluate the benefits of alternatives against a set of criteria that address importance of information that could be gained from an E-W drift and other tests. These draft criteria presented here are drawn from or adapted from previous evaluations of enhanced characterization efforts. It is proposed that the Working Groups evaluate these criteria, modify or add to the set as appropriate, and reach consensus on a set of evaluation criteria that can then be used as the basis for determining a project position on the appropriate location and work scope for an east-west drift. Unless there are compelling reasons to move to a finer resolution scale, it is suggested that the discrimination be no finer than north, middle, or southern end of the block, and above, within, or below the potential repository horizon.

a) Scientific Criteria:

1. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to evaluation of variations in the Topopah Spring member TSw2, sufficient to allow characterization of spatial variability of hydrologic properties?

2. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to evaluation of variations in the Topopah Spring member TSw3, sufficient to allow characterization of spatial variability of hydrologic properties.

3. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to greater likelihood of obtaining information regarding hydrologic or mechanical effects of unexpected formation heterogeneity or structural features, such as faults or shear zones that exhibit no surface expression?

4. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to a better opportunity to observe and sample environmental isotopes (including chlorine-36 and tritium) in below zones of high infiltration flux or saturation associated with stratigraphic contacts in the lower Tiva Canyon member and the Paintbrush nonwelded unit?

5. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to a better

opportunity to observe, monitor and sample (including chlorine-36 and tritium) (perhaps episodically) evidence for percolating water in the Topopah Spring member?

6. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to a better opportunity to observe and sample (including chlorine-36 and tritium) within and beneath stratigraphic contacts in the lower Topopah Spring member and the Calico Hills tuff?

7. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to a better opportunity to observe differences in fault or fracture patterns, persistence, and properties within stratigraphically continuous welded and nonwelded units?

8. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to a better opportunity to observe and measure fault and fracture characteristics, and to characterize and sample moisture, in the vitric Calico Hills tuff?

9. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to a better opportunity to observe fault displacement, distributed faulting and rupture of datable fracture fillings that may indicate the timing or extent of future faulting which might cause the direct failure of canisters due to fault displacement or possible changes in groundwater depth or flow patterns?

10. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to better information to characterize the physical boundaries of the Calico Hills barrier, especially the nature of the vitric to zeolitized transition, structural and lithologic features, and chemical or physical process affecting flow or causing lower retardation, in that unit or potential changes resulting from repository heat?

11. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to a better opportunity to obtain information regarding faulting and other structural features (such as the Solitario Canyon fault) that may affect the area available for the repository (including potential extensions and abandonments)?

12. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to a better opportunity to observe and sample exposures that may help to resolve the question of whether open and connected fractures systems can exist/persist in

the softer, generally nonwelded stratigraphic intervals at Yucca Mountain, and to detect direct evidence regarding flow and the interaction of fractures and matrix?

13. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to a better opportunity to obtain information regarding the rock quality or excavation drift stability to be anticipated within the Topopah Spring member in the main repository region?

14. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the hydrologic properties of faults (especially the Solotario Canyon fault) and the impacts of those faults on the unsaturated and saturated zone flow systems?

b) Engineering

1. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to integration into repository emplacement operations?

2. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to integration of the drift into repository performance confirmation activities?

c) Construction Criteria (including Health and Safety Criteria)

1. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to cristobalite concentrations and safety issues?

2. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to enhanced dust control in construction activities?

3. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to enhanced excavation performance?

4. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to alcove excavation methodologies and equipment?

d) Cost Criteria

1. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to repository construction costs?

e) Regulatory and performance Criteria

1. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to the 200 meter overburden disqualifying condition of 10 CFR Part 960?

2. Are there location, layout, or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to necessary controls to limit impacts to the waste isolation characteristics of the site?

Peter Hastings
03/20/97 11:11 PM

To: Robert Sandifer@CRWMS, Michael Voegele@CRWMS, James Beyer@CRWMS
cc: Janet Christ@CRWMS, Jeff Skov@CRWMS, Robert Wemheuer@CRWMS, Mike Pochowski@CRWMS, Patrick Auer@CRWMS, Steve Dana@CRWMS, Tom Pysto@CRWMS, Ed McCann@CRWMS, John Fisher@CRWMS, Jim Houseworth@CRWMS, Ron Berlien@CRWMS, Fred Zinkevich@CRWMS, Gary Teraoka@CRWMS, M.Sam Rindskopf@CRWMS, Robert Barton@CRWMS, James Compton@CRWMS, Tom Fortner@CRWMS, Scott Wade@CRWMS, Richard Wagner@CRWMS
Subject: Enhanced Characterization - Controls & Requirements Feedback - OBJECTIVES

Most of you have received minutes from the Controls & Requirements Working Group's first meeting. At that meeting, the attendees were asked to give some thought to the objectives for the enhanced characterization effort, using Mike Voegele's draft notes as a point of departure. The members of the CRWG have completed their first task, and offer the following feedback. Overall, there are no significant comments as to the definition of objectives, either as to problems with the objectives listed in Mike's draft, or with regard to any missing objectives. There are some very minor comments and observations:

1. In several places (e.g., under "objectives" and at the end of the first paragraph of "evaluation criteria"), the additional excavation in support of enhanced characterization is described as an east-west drift. At least as long as the working groups are thinking "outside the box," we may want to consider generalizing these descriptions a bit, unless we are constrained to consideration of strictly an east-west drift (or drifts).

2. It was noted that the criteria listed under "Construction Criteria" and "Cost Criteria" are likely not sufficient in themselves to warrant any excavation with the possibility of compromising the repository block in any way. It will be important as we proceed to communicate these criteria and associated benefits in a way that makes it clear that such criteria are secondary to enhancement of site characterization and test data.

3. Although criteria are to be evaluated as a subsequent step in the planning exercise, it was noted that a third criterion under "Regulatory and Performance Criteria" would discuss any existing prohibitions against beginning repository construction in advance of NRC authorization.

Jeff Skov
03/20/97 04:28 PM

To: Peter Hastings@CRWMS, Mike Pochowski@CRWMS, Patrick Auer@CRWMS, Tom Pysto@CRWMS, John Fisher@CRWMS, Jim Houseworth@CRWMS, Bob Morgan@CRWMS, Ron Berlien@CRWMS, Gary Teraoka@CRWMS, Robert Barton@CRWMS, Steve Dana@CRWMS, Scott Wade@CRWMS, Fred Zinkevich@CRWMS
cc: Robert Sandifer@CRWMS, Michael Voegele@CRWMS, James Beyer@CRWMS, Robert Wemheuer@CRWMS
Subject: Minutes of 3/19/97 ECRB CRWG Meeting

This note documents the minutes of the first meeting of the Design, Construction and Testing Controls and Requirements Working Group (CRWG) of the Enhanced Characterization of the Repository Block (ECRB) 90-day planning effort. The meeting was held on 3/19/97 between 3:30 and 4:30 p.m. in Rm 1257 in the M&O's Canyon Center facility. In attendance were:

Peter Hastings*	M&O Safety Assurance
Jeff Skov*	M&O Determination of Importance Evaluation Group
Mike Pochowski*	M&O Safety and Health
Pat Auer*	OQA/QATSS (backup will be Steve Dana)
Tom Pysto*	M&O Environmental
John Fisher*	M&O Institutional and External Affairs
Jim Houseworth*	M&O Performance Assessment
Bob Morgan	M&O QA
Ron Berlien*	M&O QA (backup will be Fred Zinkevich)
Gary Teraoka*	M&O Requirements
Jim Beyer	M&O Project Engineering
Bob Barton*	DOE AML

(Note -- an asterisk denotes membership in the Working Group. Backup members are identified if known.)

Peter Hastings conducted the meeting. Following introductions, Peter gave a brief overview of the purpose of the ECRB planning effort -- within the next 90 days, the M&O is tasked to identify and evaluate various options to place and excavate a drift to enhance the program's characterization of the actual proposed repository block to the west of the current ESF Main Drift. One option will be selected, a cost and schedule estimate will be prepared, and a Change Request (CR) will be submitted to and approved by DOE. The excavation is intended to be completed within 18 months; i.e., prior to the end of FY98. To support this excavation schedule, certain actions (e.g., early procurement activities) will commence prior to the completion of the 90-day planning effort.

An Integrated Planning Committee (IPC) has been established, chaired by Bob Sandifer, to oversee and integrate the activities of five subordinate working groups. The five working groups are:

Testing -- led by Ned Elkins
Performance Assessment -- led by Jim Houseworth
Licensing/Regulatory Affairs -- led by Ken Ashe
Design/Construction -- led by Bill Kennedy
Design, Construction and Testing Controls and Requirements -- led by Peter Hastings

The M&O Construction and Operations Project Engineering organization will facilitate and coordinate working group activities, and will prepare the CR.

Peter noted that various "east-west drift" alternatives have been previously discussed by the project, but that, for this ECRB planning effort, the term "east-west drift" had been deliberately abandoned to prevent the potential for such terminology to bias the outcome of the effort. All working group members were encouraged to "think outside of the box" with respect to potential points of origination, trajectories, and termini for the ECRB drift (or drifts).

Peter referred to two documents that were of particular importance now for CRWG members:

-- *Enhanced Characterization of Repository Block, Plan for 90 Day Planning Effort* (dated March 17, 1997) -- This document describes the objectives, criteria and assumptions for the planning cycle, and includes an organization chart and preliminary schedules for both the planning activity and the total 18-month period. Initially, the planning process provides for the successive development and validation of objectives for the ECRB drift(s), criteria to be used to evaluate the objectives, and benefits to be derived from the various objectives.

-- *Draft Notes on a Process to Evaluate the Location and Scope of Enhancements to the Site Characterization Program Incorporating an East-West Drift* (Rev. 1) -- This document provides a first-cut statement of the overall objective for the ECRB effort, and various evaluation criteria categorized as scientific, engineering, construction (including health and safety), cost, and regulatory/performance.

The first action for the CRWG is to review and provide comments on the objective statement and criteria contained in the second document above. (This document had been distributed to the known members of the CRWG by Hastings' e-mail dated 3/19/97.) The IPC has directed that the objective statement receive a particularly thorough, critical review.

The criteria contained in the "draft notes" document above should be considered to be the potential "objectives" to be achieved by the ECRB drift(s), as discussed in the first document above.

CRWG members should submit their comments on the "draft notes" document above to Jeff Skov by 2:00 p.m. on Thursday, 3/20/97. These comments will be consolidated and forwarded to Jim Beyer by COB on Thursday, 3/20/97.

The next meeting of the CRWG will be on Friday, 3/21/97, in Rm 923 (in Bldg. 9 of the M&O's Summerlin facility) at 9:00 a.m.

Please call Jeff Skov or Peter Hastings if you have any questions or comments regarding these minutes.

Jeff Skov.

Jeff Skov
03/21/97 04:51 PM

To: Robert Wemheuer@CRWMS, Mike Pochowski@CRWMS, Patrick Auer@CRWMS, Steve Dana@CRWMS, Tom Pysto@CRWMS, Ed McCann@CRWMS, John Fisher@CRWMS, Jim Houseworth@CRWMS, Ron Berlien@CRWMS, Fred Zinkevich@CRWMS, Gary Teraoka@CRWMS, M.Sam Rindskopf@CRWMS, Robert Barton@CRWMS, James Compton@CRWMS, Tom Fortner@CRWMS, Scott Wade@CRWMS
cc: Robert Sandifer@CRWMS, Michael Voegele@CRWMS, James Beyer@CRWMS, Richard Wagner@CRWMS, Janet Christ@CRWMS, David Seamans@CRWMS
Subject: Minutes of 3/21/97 ECRB CRWG Meeting

This note documents the minutes of the second meeting of the Design, Construction and Testing Controls and Requirements Working Group (CRWG) of the Enhanced Characterization of the Repository Block (ECRB) 90-day planning effort. The meeting was held on 3/21/97 between 9:00 and 10:00 a.m. in Rm 923 in Building 9 of the M&O's Summerlin facility. In attendance were:

Peter Hastings	M&O Safety Assurance
Robert Wemheuer	M&O Determination of Importance Evaluation (DIE) Group
Jeff Skov	M&O DIE Group
Steve Dana	OQA/QATSS
John Fisher	M&O Institutional and External Affairs
Jim Houseworth	M&O Performance Assessment
Ron Berlien	M&O QA
Gary Teraoka	M&O Requirements

Peter Hastings conducted the meeting. He reported that he had submitted the CRWG's comments on the draft objectives (late in the evening on 3/20/97), which completed the first required action of the working group. A hard-copy of the comments was included in a handout that Peter provided to attendees.

Peter next reviewed the long-term (18-month) schedule for the ECRB effort, identifying the particular activities for which the CRWG would have significant input (e.g., "Plan Repository Data," "Develop TBM Spec."), and those for which the CRWG would only be peripherally involved ("Establish South Portal Access," "Develop TBM Rehab. Plan"). Our working group, as well as those for Performance Assessment and Licensing, will also help address and resolve certain key considerations, for example:

- What will be the impact of the various excavation options on the "Waste Isolation Alternatives Study"?

- To what extent will the 200-meter overburden requirement be preserved?

- For a potential ECRB drift *through* the repository block, how significant is the risk that the selected drift alignment will not match the ultimate optimum repository drift alignment (to be based on the geology of the actual repository block host rock), such that potentially several adjacent repository emplacement drifts would become unusable for waste emplacement purposes?

- To what extent can a proposed ECRB drift that coincides with a conceptual repository drift be excavated and still not constitute repository construction (which is prohibited in accordance with 10 CFR 60 prior to the receipt of a construction authorization from the NRC)?

No specific cost structure (i.e., separate JNs) has been established for the ECRB *planning* effort, but Peter observed that a stand-alone cost structure would almost certainly be implemented for the actual

excavation work (since "costing" the excavation of potential repository drifts is one of the ancillary objectives of the ECRB activity).

There was a brief discussion regarding the importance of having the actual design and construction of an ECRB drift conform with applicable ESFDR requirements, rather than allow a diversion between a design that conforms with the ESFDR and an actual plant configuration, comprising various "temporary construction utilities," that may not.

Dr. Houseworth noted that water-use controls are liable to be particularly stringent if the trajectory the ECRB drift crosses the 37-meter lateral offset (i.e., offset between the extent of the drift and the nearest potential waste emplacement location) that has been previously evaluated. It was noted that a TBM incorporating "dry excavation" features may take some time to procure.

Peter reviewed the CRWG's schedule for next week, per the *Enhanced Characterization of Repository Block Plan for 90 Day Planning Effort* (dated March 17, 1997). **Our next action is to develop criteria and assumptions -- Peter requested that members' input be passed to Jeff Skov by 2:00 p.m. on Monday, 3/24/97.**

The time and location for the next meeting will be announced by separate e-mail.

Please call Jeff Skov or Robert Wemheuer if you have any questions or comments regarding these minutes. (Peter Hastings will be out of the office until Monday, 3/31/97.)

Jeff Skov.

Jeff Skov
03/24/97 10:49 AM

To: Robert Wemheuer@CRWMS, Mike Pochowski@CRWMS, Patrick Auer@CRWMS, Steve Dana@CRWMS, Tom Pysto@CRWMS, Ed McCann@CRWMS, John Fisher@CRWMS, Jim Houseworth@CRWMS, Ron Berlien@CRWMS, Fred Zinkevich@CRWMS, Gary Teraoka@CRWMS, M.Sam Rindskopf@CRWMS, Robert Barton@CRWMS, James Compton@CRWMS, Tom Fortner@CRWMS, Scott Wade@CRWMS
cc: Robert Sandifer@CRWMS, Michael Voegele@CRWMS, James Beyer@CRWMS, Peter Hastings@CRWMS, Richard Wagner@CRWMS, James Beyer@CRWMS, Janet Christ@CRWMS, David Seamans@CRWMS
Subject: ECRB Objective Statement

To the ECRB CRWG:

I attended the ECRB Integrated Planning Committee meeting this morning. The purpose of the meeting was to resolve comments and finalize the wording of the ECRB Objective Statement. The final statement will read as follows:

> The objective of the enhanced characterization effort is to enhance scientific understanding of the behavior of the site, as well as enhance understanding of engineering; construction, health and safety; cost; and regulatory and performance aspects of the potential repository.
>
> A planning effort will develop a recommended integrated functional approach for an enhanced site characterization effort incorporating the appropriate drifting, test alcoves and subsurface boreholes, surface boreholes, and other investigations. The planning approach should consider the relationship between ongoing characterization activities, particularly how the current programs could complement and be complemented by the enhanced characterization effort. The approach should identify data needs that would strengthen the licensing basis for the siting criteria, design criteria, performance objectives, and Safety Analysis Report content requirements in the disposal regulations (10 CFR Part 60), while avoiding limitations on characterization activities listed in 10 CFR 60.15(c). It should also address any potential efficiencies that could be gained from the enhanced program to support planned future activities. It should reflect the latest scientific understanding of the behavior of the site. The extent to which enhancements in the program can confirm the data supporting the Viability Assessment should be incorporated into the prioritization of integrated activities.

The criteria that we are developing today should be worded in question format -- similar to the format of the criteria contained in the document, *Draft Notes on a Process to Evaluate the Location and Scope of Enhancements to the Site Characterization Program Incorporating an East-West Drift* (Rev. 1), which you have received already. The criteria should also be segregated into the same categories as appear in the *Draft Notes* document (Scientific, Engineering, Construction [including Health and Safety], Cost, and Regulatory and Performance); although you should feel free to suggest new categories if reasonably warranted. We are also tasked with identifying assumptions today; some of the considerations of our working group may perhaps be more appropriately advanced as assumptions rather than as criteria (for now, I will leave that determination to you).

As a reminder, **I need your criteria and assumptions input by 2:00 p.m. this afternoon (3/24/97).**

Thanks.

Jeff Skov.

To: Robert Wemheuer, Mike Pochowski, Patrick Auer, Steve Dana, Tom Pysto, Ed McCann, John Fisher, Jim Houseworth, Ron Berlien, Fred Zinkevich, Gary Teraoka, M.Sam Rindskopf, Robert Barton, James Compton, Tom Fortner, Scott Wade
cc: Peter Hastings, Richard Wagner, James Beyer, Janet Christ, David Seamans
From: Jeff Skov
Date: 03/21/97 03:46:22 PM
Subject: ECRB Objective Statement

Following is the consolidated ECRB objective statement just received from Jim Beyer, fyi. I will attend the meeting on Monday morning (3/24/97) for the CRWG. -- Jeff Skov.

To: Ned Elkins, Jim Houseworth, Peter Hastings, Ken Ashe, William Kennedy
cc: Jeff Skov, Ralph Rogers, Robert Sandifer, Michael Voegele
From: James Beyer
Date: 03/21/97 03:08:07 PM
Subject: ECRB Objective Statement

Attached is the Enhanced Characterization of the Repository Block Objective statement that will be discussed at the Integrated Planning Meeting on Monday. Comments from the Testing WG, Licensing/Reg WG, Control & Reqmts WG, and Bob Sandifer have been incorporated. Performance Assessment WG indicated no comment. The Design/Const WG did not make specific comments to the original Mike V objective statement. as they were concentrating at a lower level which will become the evaluation criteria stements. (Bill, please call me so we can discuss further. I don't think this will cause your group any heartburn as all of your items are being incorporated into the criteria statements.)

Please let me know if you have any comments, questions, etc concerning this objective statement.

Thank you for the good and timely work. I think we are off to a very good start.

ECRBOBJ1

Jeff Skov
03/24/97 07:14 PM

To: James Beyer@CRWMS
cc: Robert Wemheuer@CRWMS, Mike Pochowski@CRWMS, Patrick Auer@CRWMS, Steve Dana@CRWMS, Tom Pysto@CRWMS, Ed McCann@CRWMS, John Fisher@CRWMS, Jim Houseworth@CRWMS, Ron Berlien@CRWMS, Fred Zinkevich@CRWMS, Gary Teraoka@CRWMS, M.Sam Rindskopf@CRWMS, Robert Barton@CRWMS, James Compton@CRWMS, Tom Fortner@CRWMS, Scott Wade@CRWMS, Robert Sandifer@CRWMS, Michael Voegele@CRWMS, Richard Wagner@CRWMS, Janet Christ@CRWMS, David Seamans@CRWMS, Peter Hastings@CRWMS
Subject: CRWG Input to ECRB Criteria and Assumptions

Jim -- This note forwards the Criteria and Assumptions input from the Design, Construction and Testing Controls and Requirements Working Group (CRWG) of the Enhanced Characterization of the Repository Block (ECRB) 90-day planning effort. The statements/questions of criteria are fairly rough -- but I felt it better to get the thoughts out for consideration rather than worry about format or consistency. You will note that S&H addresses the concerns for erionite in their input below.

From Performance Assessment:

Criteria:

Does the unrecoverable discharge of TFMs, including water, during the construction and testing of any excavations or boreholes planned for enhanced characterization have any adverse effects on the performance of the potential repository?

Does the layout of any excavations or boreholes planned for enhanced characterization, relative to the potential repository, have any adverse effects on the performance of the potential repository?

Do the construction methods for any excavations or boreholes planned for enhanced characterization have any adverse effects on the performance of the potential repository?

From OQA:

Since QA may potentially affect the scientific, engineering, construction, and regulatory performance criteria, you may want to make a general statement regarding QA applicability or add a new category.

Assumption: Quality Assurance will apply to the design, construction and procurement of the drift(s).

Criteria:

1. Is the 10CFR 60 subpart G QA program (QARD) the appropriate base QA document?

2. Are the design requirements in the ESFDR and RDRD interfaces appropriate?

3. Will procurement be handled under applicable QARD controls (criteria 4 & 7) and procedures, i.e. will it be a "Q" procurement?

4. Will design (analyses, specifications, etc.) be accomplished using QARD (criterion 3)?

5. Is field quality control going to be used to verify design during construction?

6. Are lessons learned from ESF construction applicable to construction of the new drift(s).

7. Are adequate procedures to implement design and QA requirements already in place?

From M&O QA:

Assumptions:

With regard to input about criteria and assumptions, it is probably too early for any meaningful response from a QA perspective. However, for now, a first assumption would be that this activity is Q and therefor the QARD criteria apply. This would mean that M&O and OCRWM Q procedures would be invoked including those for activities such as procurement. Secondly, I would assume that a readiness review would be performed to QAP-2-6 criteria.

From M&O Safety and Health:

1. If the site location is (Specific):

.1 If the site is off of the North Ramp:
- .1 What traffic problems will we have with other operational drifts?
  - .1 Transport others via South Portal (Alc 2 tours???)
  - .2 Ventilation -Will the ventilation system be connected to current system?
    - .1 Yes:
    - .2 No:
  - .3 Muck handling:
    - .1 Yes: Conveyor system- Will the conveyor system be a direct connection to current system?
      - .1 Yes:
      - .2 No:
    - .2 No: Muck cars- Will muck cars be used exclusively?
      - .1 Yes:
      - .2 No:
  - .4 TBM vs other Excavation Devices

.2 If the site is off of the South Ramp
- .1 No major traffic problems with other operational drifts.
- .2 Ventilation - Will the ventilation system be connected to current system?
  - .1 Yes:
  - .2 No:
- .3 Muck handling:
  - .1 Yes: Conveyor system- Will the conveyor system be a direct connection to current system?
    - .1 Yes:
    - .2 No:
  - .2 No: Muck cars- Will muck cars be used exclusively?
    - .1 Yes:
    - .2 No:

.3 Others
- .1 Will there be traffic problems with other operational drifts(?)
- .2 Ventilation - Will the ventilation system be connected to current system?
  - .1 Yes:

.2 No:

.3 Muck handling:

.1 Yes: Conveyor system- Will the conveyor system be a direct connection to current system?

.1 Yes:

.2 No:

.2 No: Muck cars- Will muck cars be used exclusively?

.1 Yes:

.2 No:

.3 TBM vs others

2. Location (Non-specific):

.1 Will there be traffic problems with other operational drifts.

.2 Ventilation - Will the ventilation system be connected to current system?

.1 Yes:

.2 No:

.3 Muck handling:

.1 Yes: Conveyor system- Will the conveyor system be a direct connection to current system?

.1 Yes:

.2 No:

.2 No: Muck cars- Will muck cars be used exclusively?

.1 Yes:

.2 No:

.4 Will there be penetration of protective barriers?

.1 If yes, Erionite becomes a major issue (very similar to asbestos)

.1 (Assumptions) Control measures required include (very expensive and time consuming):

.1 High efficiency particulate air (HEPA) filtration of ventilation system- handling problems (hazardous waste)

.2 Powered air purifying respirators (PAPRs) with HEPA filtration for workers- handling and cleaning problems (hazardous waste)

.3 Special coveralls for workers- handling and laundering problems (hazardous waste)

.4 Sealed work areas (entire drift/shaft, etc.)

.5 Handling of muck, etc., as hazardous waste, with all connotations (special packaging, special landfills, etc.)

.6 Equipment (locis, flat beds, etc.) And personnel will require decontamination anytime it leaves the regulated areas. Containment of the decontaminated materials (hazardous waste)

.7 Showering facilities for workers, with all connotations listed for hazardous waste

.8 trained staff to handle all decontamination processes

.2 Possible inability to make repairs to protective barrier

.5 Silica will continue to be an issue - adequate ventilation, water usage vs dry techniques, respirator usage, control techniques, etc.

.6 TBM vs other

3. If the Equipment Used is:

.1 TBM

.1 Wet (preferred by M&O Safety and Health for health reasons- better control of dust)

.1 Affect to repository/scientific evaluation

.2 Dry (preferred by scientific community- less chance to fowl up their work)

.3 Ventilation controls

.4 Muck handling

.2 Alpine Miner/ Road Header, etc.

.3 Drill & Blast

From M&O Environmental:

Criteria:

Are there location, layout or test program specific considerations for an east-west drift that can enhance the understanding of the site relative to storage location and reclamation of the mine muck removed from the drifts?

Assumptions:

The mine muck shall be stored in the existing muck storage pile. [Note: there is a requirement to segregate Calico Hills muck from TS Loop muck; also the existing muck piles are approaching their max-allowed heights.]

The above ground conveyor system shall not be modified to handle the additional muck. [This may be required; see note above.]

A modification to the Underground Injection Control Permit will not be needed because no additional tracer use (other than what is already approved) is expected.

The mine evaporation pond will not be constructed.

The ventilation system shall be modified to handle any additional dust from the new construction.

From Safety Assurance:

Assumptions:

Our first cut at the inputs from Safety Assurance & PA for a constructor's contract are listed below. These should be caveated with the fact that the constraints that will fall out of the DIE/CA for this drift - and the time it takes to prepare the DIE and CA - may be extremely sensitive to the function and requirements for

the use of this drift.

- The construction contractor shall be subject to requirements imposed by applicable Determination of Importance Evaluations (DIEs) and/or QA Classification Analyses (CAs), or to those requirements imposed through design specifications and drawings. Demonstration of satisfaction of these requirements shall be required under the QA program. These requirements are derived from limiting impacts on the repository natural barrier, limiting impacts on current or future testing, and preserving critical characteristics of designed items determined to be Important to Radiological Safety or Waste Isolation. Requirements typically include, but are not limited to: constraints on types and amounts of tracers, fluids, and materials (e.g., water, hydraulic fluid, oil, surfactants, etc.) used in construction and operation; requirements on requesting evaluation of those materials and reporting of their use by the constructor; requirements on maintenance and use of construction equipment (e.g., TBMs, roadheaders, etc.) to prevent leakage/spills of such materials; performance to line-and-grade tolerances; procedural requirements for training to certain construction tasks, such as installation of ground support; production and maintenance of construction records; and other similar requirements as deemed necessary by DIEs/CAs produced during design development.

- Access shall be allowed to construction sites by M&O and DOE surveillance and inspection personnel.

- The construction contractor shall be subject to requirements imposed though system safety analyses; Job Safety Analyses shall be performed by the construction contractor for activities not evaluated in system safety analyses, and requirements indicated therein shall be followed under the contractor's safety and health program.

- Access to testing locations shall be maintained and construction activities shall be coordinated with the M&O Test Coordination Office (TCO).

- Deviations from design shall be authorized by the A/E in advance.

We also suggest that the constructor's management and supervisory personnel be required to undergo some form of DIE/Classification/QA program orientation/training based on 10CRF60.15(c)(1) before the commencement of <u>any</u> construction activities. This may make the transition from normal construction contractor to one that will be required to work under a QA program easier and more effective up front. This type of training would go a long way in preventing the same type of QA problems and concerns from arising as we had in the ESF starter tunnel/north ramp.

<u>From DOE/AMAAM</u>:

Comment:

Based on the Objective statement, the planning effort may be growing out of hand. We may want to consider going back and reviewing "The Accelerated EWD for VA." which was part of a previous package for our review. We appear now to be including the complete scientific program and any other program activities into the EWD package. The EWD could be constructed as specified in the accelerated case in the time allowed. Any additions to that may mean a failure to meet schedule. We must maintain the block, but not reinvent the wheel.

<u>From Requirements</u>:

Comment:

The specific scientific, engineering, construction, health and safety, cost and regulatory and performance objectives should be identified before criteria can be developed. The criteria should then provide a basis or approach to how each of the specific objectives will be met/accomplished.

For the most part, the set of criteria delineated in the document *Draft Notes on a Process to Evaluate the Location and Scope of Enhancements to the Site Characterization Program Incorporating an East-West Drift* (Rev. 1) appear to ask whether certain data or information will be collected from an east-west drift. We should first identify what data or information is most needed, then answer the question of "what will provide us with this data/information?" and will an east-west drift provide us with these answers?

Jim, I got a call-back from John Fisher this afternoon; he expects to be able to supply the IEA input tomorrow a.m. Also, Jim Compton noted that he would look over our input, and provide any comments prior to the validation meeting on Thursday (Bob Barton is on vacation).

I'll be at the site tomorrow morning, but will be returning here in the afternoon.

Jeff Skov.

Robert Wemheuer
03/27/97 05:58 PM

To: Mike Pochowski@CRWMS, Patrick Auer@CRWMS, Steve Dana@CRWMS, Tom Pysto@CRWMS, Ed McCann@CRWMS, John Fisher@CRWMS, Jim Houseworth@CRWMS, Ron Berlien@CRWMS, Fred Zinkevich@CRWMS, Gary Teraoka@CRWMS, M.Sam Rindskopf@CRWMS, Ray Mele@CRWMS, Tom Fortner@CRWMS, Scott Wade@CRWMS, Jeff Skov@CRWMS
cc: Richard Wagner@CRWMS, James Beyer@CRWMS, Peter Hastings@CRWMS, Robert Barton@CRWMS, James Compton@CRWMS, David Seamans@CRWMS
Subject: ECRB Criteria

Attached is the consolidated list of criteria that was discussed in the ECRB Integrated Planning Committee meeting today. This list was generated from the inputs you provided along with the other four working groups last week. Please review this list and determine if the list has any criteria missing from it or items that need clarification. Please be prepared to meet, review and discuss any recommended changes you may have to the attached criteria list at 9:00 a.m. on Monday 3/31/97. David Seamens will contact you regarding the location of the meeting. If you can not attend the meeting please provide me with your written comments by COB Friday, 3/28/97 so that the working group can discuss them in the meeting and we can provide the required input to James Beyer by COB Monday, 3/31/97. Thanks.

To: Robert Sandifer, Richard Snell, Larry Hayes, Jean Younker, Doug Chandler, Jerri Adams, Vince Iorii, Mark VanDerPuy, Dennis Williams, Marshall Bishop, Mike Cline, Ken Ashe, Jim Houseworth, Ned Elkins, William Kennedy, Robert Wemheuer
cc: Peter Hastings, Ralph Rogers, Jeff Skov
From: James Beyer
Date: 03/27/97 16:58:22
Subject: ECRB Criteria

Attached is the consolidated list of criteria that was discussed in the 3:00 meeting today. Please review this list and determine if we have any items missing or items that need clarification and provide me with your comments by COB Monday, 3/31/97. Please remember that this was Mike's attempt to remove any bias as to the ultimate architecture or final solution. Items associated with architecture or the final solution will be addressed as part of the evaluation of benefits and optimize configuration steps.

I will set up a followon meeting for Tuesday or Wednesday next week.

If you have any questions, please call Bob Sandifer, Mike Voegele or myself.

To: James Beyer
cc:
From: Michael Voegele
Date: 03/27/97 04:42:06 PM
Subject:

CRIT3272

James Beyer
03/28/97 11:36 AM

To: Peter Hastings
cc: Jeff Skov, Robert Wemheuer
Subject: ECRB

An item came up in the Design/Construction WG meeting that I forgot to pass on. It deals with the longstanding issue of what regs apply to us --- MSHA vsOSHA. We need to keep this in mind as we are going through the evalauations. You may or may not know there is a new MOU with MSHA.

Peter Hastings
03/31/97 11:53 AM

To: James Beyer@CRWMS
cc: Robert Sandifer@CRWMS, Michael Voegele@CRWMS, Janet Christ@CRWMS, Jeff Skov@CRWMS, Robert Wemheuer@CRWMS, Mike Pochowski@CRWMS, Patrick Auer@CRWMS, Steve Dana@CRWMS, Raymond Mele@CRWMS, Tom Pysto@CRWMS, Ed McCann@CRWMS, John Fisher@CRWMS, Jim Houseworth@CRWMS, Ron Berlien@CRWMS, Fred Zinkevich@CRWMS, Gary Teraoka@CRWMS, M.Sam Rindskopf@CRWMS, Robert Barton@CRWMS, James Compton@CRWMS, Tom Fortner@CRWMS, Scott Wade@CRWMS, Richard Wagner@CRWMS, David Seamans@CRWMS
Subject: ECRB Controls & Reqts Working Group - 31 March Meeting Minutes & Feedback on Criteria/Assumptions

The Controls & Requirements Working Group met this morning to discuss the draft criteria and assumptions dated 27 March. In attendance were Scott Wade, Tom Pysto, Bob Wemheuer, John Fisher, Jim Compton, Ray Mele (to represent Barton/Compton in future meetings), Ron Berlien, Pat Auer, and Tom Fortner.

The final objectives statement (dated 26 March 17:30) was briefly reviewed, without further comment.

The draft consolidated criteria/assumptions list (dated 27 March 16:30) was reviewed, resulting in the following comments:

1. There was some general confusion on the overall direction of the planning effort. Some of the nuances about what we intend to accomplish are not well understood among the team members, such as whether we are developing criteria for a decision on what to do, or criteria for specific options. The team requested that Mike Voegele, Bob Sandifer, or Jim Beyer attend a subsequent working group meeting (next meeting schedule TBD) to answer some related questions.

2. Somewhat related to comment #1 above, some revision of the format of the draft criteria might help in defining how the criteria are to be applied. For example, criterion #40, which is ultimately a design criterion, might be clearer if worded: "For any additional underground excavation, muck handling methods will be required to interface appropriately with existing muck handling systems."

3. Several of the draft criteria, namely 26, 27, 28, 30, 38, 39, 40, and 41, were noted to not require an excavation in or near the repository block. Again, clarification as to the intent of the different criteria might help in this regard, as each of these criteria are essentially secondary to the primary criterion of collecting additional characterization data. It might help to differentiate between those criteria used to justify whether to take any additional action and those used to compare or constrain specific configurations. Another example is criterion #49, which won't really be the basis for whether or not to do additional field work, but will rather be a constraint imposed on any given implementation solution.

4. It was not clear that assumptions were contained in this list; feedback from last week's PI Committee meeting indicated that the assumptions would be added later. As an example, there is no discussion of the applicability of the QA program to this effort; this may simply be an assumption (i.e., that the work will be conducted in accordance with the QA program, as applicable). This particular example may be important as a criterion as well, depending on what current plans are with regard to contracting for the constructor.

5. It was also noted that no criteria existed for the following considerations:

   cost impacts (i.e., cost of the additional field work) - there is discussion as to how various

options might improve our understanding of repository costs, but none about impact in FY97 and FY98;

political considerations (i.e., to what degree will the political considerations of maintaining construction activities be taken into account);

the need (if any) to reach geologic contacts below the repository block (this consideration may already be covered in other criteria, such as #18, 19, and 22); and

consideration of impact (if any) to evaluation of waste isolation alternatives.

6. The working group recommends the following priorities for evaluating the criteria in descending order of importance:

   1 - what criteria are not already being met by the existing program?
   2 - what criteria are associated with testing or characterization?
   3 - what criteria will generate additional repository design criteria?
   4 - what criteria are associated with environmental safety and health?
   5 - what criteria are associated with construction proof of concepts?
   6 - what criteria are associated with contracting practices?

The scheduled work pending this week was reviewed, but it was noted that this schedule may be changing this week:

Mon 31 Mar	Step 6 - Beyer to consolidate comments from contributors on CRITERIA & ASSUMPTIONS (action all)
Tue 1 Apr	Step 6 - Beyer to get concurrence on CRITERIA & ASSUMPTIONS (action Hastings)
Tue 1 Apr	Step 6 - IP Committee to meet with DOE for concurrence on CRITERIA & ASSUMPTIONS
Wed 2 Apr	Step 7 - Confirm/revise potential BENEFITS (action all)
Fri 4 Apr	Step 7 - Beyer to get concurrence from WG on BENEFITS (action all)

Peter Hastings
04/01/97 12:21 PM

To: James Beyer@CRWMS
cc: Jeff Skov@CRWMS, Ken Ashe@CRWMS, Jim Houseworth@CRWMS
Subject: ECRB Criteria - WI impact issues

As per your request, I've looked at criteria 43, 46, and 47, and offer the following amendments for grouping/combining them to describe all our concerns. In summary, we want to make sure we establish criteria associated with three or four considerations: limiting large-scale impacts to repository performance (such as might be associated with the overall concept of putting holes in the repository); similarly, demonstrating that we haven't precluded significant alternatives for WI performance (i.e., for eventual compliance with 10CFR60.21(c)(1)(ii)(D)); limiting discrete impacts to WI (i.e., in DIE space); and limiting test interference impacts (i.e., also in DIE space). With these considerations in mind, I think perhaps criterion 47 may still belong on its own, as it is more likely to benefit from scientific data, and may therefore be more of a primary criterion (i.e., will the new testing or excavation give us more data with regard to identifying qualifying or disqualifying conditions). So...here goes:

Are there location- or layout-specific considerations...that can enhance the scientific understanding of the site relative to:

(47) collecting further data to enhance our abiliyt to demonstrate compliance with 10CFR60.122 in ivestigating and adequately evaluating potentially adverse conditions that may be present?

For any additional excavations, boreholes, investigations, etc., are there location- or layout-specific considerations that will:

(43) limit impacts to major features that may be important to site performance?

(new) limit impacts to availability of alternatives to design features important to waste isolation, and promote ultimate compliance with the 10CFR61.21(c)(1)(ii)(D) requirement to provide a comparison of those alternatives?

(46) limit, during site characterization, impacts to waste isolation, construction-to-test and test-to-test interference, and other requirements derived from 10CFR60.15(c)?

It ain't perfect, but it should hit the major points. Comments?

Jeff Skov
04/07/97 08:34 AM

To: James Beyer@CRWMS
cc: Robert Wemheuer@CRWMS, Mike Pochowski@CRWMS, Patrick Auer@CRWMS, Steve Dana@CRWMS, Ray Mele@CRWMS, Tom Pysto@CRWMS, Ed McCann@CRWMS, John Fisher@CRWMS, Jim Houseworth@CRWMS, Ron Berlien@CRWMS, Fred Zinkevich@CRWMS, Gary Teraoka@CRWMS, M.Sam Rindskopf@CRWMS, Robert Barton@CRWMS, James Compton@CRWMS, Tom Fortner@CRWMS, Scott Wade@CRWMS, Peter Hastings@CRWMS, Richard Wagner@CRWMS, Janet Christ@CRWMS, David Seamans@CRWMS, Richard Memory@CRWMS, MacKaye Smith@CRWMS, Robert Sandifer@CRWMS, Michael Voegele@CRWMS
Subject: Draft ECRB-CRWG Benefits

Jim -- Here is our first cut at benefits for each ECRB criterion that the Controls and Requirements Working Group (CRWG) determined to applicable for our working group. These may be subject to modification this week. Please call Peter or me if you have any questions or desire additional information. Thanks. -- Jeff.

To: Peter Hastings
cc: Robert Wemheuer, Dealis Gwyn
From: Jeff Skov
Date: 04/06/97 02:28:27 PM
Subject: Draft ECRB-CRWG Benefits

Peter -- Here are the draft benefits for each criterion that we (the CRWG) determined to be applicable.

DEVSUM1A.WP

With your concurrence, I will beam this over to Beyer first thing Monday (4/7) a.m.

Jeff.

Enhanced Characterization of the Repository Block
Controls and Requirements Working Group
Development Summary

Criteria	Benefits	Preferred Source, Alternative Sources	Rationale	Risks
Are there location or layout specific considerations, including appropriate drifting, test alcoves, and subsurface boreholes, surface boreholes, and other investigations, that can enhance the scientific understanding of the site relative to:				
29) the geochemical environment in the drifts (including the interaction with cement) to better define conditions affecting radionuclide solubilities and waste package corrosion?	Enhanced understanding of the geochemical environment in the drifts (including the interaction with cement) would benefit the development of the controls and requirements that will be established for repository drift excavation associated with preserving the waste isolation capabilities of the site.			
50) projected environmental impacts in the affected area that can be mitigated to an acceptable degree, taking into account programmatic, technical, social, economic, and environmental factors? [960.5-2-5(a) and (d)]	Enhanced understanding of projected environmental impacts in the affected area would benefit the development of the controls and requirements that will be established for repository drift excavation associated with preventing/minimizing such impacts, and ensuring environmental permit compliance.			

Criteria	Benefits	Preferred Source, Alternative Sources	Rationale	Risks
44) the performance confirmation requirements in 10 CFR Part 60 to show that conditions have not varied beyond the limits assumed for design and to show that conditions are within the limits assumed for design?	Enhanced understanding of the site would benefit the development of the controls and requirements that will be established for repository drift excavation associated with ensuring Part 60 performance confirmation requirements are satisfied.			
Are there location or layout specific considerations associated with any drifting, test alcoves and subsurface boreholes, surface boreholes, or other investigations, that must be examined relative to:				
31) maintaining emplacement drift orientation flexibility?	Preserving emplacement drift orientation flexibility would enhance the number of design options available to repository designers, and help ensure that the total maximum volume available for waste emplacement is not reduced.			

Criteria	Benefits	Preferred Source, Alternative Sources	Rationale	Risks
33) demonstrating a cost effective construction approach?	The costs to develop and implement controls and requirements for repository excavation will be prominent components of the overall per-foot excavation cost of the repository. Additional ECRB excavation experience would thus provide an opportunity to examine these activities, evaluate alternative concepts, and potentially reduce the associated costs.			
34) demonstrating effective ventilation and hazardous minerals/dust control?	There is significant benefit in demonstrating effective ventilation and hazardous minerals/dust control, using minimal amounts of water, prior to full-scale repository excavation efforts. Successes in this regard could both significantly reduce the overall per-foot excavation cost of the repository, and reduce worker health concerns. One significant consideration in this regard is the avoidance during excavation of volumes of rock containing erionite.			

Criteria	Benefits	Preferred Source, Alternative Sources	Rationale	Risks
35) demonstrating an integrated environment, safety (including fire safety and evacuation preparedness) and health approach?	Benefits associated with this criterion are related to those for Criteria 33 and 34 above. That is, any successes in enhancing the integration of environment, safety and health programs would translate into a reduction in the overall per-foot excavation cost of the repository, and reduce potential worker health and safety concerns.			
36) implementing a performance based approach to design and construction, including a construction based TBM configuration? Full consideration is to be given to constructability, operability, and maintainability issues associated with a potential storage facility.	The principal benefit to be derived from establishing a performance based approach to design and construction (from the perspective of controls and requirements implementation) would come from identifying the critical performance parameters to be included in the contract such that the implementation of applicable controls and requirements (e.g., controls associated with water use minimization) are appropriately addressed and incentivized.			

Criteria	Benefits	Preferred Source, Alternative Sources	Rationale	Risks
37) testing "state of the art" mechanical excavators?	The benefits to be derived from testing "state of the art" mechanical excavators would be (1) the potential identification of more effective ways to control dust while simultaneously minimizing water use, and (2) the potential demonstration of better line and grade performance.			
38) traffic problems that could occur with other operational drifts?	There are potential controls that may be required to ensure worker (and visitor) safety in high-traffic areas or at the junctions of high-traffic routes. Understanding traffic patterns and problems in multiple-drift scenarios would enhance the development of such controls when required later for full-scale repository excavation.			
40) muck handling, including direct connection to current system?	There are potential design requirements that may be necessary with respect to muck handling. Understanding the relative effectiveness of muck handling approaches in multiple-drift scenarios would enhance the development of such requirements when required later for full-scale repository excavation.			

Criteria	Benefits	Preferred Source, Alternative Sources	Rationale	Risks
41) storage location and reclamation of the mine muck removed from the drifts?	There are requirements for muck storage that restrict the maximum height of muck piles, restrict the areas on the surface where muck piles can be located (based on state land-use permits), require muck from different geologic units to be segregated in some cases, and require muck piles containing hazardous materials (e.g., erionite) to be treated as hazardous waste. Understanding the different potential approaches to muck storage in multiple-drift scenarios would enhance the development of such requirements when required later for full-scale repository excavation.			
43) Limiting impacts to major natural features that may be important to site performance?	Limiting, during site characterization, any impacts to major natural features that may be important to site performance is a requirement from 10CFR Part 60. Additional excavation would be expected to enhance future development of controls in this regard; in particular, those controls that will be required to ensure the actual excavation of the repository does not diminish or destroy the intended waste isolation capabilities of the repository.			

Criteria	Benefits	Preferred Source, Alternative Sources	Rationale	Risks
51) limiting impacts to availability of alternatives to design features to waste isolation, and promote ultimate compliance with the 10CFR60.21(c)(1)(ii)(D) requirement to provide a comparison of these alternatives?	The benefit of not precluding potential waste isolation alternatives is that enhanced flexibility is afforded to repository designers			
46) limiting, during site characterization, impacts to waste isolation, construction-to-test and test-to-test interference, and other requirements derived from 10CFR60.15(c)?	See benefits associated with Criterion 43 above.			
42) ensuring that additional drifts or excavations do not violate the 200 meter overburden disqualifying condition of 10 CFR Part 960? [960.4-2-5(d)]?	Preserving the 200-meter overburden requirement would enhance the number of design options available to repository designers, and help ensure that the total maximum volume available for waste emplacement is not reduced.			
45) the requirements for underground records in 10 CFR 60.72 such that construction of another drift during site characterization could fulfill level of detail requirements needed to satisfy some of the construction records requirements?	The QA Program implements requirements for records retention. Conformance with these requirements will be a component of the per-foot cost to excavate the repository. Additional ECRB excavation could provide an opportunity to evaluate ways to reduce these costs; e.g., through process streamlining or automation initiatives.			

Criteria	Benefits	Preferred Source, Alternative Sources	Rationale	Risks
48) beginning construction of the geologic repository operations area without a construction authorization as identified in 10 CFR Part 60.3?	The benefit of restricting ECRB excavations to areas not currently intended for waste emplacement is that such restrictions would limit the potential for ambiguity that may arise with respect to this criterion. That is, there would be less basis for contentions that repository construction was in fact proceeding prior to receipt of the construction authorization required by 10 CFR Part 60.3.			
49) minimizing any significant adverse environmental impacts identified in comments on the Site Characterization Plan or in the Environmental Assessment? [NWPA Sec. 113(a)]	The benefit to minimizing any significant adverse environmental impacts identified in comments on the Site Characterization Plan or in the Environmental Assessment, as mandated in Section 113(a) of the NWPA, is to ensure proper consideration is preserved for local area residents.			

Jeff Skov
04/07/97 04:30 PM

To: Robert Wemheuer@CRWMS, Mike Pochowski@CRWMS, Patrick Auer@CRWMS, Steve Dana@CRWMS, Ray Mele@CRWMS, Tom Pysto@CRWMS, Ed McCann@CRWMS, John Fisher@CRWMS, Jim Houseworth@CRWMS, Ron Berlien@CRWMS, Fred Zinkevich@CRWMS, Gary Teraoka@CRWMS, M.Sam Rindskopf@CRWMS, Robert Barton@CRWMS, James Compton@CRWMS, Tom Fortner@CRWMS, Scott Wade@CRWMS
cc: Peter Hastings@CRWMS, Richard Wagner@CRWMS, Janet Christ@CRWMS, David Seamans@CRWMS, Richard Memory@CRWMS, MacKaye Smith@CRWMS, James Beyer@CRWMS
Subject: Renumbered ECRB Criteria

Following is a note from Jim Beyer. I called Jim and he confirmed that there were no wording changes to the criteria. He deleted two that were duplicates, then renumbered the set from one to fifty. The renumbering affects the benefits listing that the CRWG submitted this morning as follows:

New Crit. No.	Old Crit. No.
29	Same
32	50
33	44
34	31
36	33
37	34
38	35
39	36
40	37
41	38
42	40
43	41
44	43
45	51
46	Same
47	42
48	45
49	48
50	49

FYI.

Jeff.

To: Robert Sandifer, Richard Snell, Jean Younker, Larry Hayes, Doug Chandler, Michael Voegele, Jerri Adams, Vince Iorii, Dennis Williams, Scott Wade, Richard Craun, Marshall Bishop, Mike Cline, Ken Ashe, Ned Elkins, Peter Hastings, Jim Houseworth, William Kennedy
cc: Mark VanDerPuy, Jeff Skov, Ralph Rogers
From: James Beyer
Date: 04/07/97 03:11:59 PM
Subject: ECRB Criteria

Attached is the final list of criteria with crosswalk to original Working Group criteria. Please note that these are renumbered sequentially 1-50. I trust this will not confuse everyone.

CRITCRWK

4/7/97 3:00 pm

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK
CONSOLIDATED CRITERIA LIST
CROSSWALK TO WORKING GROUP CRITERIA

Are there location or layout specific considerations, including appropriate drifting, test alcoves, and subsurface boreholes, surface boreholes, and other investigations, that can enhance the scientific understanding of the site relative to:

		Working Group Criteria
1)	fracture variability?	TS1, D5C
2)	unexposed faults?	TS2, PA15, D3
3)	hydrologic properties, fracture properties and geotechnical properties in and near faults?	TS3, PA14, D3, D5B
4)	the characterization of the spatial distribution of moisture tension and saturation?	TS4
5)	the age and distribution of perched water?	TS5
6)	alternative conceptual models of perched water formation?	TS6
7)	the distribution and mineralogy of fracture fillings?	TS7
8)	the age and genesis of fracture filling minerals?	TS8
9)	the distribution of environmental isotopes from systematic and feature based samples?	TS9, PA4
10)	the spatial distribution of percolation flux?	TS10

11)	fracture and matrix components of flow and transport?	TS11, PA9
12)	flow into openings?	TS12, PA1
13)	temperature gradients in the repository block?	TS13
14)	gas ages and flow patterns and distribution of gaseous environmental isotopes?	TS14
15)	infiltration and percolation throughout the UZ in and around faults?	TS15
16)	pressure and chemical gradients and flow in the saturated zone in and around faults?	TS16
17)	flow patterns in the unsaturated zone below the repository horizon?	TS17, PA10
18)	the distribution and continuity of zeolitization?	TS18, PA12, D2
19)	the hydrochemistry of the unsaturated zone below the repository horizon?	TS19, PA10
20)	the location and origin of the large hydraulic gradient north of the repository block?	TS20, PA13, D5A
21)	dilution, mixing and flux distribution in the saturated zone?	TS21, PA3
22)	the hydrochemistry of the saturated zone?	TS22, PA3
23)	the spatial distribution of thermal and geomechanical properties of the repository horizon?	TS23, D1, D4
24)	the location and continuity of stratigraphic contacts in the expanded repository block?	TS24, D1, D4
25)	the distribution of hazardous minerals in the rock mass?	TS25

26) transport through a perforated waste package to see if radionuclide releases from waste packages can occur through the initial pinhole perforations? PA5,

27) in-drift water movement in the presence of a drip shield to better define the effects of such a barrier on water contact with waste packages and its potential effect on radionuclide releases? PA6

28) cathodic protection to better define the effects on waste package corrosion? PA7

29) the geochemical environment in the drifts (including the interaction with cement) to better define conditions affecting radionuclide solubilities and waste package corrosion? PA8

30) the effects of EBS materials and waste heat on the geochemical environment outside the drift to better define the influence of the altered zone on radionuclide transport characteristics (solubilities, sorption, colloidal interactions) in the unsaturated zone? PA11

31) collecting further data to enhance the ability to demonstrate compliance with 10 CFR 60.122 that require demonstrations that potentially adverse conditions that are present have been adequately investigated and adequately evaluated? LR6

32) projected environmental impacts in the affected area that can be mitigated to an acceptable degree, taking into account programmatic, technical, social, economic, and environmental factors? [960.5-2-5(a) and (d)] LR11

33) the performance confirmation requirements in 10 CFR Part 60 to show that conditions have not varied beyond the limits assumed for design and to show that conditions are within the limits assumed for design? LR3

Are there location or layout specific considerations associated with any drifting, test alcoves and subsurface boreholes, surface boreholes, or other investigations, that must be examined relative to:

34)	maintaining emplacement drift orientation flexibility?	D6
35)	confirming a preferred emplacement drift orientation?	D7
36)	demonstrating a cost effective construction approach?	C1
37)	demonstrating effective ventilation and hazardous minerals/dust control?	C2, CR12
38)	demonstrating an integrated environment, safety and health approach?	C3
39)	implementing a performance based approach to design and construction, including a construction based TBM configuration? Full consideration is to be given to constructability, operability, and maintainability issues associated with a potential storage facility.	C4
40)	testing "state of the art" mechanical excavators?	C5
41)	traffic problems that could occur with other operational drifts?	CR11
42)	muck handling, including direct connection to current system?	CR13
43)	storage location and reclamation of the mine muck removed from the drifts?	CR15
44)	Limiting impacts to major natural features that may be important to site performance?	LR2

~~compromise repository system performance?~~
limiting, during site characterization, impacts to waste isolation, construction-to-test and test-to-test interference, and other requirements derived from 10CFR60.15(c)?

42) ensuring that additional drifts or excavations do not violate the 200 meter overburden disqualifying condition of 10 CFR Part 960? [960.4-2-5(d)]?

45) the requirements for underground records in 10 CFR 60.72 such that construction of another drift during site characterization could fulfill level of detail requirements needed to satisfy some of the construction records requirements?

48) beginning construction of the geologic repository operations area without a construction authorization as identified in 10 CFR Part 60.3?

49) minimizing any significant adverse environmental impacts identified in comments on the Site Characterization Plan or in the Environmental Assessment? [NWPA Sec. 113(a)]

E.6 Combined Working Groups

Enhanced Characterization of the Repository Block
Meeting to Discuss Configuration
4/24/97 2:00pm-4:00pm
Room 609

A meeting was held on 4/24/97 to begin discussions of the configuration elements identified by the Working Groups toward reaching an optimum configuration that would be recommended to the Integrated Planning Committee. Those in attendance were:

James R Beyer, M&O Construction & Operations PE
Ron Oliver, M&O TCO
Ralph Rogers, M&O Testing WG
Bill Kennedy, M&O Design/Construction WG Lead
Peter Hastings, M&O Requirements/Controls WG Lead
Ken Ashe, M&O Licensing/Regulatory WG Lead
Albin Brandstetter, M&O PA (representing Jim Houseworth, M&O PA WG Lead)
Ned Elkins, M&O Testing WG Lead (by phone)
Mitch Brodsky, DOE AML

Jim Beyer opened the meeting with a brief description of the compiled list of configuration elements and the ranking of the various elements by investigative criteria only. (Reference Lotus Notes from J. Beyer dated 4/23/97 with attachment)

A significant amount of discussion occurred on the use of water when excavating a drift or alcoves. It is felt that water usage will be a primary consideration when dealing with dust suppression.

Discussion on the pros/cons of placing an East-West drift at, above, or below the potential repository horizon as well as northern block, central block, or southern block was held. Key points from the various working groups are as follows:

Testing Working Group

Displacement on the Solitario Canyon fault increases dramatically from north to south. We need to study the fault at a location where the displacement is great enough to see well developed physical characteristics of the fault zone itself and wall rock deformation associated with the fault. We also need enough displacement to allow us to access the Calico Hills without traversing the vitrophyre.

We have very little data on the physical properties of the rocks in the actual emplacement horizon itself. It is important to traverse as much of this horizon as possible. This point has several subpoints. The lower lithophysal zone of the Topopah will constitute at least 50% of the repository horizon and about the only data we have on it comes from a few meters in the ESF the traverse the very upper most portion of the unit. Hydrologic properties of this unit will be particularly

important and could be significantly different from what we have seen in other units. This potential difference results from the observation that fracture characteristics, such as continuity, curvature, abundance, etc., are strongly influenced by the presence and abundance of lithophysae. The distribution and abundance of lithophysae in this unit could be significantly different in this unit from other units that we have encountered higher in the section. This means that it is critical to do tests like the niche studies in the lower lith under the areas of high surface infiltration. otherwise we will always be accused of trying to bias our results.

Fracture distributions and abundances vary both from north to south and within the section between stratigraphic subunits. In part this is a subset of the second point and makes it important to sample the entire section of the emplacement horizon if possible. This also indicates that it is important to study the Solitario Canyon fault where it crosses the emplacement horizon because the wallrock deformation may change significantly between stratigraphic subunits.

The splay coming off of the Solitario Canyon fault in the central part of the block shows decreasing displacement going up section in outcrop. One interpretation of this data is that it is a pre-Tiva fault. If this is correct it could project for significant distances into the potential repository block. This possibility should be checked by underground construction.

Design/Construction Working Group

Placement of a drift at the elevation of the proposed emplacement horizon could reduce the layout flexibility for the emplacement drifts, causing a potential loss of usable area.

Placement of a drift above the emplacement horizon could be incorporated into the performance confirmation drift scheme. It is also not expected that the emplacement horizon would be raised any higher than currently envisioned.

Placement of a drift below the emplacement horizon could reduce layout flexibility if the proposed layout horizon were to be lowered.

Placement of a drift to the north would have less potential for impacting the block

than on located in the central block.

Performance Assessment Working Group

Placement of a drift in the central part of the block would have more potential for negatively impacting the block resulting from water usage, other liquids, and hydrocarbons.

Dan McKenzie (Repository Design) joined the meeting late to discuss repository design issues associated with an East-West drift.

The Licensing/Regulatory and Requirements/Controls working groups were asked to review the compiled configuration list and apply their criteria to these configuration elements.

Another meeting was scheduled for 4/28/97 to continue the discussion.

Minutes recorded by James R. Beyer.

Enhanced Characterization of the Repository Block
Meeting to Discuss Configuration
4/28/97 7:30am-9:30am
Room 609

A follow-on to the 4/24/97 meeting was held on 4/28/97 to continue discussions of the configuration elements identified by the Working Groups toward reaching an optimum configuration that would be recommended to the Integrated Planning Committee. Those in attendance were:

James R Beyer, M&O Construction & Operations PE
Mike Voegele, M&O Deputy AGM
Ralph Rogers, M&O Testing WG
Bill Kennedy, M&O Design/Construction WG Lead
Dan McKenzie, M&O Design/Construction WG
Peter Hastings, M&O Requirements/Controls WG Lead
Ken Ashe, M&O Licensing/Regulatory WG Lead
Jim Houseworth, M&O Performance Assessment WG Lead
Ned Elkins, M&O Testing WG Lead
Mitch Brodsky, DOE AML

The discussion focused primarily on an East-West drift. Key investigative areas include:

- potential high infiltration areas (mid-block east of Solitario Canyon Fault)
- Solitario Canyon Fault (minimal displacement in the North, more significant displacement in the central and southern portion)
- a northeasterly splay of the Solitario Canyon Fault near mid-block
- the subunits of TSW2 (key hydrology issue)
    + Repository design wants to keep any East-West drifting 10-20 meters above the potential repository horizon.
    + Lower lithophysal subunit (majority of potential repository layout is in this subunit)

The 200 meter cover disqualifier in 10CFR960 was discussed. Starting an East-West drift off the North Ramp has a portion going through an area with less than 200 meters of cover(Drill Hole Wash). This portion is east of the proposed repository block and should be considered an access which is not subject to the 200 meter cover requirement.

It was stated by Ned Elkins that an East-West drift starting off the main drift could have negative impacts on testing activities in Alcoves 6 and 7.

The issue of a northern borehole was discussed. The group felt that a hole between G-2 and UZ-14 west of WT-24 would be beneficial in examining the hydraulic gradient.(possibly in Teacup Wash)

Enhanced Characterization of the Repository Block
Meeting to Discuss Configuration
4/28/97 7:30am-9:30am
Room 609

A follow on meeting was scheduled for 4/29/97 to examine geologic cross sections associated with a potential East-West drift starting in the north and crossing Solitario Canyon Fault at mid-block.

Minutes recorded by James R. Beyer.

Enhanced Characterization of the Repository Block
Meeting to Discuss Configuration
4/29/97 7:30am-9:30am
Room 630

A follow-on to the 4/24/97 & 4/28/97 meetings was held on 4/29/97 to continue discussions of the configuration elements identified by the Working Groups toward reaching an optimum configuration that would be recommended to the Integrated Planning Committee. Those in attendance were:

James R Beyer, M&O Construction & Operations PE
Mike Voegele, M&O Deputy AGM
Ralph Rogers, M&O Testing WG
Bill Kennedy, M&O Design/Construction WG Lead
Dan McKenzie, M&O Design/Construction WG
Peter Hastings, M&O Requirements/Controls WG Lead
Ken Ashe, M&O Licensing/Regulatory WG Lead
Jim Houseworth, M&O Performance Assessment WG Lead
Mitch Brodsky, DOE AML

Dan McKenzie provided geologic cross sections of the 3 headings of the East-West cross drift that were being examined. All of the headings start at approximately 2,000 meters down the North Ramp and go in a south-westerly direction toward the Solitario Canyon Fault crossing the fault at different locations from central block toward the north. These cross sections illustrated what geologic subunits of the TSW2 the cross drift would penetrate.

The general discussion was that the East-West cross drift should probably go above the emplacement horizon.

A point was made that there may be a 200 meter cover issue on the west side of Solitario Canyon Fault particularly in the south.

Access to Calico Hills was discussed. Approximately 300 - 500 feet vertical drop would be required to reach the Calico Hills formation from the west end of the cross drift. This could be a significant amount of excavation if done by TBM at a 3% slope (3,000 - 5,000 meters).

A final meeting was scheduled for April 30, 1997 at 4:00pm for the purpose of reaching consensus on an optimum configuration to recommend to the Integrated Planning Committee.

Minutes recorded by James R. Beyer.

Enhanced Characterization of the Repository Block
Meeting to Discuss Configuration
4/30/97 4:00pm-6:00pm
Room 630

A follow-on to the 4/24/97, 4/28/97 & 4/29/97 meetings was held on 4/30/97 to continue discussions of the configuration elements identified by the Working Groups toward reaching an optimum configuration that would be recommended to the Integrated Planning Committee. Those in attendance were:

James R Beyer, M&O Construction & Operations PE
Mike Voegele, M&O Deputy AGM
Ralph Rogers, M&O Testing WG
Bill Kennedy, M&O Design/Construction WG Lead
Dan McKenzie, M&O Design/Construction WG
Peter Hastings, M&O Requirements/Controls WG Lead
Ken Ashe, M&O Licensing/Regulatory WG Lead
Albin Brandstetter, M&O PA(representing Jim Houseworth, M&O PA WG Lead)
Ned Elkins, M&O Testing WG Lead
Mitch Brodsky, DOE AML

There was discussion on how to access Calico Hills. Options included continuing with the TBM from the East-West Drift or dropping an internal shaft on the west side of Solitario Canyon Fault then using a roadheader to tunnel back through the fault and into the Calico Hills. No decision was made at this meeting but the ability to go to Calico Hills would not be precluded.

The group reached consensus that the following configuration elements, in rank order would be recommended to the Integrated Planning Committee as the optimum configuration.

1. A cross drift coming off the North Ramp to the southwest intersecting Solitario Canyon Fault central block, above repository horizon, preserving the ability to go to Calico Hills.
2. Northern borehole to water table between UZ-14 and G-2 at the head of Teacup Wash.
3. Southern borehole to water table along the crest between UZ-6 and H-3.
4. Access to Calico Hills from the west end of the East-West cross drift
5. Performance Assessment related Laboratory Testing
   - Cathodic Protection
   - Flow & transport through corrosion pits in waste package
   - Drip shields
   - Cladding
   - Thermomechanical data and dissolution rates under different water composition and heating scenarios
6. Southern Testing Complex (3-4 boreholes)

Elements 1,2 & 3 are approximately equal in rank. Elements 4 & 5 are approximately equal in rank, but noticeably less than 1,2 & 3. Element 6 is noticeably less in rank than 4 & 5.

Minutes recorded by James R. Beyer.

Minutes of Meeting with Dr. Fred Kissell 06/02/97

Subject: Discussions on Engineering Controls, primarily dust, during Tunnel Boring Machine (TBM) Operations with regard to Planned ECRB Operations.

Attendees: Dr. Kissell
From DOE: M. Vanderpuy/J. Replogle/V. Iorii/R. Baumeister/T. Fortner
From M&O: R. Taylor/ R. Sandifer/G. Kimura/T. Touchstone/R. Dresel/ J. Houseworth/B. Kennedy/C. Parker
From Kiewit: T. Wightman

The meeting was opened at 9 AM by Bob Sandifer. After a short overview by Ralph Dresel, Dr. Kissell asked, in essence, "What has changed now (with planned operations) that we can now cut with a wet (TBM) head where before we could not" (to control the dust). The answer lies in water management i.e water in vs. water removed. We can use as much as is needed as long as we do not exceed limits. We must remove as much water as possible. Dr. Kissell proposed that we talk about the type of controls to control dust we had used in our past TBM operations, their effectiveness, their practicality, and whether or not they had been tried or not. Having said that Dr. Kissell went to the "white board" and outlined in a systematic fashion the various aspects of our dust control measures then made a summation at the end of the discussion. It was an interactive proceeding with participation from all around the table.

Conveyor System
Water sprays. They were particularly effective in controlling dust but water collection was a problem.
Scraper systems. Good in that they helped to clean off the conveyor.
Covered conveyor. Not utilized. Deemed not cost effective in the short term. However, in the long term, during repository operations, they might prove to be cost effective. At this point in it would be a "last resort.
Improved "drop off or transfer points" This was an area that could be improved.

Ventilation Lines
Exhaust. Effective.
Leaking vent duct joints. This is a contributory source of dust. The duct joint wrapping could however, be improved.
Vent line pressure. Positive pressure in the vent lines needs to be minimized.
Configuration control This needs to be emphasized throughout the system. There was some discussion at this point regarding axial vs. centrifugal flow fans regarding noise emissions. It was agreed that space limitations preclude the use of latter type of fan. Fan spacing was discussed and while more could be used to maintain the volumetric flow this would increase the noise. A short discussion ensued regarding the fact that some fans may be operating at or near stall speed with the conjecture that operating at or near stall speed could contribute to the noise level. Fan blade and speed adjustment could be used to alleviate this condition, and optimize efficiency, but this methodology and time consuming can be very expensive.

Dr. Kissell, in response to a question, enlightened all with a short tutorial on just what that meant and how it affected the vent flow.

Transfer Points
These are areas where muck is being moved form one location to another.
Enclosure. This was in reference to the enclosure of the conveyor belt system. Discussed previously as a means of last resort.
Main line ducting. There was discussion of the possibility of providing main duct vent line pick up to draw off dust during conveyor operations. It was reasoned that is would be costly and not practical.
"Mud Flaps". These are the same as scrappers and were discussed above. They proved to be useful in cleaning of the conveyor belt.
Sprays. Discussed above. The significant problem here is water catchment and containment. Also, the maintenance of water catchments is a problem and a better system is needed. The comment that these systems are too readily clogged up is of concern.

Air Cleaning Station
This proved to be very effective up near the TBM. Concerns were voiced that the one currently used may not be practicable in the E-W drift due to its size. Comments were offered that it would be part of the trailing gear and would be close to the rear of the TBM and hence, could be utilized. The other concern here was the mapping gantry needed to be within 200 meters of the TBM and the constant requirement to do mapping while the TBM was in operation. Clear air is essential in order to keep the mapping personnel out of respirators.

Haulage
Toby Wightman mentioned the Keiwit was looking into some type of haulage surface other than inverts as well as the use of dust suppressant chemicals.

TBM
Dust sources included drilling as well as TBM operations and muck transfer points. The trombone system proved very effective in removing dust as did vacuuming. Some concern voiced on washing as it applied to electrical equipment. The concern being for adequate electrical protection to the equipment. Improvement in this location were enclosed belts and water collection...."french drains" and use of shotcrete were discussed. Of importance was the maintenance of sufficient volumetric flow to remove dust.

Dust Control at the TBM Head
Contributors to dust included dry cutting and leakage around the TBM head and low air extraction rates....higher rates needed.

At point Dr. Kissell shifted his focus and homed in on those actions that the M&O might consider taking to minimize dust during the E-W drift excavation.

E-W Drift... points to consider

- Use a wet head operation and spray muck ASAP.
- Use a condensing foam. This would also substantially reduce the amount of water used during construction.
- Contact A. H. Robbins (TBM manufacturer) and solicit their advise on dust reduction initiatives.

- Increase the volumetric air flow in the vicinity of the TBM head.
- ** Build a secondary containment area. ***THIS IS A KEY RECOMMENDATION.*** Dr. Kissell expended considerable energy in detailing the value of such an area. He considered it to be a key design element that should be built into the TBM. He very strongly recommended that the M&O incorporate this action into the TBM upgrade. **
- Use built in sprayer system in the secondary containment area and have a negative pressure in this area and duct off to the main from this room.
- Build in sampling ports into both the primary and secondary containment areas. Gages should be placed ahead of the TBM operator.
- Consider a wet collect. Dr. Kissell mentioned that while he was familiar with these units in the coal industry..they are labor intensive and require cleaning on a per shift basis... the M&O would need to contact manufacturers to determine their applicability to our operations.

Dr. Kissell then stated "it's time to look at the other side of the coin".....Do we/have we identified 2 to 3 ways to deal with every dust source?

Conveyor

Yes. Sprayers, air cleaning filters, transfer point containment and scrappers.

Vent Line

Yes. Minimize leaks though better sealing techniques, configuration management, pressure and flow management, and clean air flow into system.

Miscellaneous Sources

Yes. Drilling dust, dust settlement and catchment areas, wash down, vacuuming, wet discharge.

TBM Head

Yes. Wet head cutting, containment foam, secondary containment barrier, ventilation re-route paths from containment areas, monitoring ports, air scrubber/collectors.

Dr Kissell reiterated his comment on the importance of a secondary containment area.

The meeting adjourned at 11:35 AM

Minutes recorded and transcribed by Rufus Taylor.