

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6612FB3
2. Summary Account Title: Design ECRB Cross-drift.
3. Summary Account MGR/ORG: Kimura
4. Status of Change: ___ Revised X New
5. Scope Description: Develop designs and technical requirements for the second phase of the implementation of the Enhanced Characterization of the Repository Block.
Specific AE activities include: Performing the title II design of the East West Cross Drift (Excavation Layouts, Ground Support, Construction Support Utilities, General Construction Specification), Review constructor submittals and technically accept the plans prepared by the constructor. A/E designed construction support utilities will consist of water supply, waste water collection, compressed air supply, drift lighting, power supply, communications, ventilation system, and fire protection. A/E scope of work consists of determination of requirements, development of supporting design basis analysis, development of design drawings and specifications. The A/E will review submittals on the constructor supplied muck conveyor, rail transport systems, typical mounting details for A/E designed utility systems, and typical utility location layouts. The A/E will determine and specify the type and extent of constructor submittals required for review.
6. Scope Differences from the Baseline:
 New Scope
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section.
 2. The design of the ESF ECRB cross-drift will not preclude the potential extension of access to the Calico hills.
 3. The ECRB cross drift will extend from the TBM launch chamber in the North Ramp generally westward across the Solitario Canyon Fault.
 4. The design of ECRB cross drift utilities will be in accordance with OSHA 1926. Equipment and utility mountings will not be evaluated for seismic loads

5. The constructor will be responsible for the design of the cross drift muck conveyor and rail transport systems including modifications to existing ESF utility systems required to support the addition of these systems. Proposed modifications to existing systems will be submitted to A/E for review.
6. ECRB cross drift utilities will be construction support systems and not subject to the design requirements found in the ESFDR. Systems Engineering will provide a letter for the AE to this effect.
7. A/E developed design drawings and specifications will generally be schematics or flow diagrams which will specify equipment sizings, materials, general locations, Etc. The actual utility locations in the cross drift will be the responsibility of the constructor. Typical utility configurations will be submitted to A/E for review to ensure that any applicable requirements from testing or DIES are met.
8. Utilities will not be required to remain operational during or after a seismic event.
9. All A/E work on cross drift utilities will be Non-Q.
10. Design inputs will be required before Starter Tunnel design can start. QAP 3.12 inputs will be required from Science (DST Standoff, Coordinates of terminal end of cross drift), Constructor (Size requirements for TBM assembly and launch, Grade, Angle of departure from No. Ramp, TBM turning radius), Repository Design (Gradient, Sill), SA (CA, Seismic requirements).
11. DIE will be completed before first analysis can complete checking (4 weeks from start of design)

8. Cost Rationale: -CURRENT ESTIMATE \$505,887
9. Level III Milestones:
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

MGDS - ESF DESIGN

Engineering Estimate Work Sheet

Date: 06/10/97

Rev.: 00

W.B.S/Title: <u>1.2.6.6.1.2 ESF TSL Excavations</u>	Discipline: <u>Mining</u>
Job No.: _____ Task No.: _____	Prepared by: <u>W. Kennedy</u>
JN Descriptn: _____ Task: _____	Reviewed by: _____
<u>ESF EWX Drift Title II Design</u>	

Description	Product Development			Product Check		
	Units	MHrs	Total	Units	MHrs	Total
<i>Analyses:</i>						
E-W Drift General Construction Analysis "Q" 25	1	200	200	1	40	40
Rock Bolt & Accessories Analysis "Non Q" 15	1	120	120	1	24	24
<i>Specifications (Including Inputs Lists):</i>						
East-West Drift General Construction Spec "Q" 20	1	160	160	1	32	32
Rock Bolt & Accessories Spec "Non Q" 15	1	120	120	1	24	24
<i>Drawings (Including Inputs Lists):</i>						
Layouts - Plans & Profiles 75	6	100	600	6	20	120
Overall Plan 12.5	1	100	100	1	20	20
Typical Cross-Section 12.5	1	100	100	1	20	20
<i>Review</i>						
Review Constructor Design Inputs/Submittals 18	6	24	144			
<i>Common Activities:</i>						
Planning & Supervision 20% of discrete MHrs			308.8			308.8
Design Review 15% of discrete MHrs			231.6			231.6
			Subtotal MHR	2084.4		
					Subtotal MHrs	230
TOTAL MHrs						2364.4

Notes/Assumptions:

MGDS - ESF DESIGN

Engineering Estimate Work Sheet

Date: 06/10/97

Rev.: 00

W.B.S/Title: <u>1.2.6.6.1.2 ESF TSL Excavations</u>		Discipline: <u>Geotech</u>	
Job No.: _____	Task No.: _____	Prepared by: <u>J. H. Pye</u>	
JN Descriptn: _____	Task: _____	Reviewed by: <u>S. Bonabian</u>	
ESF EWX Drift Title II Design			

Description	Product Development			Product Check		
	Units	MHrs	Total	Units	MHrs	Total
<i>Analyses:</i>						
Geotechnical Ground Support Loads Analysis Quasi-Static and Dynamic Analysis	40	1	320	320	1	64
<i>Specifications (Including Inputs Lists):</i>						
<i>Drawings (Including Inputs Lists):</i>						
Rock Bolt & Accessories drawings	25	2	100	200	2	20
<i>Review</i>						
Review Constructor Design Inputs/Submittals	12	4	24	96		
<i>Common Activities:</i>						
Planning, Supervision & tech Supt			20% of discrete MHrs	123	123.2	
Design Review			15% of discrete MHrs	92.4	92.4	
		Subtotal M	831.6	Subtotal MHrs	104	
					TOTAL MHrs	935.6

Notes/Assumptions:

MGDS - ESF DESIGN

Engineering Estimate Work Sheet

Date: 06/10/97

Rev.: 00

W.B.S/Title: 1.2.6.6.1.2 ESF TSL Excavations

Discipline: Civil/Structural

Job No.: _____ Task No.: _____

Prepared by: M. Taylor

JN Descriptn: _____ Task: SS Struct

Reviewed by: _____

ESF EWX Drift Title II Design

Description	Product Development			Product Check		
	Units	MHrs	Total	Units	MHrs	Total
<i>Analyses:</i>						
Steel Sets Analysis "Non Q" 20	1	160	160	1	32	32
<i>Specifications (Including Inputs Lists):</i>						
Steel Set Spec "Non Q" 20	1	160	160	1	32	32
<i>Drawings (Including Inputs Lists):</i>						
<i>Review</i>						
Review Constructor Design Inputs/Submittals 6	2	24	48			
<i>Common Activities:</i>						
Planning & Supervision 20% of discrete MHrs		73.6	73.6			
Design Review 15% of discrete MHrs		55.2	55.2			
			Subtotal M	496.8	Subtotal MHrs	64
TOTAL MHrs						560.8

Notes/Assumptions:

MGDS - ESF DESIGN

Engineering Estimate Work Sheet

Date: 06/10/97

Rev.: 00

W.B.S/Title: <u>1.2.6.6.1.2 ESF TSL Excavations</u>	Discipline: <u>SubSurface Utilities</u>
Job No.: _____ Task No.: _____	Prepared by: <u>L. R. Morrison / W. J. Reed</u>
JN Descriptn: _____ Task: <u>Utilities</u>	Reviewed by: _____
ESF EWX Drift Title II Design	

Description	Product Development		Product Check			
	Units	MHrs	Total	Units	MHrs	Total
<i>Analyses:</i>						
Construction Support Utilities Design Basis	58		1	460	460	1 92 92
Mech	160					
Elec	160					
Mining	100					
Struct	40					
<i>Specifications (Including Inputs Lists):</i>						
ECR Electrical Equipment spec	5		1	40	40	1 8 8
<i>Drawings (Including Inputs Lists):</i>						
Fresh water, waste water, compressed air	25		2	100	200	2 20 40
Ventilation	25		2	100	200	2 20 40
Power	25		2	100	200	2 20 40
Lighting	13		1	100	100	1 20 20
Communication	13		1	100	100	1 20 20
<i>Review</i>						
Review Constructor Design Inputs/Submittals	24		8	24	192	
<i>Common Activities:</i>						
Planning & Supervision	20% of discrete MHrs		298	298.4		
Design Review	20% of discrete MHrs		298	298.4		
		Subtotal M	2088.8	Subtotal MHrs	260	
					TOTAL MHrs	<u>2348.8</u>

Notes/Assumptions:

Please note in the description if the product is new or a revision.

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6DGA2B
2. Summary Account Title: ECRB Title III
3. Summary Account MGR/ORG: Kimura
4. Status of Change: ___ Revised X New
5. Scope Description: Provide Title III services for the construction and the continuation of design for the ECRB. Provide Title III services for No. & So. Portal area improvements.
6. Scope Differences from the Baseline:
 New scope
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section
 2. This activity will not include the development of ground support performance parameters.
 3. ECRB Title III activities are in addition to the technical activities necessary to complete construction of the ESF main loop and associated surface facilities.
 4. Any as-builts, system descriptions or O&M related activities are not included in this Summary Account.
 5. Includes full time electrical to review installation for OSHA 1926 compliance.
 6. Will provide 3 shift coverage through April '98. Will provide follow on 1 shift coverage through July '98. Title III Coverage for ECRB ends July '98.
8. Cost Rationale: - CURRENT ESTIMATE \$937,752
9. Level III Milestones:
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6613GB1
2. Summary Account Title: Design ECRB Alcoves
3. Summary Account MGR/ORG: Kimura
4. Status of Change: ___ Revised X New
5. Scope Description: Provide designs for the alcoves necessary to support the underground site characterization of the Solitario Canyon Fault and the Hydrological and Geochemical investigations.
6. Scope Differences from the Baseline:
New Scope
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section.
 2. There will be three Test Alcoves, 3m x 4m x 100m ea. The alcoves will have 4-6 boreholes - 20-30 meters long ea. Alcoves will be located at various points, to be determined by TCO, along the ECRB Cross Drift.
 3. There will be two Niches similar to the Moisture Studies (3.5x4x10?) The niches will have 8ea. - 15 to 20 meter holes
 4. It is understood that the excavation of these alcoves shall be after the completion of TBM operations and demob.
 5. AE alcove & niche designs will consist of excavation layouts based on criteria letters from the TCO and ground support.
8. Cost Rationale:
9. Level III Milestones:
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

MGDS - ESF DESIGN

Engineering Estimate Work Sheet

Date: 06/10/97

Rev.: 00

W.B.S/Title: 1.2.6.6.1.3 ESF TSL Testing	Discipline: Mining
Job No.: _____ Task No.: _____	Prepared by: W. Kennedy
JN Descriptn: _____ Task: _____	Reviewed by: _____
ESF ECRB Test Alcoves & Niches Title II Design	

Description	Product Development			Product Check			
	Units	MHrs	Total	Units	MHrs	Total	
<i>Analyses:</i>							
NO New Analysis - Design will be based on criteria letters from the TCO							
<i>Specifications (Including Inputs Lists):</i>							
<i>Drawings (Including Inputs Lists):</i>							
Alcove Layouts - Plans	37.5	3	100	300	3	20	60
Alcove Layouts - Profiles	37.5	3	100	300	3	20	60
Niche Plans & Profiles	25	2	100	200	2	20	40
Alcove Ground Support		2	100	200	2	20	40
<i>Review</i>							
Review Constructor Design Inputs/Submittals						24	
<i>Common Activities:</i>							
Planning & Supervision	20% of discrete MHrs		200	200			
Design Review	15% of discrete MHrs		150	150			
			Subtotal MHR	1350	Subtotal MHrs	200	
TOTAL MHrs						1550	

Notes/Assumptions:

Please note in the description if the product is new or a revision

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6621GB2
2. Summary Account Title: Conceptual Design of the Calico Hills Extension
3. Summary Account MGR/ORG: Kimura
4. Status of Change: ___ Revised X New
5. Scope Description: Develop a Conceptual Design Report for the Extension of the ESF cross drift into the Calico Hills
6. Scope Differences from the Baseline:
 New Scope
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section .
 2. The design of the ESF ECRB cross-drift will not preclude the potential extension of access to the Calico hills
 3. After the Site Characterization objectives are defined for the proposed Calico Hills investigation, the conceptual design process will determine the most effective configuration to meet these objectives. Various access options will be considered such as ramps with varying degrees of declines and vertical shafts. Interfaces with the potential repository will be considered. Costs and construction schedules will be developed for each defined option.
 4. Conceptual Design will be performed in FY99.
8. Cost Rationale:
9. Level III Milestones:
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6311FB1
2. Summary Account Title: Design No. Portal Construction Support Facilities
3. Summary Account MGR/ORG: Kimura
4. Status of Change: ___ Revised X New
5. Scope Description: Provide designs for the ECRB Drift Muck Storage Pile.
 - EWX Drift Muck Storage Pile - Develop grading and drainage drawings.
6. Scope Differences from the Baseline:
 - New Scope
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section.
 2. Existing Surface Waste Water System drawings will be used.
 3. Volume of the ECRB muck pile will be based on 1/8 of the Main Drift tunnel muck.
 4. Surface conveyor and radial stacker will be used "as is" in their current location and configuration. NO design required.
 6. No Surface Perched Water Evaporation Pond.
 7. No modifications required to the existing Air Quality Permits.
8. Cost Rationale: CURRENT ESTIMATE ^S 67,268
9. Level III Milestones:
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

MGDS - ESF DESIGN

Engineering Estimate Work Sheet

Date: 06/10/97

Rev.: 01

W.B.S/Title: 1.2.6.3.1.1 North Portal
 Job No.: _____ Task No.: _____
 JN Descriptn: _____ Task: SS Struct
 Design No. Portal Construction Support Facilities

Discipline: Civil/Structural
 Prepared by: H. Montalvo
 Reviewed by: _____

Description	Product Development			Product Check		
	Units	MHrs	Total	Units	MHrs	Total
<i>Analyses:</i>						
Muck Storage Pad (rev)	1	60	60	1	12	12
Drainage Calculations	1	60	60	1	12	12
<i>Specifications (Including Inputs Lists):</i>						
<i>Drawings (Including Inputs Lists):</i>						
Overall Site Plan (rev)	1	10	10	1	2	2
No. Portal Site Plan (new)	1	40	40	1	8	8
Finished Grading & Location Plan (new)	2	80	160	2	16	32
Storm Drain Details (new)	1	40	40	1	8	8
<i>Common Activities:</i>						
Planning, Est. Supt & Supervision	20% of discrete MHrs		74	74		
Design Review	15% of discrete MHrs		55.5	55.5		
			Subtotal M	499.5	Subtotal MHR	74
TOTAL MHrs						573.5

Notes/Assumptions:

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6312FB1
2. Summary Account Title: Design So. Portal Support Facilities
3. Summary Account MGR/ORG: Kimura
4. Status of Change: ___ Revised X New
5. Scope Description: Provide Title II designs for the So. Portal area support systems to provide access to the ESF via the So. Portal during ECRB Construction. AE Designed Systems include Security, Lighting, Power, Grounding Grid.
 - ▶ Security - Design Security Fencing for So. Portal Area.
 - ▶ Power & Lighting - Provide power & lighting to So. Portal Facilities (from No. Portal), both permanent and temporary. Install a 750 kVA Mine Power Center (MPC).
 - ▶ Grounding Grid - Provide separate ground system for So. Portal.
6. Scope Differences from the Baseline:
 New Scope
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section.
 2. No. Portal will be reserved for ECRB Construction Access, So. Portal will handle all visitor and scientific Access.
 3. Surface Rail Spur and Materials Storage and Handling Facilities will be designed by constructor.
 4. TBM will be removed from So. Portal Pad before So. Portal Improvements are started.
 5. Temporary items will be designed in accordance with OSHA 1926 and Specification Section Q1500.
 6. Permanent ESF Facilities will be designed to the ESFDR.

7. There will be NO Diesel Fuel System at the So. Portal. Constructor will provide mobile fueling at So. Portal.
 8. Existing Pad size is adequate for all facilities.
 9. Portable sanitation facilities will be used. This will consist of six Pot-a-potties located on the pad. No Design required .
 10. No permanent potable or non-potable water facilities. Water will be trucked in.
 11. Road has a surface of 8" to 12" of compacted select fill. No Road improvements required. No Pad Grading & Drainage improvements required.
 12. Compressed air will not be required on the South Portal Pad. Compressed air will be available at the portal entrance.
 13. No Medical Facility required at So. Portal.
 14. Construction Labor costs and Capital Equipment costs not included in AE estimate. Will be included in Construction estimate.
 15. Portal Access Control and Security Station will be a trailer provided by Constructor. No AE design required.
 16. There will be NO hardwire telephones at So. Portal
8. Cost Rationale: CURRENT ESTIMATE \$ 101,226
9. Level III Milestones:
 10. Level III Milestone Acceptance Criteria:
 11. Attachments and References:

MGDS - ESF DESIGN

Engineering Estimate Work Sheet

Date: 06/10/97

Rev.: 01

W.B.S/Title: <u>South Portal</u> Job No.: _____ Task No.: _____ JN Descriptn: _____ Task: <u>SS Struct</u> Design So. Portal Support Facilities	Discipline: <u>Civil/Structural</u> Prepared by: <u>H. Montalvo</u> Reviewed by: _____
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Description	Product Development			Product Check		
	Units	MHrs	Total	Units	MHrs	Total
<i>Analyses:</i>						
<i>Specifications (Including Inputs Lists):</i>						
<i>Drawings (Including Inputs Lists):</i>						
Overall Site Plan (rev)	1	20	20	1	4	4
So Portal Pad Grading Plan & Elevations (rev)	2	40	80	2	8	16
So Portal Pad Fencing Plan (new)	1	60	60	1	12	12
<i>Common Activities:</i>						
Planning & Supervision		20% of discrete MHrs	32		32	
Design Review		15% of discrete MHrs	24		24	
Subtotal M			216	Subtotal MHrs		32
TOTAL MHrs						248

Notes/Assumptions:

15-Built topo info required for existing pad and access road. Cost estimated at \$10,000

MGDS - ESF DESIGN

Engineering Estimate Work Sheet

Date: 06/10/97
 Rev.: 01

W.B.S/Title: <u>South Portal</u> Job No.: _____ Task No.: _____ JN Descriptn: _____ Task: _____ Design So. Portal Support Facilities	Discipline: <u>Mechanical</u> Prepared by: <u>R. Flye</u> Reviewed by: _____
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Description	Product Development		Product Check			
	Units	MHrs	Total	Units	MHrs	Total
<i>Analyses:</i>						
<i>Specifications (Including Inputs Lists):</i>						
revise Mechanical Specs	1	30	30	1	6	6
<i>Drawings (Including Inputs Lists):</i>						
<i>Review</i>						
<i>Common Activities:</i>						
Planning & Supervision		20% of discrete MHrs	6		6	
Design Review		15% of discrete MHrs	4.5		4.5	
Subtotal M			40.5	Subtotal MHrs		6
TOTAL MHrs						46.5

Notes/Assumptions:

Please note in the description if the product is new or a revision.

MGDS - ESF DESIGN

Engineering Estimate Work Sheet

Date: 06/10/97

Rev.: 01

W.B.S/Title: <u>South Portal</u>	Discipline: <u>Electrical</u>
Job No.: _____ Task No.: _____	Prepared by: <u>Fernandez</u>
JN Descriptn: _____ Task: _____	Reviewed by: _____
Design So. Portal Support Facilities	

Description	Product Development			Product Check		
	Units	MHrs	Total	Units	MHrs	Total
<i>Analyses:</i>						
So. Portal Power Analysis	1	120	120	1	24	24
<i>Drawings (Including Inputs Lists):</i>						
So. Portal one line diagrams	1	80	80	1	16	16
So. Portal Electrical Layout	1	60	60	1	12	12
So. Portal Lighting	1	60	60	1	12	12
So Portal Grounding	1	60	60	1	12	12
<i>Common Activities:</i>						
Planning & Supervision	20% of discrete MHrs		76	76		
Design Review	15% of discrete MHrs		57	57		
Subtotal M			513	Subtotal MHR		76

TOTAL MHrs 589

Notes/Assumptions:

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6621GB2
2. Summary Account Title: Conceptual Design of the Calico Hills Extension
3. Summary Account MGR/ORG: Kimura
4. Status of Change: Revised X New
5. Scope Description: Develop a Conceptual Design Report for the Extension of the ESF cross drift into the Calico Hills
6. Scope Differences from the Baseline:
 New Scope
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section
 2. The design of the ESF ECRB cross-drift will not preclude the potential extension of access to the Calico hills
 3. After the Site Characterization objectives are defined for the proposed Calico Hills investigation, the conceptual design process will determine the most effective configuration to meet these objectives. Various access options will be considered such as ramps with varying degrees of declines and vertical shafts. Interfaces with the potential repository will be considered. Costs and construction schedules will be developed for each defined option.
8. Cost Rationale: *SEE ATTACHED - CURRENT ESTIMATE \$135,454*
9. Level III Milestones:
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

MGDS - ESF DESIGN DESCRIPTION OF WORK

Date: 01.02/97

Rev.: 00

W.B.S	1.2.6.6.1.3		
W.B.S. Title	ESF TSL Testing		
P&S Account No.			
P&S Account Title			
Summary Account No.	TR6613FB?	2H80tbd	
Summary Account Title	ESF ECRB Conceptual Design of the Calico Hills Access		
Participant	MKE		
Type of Work	Discrete		

Work Scope:

Develop a Conceptual Design Report for the Extension of the ESF cross drift into the Calico Hills.

After the Site Characterization objectives are defined for the proposed Calico Hills investigation, the conceptual design process will determine the most effective configuration to meet these objectives. Various access options will be considered such as ramps with varying degrees of declines and vertical shafts. Interfaces with the potential repository will be considered. Costs and construction schedules will be developed for each defined option.

Four options will be considered.

Assumptions

Notes:

Man-hour	1,622	@	\$70	\$113,540
FTEs	10.5			
Man-Year	0.9			

Deliverable/Product	Criteria	Date
Conceptual Design Report	M&O Acceptance	

MGDS - ESF DESIGN DESCRIPTION OF WORK Continuation

Date: 06/02/97
Rev.: 00

W.B.S	1.2.6.6.1.3
W.B.S. Title	ESF TSL Testing
P&S Account No.	
P&S Account Title	
Summary Account No.	TR6613FB?
Summary Account Title	ESF ECRB Conceptual Design of the Calico Hills Access
Participant	MKE
Type of Work	Discrete

Work Scope:

Analysis	480
Drawings & Specs	680

Review Constructor Design Inputs / Submittals

Common Activities:

Planning & Supervision	232
Checking	56
Design Review	174
	1622

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6613GB1
2. Summary Account Title: Design ECRB Alcoves
3. Summary Account MGR/ORG: Kimura
4. Status of Change: ___ Revised X New
5. Scope Description: Provide designs for the alcoves necessary to support the underground site characterization of the Solitario Canyon Fault and the Hydrological and Geochemical investigations.
6. Scope Differences from the Baseline:
New Scope
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section. -
 2. There will be three Test Alcoves, 3m x 4m x 100m ea. The alcoves will have 4-6 boreholes - 20-30 meters long ea. Alcoves will be located at various points, to be determined by TCO, along the ECRB Cross Drift.
 3. There will be two Niches similar to the Moisture Studies (3.5x4x10?) The niches will have 8ea. - 15 to 20 meter holes
 4. It is understood that the excavation of these alcoves shall be after the completion of TBM operations and demob.
 5. AE alcove & niche designs will consist of excavation layouts based on criteria letters from the TCO and ground support.
8. Cost Rationale:
9. Level III Milestones:
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

MGDS - ESF DESIGN DESCRIPTION OF WORK

Date: 06/02/97
Rev.: 00

W.B.S	<u>1.2.6.6.1.3</u>
W.B.S. Title	<u>ESF TSL Testing</u>
P&S Account No.	<u></u>
P&S Account Title	<u></u>
Summary Account No.	<u>TR6613GB1</u>
Summary Account Title	<u>ESF ECRB Test Alcoves & Niches Title II Design</u>
Participant	<u>MKE</u>
Type of Work	<u>Discrete</u>

Work Sc Provide designs for the alcoves necessary to support the underground site characterization of the Solitario Canyon Fault and the Hydrological and Geochemical investigations.
(160M TOTAL)

There will be three Test Alcoves, 3m x 4m x 40m ea. The alcoves will have 4-6 boreholes - 20-30 meters long ea. Alcoves will be located at various points, to be determined by TCO, along the ECRB Cross Drift.

It is understood that the excavation of these alcoves shall be after the completion of TBM operations and demob.

AE alcove & niche designs will consist of excavation layouts based on criteria letters from the TCO and ground support.

Assumptions: All other EWX Design and construction support will be estimated separately
Rail and Muck Conveyance will be by Contractor

Notes:

Submittals	<u>0</u>				
Analyses	<u>0</u>				
Specs	<u>0</u>				
Drawings	<u>10</u>				
Man-hour	<u>1,550</u>	<u>@</u>	<u>\$70</u>	<u>\$108,500</u>	
FTEs	<u>10.0</u>				
Man-Year	<u>0.8</u>				

<i>Deliverable/Product</i>	<i>Criteria</i>	<i>Date</i>
	<u>M&O Acceptance</u>	

MGDS - ESF DESIGN

Engineering Estimate Work Sheet

Date: 06/02/97

Rev.: 00

W.B.S/Title: <u>1.2.6.6.1.3 ESF TSL Testing</u> Job No.: _____ Task No.: _____ JN Descriptn: _____ Task: _____ ESF ECRB Test Alcoves & Niches Title II Design	Discipline: <u>Mining</u> Prepared by: <u>W. Kennedy</u> Reviewed by: _____
--	--

Description	Product Development			Product Check			
	Units	MHrs	Total	Units	MHrs	Total	
<i>Analyses:</i>							
NO New Analysis - Design will be based on criteria letters from the TCO							
<i>Specifications (Including Inputs Lists):</i>							
<i>Drawings (Including Inputs Lists):</i>							
Alcove Layouts - Plans	37.5	3	100	300	3	20	60
Alcove Layouts - Profiles	37.5	3	100	300	3	20	60
Plans & Profiles	25	2	100	200	2	20	40
Alcove Ground Support		2	100	200	2	20	40
<i>Review</i>							
Review Constructor Design Inputs/Submittals						24	
<i>Common Activities:</i>							
Planning & Supervision	20% of discrete MHrs		200	200			
Design Review	15% of discrete MHrs		150	150			
			Subtotal MHr	1350	Subtotal MHrs	200	
						TOTAL MHrs	1550

Notes/Assumptions:

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6612FB3
2. Summary Account Title: TBM Mobilization and Rehabilitation
3. Summary Account MGR/ORG: _____
4. Status of Change: ___ Revised ___ New
5. Scope Description: Rehabilitate the ECRB TBM and associated equipment consistent with the project requirements and mobilize the equipment to the ESF site at Yucca Mountain.
6. Scope Differences from the Baseline:
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section.
 2. This activity will be supported from the ESF General Support accounts which will be defined as part of the FY98 ESF planning.
 3. The required planning for the TBM rehabilitation is included in the Early Start ECRB CR.
 4. This activity will start once there is agreement with the constructor on the usage rate for the equipment and will be complete once the equipment arrives at the ESF jobsite. Any follow on activities will be included in Summary Account TR6612FB6 - Install Excavation Equipment.
 5. Any specialized equipment installed on the TBM system during rehabilitation to meet YMP requirements. will be the property of the constructor at the completion of the work and will be demobilized with the TBM.
8. Cost Rationale: ^{2,112,014}~~\$2,717,450~~ - See the enclosed construction cost estimate for details.
9. Level III Milestones: See the preceding milestone and deliverable summary > where?
10. Level III Milestone Acceptance Criteria:

11. **Attachments and References:**

o **Data Sheet for the PK TBM**

GENERAL SPECIFICATIONS -

MACHINE DIAMETER (WITH NEW CUTTERS): 16 FEET 5 INCHES
MAIN BEARING: TAPERED ROLLER TYPE
CUTTERS: 34 ROBBINS 17-INCH DISCS
ON 32 ASSEMBLIES
MAXIMUM RECOMMENDED AVERAGE
CUTTER LOAD: 45,000 POUNDS
MAXIMUM RECOMMENDED
CUTTERHEAD THRUST: 1,530,000 POUNDS
CUTTERHEAD DRIVE ASSEMBLIES: AC MOTORS/GEAR
REDUCERS/HYDRAULIC
CLUTCHES
CUTTERHEAD HORSEPOWER: 1200 HP (SIX 200-HP WATER-
COOLED MOTORS)
CUTTERHEAD SPEED: APPROXIMATELY 10 RPM
CUTTERHEAD TORQUE: 630,000 LB.-FT.
BORING STROKE: 72 INCHES

HYDRAULIC SYSTEM:

RECOMMENDED SYSTEM OPERATING
PRESSURE: 4200 PSI
MAXIMUM SYSTEM PRESSURE: 5000 PSI
MACHINE CONVEYOR: TROUGHED BELT

TBM Rebuild Assumptions developed by the CMO

We anticipate that the used TBM will require a general rebuilding which would include but not necessarily be limited to the following:

- Disassemble, clean and inspect entire machine.
- Replace worn or damaged components.
- Replace structural fasteners.
- Replace all seals, filters, hoses.
- Rebuild hydraulic cylinders.
- Rebuild drive motors and gear boxes.
- Replace bearings.
- Rebuild or replace main bearing.
- Clean, inspect and replace as necessary all electrical components.
- Clean and inspect vent ducts, repair or replace as rq'd.
- Completely assemble machine, perform no load shop test of all systems and components.
- Paint one coat shop primer, one coat white finish.
- Disassemble and ship to site.
- Provide complete o&m manuals and assembly instructions.
- Repair/replace railings and ladders as rq'd

In addition, special program requirements regarding fluid spills, and water use, and dust control will add the following:

- Incorporate knock-down features that will allow removal of the TBM back out through the bored tunnel.
- Provide an enhanced dust control system.
- Rebuild or replace the water spray system on the cutter head.
- Repair, replace or construct cutter head dust shield to effectively contain dust in the cutter head area.
- Replace dust scrubber with unit sized to handle 1.5 times the anticipated tunnel air flows
- Configure the TBM vent system to have a minimum capacity capable of maintaining a 100 fpm tunnel air velocity.
- ~~Provide enclosed operator's cab with air conditioner/filter.~~
- Provide water sprays on the muck conveyor both top and bottom.
- Enclose conveyor where practical.
- Provide noise attenuation as feasible at all noise generating areas.
- Replace hydraulic system piping and hoses with high pressure components.
- Minimize storage capacity of organic-containing fluids to reduce spill potential.
- Install drip pans.
- Provide dry-type transformers if not already equipped.
- Provide automatic fire suppression system.
- Install closed loop hydraulic or coolant systems where feasible.

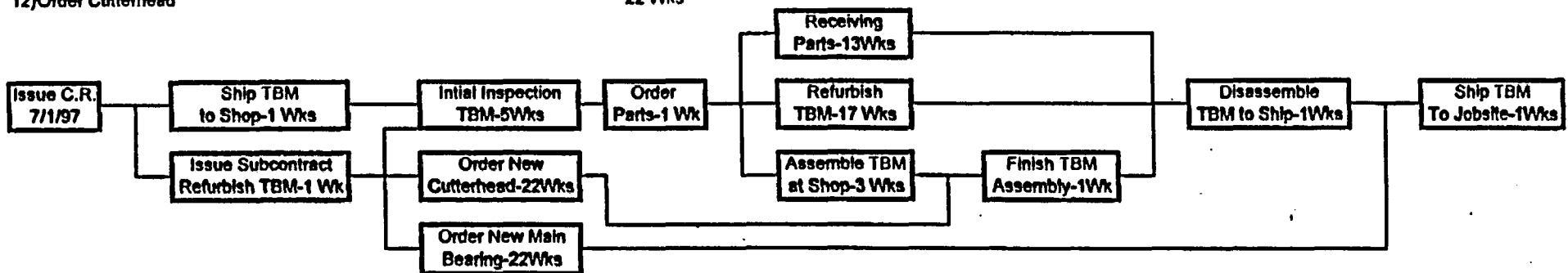
Preliminary Schedule of Refurbishment of TBM

List of Activities:

- 1) Issuance of Change Order, TRW to K/PB
- 2) Prepare and Ship TBM
- 3) Initial Inspection
- 4) Ordering of Parts
- 5) Receiving Parts
- 6) Refurbishment
- 7) Final Assembly in Shop
- 8) Disassemble for Shipment
- 9) Ship to Job Site
- 10) Issuance Subcontract for TBM Refurbishment
- 11) Order New Main Bearing
- 12) Order Cutterhead

Duration

- N/A
- 1 Wks
- 5 Wks
- 1 Wk
- 13 Wks
- 17 Wk
- 3+1 Wk
- 1 Wks
- 1 Wks
- 1 Wk
- 22 Wks
- 22 Wks



**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6612GB5
2. Summary Account Title: Excavate ECRB Launch Chamber
3. Summary Account MGR/ORG: McDonald
4. Status of Change: Revised New
5. Scope Description: Excavate and support the ECRB Launch Chamber in accordance which project requirements.
6. Scope Differences from the Baseline:

New Scope
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section.
 2. This activity will be supported from the ESF General Support accounts which will be defined as part of the FY98 ESF planning.
 3. This activity is limited to the activities associated with the excavation and installation of ground support for the ECRB TBM launch chamber. The installation of the electrical and mechanical systems necessary for the excavation of the ECRB cross drift shall be in Summary Account TR6612FB6 - Install excavation equipment
8. Cost Rationale: ^{1,152,078}~~\$2,106,006~~ - See the enclosed construction cost estimate for details.
9. Level III Milestones: See the preceding milestone and deliverable summary) *where?*
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

To: BILL KENNEDY
cc: Ivan Cottle, John Eastlund, Lyman File
From: Toby Wightman
Date: 05/15/97 11:58:52 AM
Subject: East-West Drift Launching Chamber and Starter Tunnel

As requested, our best evaluation of dimensional requirements from the information we have at this time is as follows:

1. Angle of departure from North Ramp - 45 degrees.
2. Total length of combined Launching/Starter Tunnel - 300 LF.
3. The first 150 LF of tunnel will be the assembly, marshalling and working area to support the tunneling activity. It will also contain the conveyor drive and takeup units electrical switchgear, rail switching etc. Dimensions should be 30 ft. wide X 23 ft high X 150 ft long.
- 3 The next 150 ft will contain the gripper saddles and sufficient room for the necessary TBM assembly for startup. It will be a horseshoe section, 22 ft. wide by 21 ft. high.

I realize that this is outside the currently justified rock design dimensions that you mentioned, but it is about the best that we can do at this time.

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6612EB3
2. Summary Account Title: Establish South Portal Access to Alcoves
3. Summary Account MGR/ORG: MCDONALD
4. Status of Change: ___ Revised ___X New
5. Scope Description: Construct the necessary modifications the South Portal and pad to provide effective alternative access to the ESF Main Loop down station from the North Ramp intersection with the ECRB launch chamber during ECRB construction.
6. Scope Differences from the Baseline:

New Work
7. Key Assumptions:

1. See the General ESF Technical Basis that prefaces this section.

2. This activity will be supported from the ESF General Support accounts which will be defined as part of the FY98 ESF planning.
8. Cost Rationale: ^{519,363}~~520,402~~ - See the enclosed construction cost estimate for details.
9. Level III Milestones:
None
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6612GB6
2. Summary Account Title: Install Excavation Equipment
3. Summary Account MGR/ORG: McDonald
4. Status of Change: ___ Revised X New
5. Scope Description: Install all the necessary electrical and mechanical systems necessary for the excavation of the ECRB cross drift.
6. Scope Differences from the Baseline:
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section.
 2. This activity will be supported from the ESF General Support accounts which will be defined as part of the FY98 ESF planning.
 3. This activity will begin after the completion of the launch chamber excavation and the installation of ground support and will be completed with the beginning of the excavation of the ECRB cross-drift.
8. Cost Rationale: ^{974,850}~~976,802~~ - See the enclosed construction cost estimate for details.
9. Level III Milestones:
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

SECTION 0
GENERAL INFORMATION

MODEL 156-245

Cl

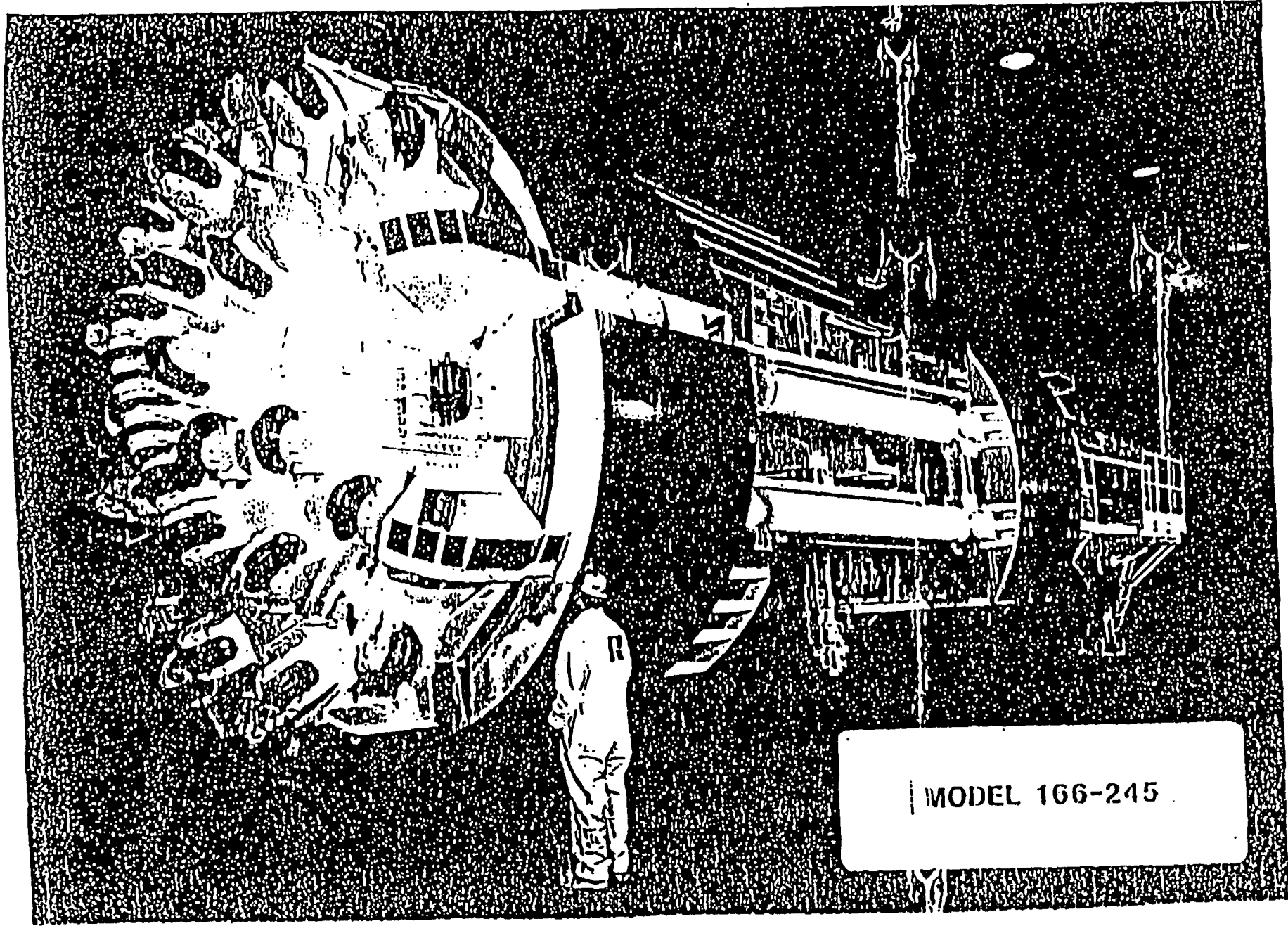
ELECTRICAL SYSTEM:

INCOMING POWER:	4160V, 3-PHASE, 60 HZ
TRANSFORMERS: (2)	700 KVA EACH (4160V:460V) (NITROGEN-FILLED)
MOTOR CIRCUITS:	460V, 3-PHASE, 60 HZ
CONTROLS AND LIGHTING:	120V, 60 HZ
MACHINE WEIGHT:	APPROXIMATELY 225 TONS
TURNING RADIUS:	APPROXIMATELY 500 FEET

MAY 12 '97 08:41AM KIEBITZ/PS EEF P40

P.3 CI

0.9



MODEL 166-245

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6612GB7
2. Summary Account Title: Excavate ECRB Cross-drift
3. Summary Account MGR/ORG: McDonald

4. Status of Change: Revised New

5. Scope Description: Excavate and support the ECRB Cross Drift from the launch chamber through the intersection of the Solitario Canyon fault.

6. Scope Differences from the Baseline:
New work

7. Key Assumptions:

1. See the General ESF Technical Basis that prefaces this section.

2. This activity will be supported from the ESF General Support accounts which will be defined as part of the FY98 ESF planning.

3. This activity includes all the incidental activities necessary to accomplish the work. It includes but is not limited to:

- o Installation of ventilation system
- o Installation of compressed air, water, communications, and mine waste water system.
- o Installation of the conveyor and transportation system.
- o Installation of all ground support.
- o Installation of electrical systems.
- o Maintenance of TBM and other electrical/ mechanical systems within the ECRB cross-drift.
- o Installation of trackage
- o Small tools, supplies and other consumables

4. This activity excludes any construction or maintenance activities occurring within the ESF Main Loop

ucca Mr.
 SF Subsurface Design
 East West Cross Block Drift
 Budgetary Estimate - Ground Support material requirements
 Prepared by: Jerald W. Keifer

3-May-97

page 1 of 2

Parameters:

Drift Diameter (Ft.) 16.5 Rockbolt Pattern 4' X 4'
 Drift Diameter (m) 5.0 Conversion from (ft) to(m) 0.3048

Rockbolts Super Swellex 3 m length with accessories per spec. 02165

Number of bolts per ft of drift	Spacing between bolts	Arc distance of coverage	Circumference of drift	Degrees of coverage	Distance between rings (Ft)	Bolts per ft of drift	Bolts per m of drift
7	4	24	51.8	167	4	1.75	5.74

Galvanized Wire Fabric WWF 3X3X1.9X1.9

Number of sheets per ft of drift	Minimum overlap (ft.)	Length of coverage (ft)	Length of sheet (ft)	Width of coverage	Width of sheet (ft)	Area of sheet (ft ²)	Area per 4 ft. ring	Sq. ft. WWF per ft. of drift	Sq. ft. WWF per m of drift
2	0.5	12	13	4	5	20	40	10	32.8

Bolting Channels C10 X15.3

Number of bolts per ft of drift	Degree of coverage required	Circumference of drift	Length of channel required	Number of channel per ft of bolted drift	Number of channel per m of bolted drift
1	69.5	51.8	10.0	0.25	0.820

C-5

5. See attachment for assumptions for the ground control installation details

8. Cost Rationale: ^{10,580,977}~~9,444,304~~ - See the enclosed construction cost estimate for details.

9. Level III Milestones: See the preceding milestone and deliverable summary

10. Level III Milestone Acceptance Criteria:

11. Attachments and References:

o Ground control details

what?

Steel sets W6 X 15 full 360 degree ring.

Lumber per ring	Spacing between sets (ft)	Number of set per ft.	Number of set per m
1	4	0.25	0.82

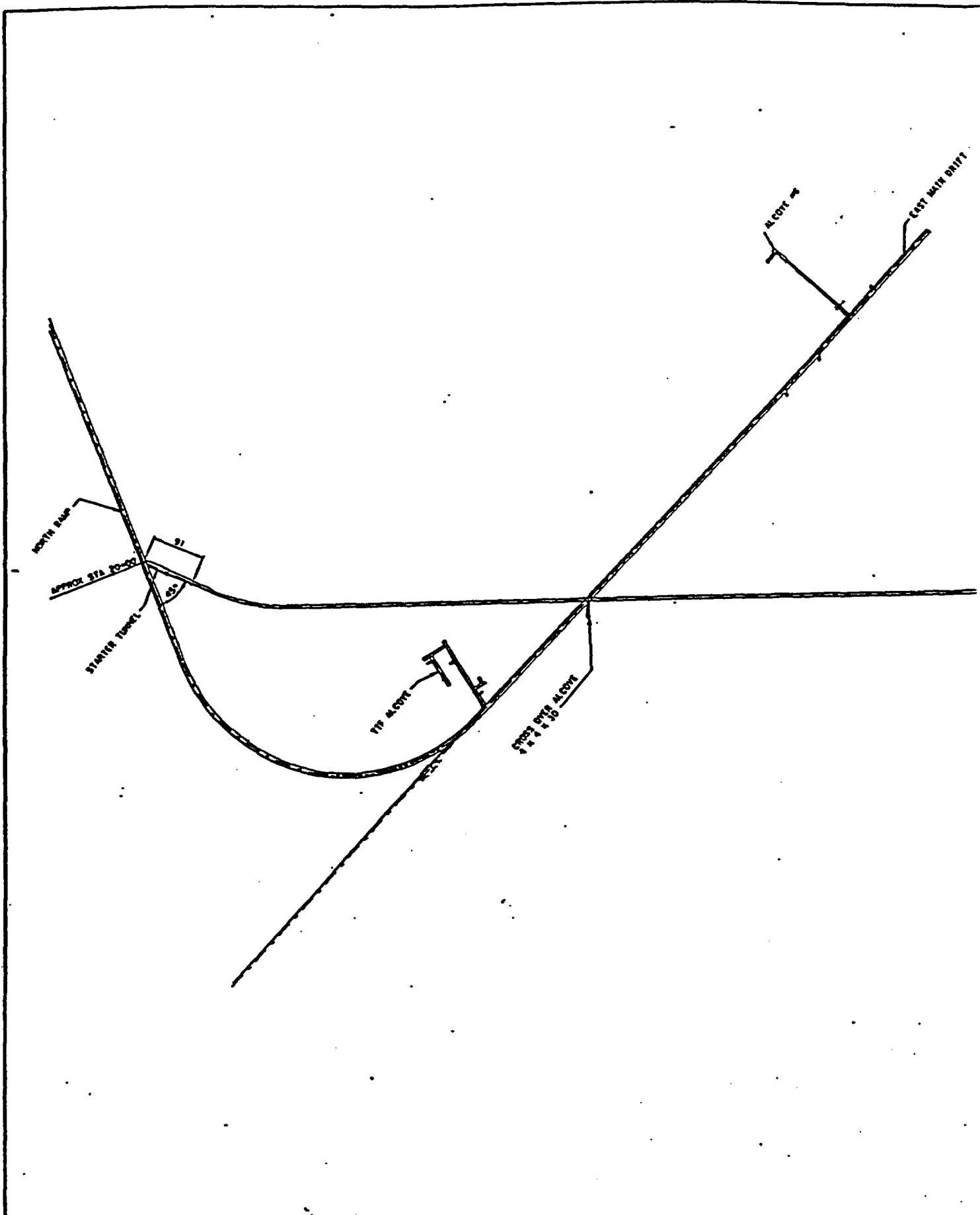
Lagging C8 X 11.5 with clips

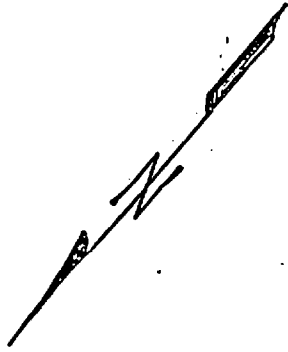
Percentage of partial lagging	Percentage full lagging	Width of lagging inches	Average width of gap on partial lagging (in)	Arc distance springline to springline (in)	Number of lagging for partial lagged set	Degree of Arc full lagging	Arc distance full lagging (in)	Number of lagging for full set	Weighted Average of lagging per set	Lagging per ft of Steel set supported drift
95%	5%	8	8	311	20	270	467	58	21.9	5.48

Lagging per m of steel set supported drift
17.96

Split Set rockbolts (pins) 0.9 m SS - 39 with face plate

Pins per row	Distance between row (ft)	Number of pins per ft of bolted drift	Number of pins per m of bolted drift
2	4	0.5	1.64





CRUST SLICE
12' x 100'

WEST MAIN DRIFT

22' CRUST SLICE
12' x 100'

205.112410 CANTON FAULT 204.112

205.112418 CANTON FAULT

205.112418 CANTON FAULT

ECRB EXCAVATION CONCEPT

DRAFT

PRELIMINARY EAST-WEST DRIFT EXCAVATION PLAN

REV. 0 5/12/97

The detail of the the latest East-West Drift plan is very limited at this time. We know that it will probably be a 16.5 ft. diameter, 2600 meter long tunnel, spurring off the North Ramp tunnel at an angle to the left (south) side. then turning west and continuing across and above the repository horizon at a +0.5% grade to a predetermined destination.

We would anticipate excavating a working chamber enlargement and starter tunnel at the North Ramp Intersection, that would be of sufficient size and configuration to accomodate rail switching and turnouts, conveyor transfer station, the drive and take-up units for the 24inch conveyor, ventilation/conveyor and utility crossovers, electrical switchgear, plus a marshalling area for materials and supplies. The starter tunnel will need to accomodate gripper pads for launching the machine and will need to be of sufficient length to accomodate the TBM and minimal trailing gear to start mining. Excavation of the working chamber and starter tunnel is expected to be accomplished by a combination of drill/blast and mechanical (roadheader) methods.

The invert segments in the mainline tunnel at the interseccion will likely be removed and replaced with a cast-in-place invert extending into the working chamber and starter tunnel.

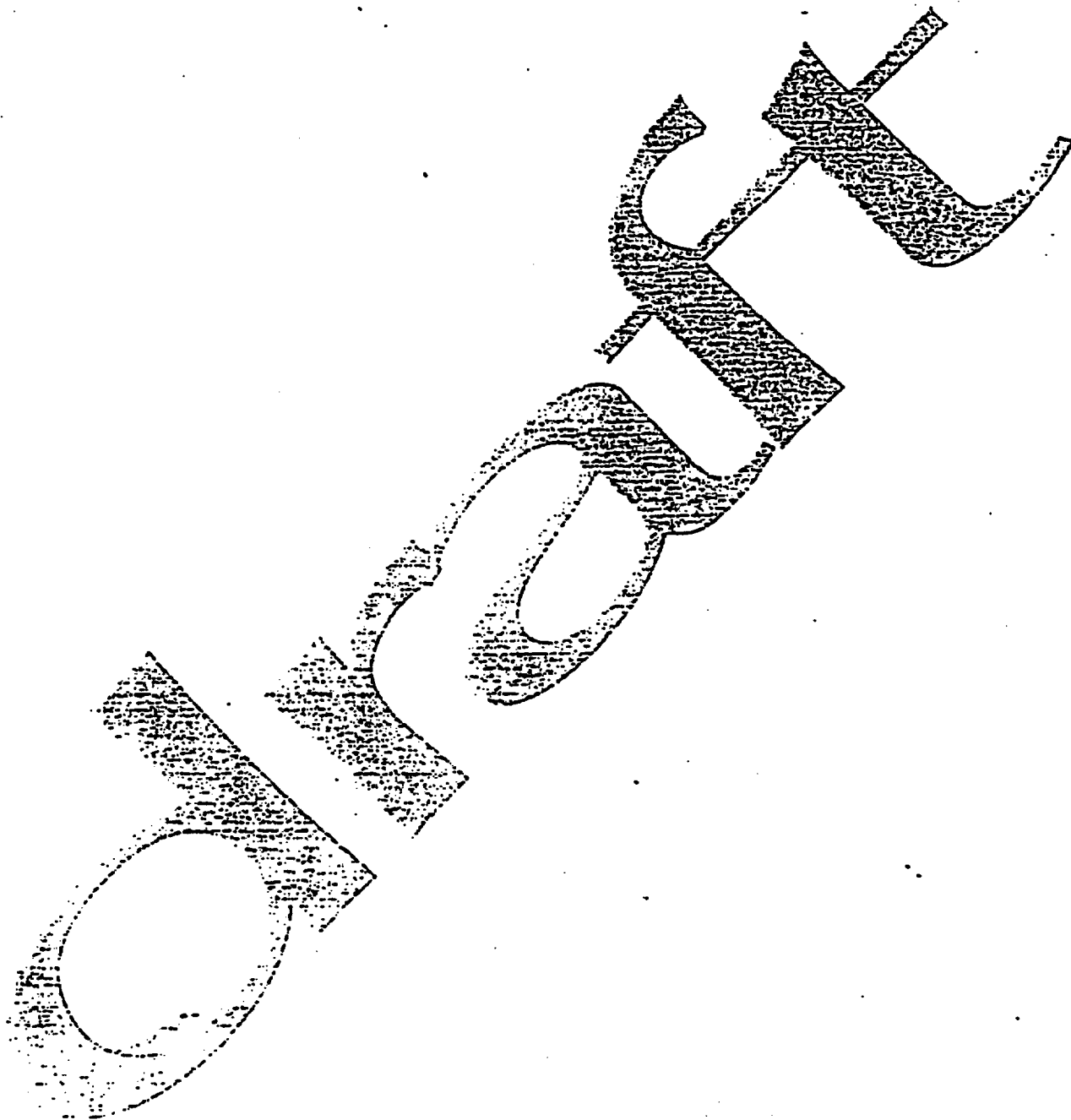
While the chamber excavating and outfitting is underway, the TBM will be shipped and partially assembled at the North Portal yard. We anticipate that the 16.5 ft TBM, with cutterhead attached, can be trammed down the North Ramp tunnel to the launching site without removing the vent line or utilities in the main tunnel. At the launching site, the TBM will be moved into the gripper saddle and assembly completed to the extent necessary to begin excavation without the conveyor. We would expect to use the initially assembled machine to excavate sufficient tunnel necessary for installation of 24" conveyor and the remaining backup system. Mucking of this portion of the tunnel would either be by rail car to the outside dump, or more likely, by front end loader to a temporary transfer conveyor.

When sufficient tunnel has been driven to do so, the permanent 24" continuous conveyor will be installed. The remainder of the tunnel will be excavated by TBM with continuous conveyor haulage. Ground support, ventilation and backup utilities will be installed in accordance with A/E supplied design as the tunneling progresses. It is likely that niches will need to be excavated for such things as conveyor booster stations, transformers and other, similar support equipment, as this tunnel will have a smaller clearance envelope. This activity should be factored into the tunneling duration projections for scheduling purposes.

Precast invert segments are not anticipated. Rail will be mounted on steel or timber ties, or some

combination of both.

Very little more can be added to this summary until more specific detail is available relative to QARD controls, governing Safety and Health standards, ventilation and support utility design, special equipment specifications and other design features.



**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6613GB2
2. Summary Account Title: Excavate ECRB Alcoves
3. Summary Account MGR/ORG: McDonald
4. Status of Change: ___ Revised ___X New
5. Scope Description: Excavate testing alcoves and niches to provide access to underground site characterization testing.
6. Scope Differences from the Baseline:
new work
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section.
 2. This activity will be supported from the ESF General Support accounts which will be defined as part of the FY98 ESF planning.
 3. See attached sheet for required sizes and timing.
 4. Excavation will be drill and blast
8. Cost Rationale: \$1,478,655- See the enclosed construction cost estimate for details.
9. Level III Milestones:
None
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

o memo

To: Ivan Cottle
cc: Ned Elkins, Ron Oliver, Ralph Rogers
From: Kevin Kinter
Date: 06/23/97 02:36:17 PM
Subject: Information for E-W Drift Construction Schedule

After reviewing the Schedule that you provided me last week the following comments are offered:

The Main excavation would be from 2 + 40 to 24 + 50

The Solitario Extension would be from 24 + 50 - 28 + 05

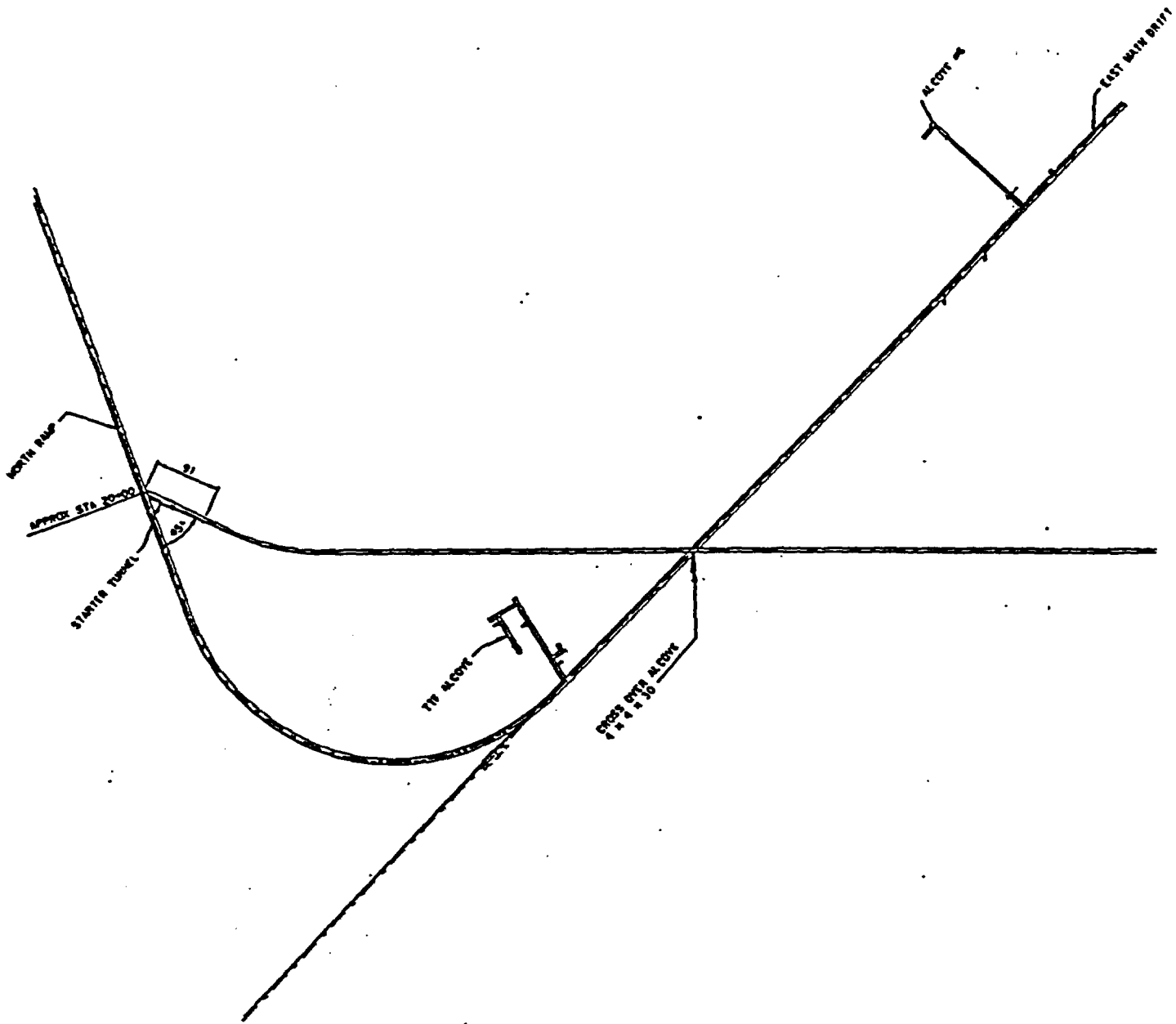
Excavation for Alcove and Niches (associated with ECRB) would be reduced to 3 alcoves (~4mX4m)

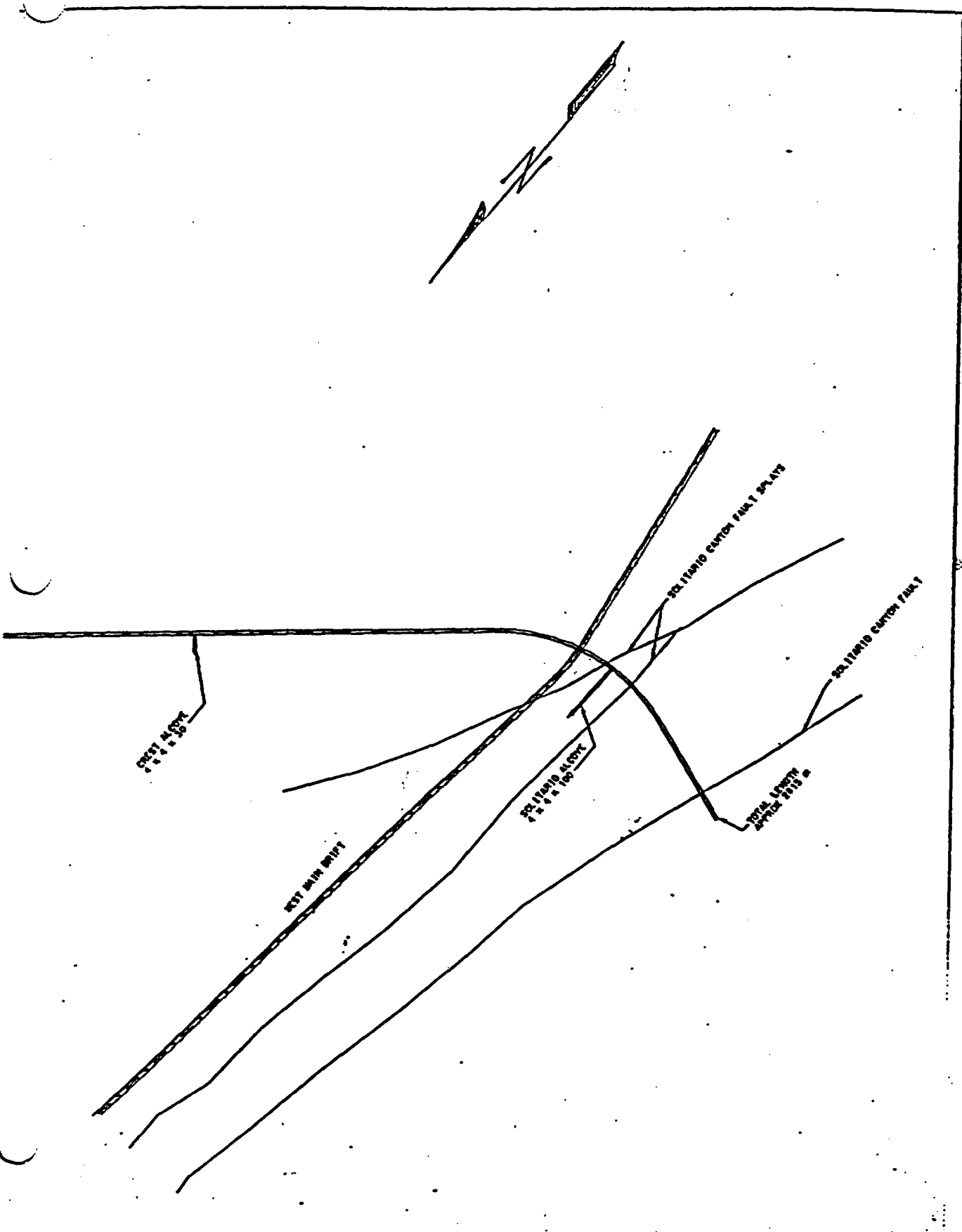
one alcove in the area where the E-W drift crosses over the ESF (@30m)

one alcove somewhere near the drift level location of the Yucca Mountain Crest (@30m)

one alcove that runs parallel between the upper two splays of the solitario fault (~100m)

We expect the mining for all alcoves to take in the area of 78 days, to follow the TBM excavation, but may be before TBM demobe. Additional niches will be included in this drift, but will be planned in the FY 98 and/or 99 annual planning process.





• ECRB EXCAVATION CONCEPT •

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6612GB2
2. Summary Account Title: ECRB TBM Demobilization
3. Summary Account MGR/ORG: McDonald
4. Status of Change: ___ Revised X New
5. Scope Description: Demobilize the ECRB TBM from the underground and transport to the point of origin
6. Scope Differences from the Baseline:
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section.
 2. This activity will be supported from the ESF General Support accounts which will be defined as part of the FY98 ESF planning.
 3. This activity will include all necessary activities occurring after the excavation to the final ECRB cross-drift station. Includes the Demob chamber and associated ground support.
8. Cost Rationale: ^{827,532}~~828,999~~ -See the enclosed construction cost estimate for details.
9. Level III Milestones:
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR6613GB1
2. Summary Account Title: ECRB Sampling and Mapping Support
3. Summary Account MGR/ORG: McDonald
4. Status of Change: ___ Revised X New
5. Scope Description: Provide craft labor, materials supplies and equipment fort the support of the sampling and mapping program behind the TBM
6. Scope Differences from the Baseline:
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section.
 2. This activity will be supported from the ESF General Support accounts which will be defined as part of the FY98 ESF planning.
 3. See the attached memo that addresses the support requirements
8. Cost Rationale: ^{† 354,608}~~276,764~~ - See the enclosed construction cost estimate for details.
9. Level III Milestones:
None
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:
 1. Requirements memo and discussion

To: Steven Beason
cc: Daniel Soeder, Michael Chornack, Ralph Rogers, Kevin Kinter, Ned Elkins
From: Ivan Cottle
Date: 05/14/97 11:39:14 AM
Subject: Re: Mapping Requirements in the Enhanced Repository Block Characterization Drift (a.k.a. E-W drift)

Thanks for the info, I discussed your requirements in a meeting with PK and the CMO. Everything is OK with the exception of the 200 continuous degrees. We will have a 16.4 ft. hole, there will be about a 40in. fanline on the back center line and a set of tracks on the invert centerline. The left rib will have a 24 in conveyor. There will be pipes for air, water (in and out) plus power cables and communication lines. With the exception of a smaller fanline there is about the same quantity of utilities as the main loop with a one third reduction of "wall space". If you must have 200 degrees, we will need to consider a two stage approach. During TBM demob it will probably be necessary to remove the fanline, if so mapping can catch the "gap" in the 200 degrees at that time. I will set up a PK testing support account to provide the required services and equipment for your data collection.

To: Ivan Cottle
cc: Daniel Soeder, Michael Chornack
From: Steven Beason
Date: 05/13/97 03:12:41 PM
Subject: Mapping Requirements in the Enhanced Repository Block Characterization Drift (a.k.a. E-W drift)

Exact requirements for the FY-98 drifting are still a bit sketchy at best. I hope to sit down with Ned Elkins and Dick McDonald later this week and discuss possibilities for possible configurations which might benefit both construction and mapping. That procedure was followed prior to construction of the ESF which resulted in the development of the mapping area on the trailing gear of the present TBM. I do not believe that configuration will end up being the case for the coming excavation. With present thinking, I believe it will be expedient to have the mapping team in the area behind the trailing gear. Here are the basic requirements as I know for now:

1. The walls must be thoroughly cleaned with an air/water blowpipe prior to mapping. This must be a responsibility of the constructor and is a ASTM requirement for underground mapping. In the past however, this has always been a real pain to initiate and enforce. Is there a chance we can make this a contractual requirement for the constructor?

2. Placement of utilities must be such that no less than 200 continuous deg. of the periphery of the tunnel are unobstructed for mapping. This will be the most difficult issue to deal with. Constructors are notoriously protective of anyone messing with where their stuff is hung, mostly because they are not used to restrictions of this kind. Hopefully, we can come up with some innovative ideas that will allow peaceful coexistence of mining and mapping. Perhaps temporary placement of utilities at the trailing gear, with permanent placement occurring behind us.

3. Construction of an independent platform from which photography, mapping, and sampling can occur. Perhaps a small rubber-tired vehicle, through which supply trains could pass. The platform must be able to move independently of the TBM trailing gear to allow the mapping team and photography crew adjust to the daily footage mined.

4. Continuous access to standard electricity and outside phone lines. If we are to meet emerging requirements for quick downloads of data, the team will need continual access to standard electrical service (110VAC, 60hz) and a standard phone line for dumping data to the surface.

These are the requirements I know of at this time. As things develop, these may change, or be augmented as necessary.

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR682FAI
2. Summary Account Title: ECRB Direct Supervision and Engineering
3. Summary Account MGR/ORG: McDonald
4. Status of Change: ___ Revised ___X New
5. Scope Description: Provide ECRB direct supervision and engineering from the start of the TBM rehabilitation to the completion of the crossdrift.
6. Scope Differences from the Baseline:
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section.
 2. This activity will be supported from the ESF General Support accounts which will be defined as part of the FY98 ESF planning.
 3. Work in the ESF Main Loop will be excluded from this activity.
8. Cost Rationale: ^{\$}~~2,047,417~~ ^{1,834,049} - See the enclosed construction cost estimate for details.
9. Level III Milestones:
None
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR682FAI
2. Summary Account Title: Lease Constructors Equipment for the ECRB
3. Summary Account MGR/ORG: McDonald
4. Status of Change: ___ Revised X New
5. Scope Description: Provide lease or rental payments to the constructor for ECRB equipment.
6. Scope Differences from the Baseline:
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section.
 2. This activity will be supported from the ESF General Support accounts which will be defined as part of the FY98 ESF planning.
 3. Includes but is not limited to the TBM, trailing gear, and conveyor
8. Cost Rationale: ^{1,995,613}~~51,822,182~~ See the enclosed construction cost estimate for details.
9. Level III Milestones:
None
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR682GA1
2. Summary Account Title: ECRB Muck Handling
3. Summary Account MGR/ORG: McDonald
4. Status of Change: Revised New
5. Scope Description: Prepare a surface area to receive ECRB muck and transport and spread the muck from ECRB TBM operations.
6. Scope Differences from the Baseline:
7. Key Assumptions:
 1. See the General ESF Technical Basis that prefaces this section.
 2. This activity will be supported from the ESF General Support accounts which will be defined as part of the FY98 ESF planning.
8. Cost Rationale: ^{484,061}~~549,800~~ - See the enclosed construction cost estimate for details.
9. Level III Milestones:
None
10. Level III Milestone Acceptance Criteria:
11. Attachments and References:

Adjustments to the Construction Estimate

Since the 10June97 CR for the ECRB two basic changes have occurred:

1. The length of excavation has been extended for 2300 meters to 2815 meters to support the complete characterization of the Solitario Canyon Fault.
2. Scientific requirement have changed for alcove construction.

These two changes have resulted in modifications to the associated time related costs.

The following markups have been developed to reflect changes to the original construction estimate included in the 3JUN97 ECRB CR.

ADJUSTMENT FOR ITEM 05 - EXCAVATE ECRB

CURRENT DATA

MAN HOURS 81,692

LABOR 2,981,446
PM 2,277,631
EQUIP 8,819
SUPPLIES 2,708,656

TOTAL DIRECTS 7,976,546
TOTAL COST 8,877,896

MARK-UP = 1.113

2300 METER TOTAL 90m LAUNCH CHAMBER, 2210 TBM
84 TOTAL PRODUCTION DAYS

REVISED DATA

° TOTAL LENGTH 2816 - 90m LAUNCH, 2726 TBM $f = 1.233$

° ASSUME 20m/DAY BEYOND 2500 THROUGH THE FAULT

200m @ 30m/DAY = 7 DAYS
316m @ 20m/DAY = 16 DAYS
ADD 23 PRODUCTION DAYS

TOTAL DAYS = 84 + 23 = 107 $f = 1.273$

ADJUSTMENTS

MAN HOURS

$$81,692 \times 1.273 = 103,994$$

LABOR	2,981,440	$\times 1.273$	3,795,373
PM	2,277,631	1.233	2,808,319
EQUIP	8,819	1.273	11,227
SUPPLIES	2,708,656	1.233	3,339,773

$$9,954,692$$
$$\times 1.113$$

REVISED TOTAL COST

$$11,079,572$$

$$+ .247 \checkmark$$

INCREASE

$$2,201,676$$

ITEM 6 - EXCAVATE ALCOVES

THE ORIGINAL ESTIMATE FOR THE EXCAVATION OF ALCOVES ASSUMED MECHANICAL EXCAVATION AND IS NOT CURRENTLY APPLICABLE. PK PROVIDED A SUMMARY DRILL AND BLAST ESTIMATE FOR THE 1000'S CR. THIS DATA WILL BE FACTORED TO DEVELOP THE REVISED ESTIMATE

PK DATA

DIRECT COST ESTIMATE - 1,802,808 + 11% LOADS = 2,006,500

140 METER OF TILL AND BLAST

TOTAL DURATION 83 DAYS - 32,380 M HRS

3 SHIFTS/DAY

23 MEN UG / 24 HRS

14 MEN SURFACE SUPPORT 24 HRS.

APPLICABLE FACTORS

PK LABOR COST $32,380 \times \$42/\text{HR} = 1,360$

Mtls, SUPPLIES, & EQUIP = 2,007 - 1360K = 647

UNIT PRICE FOR NON-LABOR $647K \div 140 = 4621/\text{METER}$

THE ESF MAIN LOOP WILL BE ON A SINGLE DAY SHIFT DURING ALCOVE EXCAVATION

ASSUMED DAY SHIFT CREW (SUPPORT PROVIDED BY DAY CREW)

1 - FOREMAN

5 - MINERS

BACK SHIFT CREW

1 - FOREMAN

5 - MINERS

2 - TRAW CREW

1 - TOPMAN

1 - SURFACE MAN

1 - MECH.

1 - ELECT

1 - WALKER

13 / SHIFT

TOTAL CREW SIZE / 24HRS

DAY	6
SWING	13
GY	<u>13</u>
	32

LABOR COST/DAY

$$32 \times 9 \times 42 = \$12,100$$

ACTIVITY DURATION

THE THREE ALCOVE ARE SEPERATED BY SEVERAL HUNDREDS METERS. THEREFOR ASSUME THAT EXCAVATION WILL OCCUR IN SEQUENCE. ASSUME VENTILATION IS ESTABLISHED FOR BLASTING IMMEDIATELY AFTER LOADING AND NO OTHER WORK IS OCCURRING IN THE CROSS DRIFT. DRILL WITH SMALL JUMBO, MUCK WITH STB

DRILL, BLAST, SMOKE MUCK, AND SUPPORT CYCLE IS 12HRS

ASSUME 2m / ROUND

TYPICAL PRODUCTION 4m/DAY

$$160m \div 4m/DAY = 40 \text{ DAYS}$$

ADDS

SET-UP & TEAR DOWN/
ALCOVE 3da X 3

9

10 DAY @ 1 RD

5

54 DAYS

ESTIMATE

MTLS, EQUIP, & SUPPLIES $\$4621/m \times 160m = \$739,36$

LABOR = $12,100/\text{DAY} \times 54 \text{ DAYS} = 653,40$

1,392,76

TOTAL COST PER METER $\$8705$

MANHOURS $32 \times 9 \times 54 = 15,552$

RESOURCE DISTRIBUTION

TBM DEMO DATE - 15 JUL 98

54 DAYS PRODUCTION = 2.5 mi

COMPLETE LATE SEPT 98

	MAN/HRS	\$
JULY	3110	278,552
AUG	6220	557,104
SEPT	6220	557,104

GENERAL ADJUSTMENT FOR TIME RELATED INDIC

ADJUSTMENT BY ITEM

ITEM 8 - SAMPLING AND MAPPING SUPPORT

MAN HOURS	2043	X 1.273	= 2600 mhr
LABOR	76403	X 1.273	97,261
			X 1.113
			108,251
			+31,848
			<u>260,163</u>
		REVISED TOTAL	\$ <u>292,011</u>

ITEM 9 - DIRECT SUPERVISION/ENG.

MAN HOURS 41,347
LABOR 1,729,224

17 MONTH IW CURRENT ESTIMATE

ITEM 10 - LEASE TBM

EST 1,712,907

ADD Imo $f = \frac{13}{12}$
JULY 97 TO 1 AUG 98

REVISED TOTAL = 1,855,649

ITEM 11 MUCK HAULING

MAN HOURS	5035	$\times 1.273$	= 6409
LABOR	201,810	$\times .273$	$\times 1.113 = \Delta$
			= 61,319
		$394,625 + 61,319$	= 455,944

SEPT - DEC

FEB - JUNE

JUNE - SEPT

Morrison Knudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqmnts.

Burdened Cost Summary
 Sorted By: Constructio Area
 (Costs Adjusted to Bid Quantities)

05/30/97
 1:04 pm
 Page: 1

Constructio Are Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Direct Cost	Indirect Costs	Total Cost
1.FB3 TBM Mobilization/Rehab.						2,295,125			2,295,125	259,349	2,554,474
2.FB3 South Portal Improvements		2,613	102,011	23,269		314,245			439,525	49,666	489,191
3.CB5 Launch Chamber Sta. 0+00 to 0+90		37,624	1,363,645	72,437	12,238	330,385			1,778,705	200,994	1,979,699
4.CB6 Install Drift Excavation Equip.		18,597	686,033		4,644	134,318			824,995	93,224	918,219
5.CB7 Excavate ECRB Sta.0+90 to 23+00		81,692	2,981,440	2,277,631	8,819	2,708,656			7,976,546	901,350	8,877,896
6.CB2 Excavation of Alcoves 3m X 4m X 100m		42,496	1,555,314	38,674		267,314			1,861,302	210,327	2,071,629
7.CB2 Demobilization of TBM @ Sta 23+00		14,438	537,876		15,543	146,735			700,154	79,117	779,271
8.CB1 Sampling and Mapping Support		2,043	76,403		5,797	151,549			233,749	26,414	260,163
9.FA1 ECRB Direct Supervision/Engineering		41,347	1,729,224						1,729,224	195,402	1,924,626
0.FA1 Lease Construction Equipment for ECRB					1,539,000				1,539,000	173,907	1,712,907
1.GA1 North Portal Muck Modification		5,035	201,810	11,209	51,848	89,692			354,559	40,065	394,624
<hr/>											
REPORT TOTALS:		245,885	9,233,756	2,423,220	1,637,889	6,438,019			19,732,884	2,229,815	21,962,699
<hr/>											
Rounding Error:		-1	-0	1	1	-0			1	1	2
<hr/>											
Exact Totals:		245,884	9,233,756	2,423,221	1,637,890	6,438,019			19,732,885	2,229,816	21,962,701

Harrison Knudsen Corp.
 Project: ECRB (Budget) Rev. Alcove Rqmnts.
 Number: ECRB.3

Sheet No: 999999
 Operation: Constructor, G & A, & Fee
 Quantity: 1.0000 LS
 Sheet Type: Indirect
 Estimator: rbp
 Date: 05/30/97
 Revision: 3

Line-Type	Group/Code	Description	Quantity	Hours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
1.00-Note		1. G & A =====									
2.00-Note		Direct Cost.....			\$19,732,885						
		G & A @ 6%			1,183,973						
		S/T			20,916,858						
		Fee @ 5%.....			1,045,843						
		Total			\$ 21,962,701						
		Total G & A, & Fee...\$			2,229,816						
3.00-Lump Sum	GA-F/99999	G & A, & Fee			Lump Sum					2,229,816	2,229,816
4.00-Note											
5.00-Grand S/T		Subtotal								2,229,816	2,229,816
		TOTALS for Sheet No. 999999:			1.00 LS					2,229,816	2,229,816

Morrison Knudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqmnts.

Cost & Estimate Summary (Constructn. Area)
 Sorted By: Constructio Area
 (Costs Adjusted to Bid Quantities)

05/30/97
 12:30 pm
 Page: 1

Constructio Are Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
11.FB3 TBH Mobilization/Rehab.	1 LS					2295125.000 2,295,125			2295125.000 2,295,125
12.FB3 South Portal Improvements	1 LS	2,613.250 2,613	102,010.990 102,011	23,269.365 23,269		314,245.398 314,245			439,525.753 439,525
13.GB5 Launch Chamber Sta. 0+00 to 0+90	1 LS	37,624.235 37,624	1363645.015 1,363,645	72,437.348 72,437	12,238.451 12,238	330,384.662 330,385			1778705.476 1,778,705
14.GB6 Install Drift Excavation Equip.	1 LS	18,596.500 18,597	686,032.820 686,033		4,644.480 4,644	134,317.504 134,318			824,994.804 824,995
15.GB7 Excavate ECRB Sta.0+90 to 23+00	1 LS	81,691.740 81,692	2981439.640 2,981,440	2277631.280 2,277,631	8,818.646 8,819	2708656.255 2,708,656			7976545.821 7,976,546
16.GB2 Excavation of Alcoves 3m X 4m X 100m	1 LS	42,496.000 42,496	1555314.400 1,555,314	38,674.458 38,674		267,314.263 267,314			1861303.121 1,861,302
17.GB2 Demobilization of TBH @ Sta 23+00	1 LS	14,437.900 14,438	537,876.040 537,876		15,543.270 15,543	146,734.664 146,735			700,153.974 700,154
18.GB1 Sampling and Mapping Support	1 LS	2,043.000 2,043	76,402.800 76,403		5,796.800 5,797	151,548.888 151,549			233,748.488 233,749
19.FA1 ECRB Direct Supervision/Engineering	1 LS	41,347.000 41,347	1729224.251 1,729,224						1729224.251 1,729,224
10.FA1 Lease Construction Equipment for ECRB	1 LS				1539000.000 1,539,000				1539000.000 1,539,000
11.GA1 North Portal Muck Modification	1 LS	5,034.726 5,035	201,809.582 201,810	11,208.750 11,209	51,848.275 51,848	89,691.934 89,692			354,558.541 354,559
REPORT TOTALS:		245,885	9,233,756	2,423,220	1,637,889	6,438,019			19,732,884
Rounding Errors:		-1	-0	1	1	-0			1
Exact Totals:		245,884	9,233,756	2,423,221	1,637,890	6,438,019			19,732,885

Harrison Knudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqrmts.

4.0 Direct Cost Summary
 Sorted By: Constructio Area, Activity

05/30/97
 12:30 pm
 Page: 1

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
Constructio Area 01.FB3: TBM Mobilization/Rehab.										
Activity 010A: Mobilization of TBM & Accessories										
A000	Mobilization of used TBM machine	1 LS					160,125			160,125
Activity 010B: Rehabilitate/Rebuild to Spec										
A001	Rehab.Used TBM as required	1 LS					2,135,000			2,135,000
Subtotal, TBM Mobilization/Rehab.							2,295,125			2,295,125

Morrison Knudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqmnts.

4.0 Direct Cost Summary
 Sorted By: Constructio Area, Activity

05/30/97
 12:30 pm
 Page: 2

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
Constructio Area 02.FB3: South Portal Improvements										
Activity 020A: Access Control Facility										
A002	South Portal Improvements	1 LS	200	7,500			34,694			42,194
Activity 020B: Yard rail installation										
A003	Rail System Yard area	1 LS	400	15,000			22,850			37,850
Activity 020C: Materials Storage & Handling Facility										
A004	Material Storage & Handling	1 LS	400	15,000			65,550			80,550
Activity 020D: Power Substation & Feed										
A005	South Portal, Substation/Electrical/Etc	1 LS	1,613	64,511	23,269		191,152			278,932
Subtotal, South Portal Improvements			2,613	102,011	23,269		314,246			439,526

Torrison Knudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqrmts.

4.0 Direct Cost Summary
 Sorted By: Constructio Area, Activity

05/30/97
 12:30 pm
 Page: 3

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
Constructio Area 03.G85: Launch Chamber Sta. 0+00 to 0+90										
Activity 030A: Launch Chamber Preparation										
A010	Launch Chamber Preparation	1 LS	6,168	223,475		1,968	138,067			363,510
Activity 030B: Launch Chamber Excav & Support										
A012	Launch Chamber Excavation	7,000 CY	23,265	843,743	70,516	8,609	134,020			1,056,888
	Unit Costs:		3.324	120.535	10.074	1.230	19.146			150.984
Activity 030C: Launch Chamber Concrete Floor & Drains										
A013	Launch Chamber conc.Floor	1 LS	8,191	296,427	1,922	1,661	58,298			358,307
Subtotal, Launch Chamber Sta. 0+00 to 0+90			37,624	1,363,645	72,438	12,238	330,385			1,778,706

Morrison Krudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqmnts.

4.0 Direct Cost Summary
 Sorted By: Constructio Area, Activity

05/30/97
 12:30 pm
 Page: 4

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
Constructio Area 04.GB6: Install Drift Excavation Equip.										
Activity 040A: Unload TBM & Assemble @ L.Chamber Face										
A014	Machine erection in Launch Chamber	1 LS	18,137	668,453		3,974	76,209			748,637
Activity 040B: Install 24" Conveyor to Transfer Point										
A015	Install 24" Conveyor to Transfer	1 LS	230	8,790		335	29,054			38,179
Activity 040C: North Ramp Belt Transfer Modification										
A016	North Ramp Conveyor Transfer	1 LS	230	8,790		335	29,054			38,179
Subtotal, Install Drift Excavation Equip.			18,597	686,033		4,644	134,317			824,994

Morrison Knudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqmnts.

4.0 Direct Cost Summary
 Sorted By: Constructio Area, Activity

05/30/97
 12:30 pm
 Page: 5

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
Constructio Area 05.GB7: Excavate ECRB Sta.0+90 to 23+00										
Activity 050A: Excavation Drift with TBM Boring										
A018	Machine Ecavate the ECRB Drift	1 LS	75,008	2,721,484	2,277,631	7,925	2,690,931			7,697,971
Activity 050B: Saturday Maintenance Service										
A019	Saturday Maintenance Work	1 LS	6,684	259,956		894	17,725			278,575

Subtotal, Excavate ECRB Sta.0+90 to 23+00			81,692	2,981,440	2,277,631	8,819	2,708,656			7,976,546

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
Constructio Area 06.G82: Excavation of Alcoves 3m X 4m X 100m										
Activity 060A: Sta.5+00 U.L.U. Excavation										
P 1300	R/H Heading Crew, Day Shift, Alcove	50 SHIFT	4,050	144,415			7,708			152,124
	Unit Costs:		81.000	2,888.307			154.163			3,042.470
P 1301	R/H Heading Crew, Second Shift	50 SHIFT	4,050	144,415			7,708			152,124
	Unit Costs:		81.000	2,888.307			154.163			3,042.470
P 1302	R/H Heading Crew, Third Shift	50 SHIFT	4,050	144,415			7,708			152,124
	Unit Costs:		81.000	2,888.307			154.163			3,042.470
P 1303	Support Crews, Alcove & Other Exc.	50 SHIFT	14,010	525,713			38,792			564,505
	Unit Costs:		280.200	10,514.261			775.843			11,290.104
P 1320	Exc. Equip.-Operation	50 SHIFT					37,099			37,099
	Unit Costs:						741.983			741.983
Subtotal, Sta.5+00 U.L.U. Excavation			26,160	958,959			99,016			1,057,975
Activity 060B: Sta.5+00 U.L.U. Ground Support										
P 1321	Ground Support	100.00 METER			12,891		142			13,034
	Unit Costs:				128.915		1.423			130.338
Activity 060C: Sta.5+00 U.L.U. Utilities Etc.										
P 1304	Utilities	50 SHIFT					26,420			26,420
	Unit Costs:						528.392			528.392
Activity 060D: Sta.5+00 U.L.U. Scientific Support										
P 1350	Scientific Support	0.3400 LS	218	7,133			2,323			9,456
Activity 061A: Sta.9+00 Main Cross Over Excavation										
P 1300	R/H Heading Crew, Day Shift, Alcove	10 SHIFT	810	28,883			1,542			30,425
	Unit Costs:		81.000	2,888.307			154.163			3,042.470
P 1301	R/H Heading Crew, Second Shift	10 SHIFT	810	28,883			1,542			30,425
	Unit Costs:		81.000	2,888.307			154.163			3,042.470
P 1302	R/H Heading Crew, Third Shift	10 SHIFT	810	28,883			1,542			30,425
	Unit Costs:		81.000	2,888.307			154.163			3,042.470
P 1303	Support Crews, Alcove & Other Exc.	10 SHIFT	2,802	105,143			7,758			112,901
	Unit Costs:		280.200	10,514.261			775.843			11,290.104
P 1320	Exc. Equip.-Operation	50 SHIFT					37,099			37,099

Morrison Knudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqrmts.

4.0 Direct Cost Summary
 Sorted By: Constructio Area, Activity

05/30/97
 12:30 pm
 Page: 7

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
Constructio Area 06.G82: Excavation of Alcoves 3m X 4m X 100m										
Activity 061A: Sta.9+00 Main Cross Over Excavation										
	Unit Costs:						741.983			741.983

Subtotal, Sta.9+00 Main Cross Over Excavation			5,232	191,792			49,482			241,274
Activity 061B: Sta.9+00 Main Cross Over G.Support										
P 1321	Ground Support	100.00 METER			12,891		142			13,034
	Unit Costs:				128.915		1.423			130.338
Activity 061C: Sta.9+00 Main Cross Over Utilities Etc										
P 1304	Utilities	10 SHIFT					5,284			5,284
	Unit Costs:						528.392			528.392
Activity 061D: Sta.9+00 Main Cross O.Scientific Support										
P 1350	Scientific Support	0.3300 LS	211	6,923			2,255			9,178
Activity 062A: Sta.11+00 M.L.U.Excavation										
P 1300	R/H Heading Crew, Day Shift, Alcove	10 SHIFT	810	28,883			1,542			30,425
	Unit Costs:		81.000	2,888.307			154.163			3,042.470
P 1301	R/H Heading Crew, Second Shift	10 SHIFT	810	28,883			1,542			30,425
	Unit Costs:		81.000	2,888.307			154.163			3,042.470
P 1302	R/H Heading Crew, Third Shift	10 SHIFT	810	28,883			1,542			30,425
	Unit Costs:		81.000	2,888.307			154.163			3,042.470
P 1303	Support Crews, Alcove & Other Exc.	10 SHIFT	2,802	105,143			7,758			112,901
	Unit Costs:		280.200	10,514.261			775.843			11,290.104
P 1320	Exc. Equipmt.-Operation	50 SHIFT					37,099			37,099
	Unit Costs:						741.983			741.983

Subtotal, Sta.11+00 M.L.U.Excavation			5,232	191,792			49,482			241,274
Activity 062B: Sta.11+00 M.L.U.Ground Support										
P 1321	Ground Support	100.00 METER			12,891		142			13,034
	Unit Costs:				128.915		1.423			130.338
Activity 062C: Sta.11+00 M.L.U.Utilities Etc										
P 1304	Utilities	10 SHIFT					5,284			5,284
	Unit Costs:						528.392			528.392

Morrison Knudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqrmts.

4.0 Direct Cost Summary
 Sorted By: Constructio Area, Activity

05/30/97
 12:30 pm
 Page: 8

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
Constructio Area 06.GB2: Excavation of Alcoves 3m X 4m X 100m										
Activity 0620: Sta.11+00 M.L.U.Scientific Support										
P 1350	Scientific Support	0.3300 LS	211	6,923			2,255			9,178
Activity 065A: Sta.xx+xx Moisture Study Niches Exc.										
P 1300	R/H Heading Crew, Day Shift, Alcove	10 SHIFT	810	28,883			1,542			30,425
	Unit Costs:		81.000	2,888.307			154.163			3,042.470
P 1301	R/H Heading Crew, Second Shift	10 SHIFT	810	28,883			1,542			30,425
	Unit Costs:		81.000	2,888.307			154.163			3,042.470
P 1302	R/H Heading Crew, Third Shift	10 SHIFT	810	28,883			1,542			30,425
	Unit Costs:		81.000	2,888.307			154.163			3,042.470
P 1303	Support Crews, Alcove & Other Exc.	10 SHIFT	2,802	105,143			7,758			112,901
	Unit Costs:		280.200	10,514.261			775.843			11,290.104
P 1320	Exc. Equipmt.-Operation	10 SHIFT					7,420			7,420
	Unit Costs:						741.983			741.983
P 1321	Ground Support									
	Unit Costs:				128.915		1.423			130.338
Subtotal, Sta.xx+xx Moisture Study Niches Exc.			5,232	191,792			19,803			211,595
Activity 065C: Moisture Study Niches Utilities Erect										
P 1304	Utilities	10 SHIFT					5,284			5,284
	Unit Costs:						528.392			528.392
Subtotal, Excavation of Alcoves 3m X 4m X 100m			42,496	1,555,314	38,673		267,314			1,861,301

Morrison Knudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqmnts.

4.0 Direct Cost Summary
 Sorted By: Constructio Area, Activity

05/30/97
 12:30 pm
 Page: 9

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
Constructio Area 07.GB2: Demobilization of TBM @ Sta 23+00										
Activity 070A: Disassemble TBM & Haul to Surface Store										
A020	Demobilization TBM & Conveyor	1 LS	14,438	537,876		15,543	146,735			700,154
Subtotal, Demobilization of TBM @ Sta 23+00			14,438	537,876		15,543	146,735			700,154

Horrison Krudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqmnts.

4.0 Direct Cost Summary
 Sorted By: Constructio Area, Activity

05/30/97
 12:30 pm
 Page: 10

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
Constructio Area 08.GB1: Sampling and Mapping Support										
Activity 080A: Mobilization of Mapping Loco & Cars										
A021	Mob.Mapping Locomotive & Charger	1 LS					26,688			26,688
Activity 080B: Mobilization of California Switch										
A022	Mob California Switch to Site	1 LS					16,013			16,013
Activity 080C: Clean Rock Surface & Move Mapping Car										
A023	Move Mapping Car & Clean Rock	1 LS	2,043	76,403		5,797	108,849			191,048
Subtotal, Sampling and Mapping Support			2,043	76,403		5,797	151,550			233,750

Morrison Knudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqmmts.

4.0 Direct Cost Summary
 Sorted By: Constructio Area, Activity

05/30/97
 12:30 pm
 Page: 11

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
	Constructio Area 09.FAI: ECRB Direct Supervision/Engineering									
	Activity 090A: Supervision & Overhead									
P 090A	Supervision & Overhead	1 LS	41,347	1,729,224						1,729,224

	Subtotal, ECRB Direct Supervision/Engineering		41,347	1,729,224						1,729,224

Harrison Knudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqmnts.

4.0 Direct Cost Summary
 Sorted By: Constructio Area, Activity

05/30/97
 12:30 pm
 Page: 13

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
Constructio Area 11.GA1: North Portal Muck Modification										
Activity 110A: ECRB Muck Pad Stripping Top Soil										
A024	North Portal Muck Area Topsoil	4,500 CY	680	25,078		5,171	8,971			40,020
	Unit Costs:		0.151	5.751		1.149	1.993			8.893
Activity 110B: ECRB Muck Pad Drainage Modifications										
A025	New muck pad drainage	1 LS	178	6,224	11,209	291	2,210			19,933
Activity 110C: ECRB Muck Pad Disposal Operation										
A026	Muck Disposal operation	100,000 CY	4,177	169,708		46,387	78,512			294,606
	Unit Costs:		0.042	1.697		0.464	0.785			2.946
Subtotal, North Portal Muck Modification			5,035	201,810	11,209	51,849	89,693			354,561

Morrison Knudsen Corp.
 Number: ECRB.3
 Project: ECRB (Budget) Rev. Alcove Rqmnts.

4.0 Direct Cost Summary
 Sorted By: Constructio Area, Activity

05/30/97
 12:30 pm
 Page: 12

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
	Constructio Area 10.FA1: Lease Construction Equipment for ECRB									
	Activity 101A: Drift Bore TBM 5.0m Diam. 1500 HP									
P 101A	Eqmnt Ownrshp, TBM 5.0m, 1,500hp	1 EA				1,539,000				1,539,000

Subtotal, Lease Construction Equipment for ECRB						1,539,000				1,539,000

Morrison Knudsen Corp.
Number: ECRB.3
Project: ECRB (Budget) Rev. Alcove Rqmnts.

4.0 Direct Cost Summary
Sorted By: Constructio Area, Activity

05/30/97
12:30 pm
Page: 14

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub- Contracts	Misc.	Total Cost
	REPORT TOTALS:		245,885	9,233,756	2,423,220	1,637,890	6,438,021			19,732,887
	Rounding Error:		-1	-0	1	0	-2			-2
	Exact Totals:		245,884	9,233,756	2,423,221	1,637,890	6,438,019			19,732,885

Sheet No: P 1300	----- Durations -----
Operation: R/H Heading Crew, Day Shift, Alcove	Parameters
Quantity: 80.0000 SHIFT	Calculated
Sheet Type: Standard	Hrs/Shift: 8.00
Estimator: rbp	Shift/Day: 3.00
Date: 05/28/97	Days/Wk: 5.00
Revisions:	Days/Mo: Week: 5.33
	Critical: No
	Mos: 1.27
----- Estimate Code -----	----- Quantity -----
1.0 Constructio Area	06.GB2
2.0 Activity	060A
	061A
	062A
	065A
3.0 Estimator	RBP
	Excavation of Alcoves 3m X 4m X 100m
	Sta.5+00 U.L.U. Excavation
	Sta.9+00 Main Cross Over Excavation
	Sta.11+00 M.L.U.Excavation
	Sta.xx+xx Moisture Study Niches Exc.
	Pettibon

Composite IBM crew day shift heading - crew only.
 Crew installs rockbolts/wire mesh/channel.

	Length m	Prod.Rate m/day	Time days
Testing Alcoves, 3m x 4m x 100m			
Sta 5+00 ULU	100	2	50
9+00 MCO	20	2	10
11+00 MLU	20	2	10
17+00 LLU	0	2	0
22+00 SCF	0	2	0
Niches similar to moisture studies, 3.5m x 4 m x 10m			
	5	2	Use 5
	5	2	Use 5
	150		80 days (3 shift/day)

Note: Production rate of 2 m/day is based on historical data for ESF.

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
1.00-Note		1. Alcove Excavation *****									
2.00-Note		Figure production @ 2 m/day 100 m/ 2 m/day = 50 days									
3.00-Crew	TWO /02TW	Shifter	1.00 Each	1.000	33.659						33.659
4.00-Crew	TWO /01TW	Driller	1.00 Each	1.000	32.781						32.781
5.00-Crew	TOP /03TW	Operator-Roadheader	1.00 Each	1.000	41.032						41.032
6.00-Crew	TWO /01TW	Miner	3.00 Each	3.000	98.343						98.343
7.00-Crew	TOP /04TW	Operator-2.5 FEL (6)	1.00 Each	1.000	41.032						41.032
8.00-Crew	TOP /02TW	LOCO OPERATOR	1.00 Each	1.000	40.668						40.668
9.00-Crew	TWO /03TW	BRAKEMAN	1.00 Each	1.000	33.408						33.408

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
10.00-Crew S/T (Primary)	Begins on 3.00	Crew/Spread Cost per Hour Production Rates: 0.1250 SHIFT / Crew Hour 0.0139 SHIFT / Manhour 8.0000 Crew Hours / SHIFT <-- 72.0000 Manhours / SHIFT	640.00 Hrs	9,000	320,923						320,923 205,391
11.00-Add-on	LADD/TL	Portal/Lunch Travel (12.500% of Labor into Labor) (Ref: Subtotal Line 10.00)	12.50 %	720	25,674						25,674
12.00-Grand S/T		Subtotal		6,480	231,065						231,065
13.00-Add-on	STS /05	Small Tools & Supplies @ 5% (5.000% of Labor into Supplies) (Ref: Subtotal Line 12.00)	5.00 %					11,553			11,553
14.00-Grand S/T		Subtotal		6,480	231,065			11,553			242,618
15.00-Add-on	TAX /1	State/County Sales/Use Tax @ 6.75% (6.750% of Permanent Matls, Supplies,) (Ref: Subtotal Line 14.00)	6.75 %					780			780
16.00-Range S/T	Begins on 1.00	Subtotal		6,480	231,065			12,333			243,398
17.00-Add-on	LADD/MR	Work Rules Shift Extra (0.000% of Labor into Labor) (Ref: Subtotal Line 16.00)	0.00 %								
18.00-Grand S/T		Subtotal		6,480	231,065			12,333			243,398
TOTALS for Sheet No. P 1300:			80.00 SHIF	6,480	231,065			12,333			243,398
Unit Costs:				81.000	2,888.307			154.163			3,042.470
Average labor cost per manhour:					35.658						

Sheet No: P 1301	----- Durations -----	
Operation: R/H Heading Crew, Second Shift	Parameters	Calculated
Quantity: 80.0000 SHIFT	Hrs/Shift: 8.00	Hrs: 640.00
Sheet Type: Standard	Shift/Day: 3.00	Shift: 80.00
Estimator: rbp	Days/Mk: 5.00	Days: 26.67
Date: 05/28/97	Days/Mo: No	Week: 5.33
Revision:	Critical: No	Mos: 1.27
----- Estimate Code -----		-- Quantity --
1.0 Constructio Area	05.GB2	Excavation of Alcoves 3m X 4m X 100m
2.0 Activity	060A	Sta.5+00 U.L.U. Excavation
	061A	Sta.9+00 Main Cross Over Excavation
	062A	Sta.11+00 M.L.U.Excavation
	065A	Sta.XX+XX Moisture Study Niches Exc.
3.0 Estimator	RBP	Pettibon

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
1.00-Note		1. Alcove Excavation *****									
2.00-Note		Figure 2 m/day 100 m / 2 m/day = 50 shifts									
3.00-Crew	TWO /02TW	Shifter	1.00 Each	1.000	33.659						33.659
4.00-Crew	TWO /01TW	Driller	1.00 Each	1.000	32.781						32.781
5.00-Crew	TOP /03TW	Operator-Roadheader	1.00 Each	1.000	41.032						41.032
6.00-Crew	TWO /01TW	Miner	3.00 Each	3.000	98.343						98.343
7.00-Crew	TOP /04TW	Operator-2.5 FEL (6)	1.00 Each	1.000	41.032						41.032
8.00-Crew	TOP /02TW	LOCO OPERATOR	1.00 Each	1.000	40.668						40.668
9.00-Crew	TWO /03TW	BRAKEMAN	1.00 Each	1.000	33.408						33.408
10.00-Crew S/T (Primary)	Begins on 3.00	Crew/Spread Cost per Hour Production Rates: 0.1250 SHIFT / Crew Hour 0.0139 SHIFT / Manhour 8.0000 Crew Hours / SHIFT <-- 72.0000 Manhours / SHIFT	640.00 Hrs	9.000	320.923						320.923
					5,760						205,391
11.00-Add-on	LADD/TL	Portal/Lunch Travel (12.500% of Labor into Labor) (Ref: Subtotal Line 10.00)	12.50 %	720	25,674						25,674

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
12.00-Grand S/T		Subtotal		6,480	231,065						231,065
13.00-Add-on	STS /05	Small Tools & Supplies @ 5% (5.000% of Labor into Supplies) (Ref: Subtotal Line 12.00)	5.00 %					11,553			11,553
14.00-Grand S/T		Subtotal		6,480	231,065			11,553			242,618
15.00-Add-on	TAX /1	State/County Sales/Use Tax @ 6.75% (6.750% of Permanent Mat'ls, Supplies,) (Ref: Subtotal Line 14.00)	6.75 %					780			780
16.00-Range S/T	Begins on 1.00	Subtotal		6,480	231,065			12,333			243,398
17.00-Add-on	LADD/MR	Work Rules Shift Extra (0.000% of Labor into Labor) (Ref: Subtotal Line 16.00)	0.00 %								
18.00-Grand S/T		Subtotal		6,480	231,065			12,333			243,398
TOTALS for Sheet No. P 1301:			80.00 SHIF	6,480	231,065			12,333			243,398
Unit Costs:				81.000	2,888.307			154.163			3,042.470
Average labor cost per manhour:					35.658						

set No: P 1302
 eration: R/H Heading Crew, Third Shift
 antity: 80.0000 SHIFT
 uest Type: Standard
 estimator: rbp
 ate: 05/28/97
 evision:

----- Durations -----	
Parameters	Calculated
Hrs/Shift: 8.00	Hrs: 640.00
Shift/Day: 3.00	Shift: 80.00
Days/Wk: 5.00	Days: 26.67
Days/Mo:	Week: 5.33
Critical: No	Mos: 1.27

COMPOSITE TBM CREW DAY SHIFT HEADING CREW ONLY
 CREW INSTALLS ROCKBOLTS/WIRE MESH/CHANNEL

----- Estimate Code -----	----- Quantity -----
.0 Constructio Area 06.GB2	Excavation of Alcoves 3m X 4m X 100m
.0 Activity 060A	Sta.5+00 U.L.U. Excavation 50.0000
061A	Sta.9+00 Main Cross Over Excavation 10.0000
062A	Sta.11+00 H.L.U.Excavation 10.0000
065A	Sta.xx+xx Moisture Study Niches Exc. 10.0000
1.0 Estimator RBP	Pettibon

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
1.00-Note		1. Alcove Excavation -----									
2.00-Note		Figure 2 m / day 100 m / 2 m/day = 50 shifts									
3.00-Crew	TWO /02TW	Shifter	1.00 Each	1.000	33.659						33.659
4.00-Crew	TWO /01TW	Driller	1.00 Each	1.000	32.781						32.781
5.00-Crew	TOP /03TW	Operator-Roadheader	1.00 Each	1.000	41.032						41.032
6.00-Crew	TWO /01TW	Miner	3.00 Each	3.000	98.343						98.343
7.00-Crew	TOP /04TW	Operator-2.5 FEL (6)	1.00 Each	1.000	41.032						41.032
8.00-Crew	TOP /02TW	LOCO OPERATOR	1.00 Each	1.000	40.668						40.668
9.00-Crew	TWO /03TW	BRAKEMAN	1.00 Each	1.000	33.408						33.408
10.00-Crew S/I (Primary)	Begins on 3.00	Crew/Spread Cost per Hour Production Rates: 0.1250 SHIFT / Crew Hour 0.0139 SHIFT / Manhour 8.0000 Crew Hours / SHIFT <-- 72.0000 Manhours / SHIFT	640.00 Hrs	9,000	320,923						320,923
				5,760	205,391						205,391
11.00-Add-on	LADD/TL	Portal/Lunch Travel (12.500% of Labor into Labor) (Ref: Subtotal Line 10.00)	12.50 %	720	25,674						25,674

Line Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
.00-Grand S/T		Subtotal		6,480	231,065						231,065
.00-Add-on	STS /05	Small Tools & Supplies @ 5% (5.000% of Labor into Supplies) (Ref: Subtotal Line 12.00)	5.00 %					11,553			11,553
.00-Grand S/T		Subtotal		6,480	231,065			11,553			242,618
.00-Add-on	TAX /1	State/County Sales/Use Tax @ 6.75% (6.750% of Permanent Mat'ls, Supplies,) (Ref: Subtotal Line 14.00)	6.75 %					780			780
5.00-Range S/T	Begins on 1.00	Subtotal		6,480	231,065			12,333			243,398
7.00-Add-on	LADD/WR	Work Rules Shift Extra (0.000% of Labor into Labor) (Ref: Subtotal Line 16.00)	0.00 %								
8.00-Grand S/T		Subtotal		6,480	231,065			12,333			243,398
TOTALS for Sheet No. P 1302:			80.00 SHIF	6,480	231,065			12,333			243,398
Unit Costs:				81.000	2,888.307			154.163			3,042.470
Average labor cost per manhour:					35.658						

set No: P 1303
 eration: Support Crews, Alcove & Other Exc.
 onty: 80.0000 SHIFT
 eet Type: Standard
 itimator: rbp
 ite: 05/28/97
 ivision:

Note:

Estimate Code	Description	Quantity
06.GB2	Excavation of Alcoves 3m X 4m X 100m	
060A	Sta.5+00 U.L.U. Excavation	50.0000
061A	Sta.9+00 Main Cross Over Excavation	10.0000
062A	Sta.11+00 H.L.U.Excavation	10.0000
065A	Sta.xx+xx Moisture Study Niches Exc.	10.0000
RBP	Pettibon	

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
1.00-Note		1. Support Crews *****									
2.00-Unit Cost	CMP /912	Portal Support-Day Shift	80.00 SHIF	17,600	550,229			13,216			563,445
			Extension:	1,408	44,018			1,057			45,076
3.00-Unit Cost	CMP /914	Portal Support-Swing Shift	80.00 SHIF	17,600	550,229			13,216			563,445
			Extension:	1,408	44,018			1,057			45,076
4.00-Unit Cost	CMP /916	Portal Support-Third Shift	80.00 SHIF	8,000	236,992						236,992
			Extension:	640	18,959						18,959
5.00-Unit Cost	CMP /919	R/H Mech Maint Crew-Day	80.00 SHIF	27,000	1,119,141			87,320			1,206,461
			Extension:	2,160	89,531			6,986			96,517
6.00-Unit Cost	CMP /920	R/H Mech Maint Crew-Swing	80.00 SHIF	18,000	749,853			87,320			837,173
			Extension:	1,440	59,988			6,986			66,974
7.00-Unit Cost	CMP /922	R/H Mech Maint Crew-3rd Shift	80.00 SHIF	9,000	369,288						369,288
			Extension:	720	29,543						29,543
8.00-Unit Cost	CMP /924	Electrical Maint Crew-Day	80.00 SHIF	36,000	1,577,430						1,577,430
			Extension:	2,880	126,194						126,194
9.00-Unit Cost	CMP /926	Electrical Maint Crew-Swing	80.00 SHIF	36,000	1,589,112						1,589,112
			Extension:	2,880	127,129						127,129
10.00-Unit Cost	CMP /928	Electrical Maint Crew-3rd Shift	80.00 SHIF	18,000	794,556						794,556
			Extension:	1,440	63,564						63,564
11.00-Unit Cost	CMP /936	Portal Control-Day Shift	80.00 SHIF	16,000	497,936						497,936
			Extension:	1,280	39,835						39,835

Line Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
2.00-Unit Cost	CMP /938	Portal Control-Swing Shift	80.00 SHIF	16,000	497,936						497,936
		Extension:	1,280		39,835						39,835
3.00-Unit Cost	CMP /940	Portal Control-3rd Shift	80.00 SHIF	16,000	497,936						497,936
		Extension:	1,280		39,835						39,835
14.00-Unit Cost	CMP /950	Bull Gang-Day	80.00 SHIF	18,000	592,884						592,884
		Extension:	1,440		47,431						47,431
15.00-Unit Cost	CMP /952	Bull Gang-Swing	80.00 SHIF	18,000	592,884						592,884
		Extension:	1,440		47,431						47,431
16.00-Unit Cost	CMP /954	Bull Gang-3rd	80.00 SHIF	9,000	297,855						297,855
		Extension:	720		23,828						23,828
17.00-Grand S/T		Subtotal		22,416	841,141			16,086			857,227
18.00-Add-on	STS /05	Small Tools & Supplies @ 5% (5,000% of Labor into Supplies) (Ref: Subtotal Line 17.00)	5.00 %					42,057			42,057
19.00-Grand S/T		Subtotal		22,416	841,141			58,143			899,284
20.00-Add-on	TAX /1	State/County Sales/Use Tax @ 6.75% (6.750% of Permanent Mat'ls, Supplies,) (Ref: Subtotal Line 19.00)	6.75 %					3,925			3,925
21.00-Note											
22.00-Grand S/T		Subtotal		22,416	841,141			62,067			903,208
TOTALS for Sheet No. P 1303:			80.00 SHIF	22,416	841,141			62,067			903,208
Unit Costs:				280.200	10,514.261			775.843			11,290.104
Average labor cost per manhour:					37.524						

rrison Knudsen Corp.
 oject: ECRB (Budget) Revised Facility Rqrmts.
 mber: ECRB.3

Sheet No:	P 1304
Operation:	Utilities
Quantity:	80.0000 SHIFT
Sheet Type:	Standard
Estimator:	rbp
Date:	05/28/97
Revision:	

-----	Estimate Code	-----	Quantity
1.0 Constructio Area	06.G82	Excavation of Alcoves 3m X 4m X 100m	
2.0 Activity	060C	Sta.5+00 U.L.U. Utilities Etc.	50.0000
	061C	Sta.9+00 Main Cross Over Utilities Etc	10.0000
	062C	Sta.11+00 M.L.U.Utilities Etc	10.0000
	065C	Moisture Study Niches Utilities Ectc	10.0000
3.0 Estimator	RBP	Pettibon	

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
1.00-Note		1. Temporary Utilities for Alcoves Including the Cost of Damage to the Utilities. *****									
2.00-Unit Cost	MATE/P10	Vent Line, 18"	150.00	METE				66.000			66.000
		Extension:						9,900			9,900
3.00-Unit Cost	MATD/A3	Waste Water Line 6"Victaulic W/Couplings	150.00	METE				71.190			71.190
		Extension:						10,679			10,679
4.00-Unit Cost	MATD/A1	Air Piping 8" Victallic W/Couplings	150.00	METE				86.800			86.800
		Extension:						13,020			13,020
5.00-Unit Cost	MATF/A22	Electrical Power for Utilities	3.00	MONT				2,000.000			2,000.000
		Extension:						6,000			6,000
6.00-Range S/T	Begins on 2.00.	Subtotal						39,599			39,599
7.00-Note											
8.00-Grand S/T		Subtotal						39,599			39,599
9.00-Add-on	STS /05	Small Tools & Supplies @ 5% (5.000% of Labor into Supplies) (Ref: Subtotal Line 8.00)	5.00	%							
10.00-Grand S/T		Subtotal						39,599			39,599

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 roject: ECRB (Budget) Revised Facility Rqrmts.
 umber: ECRB.3

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
11.00-Add-on	TAX /1	State/County Sales/Use Tax @ 6.75% (6.750% of Permanent Matls, Supplies,) (Ref: Subtotal Line 10.00)	6.75	%				2,673			2,673
12.00-Note								42,271			42,271
13.00-Grand S/T		Subtotal						42,271			42,271
TOTALS for Sheet No. P 1304:			80.00	SHIFT				528,392			528,392
Unit Costs:											

sheet No: P 1320
 operations: Exc. Equip.-Operation
 quantity: 160.0000 SHIFT
 sheet Type: Standard
 estimator: rbp
 date: 05/28/97
 revision:

-----	Estimate Code	-----	Quantity
1.0 Constructio Area	06.GB2	Excavation of Alcoves 3m X 4m X 100m	
2.0 Activity	060A	Sta.5+00 U.L.U. Excavation	50.0000
	061A	Sta.9+00 Main Cross Over Excavation	50.0000
	062A	Sta.11+00 M.L.U.Excavation	50.0000
	065A	Sta.XX+XX Moisture Study Niches Exc.	10.0000
3.0 Estimator	RBP	Pettibon	

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
1.00-Note		1. Equipment -----									
2.00-Unit Cost	EOPU/P9001	Roadheader, Alpine AM 75	750.00 HR					100.000			100.000
			Extension:					75,000			75,000
3.00-Unit Cost	EOPU/MK931	931B LOADER/BACKHOE	380.00 HR					7.730			7.730
			Extension:					2,937			2,937
4.00-Unit Cost	EOPU/JHYD4	2 BOOM HYDRAULIC JUMBO W/BASKT	150.00 HR					54.130			54.130
			Extension:					8,120			8,120
5.00-Unit Cost	EOPU/LCD25	DSL LOCOMOTIVE - 25 TON	750.00 HR					23.800			23.800
			Extension:					17,850			17,850
6.00-Unit Cost	EOPU/CARMN	MAN CAR	150.00 HR					1.240			1.240
			Extension:					186			186
7.00-Unit Cost	EOPU/CARMK	MUCK CAR	600.00 HR					1.900			1.900
			Extension:					1,140			1,140
8.00-Unit Cost	EOPU/CARFT	FLAT CAR	240.00 HR					1.240			1.240
			Extension:					298			298
9.00-Unit Cost	EOPU/VF 25	Vent Fan 25 hp, 18"	1600.00 HR					1.000			1.000
			Extension:					1,600			1,600
10.00-Unit Cost	EOPU/LITES	TUNNEL LIGHTING - 1000 LF	1600.00 HR					2.550			2.550
			Extension:					4,080			4,080
11.00-Range S/T	Begins on 3.00	Subtotal						36,211			36,211
12.00-Note											

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
1.00-Grand S/T		Subtotal						111,211			111,211
2.00-Add-on	STS /05	Small Tools & Supplies @ 5% (5.000% of Labor into Supplies) (Ref: Subtotal Line 13.00)	5.00	%							
3.00-Grand S/T		Subtotal						111,211			111,211
4.00-Add-on	TAX /1	State/County Sales/Use Tax @ 6.75% (6.750% of Permanent Matls, Supplies,) (Ref: Subtotal Line 15.00)	6.75	%				7,507			7,507
7.00-Note											
8.00-Grand S/T		Subtotal						118,717			118,717
TOTALS for Sheet No. P 1320:			160.00	SHIFT				118,717			118,717
Unit Costs:								741.983			741.983

Sheet No: P 1321
 Operation: Ground Support
 Quantity: 300,000 METER
 Sheet Type: Standard
 Estimator: rbp
 Date: 05/28/97
 Revision:

Estimate Code	Description	Quantity
1.0 Constructio Area	06.G82 Excavation of Alcoves 3m X 4m X 100m	
2.0 Activity	060B Sta.5+00 U.L.U. Ground Support	100.0000
	061B Sta.9+00 Main Cross Over G.Support	100.0000
	062B Sta.11+00 M.L.U.Ground Support	100.0000
3.0 Estimator	065A Sta.xx+xx Moisture Study Niches Exc.	
	RBP Pettibon	

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
1.00-Unit Cost	MATA/A3	Super Swellex Bolt 3.0M	500.00 EA			69,290					69,290
		Extension:				34,645					34,645
2.00-Unit Cost	MATA/A2	WF 3 x 3 X W1.9 x W1.9	600.00 SM			2,640					2,640
		Extension:				1,584					1,584
3.00-Unit Cost	MATA/A8	Wire Mesh support Pins	80.00 EA					5,000			5,000
		Extension:						400			400
4.00-Range S/T	Begins on 1.00	Subtotal				36,229		400			36,629
5.00-Note											
6.00-Grand S/T		Subtotal				36,229		400			36,629
7.00-Add-on	STS /05	Small Tools & Supplies @ 5% (5.000% of Labor into Supplies) (Ref: Subtotal Line 6.00)	5.00 %								
8.00-Grand S/T		Subtotal				36,229		400			36,629
9.00-Add-on	TAX /1	State/County Sales/Use Tax @ 6.75% (6.750% of Permanent Matls, Supplies,) (Ref: Subtotal Line 8.00)	6.75 %			2,445		27			2,472
10.00-Note											
11.00-Grand S/T		Subtotal				38,674		427			39,101

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Sheet No. P 1321 Page 2
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Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub- Contracts	Misc.	Total Cost
		TOTALS for Sheet No. P 1321:	300.00			38,674		427			39,101
		Unit Costs:				128.915		1.423			130.338

Sheet No: P 1350	----- Durations -----	
Operation: Scientific Support	Parameters	Calculated
Quantity: 1.0000 LS	Hrs/Shift: 8.00	Hrs: 640.00
Sheet Type: Standard	Shift/Day: 3.00	Shift: 80.00
Estimator: rbp	Days/Wk: 5.00	Days: 26.67
Date: 05/28/97	Days/Mo:	Week: 5.33
Revision:	Critical: Yes	Mos: 1.27

----- Estimate Code -----	-- Quantity --	
1.0 Constructio Area	06.GB2	Excavation of Alcoves 3m X 4m X 100m
2.0 Activity	0600	Sta.5+00 U.L.U. Scientific Support
	0610	Sta.9+00 Main Cross O.Scientific Suppor
	0620	Sta.11+00 M.L.U.Scientific Support
3.0 Estimator	RBP	Pettibon
		0.3400
		0.3300
		0.3300

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
1.00-Note		1. Figure one man for the duration of the alcove work. Approx 80 days, 1 shifts, 8 hr/shift = 640 mh. 2. Allow for electrical, & misc. supplies, at \$10/mh x 8 x 80 = \$6,400.									
2.00-Crew	TWO /01TW	Miner-Tunnel	1.00 Each	1.000	32.781						32.781
3.00-Crew S/T (Primary)	Begins on 2.00	Subtotal, Hourly Cost Production Rates: 0.0016 LS / Crew Hour 0.0016 LS / Manhour 640.0000 Crew Hours / LS 640.0000 Manhours / LS	640.00 Hrs	1.000	32.781						32.781
					20,980						20,980
4.00-Unit Cost	SUP /02	Supplies, Scientific Support	1.00 LS					6,400.000			6,400.000
		Extension:						6,400			6,400
5.00-Range S/T	Begins on 1.00	Subtotal		640	20,980			6,400			27,380
6.00-Add-on	TAX /1	State/County Sales/Use Tax @ 6.75% (6.750% of Permanent Matls, Supplies,) (Ref: Subtotal Line 5.00)	6.75 X					432			432
7.00-Range S/T	Begins on 1.00	Subtotal		640	20,980			6,832			27,812
8.00-Note											
9.00-Range S/T	Begins on 1.00	Subtotal		640	20,980			6,832			27,812

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub- Contracts	Misc.	Total Cost
10.00-Add-on	LADD/WR	Work Rules Shift Extra (0.000% of Labor into Labor) (Ref: Subtotal Line 9.00)	0.00	%							
11.00-Grand S/T		Subtotal		640	20,980			6,832			27,812
		TOTALS for Sheet No. P 1350:	1.00	LS 640	20,980			6,832			27,812
		Average labor cost per manhour:			32.781						

Sheet No: P 090A
 Operation: Supervision & Overhead
 Quantity: 1.0000 LS
 Sheet Type: Standard
 Estimator: rbp
 Date: 05/30/97
 Revision: 3

INCLUDES LABOR COSTS ONLY FOR SUPERVISION ABOVE FOREMAN / SHIFTER LEVEL, ENGINEERING, SURVEYING, OFFICE, PURCHASING, WAREHOUSE, SAFETY, MEDICAL AND YARD PERSONAL.

----- Estimate Code -----
 1.0 Constructio Area 09.FAI ECRB Direct Supervision/Engineering
 2.0 Activity 090A Supervision & Overhead
 3.0 Estimatpr RBP Pettibon

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
1.00-Unit Cost	OSAL/GR-16-2	Shift Supt., Gr. 16	18.00	MO 173.000	7,000.000						7,000.000
			Extension:	3,114	126,000						126,000
2.00-Unit Cost	OSAL/GR-15-2	Tunnel Walkers, Gr. 15 (4 ea x 17)	68.00	MO 173.000	6,400.000						6,400.000
			Extension:	11,764	435,200						435,200
3.00-Unit Cost	OSAL/GR-15-2	Elec. Supt. Gr. 15, (3 ea x 17)	51.00	MO 173.000	6,400.000						6,400.000
			Extension:	8,823	326,400						326,400
4.00-Unit Cost	OSAL/GR-14-2	Equipt. Supt. Gr. 14, (2 ea x 17)	34.00	MO 173.000	5,800.000						5,800.000
			Extension:	5,882	197,200						197,200
5.00-Unit Cost	OSAL/GR-13-2	Shift Engineer, (13) (4 ea x 17)	68.00	MO 173.000	5,200.000						5,200.000
			Extension:	11,764	353,600						353,600
6.00-Range S/T	Begins on 1.00	SUB-TOTAL MANAGEMENT BASE SALARIES		41,347	1,438,400						1,438,400
7.00-Add-on	ADD /FICA	FICA (7.650% of Labor into Labor) (Ref: Subtotal Line 6.00)	7.65	%	110,038						110,038
8.00-Add-on	ADD /DHRET	ESOP & 401(k) PLAN (5.000% of Labor into Labor) (Ref: Subtotal Line 6.00)	5.00	%	71,920						71,920
9.00-Manhour	OSAL/FSUI	FUI & SUI (Ref: Subtotal Line 6.00)	41347.00	MHrs	0.217						0.217
			Extension:		8,972						8,972
10.00-Manhour	OSAL/BENEFIT	SALARIED EMPLOYEE BENEFIT COST (Ref: Subtotal Line 6.00)	41347.00	MHrs	2.416						2.416
			Extension:		99,894						99,894
11.00-Range S/T	Begins on 1.00	MANAGEMENT & SUPERVISOR SALARIES		41,347	1,729,224						1,729,224
12.00-Note											

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub- Contracts	Misc.	Total Cost
13.00-Grand S/T		Subtotal		41,347	1,729,224						1,729,224
TOTALS for Sheet No. P 090A:			1.00 LS	41,347	1,729,224						1,729,224
Average labor cost per manhour:					41.822						

Sheet No: A026
 Operation: Muck Disposal operation
 Quantity: 100000.0000 CY
 Sheet Type: Standard
 Estimator: MLA
 Date: 05/28/97
 Revision:

----- Durations -----
 Parameters Calculated
 Hrs/Shift: 8.00 Hrs: 3060.00
 Shift/Day: 3.00 Shift: 382.50
 Days/Wk: 5.00 Days: 127.50
 Days/Mo: 25.50 Week: 25.50
 Critical: Yes Mos: 6.07

There is approx 100,000 cy of muck to dispose of over 6 months time which amounts to approx 260 cy per shift. The handling method assumed is as follows. Discharge from the 36" stacker will be picked up with the front end loader and tramed to the new muck storage area. The D8 dozer will spread the muck as required. The production is assumed to be 35cy/hr = 2860 hrs plus alcove part time shown below.

Add 200 hours for handling the alcove muck. (Approx. 2,500 cy.)

Figure 3,060 crew hours.

----- Estimate Code -----
 1.0 Constructio Area 11.GAI North Portal Muck Modification
 2.0 Activity 110C ECRB Muck Pad Disposal Operation
 3.0 Estimatbr MLA Aarested

Line-Type	Group/Code	Description	Quantity	Manhours	Labor	Perm. Mat'ls	Equip.	Supplies	Sub-Contracts	Misc.	Total Cost
1.00-Note											
2.00-Crew	OP /040P	Operator - Heavy (c.o.-l.)	1.00 Each	1.000	40.483						40.483
3.00-Crew	EOP /6538C	TRACTOR, 250-300 HP COMMON	0.50 Each	0.230	9.438		9.090	15.530			34.057
4.00-Crew	EOP /4843R	LOADER, CAT 9660, 3 CY ROCK	0.50 Each	0.135	5.540		6.070	8.505			20.114
5.00-Crew S/T (Primary)	Begins on 2.00	Subtotal, Hourly Cost Production Rates: 32.6797 CY / Crew Hour <-- 23.9412 CY / Manhour 0.0306 Crew Hours / CY 0.0418 Manhours / CY	3060.00 Hrs	1.365	55.460		15.159	24.035			94.654
				4,177	169,708		46,387	73,547			289,642
6.00-Add-on	TAX /1	State/County Sales/Use Tax @ 6.75% (6.750% of Permanent Mat'ls, Supplies, (Ref: Subtotal Line 5.00)	6.75 %					4,964			4,964
7.00-Note											
8.00-Grand S/T		Subtotal		4,177	169,708		46,387	78,512			294,606
		TOTALS for Sheet No. A026:	100000.00 CY	4,177	169,708		46,387	78,512			294,606
		Unit Costs:		0.042	1.697		0.464	0.785			2.946
		Average labor cost per manhour:			40.630						

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR682FAK
2. Summary Account Title: Ventilation System Testing and Monitoring Underground in the ECRB Cross Drift
3. Summary Account MGR/ORG: Tommy Touchstone/M&O
4. Status of Change: ___ Revised __X__ New

5. Scope Description:

Provide a ventilation monitoring program for; the collection of operating performance data from the primary and auxiliary ventilation systems, dust control equipment and operations dust control practices, and for the collection of underground air quality samples for total and respirable nuisance and silica dust levels. Provide data collection to quantify water consumption and usage for dust control. Purchase and install up to three pairs of dust samplers to measure total and respirable dust levels in the ESF and ECRD cross drift.

Provide management, technical and support staff to implement the monitoring programs in the field and in the office. Develop and maintain underground ventilation system layout drawings and system operating performance data, using the VNETPC ventilation software, including; engineering analyses, data compilation and modeling, CAD drawings, report writing and other documentation.

The final product of this work scope will be the preparation and issuance of a monthly "Ventilation System and Dust Control Monitoring Program Report" to the M&O Construction Manager. This report will include: engineering sketches and schematics of the as-built ventilation and dust control systems, installed instrumentation, scientific procedures implemented for data collection, engineering analyses, data, scientific findings and recommendations in hard and electronic document form.

As part of the normal operations provide weekly update reports to the M&O Construction Management.

6. Scope Differences from the Baseline:
 Not included in previous planning or the baseline

7. Key Assumptions:

A. Summary Account TR842FA1, (Total and Respirable Dust Levels in the ESF and ECRD Cross Drift) will provide the collection and analysis of particulate matter air quality samples taken within the underground ESF and ECRD tunnel area. Both total suspended matter (TSP) and respirable (PM-10) size dust samples will be taken at up to three sampling stations. Gravimetric analyses will be performed on all samples to determine airborne dust levels as an average mass concentration during the sampling period. Optical analyses will be performed by an outside contractor on some filters to determine type of mineral captured on the filters. The number of samples, installation, operation and analyses will be included in this account.

B. This program will *enhance* Site Construction Operations by providing: ventilation system operating data to support ECRB construction operations and management decisions for system changes to benefit worker health and safety. It will enhance primary ventilation system operations and performance, dust generation and mitigation planning, management of water for dust suppression, and the maintenance of dust collection equipment. In addition, timely reporting of results to the M&O management will be provided.

C. This program will *also enhance* Site Construction Operations by providing: timely gathering of data to support scientific data requirements, management decisions for system adjustments of the ECRB water balance, and the maintenance of scientific instrumentation and equipment.

D. The estimate assumes the resources necessary to perform the assigned tasks including management, technical and administration staff resources.

E. The estimate assumes funding approval and completion of the ECRB Phase I early scope.

F. The estimate assumes work scope to commence July 1, 1997 and completion by September 30, 1998, and does not include planning for Calico Hills excavation.

G. The estimate assumes that funding for other organizations participation is described in other Statements of work as noted (TCO, DIE, CMO, A/E).

8. Cost Rationale:

A. Period of activities, July 1, 1997 through September 30, 1998, including:
Phase I, Detailed Program Planning & Procurement, July 1 thru Sept 30, 1997
Phase II, Monitoring & Data Collection, Oct 1, 1997 thru Sept 30, 1998

B. Ventilation engineer (0.5 FTE) to manage and integrate the program with the M&O,

write procedures, address issues, and review of data, and prepare the monthly Monitoring Program Summary Report. The ventilation engineer must show a high level of expertise and experience in underground ventilation system monitoring, computer modeling, and report writing, and must be familiar with the applicable OSHA standards.

C. Design engineering, procurement, installation, maintenance of test monitoring equipment (0.30 FTE).

D. Ventilation Field Technician (1.0 FTE) for data collection and system monitoring. The field technician must be experienced in underground ventilation system monitoring techniques, equipment usage, equipment calibration and reporting.

E. Administration staff support (0.2 FTE).

F. Air sample analyses to be provided to cover up to two locations consisting of one each PM10 and TSP samplers operating on a five day excavation schedule .

G. TR682FAK, FY97 cost @ \$ 47,334 and FY98 cost @ \$ 191,430
Total cost @ \$ 238,764

9. Level III Milestones: None
10. Level III Milestone Acceptance Criteria: None
11. Attachments and References: None

06/04/97

**TECHNICAL BASIS
FOR THE REQUIRED ACTIVITIES FOR THE ENHANCED
CHARACTERIZATION OF THE REPOSITORY BLOCK**

1. Summary Account Number: TR842FA1
2. Summary Account Title: Air Quality/Meteorology
3. Summary Account MGR/ORG: Mike Harris, Environment, Safety and Regional Programs
4. Status of Change: ___ Revised X New___

5. Scope Description:

Provide for the collection and analysis of particulate matter air quality samples taken within the underground ESF and ECRB tunnel area.

6. Scope Differences from the Baseline:

Not included in previous planning or the baseline

7. Key Assumptions:

In support of proposed Summary Account TR682FAK, Ventilation System and Monitoring Underground in the ECRB, particulate matter air quality samples taken within the underground ESF and ECRB tunnel area will be collected and analyzed. Both total suspended matter (TSP) and respirable (PM-10) size dust samples will be taken at up to three sampling stations. Gravimetric analyses will be performed on all samples to determine airborne dust levels as an average mass concentration during the sampling period. Optical analyses will be performed by an outside contractor on some filters to determine type of mineral captured on the filters. The number of samples, installation, operation and analyses will be included in this account.

Effort includes three sampling stations consisting of one each PM10 and TSP samplers operated four days per week for three gravimetric and one optical analysis run each.

Period of performance is July 1, 1997 through September 30, 1998, and includes two phases.

Phase I - July 1, 1997 through September 30, 1997

Detailed program planning, writing operating procedures, and equipment acquisition.

Phase II - October 1, 1997 through September 30, 1998

Monitoring and data collection, data compilation, and documentation

8. Cost Rationale:

Phase I

Other Direct Costs

Sampler purchase for two sampling stations, each consisting of one each PM10 and TSP samplers:

PM10 samplers = \$18,000 (3 x \$6,000 each)

TSP samplers = \$9,000 (3 x \$3,000 each)

Phase II & III

Other Direct Costs

Special membrane filters for optical analysis and sample analysis costs:

Gravimetric samples = \$3,510 (702* filters x \$5 each)

Sample analysis = \$2,570 (257* filters x \$10 each) + \$46,800 (234 filters x \$200 each)

* includes spare filters

Labor

Meteorological Technician (0.75 FTE) for data collection, station monitoring, preventive maintenance, calibration, operation, and filter preparation for data collection.

Meteorologist (0.2 FTE) for ensuring compliance with current regulatory requirements, training and direction for the technician validating and analyzing data.

9. Level III Milestones:

None.

10. Level III Milestone Acceptance Criteria:

None.

11. Attachments and References:

See proposed Summary Account TR682FAK, Ventilation System and Monitoring Underground in the ECRB.

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Fiscal Year					
					FY97	FY98	FY99	FY00	FY01	FY02
ECRB Interfaces										
Performance Assessment & License Application										
125	Complete Data Enhancement to TSP/LA	0		16MAY97	Complete Data Enhancement to TSP/LA 16MAY97					
130	TSPA Sensitivity for LA Initial Data	216	04JAN99*	05NOV99	TSPA Sensitivity for LA Initial Data 04JAN99* 05NOV99					
120	Documentation of TSPA	66	08NOV99	10FEB00	Documentation of TSPA 08NOV99 10FEB00					
115	LA Preparation & Review Without East-West	68	17FEB00*	22MAY00	LA Preparation & Review Without East-West Data 17FEB00* 22MAY00					
110	LA Preparation & Review With East-West	463	23MAY00	28FEB02	LA Preparation & Review With East-West Data 23MAY00 28FEB02					
100	Submit LA to NRC	0		01MAR02	Submit LA to NRC 01MAR02					
Go Day Planning										
200	Plan Repository Data Enhancement	60	06MAR97	08AUG97	Plan Repository Data Enhancement 06MAR97 08AUG97					
210	CR Approval	0		17JUN97*	CR Approval 17JUN97*					
Repository Design										
140	Phase 1 Complete Design Input to TSPA-VA	154	27FEB97	13OCT97	Phase 1 Complete Design Input to TSPA-VA 27FEB97 13OCT97					
150	Phase 2 Design for LA Initiation	458	14OCT97	03AUG99	Phase 2 Design for LA Initiation 14OCT97 03AUG99					
300	Complete Data Enhancement to LA Design	0		03AUG99	Complete Data Enhancement to LA Design 03AUG99					
160	Phase 3 Support to LA Development	630	04AUG99	07JAN02	Phase 3 Support to LA Development 04AUG99 07JAN02					
ECRB Early Start Activities										
TR142FA1 - System Integration Support for ECRB										
SE000200	Launch Chamber Design Support	29	19MAY97	28JUN97	Launch Chamber Design Support 19MAY97 28JUN97					
SE000210	SE Support to ECRB Early Start	92	27JUN97	03NOV97	SE Support to ECRB Early Start 27JUN97 03NOV97					
SE000M4	Complete ICD Rev. 0	0		03NOV97	Complete ICD Rev. 0 03NOV97					
TR6612FB1 - Design ECRB Cross Drift										
SC10010	Develop TBM Requirements	8	19MAY97	28MAY97	Develop TBM Requirements 19MAY97 28MAY97					
SC10000	QAP 3.12 Design Input for Launch Chamber	10	19MAY97	30MAY97	QAP 3.12 Design Input for Launch Chamber 19MAY97 30MAY97					
SC10020	Initial Launch Chamber Design	20	02JUN97	27JUN97	Initial Launch Chamber Design 02JUN97 27JUN97					
SC10030	Launch Chamber Design	50	30JUN97	05SEP97	Launch Chamber Design 30JUN97 05SEP97					
SCM030M3	Complete Launch Chamber Design	0		05SEP97	Complete Launch Chamber Design 05SEP97					
TR662FA1 - ECRB Direct Supervision & Engineering										
SC10040	TBM Selection and Acquisition	24	29MAY97	01JUL97	TBM Selection and Acquisition 29MAY97 01JUL97					
SC10050	TBM Rehab Planning	51	02JUN97*	11AUG97	TBM Rehab Planning 02JUN97* 11AUG97					

Project Start: 12MAR97
 Project Finish: 01MAR97
 Data Date: 19MAY97
 Run Date: 03JUL97

Legend:
 [Green Bar] Early Bar
 [Yellow Bar] Progress Bar
 [Red Bar] Critical Activity

Yucca Mountain Project ECRB - Revision 15

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	FY97												FY98												FY99												FY00												FY01												FY02											
					[Gantt Chart Area]												[Gantt Chart Area]												[Gantt Chart Area]												[Gantt Chart Area]												[Gantt Chart Area]												[Gantt Chart Area]											
SC10060	Constructability Review, Launch Chamber	80	30JUN97	17OCT97	Constructability Review, Launch Chamber Design																																																																							
SC10080	Develop Pre-Construction Checklist	24	01JUL97*	01AUG97	Develop Pre-Construction Checklist																																																																							
SC10070	Job Safety Analysis for Launch Chamber	45	01JUL97*	01SEP97	Job Safety Analysis for Launch Chamber																																																																							
SC10090	Launch Chamber Pre-Construction Review	80	01JUL97*	20OCT97	Launch Chamber Pre-Construction Review																																																																							
ECRB Direct Activities																																																																												
Approve CR																																																																												
SC1000	Approval of ECRB CR	38	19MAY97	09JUL97	Approval of ECRB CR																																																																							
Design Muck/Conveyor Systems																																																																												
SC10520	Design Muck/Conveyor Systems	55	18JUN97*	02SEP97	Design Muck/Conveyor Systems																																																																							
Design S. Portal Support Facilities																																																																												
SC10530	Design S. Portal Support Facilities	66	18JUN97*	17SEP97	Design S. Portal Support Facilities																																																																							
Design Cross Drift																																																																												
SC10100	Design Cross Drift	80	04AUG97	21NOV97	Design Cross Drift																																																																							
SC10110	Develop Revised Method for Muck Handling	50	25AUG97	31OCT97	Develop Revised Method for Muck Handling																																																																							
SCM040M3	Design Cross Drift	0		21NOV97	Design Cross Drift																																																																							
Begin TBM Mobilization & Refurb																																																																												
SCM100M3	Begin TBM Lease	0	10JUL97*		Begin TBM Lease																																																																							
SC10130	Ship TBM	5	10JUL97	16JUL97	Ship TBM																																																																							
SC10132	Inspect TBM	25	17JUL97	20AUG97	Inspect TBM																																																																							
SC10134	Order Parts for TBM	30	17JUL97	27AUG97	Order Parts for TBM																																																																							
SC10136	Refurbish TBM	66	28AUG97	01DEC97	Refurbish TBM																																																																							
SC10138	Ship TBM	13	02DEC97	18DEC97	Ship TBM																																																																							
SCM110M3	TBM on Site	0	19DEC97		TBM on Site																																																																							
Establish South Portal Access to Alcoves																																																																												
SC10150	Establish South Portal Access to Alcoves	46	01AUG97	03OCT97	Establish South Portal Access to Alcoves																																																																							
TBM Demob																																																																												
SC10160	TBM Demob	22	24JUN98	24JUL98	TBM Demob																																																																							
Launch Chamber Excavation																																																																												
SC10170	Launch Chamber Excavation (Sta 0+00 to 0+90)	65	15SEP97	16DEC97	Launch Chamber Excavation (Sta 0+00 to 0+90)																																																																							
SCM050M3	Complete Launch Chamber Exc. (Sta 0+00 to 0+90)	0		16DEC97	Complete Launch Chamber Exc. (Sta 0+00 to 0+90)																																																																							

Project Start: 12MAR97
 Project Finish: 01MAR99
 Date Date: 19MAY97
 Run Date: 02JUL97

Legend:
 [Bar] Early Bar
 [Bar] Progress Bar
 [Bar] Critical Activity

Yucca Mountain Project

ECRB - Revision 15

Activity ID	Activity Description	Orig Dir	Early Start	Early Finish	FY97												FY98												FY99												FY00												FY01												FY02											
					[Gantt Chart]												[Gantt Chart]												[Gantt Chart]												[Gantt Chart]												[Gantt Chart]												[Gantt Chart]											
TR6612GB6: Install Excavation Equipment					▲▲▲												▲												▲																																															
SC10180	Install Excavation Equipment	22	19DEC97	21JAN98	Install Excavation Equipment 19DEC97 21JAN98																																																																							
TR6612GB7: Excavate ECRB Cross Drift																																																																												
SC10190	Equipment Shakedown (Sta 0+90 to 2+40)	10	22JAN98	04FEB98	Equipment Shakedown (Sta 0+90 to 2+40) 22JAN98 04FEB98																																																																							
SC10200	Install Conveyor	5	05FEB98	11FEB98	Install Conveyor 05FEB98 11FEB98																																																																							
SCM060M3	Begin Exc. Across the Rep. Block (2+40 to 25+00)	0	12FEB98		Begin Exc. Across the Rep. Block (2+40 to 25+00) 12FEB98																																																																							
SC10210	Exc. Across the Repository Block (2+40 to 25+00)	62	12FEB98	01JUN98	Exc. Across the Repository Block (2+40 to 25+00) 12FEB98 01JUN98																																																																							
SCM120M3	Complete Repository Cross Drift	0		01JUN98	Complete Repository Cross Drift 01JUN98																																																																							
SC10230	Solitario Canyon Fault Exc. (25+00 to 28+15)	16	02JUN98	23JUN98*	Solitario Canyon Fault Exc. (25+00 to 28+15) 02JUN98 23JUN98*																																																																							
TR6613GB1: Design ECRB Alcoves																																																																												
SC10240	Test Alcove Design	66	24NOV97	02MAR98	Test Alcove Design 24NOV97 02MAR98																																																																							
TR6613GB2: Excavate ECRB Alcoves																																																																												
SC10250	Excavate 3 Alcoves	54	27JUL98	09OCT98	Excavate 3 Alcoves 27JUL98 09OCT98																																																																							
SCM070M3	Complete ECRB Construction	0		09OCT98	Complete ECRB Construction 09OCT98																																																																							
TR6613GB3: ECRB Sampling/Mapping Support																																																																												
SC10500	Fab Mapping Platform	44	14NOV97	20JAN98	Fab Mapping Platform 14NOV97 20JAN98																																																																							
SC10510	Sample & Mapping ECRB	100	21JAN98	11JUN98	Sample & Mapping ECRB 21JAN98 11JUN98																																																																							
TR6621GB2: Conceptual Design Call Co Hills Extension																																																																												
SC10260	Conceptual Design of CH	67	24NOV97	31MAR98	Conceptual Design of CH 24NOV97 31MAR98																																																																							
SCM090M3	Complete Conceptual Design of CH	0		31MAR98	Complete Conceptual Design of CH 31MAR98																																																																							
TR6621GB3: ECRB Title III																																																																												
SC10270	ECRB Title III	274	15SEP97*	13OCT98	ECRB Title III 15SEP97* 13OCT98																																																																							
FY97 Activities																																																																												
TR652FB3: Demobilize 25 TBM																																																																												
SC1600	Demob TBM	21	19MAY97	16JUN97	Demob TBM 16JUN97 19MAY97																																																																							
TR652FB4: Design Flowthrough Ventilation System																																																																												
SC1400	Design Flowthrough Ventilation System	25	19MAY97	20JUN97	Design Flowthrough Ventilation System 20JUN97 19MAY97																																																																							
SC1400A	Complete Flow-Through Ventilation Design	9	23JUN97*	03JUL97	Complete Flow-Through Ventilation Design 03JUL97 23JUN97*																																																																							
TR652FB5: Convert Ventilation System																																																																												
SC1800A	Procure Doors	40	23JUN97	15AUG97	Procure Doors 15AUG97 23JUN97																																																																							

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Project Start	12MAR97	Early Bar	ECRB
Project Finish	01MAR98	Progress Bar	
Date Date	19MAY97	Critical Activity	
Run Date	03JUL97		

Yucca Mountain Project ECRB - Revision 15

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Fiscal Year													
					FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08		
SC1800	Construct Permanant Ventilation Bulkhead	50	04JUL97	11SEP97	04JUL97	11SEP97												
TR6613FE7	Excavate SGDF Above																	
SC3210A	SGDF Test	47	19MAY97	22JUL97	19MAY97	22JUL97												
SC3210B	SGDF Excavation	23	23JUL97	22AUG97	23JUL97	22AUG97												
SC3210C	SGDF Test	61	25AUG97	17NOV97	25AUG97	17NOV97												
SC3210D	SGDF Excavation	45	18NOV97	23JAN98	18NOV97	23JAN98												
SC3210M4	Resume Testing	0	26JAN98		26JAN98													
TR692FA	Surface Muck Handling																	
SC8100	SGDF Muck	84	19MAY97	11SEP97	19MAY97	11SEP97												
ECRB Construction Indirects																		
TR682FA	ECRB Direct Supervision & Engineering																	
SC10280	Lease TBM & Conveyor	247	05AUG97	24JUL98	05AUG97	24JUL98												
SC10290	Verify Pre-Const. Checklist for Launch	15	25AUG97	12SEP97	25AUG97	12SEP97												
SC10300	Construction Planning	5	08SEP97	12SEP97	08SEP97	12SEP97												
SC10310	Develop JSA's	90	01OCT97	09FEB98	01OCT97	09FEB98												
SC10320	Construction Planning	5	24NOV97	02DEC97	24NOV97	02DEC97												
SC10330	Verify Pre-Construction Checklist for X Drift	22	19DEC97	21JAN98	19DEC97	21JAN98												
TR682FA	Lease Constructors Equipment for ECRB																	
SC10340	Coord. Long Lead Procurements (If Any)	187	19MAY97	09FEB98	19MAY97	09FEB98												
SC10350	Develop Checklist for Pre-Construction	67	01JUL97	01OCT97	01JUL97	01OCT97												
SC10400	Prepare Muck Area	44	03NOV97	07JAN98	03NOV97	07JAN98												
SC10410	Muck Disposal	182	22JAN98	08OCT98	22JAN98	08OCT98												
TR682FA	Vent System Testing & Monitoring Water Use																	
SC10360	Detailed Program Planning	66	01JUL97	30SEP97	01JUL97	30SEP97												
SC10370	Monitoring & Data Collection	261	01OCT97	12OCT98	01OCT97	12OCT98												
Systems Engineering																		
TR12GB7	Requirements & ConOps Updates to Support																	
SE000110	ECRB Update to Con Ops	130	01OCT97	07APR98	01OCT97	07APR98												
SE000100	MGDS Req. Documents Updates - ECRB	261	01OCT97	12OCT98	01OCT97	12OCT98												
SE000120	ESFDR ECRB Support	261	01OCT97	12OCT98	01OCT97	12OCT98												

Project Start	12MAR97	Early Bar	ECRB
Project Finish	01MAR98	Progress Bar	
Date Date	19MAY97	Critical Activity	
Run Date	03JUL97		

Yucca Mountain Project ECRB - Revision 15

Activity ID	Activity Description	Orig Durr	Early Start	Early Finish	FY97		FY98		FY99		FY00		FY01		FY02	
TR16GB12 DAVIES/ MGDS ICD to Support ECRB																
SE000160	ICD	291	04NOV97	30DEC98			YCD									
SE000160	MGDS / ESF ICD Rev 1	0		30DEC98												
TR16GA3 Safeguards & Security																
SE000180	Specialty Engineering Support	522	01OCT97	22OCT99												
TR18GE2 DBE Definition & Analysis																
SE000190	DIE Support	522	01OCT97	22OCT99												
Performance Assessment Support																
TR547GA29 PA Support for ECRB - Phase II																
SL547A1	FY98 PA Support for ECRB - Phase II	261	01OCT97	12OCT98												
SL547A2	FY99 PA Support for ECRB - Phase II	261	13OCT98	22OCT99												
ES&H																
TR825FA1 Contractor Occupational Safety & Health																
SSNEX110	Contractor Operational Safety & Health	85	04JUN97	30SEP97												
TR86FA2 Support to Regulated Mat. Management																
SSNEX100	Support to Regulated Mat. Management	85	04JUN97	30SEP97												
123 Scientific Activities ESF																
TR32743GB1 Geotech Lab Testing for ECRB																
SPSD11B1	Collect SD-11 Rock Properties Samples	60	23APR98	17JUL98												
SP327B15	Collect Rock Properties Samples in ESF	64	01JUL98	30SEP98												
SPSD11B3	Test SD-11 Samples and Prepare Reports	64	20JUL98	16OCT98												
SP327B25	Test Rock Prop Samples and Prepare Rep in	61	01OCT98	29DEC98												
SPSD11B6	Finalize SD-11 Reports	61	19OCT98	15JAN99												
SPSD13A1	Collect SD-13 Samples	80	04DEC98	30MAR99												
SP327B35	Finalize Therm & Mech Lab Reports	62	30DEC98	29MAR99												
SPSDDM4	Subm TDIF Data Rpt for SD-11 Thermal Tests	0		15JAN99												
SPSDFM4	Subm TDIF Data Rpt for SD-11 Mech Tests	0		15JAN99												
SP327PM4	Subm TDIF Data Rpt for Mechanical Lab Test	0		29MAR99												
SPSD13A3	Test SD-13 Samples and Prepare Reports	64	31MAR99	29JUN99												
SPSD13A6	Finalize SD-13 Rock Properties Reports	64	30JUN99	29SEP99												

Project Start	12MAR97	Early Bar	ECRB
Project Finish	01MAR99	Progress Bar	
Data Date	19MAY97	Critical Activity	
Run Date	03JUL97		

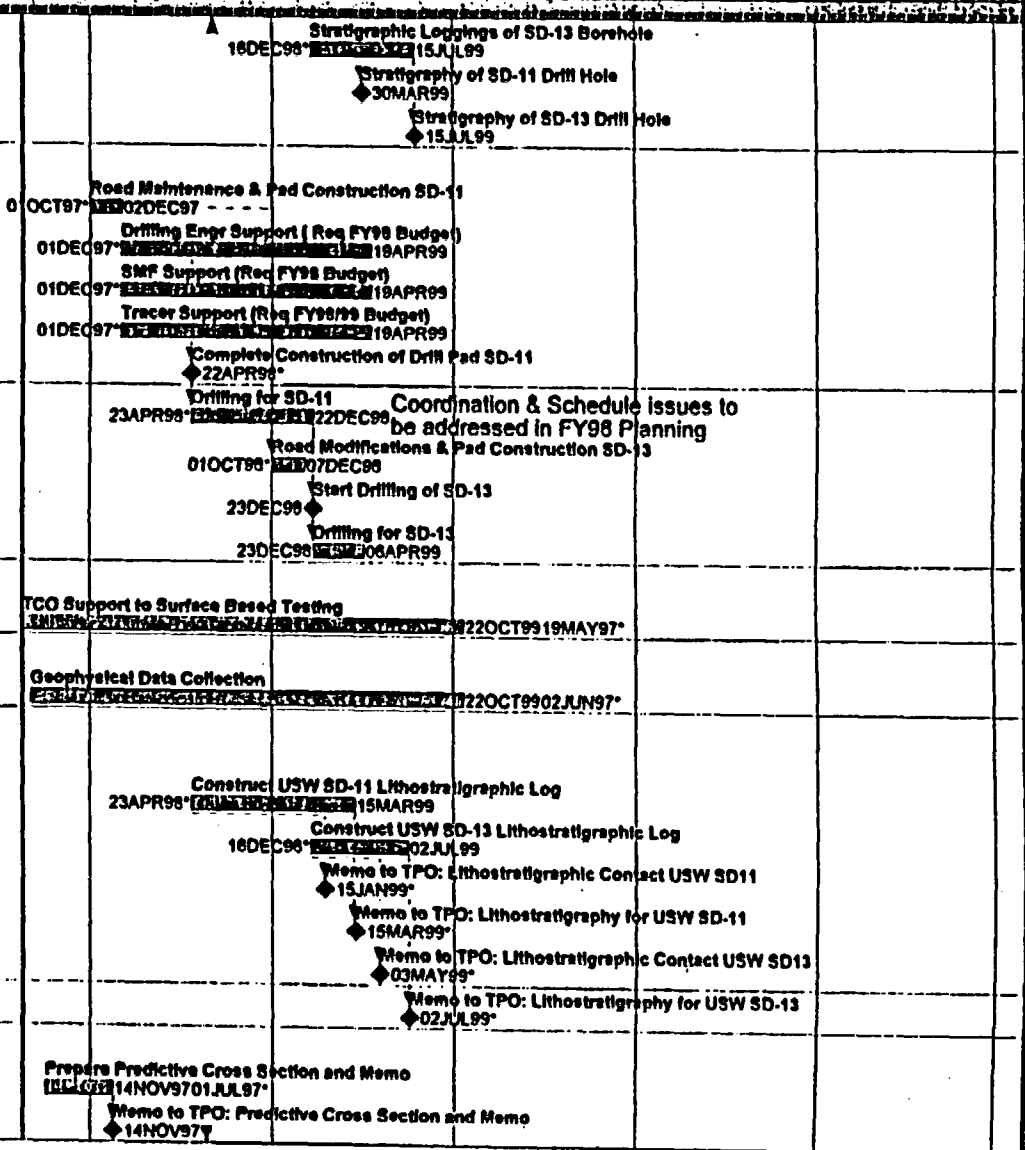
Yucca Mountain Project ECRB - Revision 15

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	FY97		FY98		FY99		FY00		FY01		FY02	
TR3B3GA ESF Geophys Logging & Data Collection																
SP3B3G10	ESF Geophysical Logging	218	01DEC97	08OCT98												
TR3E2GB Second Heater Test (in SW Drift)																
SP3E2100	Prepare test Plans & Prelim Design	219	01OCT97	12AUG98												
SP3E2130	Specify & Procure Instrumentation	240	02FEB98	13JAN99												
SP3E2110	Prepare Level 4 Prelim Test Ping & Design	32	01JUL98	14AUG98												
SP3E2AM4	Rpt: Prelim Test Planning & Design	0		14AUG98												
SP3E2140	Conduct Pre-Test T-H & T-M Predict Analyses	103	17AUG98	13JAN99												
SP3E2150	Conduct Pre-Test Characterization of Test Bed	103	17AUG98	13JAN99												
SP3E2160	Install Heaters, Instr & Data Logger System	62	15OCT98	14JAN99												
SP3E2BM4	Second Single Heater Test Heater Turn-On	0		15JAN99												
SP3E2180	Conduct Heating Phase	127	15JAN99	15JUL99												
SP3E2190	Conduct Cooling Phase	124	16JUL99	11JAN00												
SP3E2200	Conduct Post-Test Characterization Test Bed	54	12JAN00	27MAR00												
SP3E2210	Analy Data & Prep Drft Sec Sngl Htr Tst Fnl	63	12JAN00	07APR00												
SP3E2CM4	Draft Second Single Heater Test Final Rpt	0		07APR00												
SP3E2230	Prep Second Single Heater Test Final Rpt	33	10APR00	24MAY00												
SP3E2DM3	Second Single Heater Test Final Report	0		24MAY00												
TR6DEAL Test Coordination (FY97)																
SP6D100	Test Reqmnts input to Design & Construction	619	19MAY97	22OCT99												
SP6D150	Planning & Field Test Representative Test	619	19MAY97	22OCT99												
123 Scientific Activities Surface Based																
TR3211EB2 Analyze Quantitative Mineralogy of Core Samples																
SP320110	Real-Time Anly Hazard-Mineral in SD-11	60	23APR98	17JUL98												
SP32P8M4	Prelim Report on Hazard Mineral Distr at YM	0		17JUL98												
SP32P100	Real-Time Anly Hazard-Mineral in SD-13	60	04DEC98	30MAR99												
SP32PAM4	Preliminary Report on Hazard Mineral Distr	0		30MAR99												
TR3221EB2 Stratigraphic Descrip SBT Bholes																
SP322100	Stratigraphic Loggings of SD-11 Borehole	236	23APR98	30MAR99												

**Yucca Mountain Project
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Project Start	13MAR97	Early Bar	ECRB
Project Finish	09MAR99	Progress Bar	
Start Date	19MAY97	Critical Activity	
End Date	01JUL97		

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	FY97	FY98	FY99	FY00	FY01	FY02
SP322200	Stratigraphic Loggings of SD-13 Borehole	147	16DEC98*	15JUL99						
SP322DM4	Stratigraphy of SD-11 Drill Hole	0		30MAR99						
SP322CM4	Stratigraphy of SD-13 Drill Hole	0		15JUL99						
TR35GAGVRField Support to SB (Acc SD-11 & SD-13)										
SPCO100	Road Maintenance & Pad Construction SD-11	43	01OCT97*	02DEC97						
SP353G10	Drilling Engr Support (Req FY98 Budget)	350	01DEC97*	19APR99						
SP353G20	SMF Support (Req FY98 Budget)	350	01DEC97*	19APR99						
SP353G30	Tracer Support (Req FY98/99 Budget)	350	01DEC97*	19APR99						
SPSD11M3	Complete Construction of Drill Pad SD-11	0		22APR98*						
SPDSD11	Drilling for SD-11	169	23APR98*	22DEC98						
SPCO125	Road Modifications & Pad Construction SD-13	46	01OCT98*	07DEC98						
SPSD13M3	Start Drilling of SD-13	0	23DEC98							
SPDSD13	Drilling for SD-13	72	23DEC98	06APR99						
TR397FAWESFTest Coordination										
SP397A60	TCO Support to Surface Based Testing	619	19MAY97	22OCT99						
TR4B1FAWGeophysical Data Collection										
SP3B1100	Geophysical Data Collection	609	02JUN97*	22OCT99						
ST23E - Geologic Conifiratory Testing										
UG3221FB2Complete Site/Area Geologic Map										
SPG21A20	Construct USW SD-11 Lithostratigraphic Log	223	23APR98*	15MAR99						
SPG21A10	Construct USW SD-13 Lithostratigraphic Log	138	16DEC98*	02JUL99						
SPG21CM	Memo to TPO: Lithostratigraphic Contact	0		15JAN99*						
SPG21DM	Memo to TPO: Lithostratigraphy for USW	0		15MAR99						
SPG21AM4	Memo to TPO: Lithostratigraphic Contact	0		03MAY99						
SPG21BM4	Memo to TPO: Lithostratigraphy for USW	0		02JUL99*						
UG32212FB2Complete Site/Area Geologic Map										
SPG22A10	Prepare Predictive Cross Section and Memo	95	01JUL97*	14NOV97						
SPG22M4	Memo to TPO: Predictive Cross Section and	0		14NOV97						



Project Start: 12MAR97
 Project Finish: 01MAR99
 Start Date: 19MAY97
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Early Bar:
 Progress Bar:
 Critical Activity:
 ECRB

Yucca Mountain Project
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Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Activity Calendar																
					FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08					
UG32212B5 - Geologic Mapping in ECRB																					
SPG42A10	Conduct Mapping From Station 0+00 to 28+00	251	01OCT97*	30SEP98																	
SPG42GM	Geo/Geotech Data fm Cross Block Drift	0		30SEP98																	
UG32743B1 - Predictive Geotechnical Analysis ECRB																					
SPG42B10	Develop Predictive Geotechnical Memo	52	02SEP97*	14NOV97																	
SP327AM4	Memo to TPO: Predictive Geotech. Analysis	0		14NOV97																	
TR39BFB3 - Provide Prognoses of Planned Boreholes																					
SP3VB10	Prepare Draft Predictive Report for SD-11	22	02JAN98*	02FEB98																	
SP3VB1M3	Predictive Report for Borehole SD-11	0		02MAR98																	
SP3VB20	Prepare Draft Predictive Report for SD-13	23	01SEP98*	02OCT98																	
SP3VB2M3	Predictive Report for Borehole SD-13	0		02NOV98																	
SP3VB30	Prepare Draft Analysis & Measurements SD-11	42	01APR99*	28MAY99																	
SP3V3M3	Analysis of Prediction & Measurements Rpt:	0		01JUL99																	
SP3VB40	Prepare Draft Analysis & Measurements SD-13	43	01JUL99*	31AUG99																	
SP3VB4M3	Analysis of Prediction & Measurements Rpt:	0		30SEP99																	
ST24A - Hydrologic Data Collection																					
UG33126GB1 - Gas Phase Movement in the UZ																					
SPH22S10	Collect Data on Boreholes SD-11 and SD-13	251	01OCT98*	30SEP99																	
SPH22SM4	Memo to TPO: Results of Data Collected	0		30SEP99																	
ST24C - Hydrologic Ongoing Monitoring																					
UG33124FBD1 - Moisture Monitoring in the ESF																					
SPH36V30	Prep Data Pkg of Data Collected Sep97-Jul98	263	15SEP97*	30SEP98																	
SPH36V10	Conduct Analysis on Water Balance in Cross	514	15SEP97*	30SEP99																	
SPH36V20	Conduct Analysis of TBM Water Migration	196	22DEC97*	30SEP98																	
SPH36V40	Prep Data Pkg of Data Collected Sep98-Jul99	263	15SEP98*	30SEP99																	
SPH381M4	Memo to TPO: Sep97-Jul98 Data Pkg to	0		30SEP98*																	
SPH383M4	Memo to TPO: Rslts of Analysis &	0		30SEP98*																	
SPH382M4	Memo to TPO: Sep98-Jul99 Data Pkg to	0		30SEP99*																	
SPH384M4	Memo to TPO: Rslts of Analysis &	0		30SEP99*																	

**Yucca Mountain Project
ECRB - Revision 15**

Project Start	19MAR97	Early Bar
Project Finish	01MAR99	Progress Bar
Run Date	19MAY97	Critical Activity
Run Date	03JUL97	

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Activity Gantt Chart											
					FY97	FY98	FY99	FY00	FY01	FY02						
SPSDBM4	Subm TDIF Data Rpt for SD-13 Thermal Tests	0		29SEP99												
SPSDCM4	Subm TDIF Data Rpt for SD-13 Mech Tests	0		29SEP99												
UR32743GB1 Rock Mass Geomechanical Properties																
SP327D10	Plan & Drill In-Situ Stress Boreholes	64	01JUL98*	30SEP98												
SP327F10	Drill Bhole & Collect Core for Bhole Jack	64	01JUL98*	30SEP98												
SP327D20	Conduct In-Situ Stress Tests	61	01OCT98	29DEC98												
SP327F20	Perform Borehole Jack Tests	61	01OCT98	29DEC98												
SP327D30	Analyze In-Situ Stress Data and Prepare	62	30DEC98	29MAR99												
SP327F30	Analyze Results and Prepare Report	62	30DEC98	29MAR99												
SP327DM4	Subm Data Analysis In-Situ Stress Report	0		29MAR99												
SP327FM4	Subm Data Analysis for Bhole Jack Report	0		29MAR99												
UR32743GB3 Seismic Tomography Testing for ECRB																
SP327G10	Analyze Results and Prepare Report	128	01APR98*	30SEP98												
SP327GM4	Subm Data Analysis for Bhole Jack Report	0		30SEP98												
UR32744GB1 In-Situ Design Verification for ECRB																
SP327H10	Perform In-Situ Design Verification for ECRB	128	01APR98*	30SEP98												
SP327HM4	Subm Data Analysis for Bhole Jack Report	0		30SEP98												
UR33124EBB ESF Moist Monitg/Drift Seep Test																
SP33C025	Moisture Monitoring Predictions	154	01JUL97*	05FEB98												
SP33C050	Activity ID Activity descripTBM Water	197	22DEC97*	30SEP98												
SP33C100	Water Balance	263	22DEC97*	06JAN99												
SP33S3M4	Ltr Rpt: Pred Local Pim Migr E-W Drift X-over	0		30JAN98*												
SP33T1M4	Ltr Rpt: Modl Predict E-W Drft Impact Moist	0		05FEB98												
SP33T2M4	Ltr Rpt: Progr Moist & Wall Monit in E-W Drift	0		30APR98*												
SP33C600	In-Situ Testing	328	12JUN98*	28SEP99												
SP33C700	Testing	328	12JUN98*	28SEP99												
SP33S4M4	Ltr Rpt: Progr Ceiling/Niche Monit ESF Main	0		30JUN98*												
SP33T3M4	Ltr Rpt: Progr Dust Collect & Seepage	0		30JUN98*												
SP33T4M4	Ltr Rpt: Progr LiBr Samp & Vert Temp & Perc	0		31AUG98												

Project Start: 12MAR97
 Project Finish: 01MAY99
 Data Date: 19MAY97
 Run Date: 03JUL97

Legend:
 Early Bar
 Progress Bar
 Critical Activity

Yucca Mountain Project ECRB - Revision 15

Activity ID	Activity Description	Orig Dir	Early Start	Early Finish	FY97												FY98												FY99												FY00												FY01												FY02											
					Activity												Activity												Activity												Activity												Activity												Activity											
SP33S9M3	Rpt: Construction Water/Dust Control in	0		30NOV98																									Rpt: Construction Water/Dust Control in X-Drift. ◆ 30NOV98*																																															
SP33S6M4	Ltr Rpt: Alcove Test Plan & Tracer Test	0		31DEC98*																									Ltr Rpt: Alcove Test Plan & Tracer Test Design ◆ 31DEC98*																																															
SP33T9M3	Rpt: Moisture Monitoring & Plume Evaluation	0		30AUG99																									Rpt: Moisture Monitoring & Plume Evaluation ◆ 30AUG99*																																															
SP33S7M4	Ltr Rpt: Drift-Drift Hydro Interact E-W Drift & Alc	0		30SEP99*																									Ltr Rpt: Drift-Drift Hydro Interact E-W Drift & Alc ◆ 30SEP99*																																															
TR33296 - GPD Ventilation Monitoring in Unit ESF																																																																												
SP33G910	Conduct Moisture Monitoring ESF	131	01DEC97*	05JUN98	01DEC97*												05JUN98												Conduct Moisture Monitoring ESF ◆ 01DEC97*																																															
SP33G9M4	Ltr Rpt: Relts Dust/Fiber Measur with Water	0		19MAR98																									Ltr Rpt: Relts Dust/Fiber Measur with Water Use ◆ 19MAR98																																															
TR33129 - EHC Confirm UZ Hydrologic Flow Models																																																																												
SP33A100	Confirm UZ Hydrologic Flow Model	146	05FEB98*	01SEP98	05FEB98*												01SEP98												Confirm UZ Hydrologic Flow Model Predictions ◆ 05FEB98*																																															
SP33AAM4	Prediction of Ambient Cond of E-W Drift	0		01SEP98																									Prediction of Ambient Cond of E-W Drift ◆ 01SEP98																																															
TR3557A - DES FAT & Sump Support																																																																												
SP355A50	Drilling/Testing Assoc w/ Launch Chamber	62	15SEP97	11DEC97	15SEP97												11DEC97												Drilling/Testing Assoc w/ Launch Chamber Excav ◆ 15SEP97																																															
SP355A85	Drilling Engr Support (Req FY98/99 Budget)	534	15SEP97	22OCT99	15SEP97												22OCT99												Drilling Engr Support (Req FY98/99 Budget) ◆ 15SEP97																																															
SP355A90	SMF Support (Req FY98/99Budget)	534	15SEP97	22OCT99	15SEP97												22OCT99												SMF Support (Req FY98/99Budget) ◆ 15SEP97																																															
SP355A95	Tracer Test Support (Req FY98/99Budget)	534	15SEP97	22OCT99	15SEP97												22OCT99												Tracer Test Support (Req FY98/99Budget) ◆ 15SEP97																																															
SP355A55	Drift - 9 Shifts for Launch Chamber Test	4	17DEC97	22DEC97	17DEC97												22DEC97												Drift - 9 Shifts for Launch Chamber Test ◆ 17DEC97																																															
SP355A60	Drilling/Testing Assoc w/ Cross Drift Excav	83	22JAN98	19MAY98	22JAN98												19MAY98												Drilling/Testing Assoc w/ Cross Drift Excav ◆ 22JAN98																																															
SP355A65	Constructor Test Support	363	04JUN98	08NOV99	04JUN98												08NOV99												Constructor Test Support ◆ 04JUN98																																															
SP355A75	Drilling/Testing Assoc w/ Alcoves/Niches	340	27JUL98	29NOV99	27JUL98												29NOV99												Drilling/Testing Assoc w/ Alcoves/Niches Excav ◆ 27JUL98																																															
TR397A2 - Surfaced Based Test Coordination Office																																																																												
SP397B10	Test Requirements Input to Design &	445	19MAY97	17FEB99	19MAY97												17FEB99												Test Requirements Input to Design & Construction ◆ 19MAY97																																															
SP397B20	Planning & Field Test Representative Test	619	19MAY97	22OCT99	19MAY97												22OCT99												Planning & Field Test Representative Test Mgmt ◆ 19MAY97																																															
TR398B8 - Predictive Report																																																																												
SP39B100	Develop Predictions for E-W Drift	92	01AUG97	10DEC97	01AUG97												10DEC97												Develop Predictions for E-W Drift ◆ 01AUG97																																															
SP39B1M3	Predictive Report	0		15DEC97*																									Predictive Report ◆ 15DEC97*																																															
TR398B7 - ALAND Predictive Reports																																																																												
SP39C100	Develop Predictions for E-W Drift	76	01AUG97	14NOV97	01AUG97												14NOV97												Develop Predictions for E-W Drift ◆ 01AUG97																																															
SP39C1M3	Predictive Report	0		15DEC97*																									Predictive Report ◆ 15DEC97*																																															

Project Start	12MAR97	Early Bar
Project Finish	01MAR99	Progress Bar
Date Data	19MAY97	Critical Activity
Run Date	03JUL97	

ECRB
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Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Gantt Chart (FY97-FY02)											
					FY97	FY98	FY99	FY00	FY01	FY02						
ST24D - Synthesize Data/Write Ch 2.4, Hydrologic																
OG36221FB31(Syn)Dist&Anal,Geochron(Age)Dets,Polym,Percol,Water																
SPH36X30	Sample Bh's for Oxygen/Hydrogen/Isotopic	240	01OCT97*	15SEP98	Sample Bh's for Oxygen/Hydrogen/Isotopic Analysis 0 OCT97 - 15SEP98											
SPH373M4	Memo to TPO: Preliminary Interpretations of	0		15SEP98	Memo to TPO: Preliminary Interpretations of Data 15SEP98											
SPC23G10	Collect Calcite and Opal Data in Cross Drift	40	01OCT97*	28NOV97	Collect Calcite and Opal Data in Cross Drift 0 OCT97 - 28NOV97											
SPC23G20	Collect Samples of Calcite and Opal	251	01OCT97*	30SEP98	Collect Samples of Calcite and Opal Occurrences 0 OCT97 - 30SEP98											
SPC233M4	Memo to TPO: ECRB Spatiotemporal	0		28NOV97	Memo to TPO: ECRB Spatiotemporal Predictions 28NOV97											
SPC234M4	Memo to TPO: Eval and Grade Predictions	0		30SEP98*	Memo to TPO: Eval and Grade Predictions 30SEP98											
SPC235M4	Memo to TPO: Rslts Geochronologic/Isotopic	0		30SEP98	Memo to TPO: Rslts Geochronologic/Isotopic Analy 30SEP98											
SPC23G50	Prep Report Describing Spatiotemporal Distr	240	01OCT98*	15SEP99	Prep Report Describing Spatiotemporal Distr 01OCT98 - 15SEP99											
SPC23G30	Sample Fracture Fillings from Solitario	251	01OCT98*	30SEP99	Sample Fracture Fillings from Solitario Canyon 01OCT98 - 30SEP99											
SPC23G40	Complete Numerical Age and Isotopic	251	01OCT98*	30SEP99	Complete Numerical Age and Isotopic Analysis 01OCT98 - 30SEP99											
SPC233M7	Spatiotemporal Distribution of Percolation	0		15SEP99*	Spatiotemporal Distribution of Percolation 15SEP99											
ST24E - Hydrologic Confiratory Testing																
OG33123FB3E(Air)Perm Testing,SD(6)&WT 24																
SPH224	Inspect Air-K Testing Equip for Req Maint	64	01JUL97*	30SEP97	Inspect Air-K Testing Equip for Req Maint Needs 01JUL97 - 30SEP97											
SPH225	Prepare Listing of Req Maint & Calibration	64	01JUL97*	30SEP97	Prepare Listing of Req Maint & Calibration Needs 01JUL97 - 30SEP97											
SPH224M4	Memo to TPO: Status Air-Permeability Tstg	0		30SEP97	Memo to TPO: Status Air-Permeability Tstg Equip 30SEP97											
SPH264	Conduct Air-K Testing in USW SD-11	63	15JAN99*	15APR99	Conduct Air-K Testing in USW SD-11 15JAN99 - 15APR99											
SPH274	Prepare Data Pkg Air-K Testing USW SD-11	63	16APR99*	15JUL99	Prepare Data Pkg Air-K Testing USW SD-11 16APR99 - 15JUL99											
SPH234	Conduct Air-K Testing in USW SD-13	63	26APR99*	23JUL99	Conduct Air-K Testing in USW SD-13 26APR99 - 23JUL99											
SPH264M4	Memo to TPO: Air Permeability Tstg USW	0		14MAY99	Memo to TPO: Air Permeability Tstg USW SD-11 14MAY99											
SPH274M4	Memo to TPO: SD11 Air Permeability Data to	0		15JUL99*	Memo to TPO: SD11 Air Permeability Data to RPC 15JUL99											
SPH284	Prepare memo Air Permeability Tstg USW	64	16JUL99*	15OCT99	Prepare memo Air Permeability Tstg USW SD-11 16JUL99 - 15OCT99											
SPH244	Prepare Data Pkg Air-K Testing USW SD-13	64	26JUL99*	25OCT99	Prepare Data Pkg Air-K Testing USW SD-13 26JUL99 - 25OCT99											
SPH234M4	Memo to TPO: Air-Permeability Tstg in USW	0		25AUG99	Memo to TPO: Air-Permeability Tstg in USW SD-13 25AUG99											
SPH284M4	Memo to TPO: Air Permeability Tstg USW	0		15OCT99*	Memo to TPO: Air Permeability Tstg USW SD-11 15OCT99											
SPH294M4	Memo to TPO: SD13 Air Permeability Data to	0		25OCT99*	Memo to TPO: SD13 Air Permeability Data to RPC 25OCT99											

Project Start 12MAR97
Project Finish 01MAR99
Task Date 19MAY97
Task Date 03JUL97

Early Bar
Progress Bar
Critical Activity

ECRB

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Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	FY97		FY98		FY99		FY00		FY01		FY02	
SPH35Q70	Prep/Sub Letter to TPO on Draft Report	32	01APR99*	14MAY99												
SPH356M4	Memo to TPO: Submit of Draft Interperive	0		14MAY99												
SPH354M4	Memo to TPO:Data Pkg Condx/Properties to	0		30SEP99*												
SPH355M4	Memo to TPO: Rslts Analysis & Interp	0		30SEP99*												
UG33124 BB: Air Permeability & Hydrochemical Testing																
SPH35G10	Conduct Air-K/Hydrochem Tstg Solitario	85	12JAN99*	12MAY99												
SPH35GM	Memo to TPO: Start of Solitario Canyon Fit	0		15JAN99												
SPH35G20	Prepare Memo on Air-K/Hydrochem Testing	77	13MAY99	31AUG99												
SPH35KM4	Memo to TPO: Rslts of Tstg in Solitario	0		31AUG99												
UG33127 GB2: Isotopic & Hydrochemical Studies																
SPH37A20	Conduct Chemical and Isotopic Char of Pore	240	01OCT98*	15SEP99												
SPH37A30	Prepare Report on UZ Pore Waters	240	01OCT98*	15SEP99												
SPH37AM3	Unsaturated Zone Pore Waters	0		15SEP99												
UG33131 EF: AWT) Eh & pH Measurements																
SPC34B	Compile Rslts of data Compilation and Hydro	97	19MAY97	03OCT97												
SPC34A	Assemble and Evaluate Existing Ground	139	19MAY97	05DEC97												
SPC34C	Obtain/Analyze New Water samples fm Well	139	19MAY97	05DEC97												
SPC34BM4	Memo to TPO: Data Pkg of Existing SZ Chem	0		03OCT97												
SPC34CM4	Memo to TPO: Chem/Iso Anlys on Wtr	0		05DEC97												
SPC34A30	Procure and Assemble Sampling Equipment	79	05JAN98*	27APR98												
SPC34A10	Sample Perched Wtr Encountered	228	28APR98*	25MAR99												
SPC34A20	Sum Ion and Isotopic Data Collected	132	26MAR99	30SEP99												
SPC344M4	Memo to TPO: Ion and Isotopic FY99 Data	0		30SEP99												
UG33131 EG: Perched Water & SZ Hydraulic																
SPH228	Monitor WT-24 Bh During Constr for Perched	85	02JUN97*	30SEP97												
SPH229	Cond Bh Hydraulic Tsts of Observed Perched	85	02JUN97*	30SEP97												
SPH228M4	Memo to TPO:Rslts of Perched-Water	0		30SEP97												
SPH228A	Monitor SD-6 Bh During Constr for Perched	165	03NOV97	30JUN98												
SPH229A	Cond Bh Hydraulic Tsts of Observed Perched	165	03NOV97	30JUN98												

Project Start	12MAR97	Early Bar
Project Finish	01MAR92	Progress Bar
Data Date	19MAY97	Critical Activity
Run Date	03JUL97	

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Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	FY97	FY98	FY99	FY00	FY01	FY02
SP321RM4	Fast-Path Feature Mineral Input to L III Pred	0		01DEC97*		Fast-Path Feature Mineral Input to L III Pred Rp ◆01DEC97*				
SP321SM4	Progress Report on Characterization of	0		30SEP98*			Progress Report on Characterization of Fast-Path ◆30SEP98*			
SP321TM4	Final Report on Characterization of Fast-Path	0		30SEP99*				Final Report on Characterization of Fast-Path ◆30SEP99*		
TR3322E3: Distribution of Chlorides & Halides										
SP331500	Distr of CL-36 & Halides in E-W Drift	567	02JUN97*	22SEP99		Distr of CL-36 & Halides in E-W Drift				
SP331AM4	Pred Distr of CL-36 & Chloride Porewater	0		01DEC97*		Pred Distr of CL-36 & Chloride Porewater Concent ◆01DEC97*				
SP331BM4	Prog Rpt on Distr CL-36 & Chl Powtr	0		30SEP98*			Prog Rpt on Distr CL-36 & Chl Powtr Concentr ◆30SEP98*			
SP331CM4	Summ Rpt on Distr CL-36 & Chl Powtr	0		30SEP99*				Summ Rpt on Distr CL-36 & Chl Powtr Concentr ◆30SEP99*		
TR3322E3: ESEM/DRIFT MONITORING/DRIFT SUPPORT										
SP33C900	Drift/Drift Borehole Predictions	84	01OCT97*	30JAN98		Drift/Drift Borehole Predictions ◆01OCT97*				
SP33S8M4	LtrRpt: Progr Test Site Char & Trcr Flow	0		15OCT97*		LtrRpt: Progr Test Site Char & Trcr Flow Confirm ◆15OCT97*				
SP33T8M4	LtrRpt: Progr Lab Measurmnt of Core &	0		15MAY98			LtrRpt: Progr Lab Measurmnt of Core & Samples ◆15MAY98*			
SP33S5M4	Rpt: Final on Fract Flow, Matr/ Interact &	0		03AUG98			Rpt: Final on Fract Flow, Matr Interact & Imbth ◆03AUG98*			
SP33T5M4	Rpt: Rslts & Eval of Drift/Drift Bh Hydro Intera	0		14AUG98			Rpt: Rslts & Eval of Drift/Drift Bh Hydro Intera ◆14AUG98*			
TR3412E3: Microbial Analyses										
SP34K100	Microbial Analysis	267	02JUN97*	17JUN98		Microbial Analysis ◆02JUN97*				
SP34K1M4	Rpt: Predictive Rpt Microbial Analysis	0		01DEC97*		Rpt: Predictive Rpt Microbial Analysis ◆01DEC97*				
TR3557E3: Test Logging Support										
SP355A70	Drill Solitario Canyon Borehole	10	20MAY98	03JUN98		Drill Solitario Canyon Borehole 20MAY98/03JUN98				
TR3988E3: Provide Progresses for Planned Borehole										
SP3VB15	Review Draft Predictive SD-11 Report	19	03FEB98	02MAR98		Review Draft Predictive SD-11 Report 03FEB98/02MAR98				
SP3VB25	Review Draft Predictive SD-13 Report	21	05OCT98	02NOV98		Review Draft Predictive SD-13 Report 05OCT98/02NOV98				
SP3VB35	Review Draft Analysis & Measurement	23	01JUN99	01JUL99		Review Draft Analysis & Measurement SD-11Rpt 01JUN99/01JUL99				
SP3VB45	Review Draft Analysis & Measurement SD-13	21	01SEP99	30SEP99		Review Draft Analysis & Measurement SD-13 Rpt 01SEP99/30SEP99				
TR3925E3: Geophysical All Data Collection										
SPB2A25	Analyze Geophysical Logs from SD-11	177	19MAY97	26JAN98		Analyze Geophysical Logs from SD-11 19MAY97/26JAN98				
SP3B2C15	Conduct Neutron Log Analysis	68	01JUL97*	30OCT97		Conduct Neutron Log Analysis 01JUL97/30OCT97				
SPB2C10	Phase I: Pre-Tunneling Monitoring	106	01SEP97*	30JAN98		Phase I: Pre-Tunneling Monitoring 01SEP97/30JAN98				
SP3B2DM4	Rpt: Status of Neutron Log Analysis	0		30OCT97		Rpt: Status of Neutron Log Analysis ◆30OCT97				

Project Start	12MAR97	Early Bar	ECRB
Project Finish	01MAR99	Progress Bar	
Data Date	19MAY97	Critical Activity	
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