WBS: 1.2.6
QA: N/A

**Civilian Radioactive Waste Management System
Management and Operating Contractor**

**Title III Evaluation Report
for the
Material and Personnel Handling System**

BABFCC000-01717-5705-00001 Rev 01

May 1998

Prepared for:

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Under Contract Number
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**Civilian Radioactive Waste Management System
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Material and Personnel Handling System**

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May 1998

Prepared by:

Thomas A. Misiak, Technical Document Preparer

5-21-98
Date

Approved by:

William Kennedy, Department Manager

5-21-98
Date

**TITLE III EVALUATION REPORT
MATERIAL AND PERSONNEL HANDLING
BABFCC000**

1. OBJECTIVE

1.1 Introduction

This Title III Evaluation Report (TER) provides the results of an evaluation that was conducted on the Material and Personnel Handling System. This TER has been written in accordance with the *Technical Document Preparation Plan for the Mined Geologic Disposal System Title III Evaluation Reports* (BA0000000-01717-4600-00005 REV 03).

1.2 Objective

The objective of this evaluation is to provide recommendations to ensure consistency between the technical baseline requirements, baseline design, and the as-constructed Material and Personnel Handling System. Recommendations for resolving discrepancies between the as-constructed system, the technical baseline requirements, and the baseline design are included in this report. Cost and Schedule estimates are provided for all recommended modifications.

1.3 Methodology

The methodology used in the Title III Evaluation Reports of the Material and Personnel Handling System consists of the following activities:

- a field investigation to inspect the as-constructed system;
- comparison of the as-constructed system with the ESF design requirements (e.g., ESF design requirements, operational requirements, and S&H requirements) to determine if the as-constructed system satisfies the requirements;
- a review of Level 3 design documents, field investigation data, and as-constructed documentation to determine deviations between the design and as-constructed Material and Personnel Handling System;
- a review of operational requirements to determine if the as-constructed system is capable of performing/supporting the operational requirements; and
- development of recommendations to resolve discrepancies.

2. SCOPE

This TER covers the Material and Personnel Handling System. The Material and Personnel Handling System is defined as those systems, subsystems, structures, equipment, and components that transport materials (including supplies, muck, and fuel), personnel, and equipment to and from the underground areas to meet the needs of construction and underground site characterization testing. It includes all equipment, conveyances, and other appurtenances required to efficiently move material and personnel to accomplish this effort. Equipment included with this system includes rail, concrete invert segments, rail fixation systems, locomotives, general and special usage rail cars, and special muck handling rail cars and loading systems.

3. QUALITY ASSURANCE

The purpose of this TER is not to implement QA controls associated with the Material and Personnel Handling System. Rather, this document identifies those QA controls which continue to be applicable to the operation of the system. The implementation of QA control is specifically addressed in the design drawings and specifications for the Material and Personnel Handling System.

This evaluation does not comprise a QA design input. The systems, structures, and components to which it applies are not classified in accordance with QAP-2-3, *Classification of Permanent Items*, and do not rely on or incorporate any QA controls identified within any applicable Determination of Importance Evaluation (DIE). Preparation of this evaluation is not subject to *Quality Assurance Requirements and Description* requirements. QA:N/A.

4. FIELD INSPECTION

4.1 Summary

The field inspection participants met at the North Portal and conducted a walk-down of the Exploratory Studies Facility to Alcove #5. The rail system, inverts, and switch tracks at Alcove #5 were inspected and evaluated. After inspecting the subsurface items, a tour around the Constructor's yard was performed to inspect the rolling stock situated outside and to evaluate the surface rail system.

4.2 Date

10/21/97

4.3 Participant/Organization

T. Misiak

Title III A/E

G. Westwood	CMO
K. Frederick	M&O Safety & Health
J. Pullen	Repository Design
J. Ingram	MK Rail - Boise Home Office
G. Teraoka	System Engineering
S. Rindskopf	System Engineering
L. Beatty	System Engineering

4.4 Records Reviewed

See Section 9, REFERENCES, for complete list of records evaluated for this TER on the Material and Personnel Handling System.

4.5 Results

The subsurface inspection revealed that the Material and Personnel Handling system was installed per the design documents and approved Constructor submittals except for grouting the rebar ties in place which had been deferred to facilitate construction. However, the track needs realignment to bring it within the designed tolerances and also needs to be grouted in place to conform with the design. The removal of the outer two rails had begun between Station 0+00 m and Station 20+00 m for use within the ECRB Cross Drift . The removal of the outer rails does not affect the availability of the track system, nor does it sacrifice the safe transportation of material and personnel. It should be noted that this TER may not be applicable to certain 3.01X areas (example: Station 71+07 m to Station 71+44 m). Design for those areas will be prepared as required to close out the 3.01X Plans. The surface inspection revealed that the system of rail and turnouts used to bring material and rolling stock to the North Portal was satisfactory. The rolling stock inspection revealed that several of the Constructor's rail cars needed items to bring them into compliance with the specifications. All results are summarized in Section 7.

5. OPERATIONAL REQUIREMENTS

5.1 System Operational Description

The system consists of three sets of track comprised of four rails anchored to the concrete invert. Rolling stock can access any pair of rail by means of a special switching system.

5.2 Operating Parameters

Operating Parameter	Reference	Discussion
The track system shall allow for operation on a three-shift-per-day, seven-day-per-week schedule.	Ref. 9.3	This requirement has been met during construction and should continue being implemented during operations.
The track system shall be designed to provide an inherent availability of 98 percent, with maintenance per the Supplier's recommendation.	Ref. 9.3	The track system was designed to provide an inherent availability of 98 percent (Ref. 9.16).
The track system shall be designed and constructed so that it can be easily and economically maintained.	Ref. 9.3	This requirement has been met during construction and should continue being implemented during operations.
The track system shall be designed to allow ease of replacement of installed equipment.	Ref. 9.3	This requirement has been met during construction and should continue being implemented during operations.
The track system design and construction shall provide access to all points, items, units, and components which require testing, servicing, adjusting, removal, replacement, or repair.	Ref. 9.3	This requirement has been met during construction and should continue being implemented during operations.
Locomotive operating speed is 15 mph.	Ref. 9.3	This requirement has been met during construction and should continue being implemented during operations. It should be noted that the locomotive speedometers are currently inadequate to verify this requirement, but are going to be replaced.
Turnouts shall allow for operation on a three-shift-per-day, seven-day-per-week schedule.	Ref. 9.4	This requirement has been met during construction and should continue being implemented during operations.
Turnouts shall be designed and constructed so that it can be easily and economically maintained.	Ref. 9.4	This requirement has been met during construction and should continue being implemented during operations.
Turnouts shall be designed to allow ease of replacement of installed equipment.	Ref. 9.4	This requirement has been met during construction and should continue being implemented during operations.

Operating Parameter	Reference	Discussion
Turnout design and construction shall provide access to all points, items, units, and components which require testing, servicing, adjusting, removal, replacement, or repair.	Ref. 9.2	This requirement has been met during construction and should continue being implemented during operations.

5.3 Operating Permits

None

5.4 Operating S&H

Operating S&H	Reference	Discussion
Brackets, two at each end of car with pins for safety chains shall be installed on each car for 16 mm (5/8 inch) special alloy high strength steel chain with ends to fit the pins.	Ref. 9.6	This requirement should be changed to reflect and permit the use of cables as currently used on all cars and allowed by OSHA.
Cars shall have sealed wheel bearings to prevent hydrocarbon releases.	Ref. 9.6	This requirement has been met during construction and should continue being implemented during operations.
Two reflectors shall be mounted on each end of the cars.	Ref. 9.6	This requirement has been partially met during construction. Several rail cars need to have reflectors placed on each end to fully comply with this requirement.
The locomotive and all rail cars shall be equipped with air brakes of the same type. A compressor of sufficient capacity shall be installed on the locomotive unit for the locomotive and up to five supply cars.	Ref. 9.6	Some rail cars are not in compliance with this requirement as all are not equipped with air brakes. However, OSHA requires only <i>suitable means of stopping</i> which is technically met by the connection to the locomotive and rail cars equipped with air brakes. This requirement should be changed to reflect the OSHA requirement. NOTE: When using rail cars without air brakes, the Constructor should evaluate the train configuration for run away skid conditions.

Operating S&H	Reference	Discussion
An automatic or "fail safe" airbrake system shall be installed for the train system. An air line break or loss of air to below the safe operating pressure will set the spring operated brakes and automatically stop the train.	Ref. 9.6	This requirement has been met by the locomotives and rail cars equipped with air brakes and should continue being implemented during operations.
Rail cars shall have restraints (tie-downs) and/or guards which prevent supplies and equipment from shifting during transit.	Ref. 9.6	This requirement has been met during construction and should continue being implemented during operations.
Locomotives shall have sealed wheel bearings to prevent hydrocarbon release.	Ref. 9.7	This requirement has been met during construction and should continue being implemented during operations.
Locomotives shall be equipped with audible bells, horn or whistle.	Ref. 9.7	This requirement has been met during construction and should continue being implemented during operations.
Locomotives shall be equipped with steps or footboards made of nonslip material, and handholds shall be provided.	Ref. 9.7	This requirement has been met during construction and should continue being implemented during operations.
Locomotives shall be equipped with appropriate lighting, hour and amp meters and any other necessary information or control gauges.	Ref. 9.7	This requirement has been met during construction and should continue being implemented during operations.
Locomotives shall have flashing or rotating lights visible from front and rear.	Ref. 9.7	This requirement has been met during construction and should continue being implemented during operations.
Locomotives shall have approved exhaust conditioner(s) for removal of exhaust emissions as required for the ESF subsurface operation.	Ref. 9.7	This requirement has been met during construction and should continue being implemented during operations. NOTE: The issue of exhaust emissions on all underground equipment is currently being separately discussed. The results will dictate the status of the locomotives.

5.5 Operating QA Controls

Operating QA Control	Reference	Discussion
<p>The Constructor is permitted, subject to the following controls, to use diesel powered equipment in the TS Tunnel Loop and associated alcoves. Beyond Station 28+05 m diesel locomotives shall have exhaust treatment systems installed to reduce Diesel Particulate Matter (DPM) emissions. Diesel equipment exhaust emissions shall be monitored by the Constructor as described below and the information acquired under this monitoring program documented as QA records.</p> <ol style="list-style-type: none"> 1. Engines for all diesel powered equipment used in the TS Tunnel Loop and associated alcoves shall be maintained in accordance with the manufacturer's recommendations, including adjustment of the fuel system, proper maintenance of the engine air intake system and exhaust conditioning system. Exhaust emissions shall be tested/monitored prior to first use in the TS Tunnel Loop and thereafter as follows: <ol style="list-style-type: none"> a. When excessive emissions are visually observed (excluding warm-up periods or hard acceleration when "smoking" is normal) b. Prior to taking the equipment underground following maintenance of any emission related engine system 	<p>Ref. 9.19</p>	<p>This QA control is the responsibility of the Constructor. The Constructor Technical Control Procedure TCP-2.21, BAB000000-01717-6300-01501-CD-34-11 (Ref. 9.20) meets the intent of this requirement.</p>

Operating QA Control	Reference	Discussion
<p>Continued from previous Operating QA Control:</p> <ul style="list-style-type: none"> c. At normal 500 hour intervals of engine operation and not to exceed 525 hours <p>2. Exhaust emission constituents to be monitored include the following:</p> <ul style="list-style-type: none"> a. Diesel Particulate Matter (DPM) b. Oxides of Nitrogen (No_x) c. Sulphur Dioxide (SO₂) d. Carbon Monoxide (CO) and Carbon Dioxide (CO₂) <p>3. The Constructor shall implement a program to minimize diesel exhaust emissions in the tunnel. The program shall include the following:</p> <ul style="list-style-type: none"> a. Diesel engines shall be tuned in accordance with the manufacturer's recommendations for the service application and shall be tested for the exhaust emission constituents specified in Para. 3.01S.2. Constructor shall use the test results to develop on-site standards for each engine. The on-site standards shall include a 25% allowance factor for engine wear (i.e. multiply test result by 1.25). Engines that exceed the on-site exhaust emission standard on subsequent tests shall be 		

Operating QA Control	Reference	Discussion
<p>Continued from previous Operating QA Control:</p> <p>brought into compliance before using underground.</p> <p>b. Minimize engine idling time in the tunnel</p> <p>c. Engine warm-up prior to taking the equipment underground</p> <p>The Constructor shall prepare a procedure for implementing the exhaust emission minimization program <i>including qualified and trained test equipment operators</i> and submit it to the A/E for review and approval. Approved Procedure shall be implemented prior to tunnel advance beyond Station 4+00 m. (Hold Point) <i>The Emission test instrumentation shall be operated to ensure the repeatability of measurements and shall be described in the Constructor's implementing procedure. Documentation of the repeatability verification shall be maintained.</i></p> <p>4. Only low sulphur diesel fuel equal to or less than 0.05% sulphur by weight shall be used in the ESF Subsurface Facilities. The following related control shall also apply:</p> <p>a. The Constructor shall record equipment hour meter readings and fuel usage for each piece</p>		

Operating QA Control	Reference	Discussion
Continued from previous Operating QA Control: of underground equipment when it is refueled.		
The use of permanently retained organics during the construction and operation of the TS Tunnel Loop and associated alcoves shall be avoided, when practical alternative materials and methods exist. Potential equipment fluid leaks shall be minimized by performing regular inspections and scheduled maintenance. Spills of <i>organics</i> , solvents and powders in excess of drips shall be cleaned up in accordance with the SRP (Para. 3.01M). Cleanup of liquids shall include removal of puddles and partially saturated soils. Cleanup of powders shall include removal of the powder and sweeping solid surfaces to remove powder remnants. Organic spills on the invert segment which are absorbed by the invert segment need not be removed if it is clear that the spilled material is not likely to penetrate to the tunnel floor or past the invert segment seals. Any unrecovered organics spilled or permanently retained in the TS Tunnel Loop and associated alcoves shall be reported in accordance with the TFM Data Reporting and Management procedure.	Ref. 9.19	This QA control is the responsibility of the Constructor. The Constructor's Submittal BAB000000-01717-6300-01501-CD-28-1 (Ref. 9.21), Spill Response Plan, meets the intent of this requirement.

6. BASELINE REQUIREMENTS

6.1 ESFDR Requirements

ESFDR Requirements		
ESFDR Requirement	Satisfied	Description
3.2.1.2.1.2.A The permanent and temporary items of the ESF shall be designed to withstand the applicable seismic environment specified in Appendix A.	Yes	The concrete invert design accounted for the appropriate seismic reaction of 0.39g (TBV); however, the design is controlled by the larger reaction forces of the lifting mechanisms (rigging reactions).
3.2.1.2.1.2.B The ESF subsurface facilities and equipment shall be designed to withstand and operate in a dusty environment.	Yes	Bearing seals and air cleaners on the rolling stock effectively allow operation in a dusty environment.
3.2.1.2.1.2.C The ESF subsurface facilities and equipment shall be designed to withstand and operate in temperatures ranging from a low of 50 degrees F to a high of 70 degrees F.	Yes	The Material and Personnel Handling system can operate in the specified temperature range. It should be noted that the temperature in the ESF has exceeded the 70 degrees F stated in the ESFDR and yet the system continues to operate.
3.2.1.2.1.2.D The ESF subsurface facilities and equipment shall be designed to withstand and operate in a relative humidity environment of 13 to 71%.	Yes	The Material and Personnel Handling system can operate in the specified relative humidity range.
3.2.1.2.2.A The ESF non-permanent items shall be designed for a 25 year maintainable service life.	Yes	The Material and Personnel Handling system is designed for a 25 year service life.
3.2.1.2.2.B The ESF permanent items shall be designed for a 150 year maintainable service life.	N/A	The Material and Personnel Handling system is considered part of the temporary facilities, not permanent items.

ESFDR Requirement	Satisfied	Description
3.2.1.2.3.A ESF construction and operation activities shall be evaluated and monitored as necessary for the purpose of assessing the effects of those activities on the future suitability of the site for a potential repository.	Yes	ESF construction activities have been and will continue to be evaluated and monitored.
3.2.1.2.3.B Tracers, fluids, and materials to be used at the ESF shall first be reviewed for potential adverse impacts to waste isolation and site characterization testing. These substances are subject to establishment of controls, and shall only be used following review and approval, and only in those areas where use has been approved. Such substances include, but are not limited to, the following: <ul style="list-style-type: none"> • Concrete and other cementitious materials, such as shotcrete and grout. • Ground support materials, including chemical/resin anchorages • Water and any additives to water for identification (tracers) or construction, operation, or testing • Hydrocarbons and solvents • Organic materials • Combustible materials 	Yes	The use and control of tracers, fluids, and materials is dictated by the <i>Determination of Importance Evaluation for the Subsurface Exploratory Studies Facility</i> , BAB000000-01717-2200-00005 Rev 06 (Ref. 9.18) and Specification Section 01501 (Ref. 9.19).
3.2.1.2.3.C The presence of combustible materials underground during construction and operation shall be controlled and limited.	Yes	The presence of combustible materials underground has been and will continue to be controlled and limited by the <i>Determination of Importance Evaluation for the Subsurface Exploratory Studies Facility</i> , BAB000000-01717-2200-00005 Rev 06 (Ref. 9.18) and Specification Section 01501 (Ref. 9.19).

ESFDR Requirement	Satisfied	Description
3.2.1.2.3.D Within the Conceptual Controlled Area Boundary, the quantity of water used in surface site preparation, construction, and operations shall not exceed an average of two gallons per square yard of application per day, when averaged over five years (excluding water used to mix concrete or shotcrete) or an amount as determined by analysis. The amount of water used for subsurface construction and operation shall be consistent with the amount determined by analysis.	Yes	The subsurface control of water is dictated by the <i>Determination of Importance Evaluation for the Subsurface Exploratory Studies Facility</i> , BAB000000-01717-2200-00005 Rev 06 (Ref. 9.18) and Specification Section 01501 (Ref. 9.19).
3.2.1.2.3.E Spills shall be cleaned up to the extent practical. Spilled material and contaminated material (including soil) shall be disposed of in accordance with federal and state requirements, and unrecovered spills will be reported in accordance with tracers, fluids, and materials procedures.	Yes	All spills and contaminated soils are immediately cleaned up and disposed of in accordance with federal and state requirements. All spills over one gallon are reported in accordance with YAP-2.8Q.
3.2.1.2.3.F Dust, vibration, and traffic near sensitive areas shall be controlled during design, construction, and operation (e.g., testing, environmental).	Yes	Dust, vibration, and traffic near sensitive areas has been controlled and will continue to be controlled near sensitive areas.
3.2.1.2.3.G All excavation blasting shall be designed to control overbreak to minimize impacts to waste isolation and/or site characterization testing.	N/A	Blasting is not applicable to the Material and Personnel Handling System. Refer to <i>ESF Blast Design Analysis</i> , BABE00000-01717-0200-00004, Rev 04 (Ref. 9.22).
3.2.1.2.3.H All explosives and blasting agents shall be obtained from a qualified supplier, per 27 CFR 55, to limit adverse impacts on in situ site characterization and to limit blasting residue.	N/A	Blasting is not applicable to the Material and Personnel Handling System. Refer to specification <i>Subsurface Drilling and Blasting</i> , BABEA0000-01717-6300-02313, Rev 01 (Ref. 9.23).

ESFDR Requirement	Satisfied	Description
3.2.1.2.3.I Surface construction and/or the location of surface facilities shall avoid the impoundment of surface water which would have adverse effects on the ability of the site to isolate waste.	Yes	The as-constructed surface portion of the Material and Personnel Handling system does not affect the impoundment of water.
3.2.1.2.4.A The ESF shall be designed in compliance with the applicable requirements contained in the Uniformed Building Code.	N/A	The Material and Personnel Handling system components are not addressed in the Uniformed Building Code.
3.2.1.2.4.B The ESF shall be designed in compliance with the applicable requirements contained in ACI 318 Building Code Requirements for Reinforced Concrete Code.	Yes	The precast concrete inverts are designed and constructed in compliance with ACI 318.
3.2.1.2.4.C The ESF shall be designed in compliance with the applicable requirements contained in DOE Order 6430.1A.	Yes	The Material and Personnel Handling system was designed and constructed in compliance with the applicable requirements contained in DOE Order 6430.1A.
3.2.1.2.4.D The ESF shall be designed in compliance with the applicable requirements contained in DOE Order 5480.7A.	Yes	DOE Order 5480.7A has been replaced by DOE Order 420.1. The fire suppression systems on the locomotives meet the requirements in this order.
3.8.1.2.C The service facilities and equipment required for maintaining underground services shall be provided to support ESF operation and in situ site characterization.	Yes	The Material and Personnel Handling system does support ESF operation and in situ site characterization.
3.8.4.1.2.A The conveyors and/or transport system shall incorporate fail-safe devices and be designed with adequate safety factors as per applicable regulations.	N/A	The conveyors and/or transport system are not part of the Material and Personnel Handling system but are covered under the Conveyor System.

ESFDR Requirement	Satisfied	Description
3.8.4.1.2.B The muck handling system shall provide for collecting excavated rock at the shaft or ramp station, surge capacity, measuring, and loading the rock for conveyance.	N/A	The muck handling system is not part of the Material and Personnel Handling system but is part of the Conveyor System.
3.8.4.1.2.C The muck and material handling systems shall be designed, installed, tested, operated, and maintained in conformance with applicable regulations.	Yes	The Material and Personnel Handling system was constructed in accordance with design and should continue to be operated in conformance with applicable regulations.
3.8.4.4.1.B The material handling system shall be sufficiently sized to sustain construction, operations, and testing.	Yes	The Material and Personnel Handling system was constructed in accordance with the design and is therefore sufficiently sized to sustain construction, operations, and testing.
3.8.4.4.1.C The material handling system shall have appropriate safety features, as required by analysis and applicable federal, State of Nevada, and local regulations.	Yes	The Material and Personnel Handling system incorporates numerous safety features as required by analysis and applicable regulations.
3.8.4.4.1.D Routes for the material handling system shall be selected to avoid active test areas wherever possible.	Yes	The Material and Personnel Handling system routes avoid active test areas.

6.2 As-Constructed Deviations and Recommendations

NOTE: Specified tolerances that are not listed as deviations have been evaluated and found acceptable.

As-Constructed Deviations and Recommendations

As-Constructed Deviations	Design Documents	Recommendations
<p>Rail anchor system not grouted in place.</p>	<p>Ref. 9.1, 9.14</p>	<p>The rail system was discussed at length with members of MK Rail, Title III A/E, and CMO. It was determined that grouting the rail system in place would be the simplest and most economical solution (see Section 8.4) and will provide a system consistent with Federal Railroad Administration guidelines for operating up to 25 mph. Proceed with grouting anchor system in place. Before grouting, detach outside rails along the TS Tunnel Loop. (During construction of the ESF, muck has worked its way under the rebar ties causing bending and breakage of the ties near the outside rails and contributing to misalignment of the inner rails.) Transportation of the outside rails to the surface can be deferred as long as the rails are set out of the way of foot traffic to minimize tripping hazards. Use double rails and switch tracks by Alcoves as necessary. After detaching outside rails, clean out invert blockouts and replace any broken rebar ties or damaged rail. In areas where grout cover is not adequate, place a steel tie mechanically anchored directly to the invert. Along the North and South Ramp curves, reset rail so as to stagger the joints around the curve.</p> <p>NOTE 1: Grouting the North Ramp section in place may be deferred until after completion of the ECRB Cross Drift.</p> <p>NOTE 2: Although the invert blockouts not being used to anchor the rail present a potential tripping hazard, completely filling them with grout is not recommended by Title III A/E, CMO, or M&O Safety and Health due to the high cost (see Section 8.5) and minimum benefit.</p>

As-Constructed Deviations	Design Documents	Recommendations
Rail gage is not within established tolerances: -0 mm, +6 mm	Ref. 9.14	Regage track in areas not in tolerance. Change tolerances to -0.5 in (-12.7 mm), +1.25" (+31.75 mm) in Ref. 9.14 to reflect extrapolated Federal Railroad Administration limits for 36" gage track at 25 mph.
Vertical distance between tops of abutting rails or tops of track and turnouts not within established tolerance: 2 mm	Ref. 9.1, 9.2	Correct rail head mismatch in areas not in tolerance.
Rail cross level not within established tolerance: 16 mm	Ref. 9.1	Correct cross level in areas not in tolerance. Change tolerances to +1.25" (+31.75 mm) in Ref. 9.1 to reflect extrapolated Federal Railroad Administration limits for 36" gage track at 25 mph.
Departure from and return to rail cross level not within established tolerance: 16 mm per 10 m of track	Ref. 9.1	Correct cross level run off in areas not in tolerance. Change tolerances to +1.25" (+31.75 mm) per 10 m of track in Ref. 9.1 to reflect extrapolated Federal Railroad Administration limits for 36" gage track at 25 mph.
Departure from and return to specified rail alignment run off not within established tolerance: 40 mm per 10 m of track	Ref. 9.1	Realign track in areas not in tolerance. Change horizontal and vertical run off tolerances to +3.0" (+76.2 mm) per 10 m of track in Ref. 9.1 to reflect extrapolated Federal Railroad Administration limits for 36" gage track at 25 mph. NOTE: As previously mentioned, the tolerances recommended in this TER may not be applicable to certain 3.01X areas (example: Station 71+07 m to Station 71+44 m). Design for those areas will be prepared as required to close out the 3.01X Plans.

As-Constructed Deviations	Design Documents	Recommendations
Concrete inverts have cracks and lack a consistent vertical alignment between inverts.	Ref. 9.2	The concrete inverts have been installed directly on the bored tunnel invert in accordance with Reference 9.2, resulting in a vertical mismatch between inverts. There is no need to correct invert vertical alignment; however, it is critical that rail that sits upon the inverts meet the aforementioned tolerances. The cracks noted on some inverts do not affect the ability of the invert to perform its intended use for this system.

7. SUMMARY OF RECOMMENDATIONS

- 7.1 Specification 14960 (Reference 9.6), Section 1.07D needs to be changed to reflect and permit the use of cables as currently used on all cars and allowed by OSHA (29CFR1926).
- 7.2 Reflectors need to be mounted on each end of all rail cars to comply with Specification 14960 (Reference 9.6), Section 1.07F.
- 7.3 Specification 14960 (Reference 9.6), Section 1.07G needs to be changed to reflect the OSHA (29CFR1926) requirement for *suitable means of stopping*.
- 7.4 The rail system was discussed at length with members of MK Rail, Title III A/E, and CMO. It was determined that grouting the rail system in place would be the simplest and most economical solution (see Section 8.4) and will provide a system consistent with Federal Railroad Administration guidelines for operating up to 25 mph. Proceed with grouting anchor system in place. Before grouting, detach outside rails along the TS Tunnel Loop. (During construction of the ESF, muck has worked its way under the rebar ties causing bending and breakage of the ties near the outside rails and contributing to misalignment of the inner rails.) Transportation of the outside rails to the surface can be deferred as long as the rails are set out of the way of foot traffic to minimize tripping hazards. Use double rails and switch tracks by Alcoves as necessary. After detaching outside rails, clean out invert blockouts and replace any broken rebar ties or damaged rail. In areas where grout cover is not adequate, place a steel tie mechanically anchored directly to the invert. Along the North and South Ramp curves, reset rail so as to stagger the joints around the curve. NOTE 1: Grouting the North Ramp section in place may be deferred until after completion of the ECRB Cross Drift. NOTE 2: Although the invert blockouts not being used to

anchor the rail present a potential tripping hazard, completely filling them with grout is not recommended by Title III A/E, CMO, or M&O Safety and Health due to the high cost (see Section 8.5) and minimum benefit.

- 7.5 Regage track in areas not in tolerance. Change tolerances to -0.5 in (-12.7 mm), +1.25" (+31.75 mm) on Ref. 9.14 to reflect extrapolated Federal Railroad Administration limits for 36" gage track at 25 mph.
- 7.6 Correct rail head mismatch in areas not in tolerance.
- 7.7 Correct cross level in areas not in tolerance. Change tolerances to +1.25" (+31.75 mm) in Ref. 9.1 to reflect extrapolated Federal Railroad Administration limits for 36" gage track at 25 mph.
- 7.8 Correct cross level run off in areas not in tolerance. Change tolerances to +1.25" (+31.75 mm) per 10 m of track in Ref. 9.1 to reflect extrapolated Federal Railroad Administration limits for 36" gage track at 25 mph.
- 7.9 Realign track in areas not in tolerance. Change horizontal and vertical run off tolerances to +3.0" (+76.2 mm) per 10 m of track in Ref. 9.1 to reflect extrapolated Federal Railroad Administration limits for 36" gage track at 25 mph. NOTE: As previously mentioned, the tolerances recommended in this TER may not be applicable to certain 3.01X areas (example: Station 71+07 m to Station 71+44 m). Design for those areas will be prepared as required to close out the 3.01X plans.
- 7.10 The concrete inverts have been installed directly on the bored tunnel invert in accordance with Reference 9.2, resulting in a vertical mismatch between inverts. There is no need to correct invert vertical alignment; however, it is critical that rail that sits upon the inverts meet the aforementioned tolerances. The cracks noted on some inverts do not affect the ability of the invert to perform its intended use for this system.

8. COST AND DURATION ESTIMATES

- 8.1 Cost estimates are presented in ATTACHMENT I.
- 8.2 Duration estimates are presented in ATTACHMENT I.
- 8.3 Cost and duration summary

COST & DURATION SUMMARY		
Line Item	Cost	Man Hours
Design		
Total design costs	\$19,600	280
Construction		
Detach and remove outer two rails	\$120,032	2480
Transport rail to surface	\$58,080	1200
Clean out invert blockouts, check rail alignment & grout rebar ties	\$107,042	1728
Anchor steel ties to invert (10% of tunnel length)	\$42,784	432
Total direct construction costs	\$327,938	5840
Total estimated construction costs (w/ markups)	\$386,895	6890

8.4 Cost Comparison: Grouting vs. Anchoring Steel Ties

Cost Comparison: Grouting vs. Anchoring Steel Ties	
Line Item	Cost
Total direct costs for anchoring rail by grouting existing ties including detaching, removing, and transporting outer rails to surface; cleaning invert blockouts; and 10% new steel ties	\$327,938
Total direct costs for anchoring rail by installing new steel ties (100% of tunnel length) including detaching, removing, and transporting outer rails to surface	\$605,952

8.5 Cost To Grout All Invert Blockouts

This section summarizes the cost to grout all the invert blockouts excluding the 5' portion of the blockouts already grouted with the rebar ties. Grouting all the invert blockouts could remove a potential tripping hazard. For unit costs and shift breakdowns, refer to the detailed cost estimate in Attachment I.

Direct Costs To Grout All Invert Blockouts							
Line Item	Qty	Total MHs	Labor	EOE	Supplies	Material	Total
Clean Invert Blockout Grout Blockout	37800 LM 13765 CF	6080	\$260,300	\$27,455	\$13,015	\$137,650	\$438,420

9. REFERENCES

- 9.1 Specification Section 02450, RAIL AND TRACK INSTALLATION
Document Number BABFCC000-01717-6300-02450, Rev 01
- 9.2 Specification Section 02451, INVERT SEGMENT INSTALLATION
Document Number BABFCC000-01717-6300-02451, Rev 01
- 9.3 Specification Section 02452, SUBSURFACE RAILROAD TRACKWORK
Document Number BABFCC000-01717-6300-02452, Rev 00
- 9.4 Specification Section 02453, SUBSURFACE RAILROAD TURNOUTS
Document Number BABFCC000-01717-6300-02453, Rev 00
- 9.5 Specification Section 03480, PRECAST CONCRETE
Document Number BABFCC000-01717-6300-03480, Rev 00
- 9.6 Specification Section 14960, RAIL CARS-TRANSPORTATION OF
MATERIALS AND SUPPLIES
Document Number BABFCC000-01717-6300-14960, Rev 01
- 9.7 Specification Section 14962, SUBSURFACE DIESEL LOCOMOTIVES
Document Number BABFCC000-01717-6300-14962, Rev 00
- 9.8 Design Analysis, GENERAL ARRANGEMENT, INVERT SEGMENT,
RAIL WEIGHT AND TRACK
Document Number BABFCC000-01717-0200-00137, Rev 00
- 9.9 Design Analysis, TBM TUNNEL PRECAST CONCRETE INVERT SEGMENT -
DESIGN CALCS
Document Number BABFCC000-01717-0200-00139, Rev 00
- 9.10 Design Analysis, RAIL HAULAGE SYSTEM ANALYSIS
Document Number BABFCC000-01717-0200-00152, Rev 01
- 9.11 Design Analysis, LOCOMOTIVE AND RAIL CAR ANALYSIS
Document Number BABFCC000-01717-0200-00166, Rev 00
- 9.12 Engineering Drawing, STARTER TUNNEL TBM TRANSPORTATION RAIL
Document Number BABE00000-01717-2100-10165, Rev 00
- 9.13 Engineering Drawing, STARTER TUNNEL RAILWAY LAYOUT PLAN &
SECTION

Document Number BABE00000-01717-2100-10126, Rev 03

- 9.14 Engineering Drawing, RAIL PLACEMENT INVERT SEGMENT - A
PLAN, SECTIONS & DETAILS
Document Number BABE00000-01717-2100-40179, Rev 02
- 9.15 Engineering Drawing, RAIL PLACEMENT INVERT SEGMENT - B
PLAN & SECTIONS
Document Number BABE00000-01717-2100-40178, Rev 02
- 9.16 Vendor Drawing, SYSTEM DESCRIPTION AND INSTALLATION PROCEDURE
Document Number BABFCC000-01717-6300-02452-VD-12-0
- 9.17 YMP Baseline Document, Exploratory Studies Facility Design Requirements
Document Number YMP/CM-0019, Rev 02 ICN 01
- 9.18 Determination of Importance Evaluation for the Subsurface Exploratory Studies
Facility, Document Number BAB000000-01717-2200-00005, Rev 06
- 9.19 Specification Section 01501, SUBSURFACE GENERAL CONSTRUCTION
Document Number BAB000000-01717-6300-01501, Rev 05
- 9.20 Constructor Technical Control Procedure TCP-2.21, DIESEL ENGINE EXHAUST
EMISSION TESTING AND CONTROL PROCEDURE, Document Number
BAB000000-01717-6300-01501-CD-34-11
- 9.21 Constructor Submittal, SPILL RESPONSE PLAN
Document Number BAB000000-01717-6300-01501-CD-28-1
- 9.22 Design Analysis, ESF BLAST DESIGN ANALYSIS
Document Number BABE00000-01717-0200-00004, Rev 04
- 9.23 Specification Section 02313, SUBSURFACE DRILLING AND BLASTING
Document Number BABEA0000-01717-6300-02313, Rev 01

10. ATTACHMENTS

There are 2 attachments to this TER.

ATTACHMENT	DESCRIPTION
I	COST AND DURATION ESTIMATES
II	UNDERGROUND ROLLING STOCK

ATTACHMENT I

COST AND DURATION ESTIMATES

1. Design Costs
2. Construction Summary
3. Bill of Quantities
4. Quantity Takeoff
5. Task Labor Rate

DESIGN COSTS				
LINE ITEM	QUANTITY	TOTAL MAN HOURS	RATE	COST
Revise analyses	2	120	\$ 70/hr	\$ 8,400
Engineering Change Request (ECR) specifications	5	100	\$ 70/hr	\$ 7,000
ECR drawings	3	60	\$ 70/hr	\$ 4,200
Total engineering costs	10	280	\$ 70/hr	\$ 19,600

CMLIAN RADIOACTIVE WASTE MANAGEMENT SYSTEM, MANAGEMENT & OPERATING CONTRACTOR

PROJECT NAME: YUCCA MOUNTAIN SITE CHARACTERIZATION
PROJECT ELEMENT: EXPLORATORY STUDIES FACILITY
WBS NO.: 1.2.8

TASK NAME: ESF TITLE III EVALUATION REPORT (TER), MATERIAL AND PERSONNEL HANDLING SYSTEM - TRACK REALIGNMENT AND GROUTING

ESTIMATOR: D. HONG
REVISED (#2) PER: THOMAS MISIAK

DATE: MAY 15, 1998
DATE: MAY 13, 1998

COST ACCY ITEM NO	DESCRIPTION	QTY	UNIT	MANHRS PER UNIT	TOTAL MANHRS	LABOR		EOE		EQUIP PURCHASE		SUPPLIES		MATERIAL		SUBCONTRACT		DIRECT COST	
						UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
1.	DETACH AND REMOVE OUTER TWO RAILS:	31	SHIFT	80	2480	3,469.00	107,539	230.00	7,130	0.00	0	173.00	5,363	0.00	0	0.00	0	3,872.00	120,032
	REMOVE STD RAIL CLIP	12732	EA	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
	REMOVE JOINT BARS & TRACK BOLTS	1158	PAIR	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
	REMOVE ELASTOMERIC RAIL PAD	8366	EA	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
	REMOVE SHIMS - TRACK SUPPORT	8366	EA	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
	L/T/UNL FASTENERS & ACCESSORIES	25	TON	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
	CUT OFF REBAR TIES	7698	LOC	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
	REMOVE CUT OFF REBAR TIES W/(1) RAIL SEA	7698	EA	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
	LOAD/TRANSPORT/UNLOAD TIES & PLATES	93	TON	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
	SUBTOTAL	5820	TNL LM		2,480		107,539		7,130		0		5,363		0		0		120,032
2.	TRANSPORT RAIL TO SURFACE	15	SHIFT	80	1200	3,469.00	52,035	230.00	3,450	0.00	0	173.00	2,595	0.00	0	0.00	0	3,872.00	58,080
	SUBTOTAL	542	TON		1,200		52,035		3,450		0		2,595		0		0		58,080
3.	CLEAN OUT INVERT BLOCKOUT, CHECK RAILS ALIGNMENT AND GROUT REBAR TIES:	27	SHIFT	64	1728	2,740.00	73,980	289.00	7,803	0.00	0	137.00	3,699	0.00	0	0.00	0	3,168.00	85,482
	CLEAN OUT INVERT BLOCKOUT	5866	LM	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
	CHECK RAILS ALIGNMENT	7038	TNL LM	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
	GROUT REBAR TIES	2158	CF	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	10.00	21,560	0.00	0	10.00	21,560
	SUBTOTAL	7038	TNL LM		1,728		73,980		7,803		0		3,699		21,560		0		107,042
4.	ANCHOR STEEL TIES TO INVERT:																		
	ANCHOR STEEL TIES TO INVERT	8	SHIFT	72	432	3,243.00	19,458	587.00	3,522	0.00	0	162.00	972	0.00	0	0.00	0	3,992.00	23,952
	ANCHOR BOLTS	856	EA	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	10.00	8,560	0.00	0	10.00	8,560
	ANCHOR STEEL TIES W/CLAMPS	428	EA	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	24.00	10,272	0.00	0	24.00	10,272
	SUBTOTAL	782	TNL LM		432		19,458		3,522		0		972		18,832		0		42,784
	TOTAL DIRECT COST						5,840		253,012		0		12,628		40,392		0		327,938
	G&A EXPENSES	6%					350		15,181		0		758		2,424		0		19,677
	FEE	5%					310		13,410		0		669		2,141		0		17,381
	PM&I (FY98)	6%					390		16,898		0		843		2,697		0		21,899
	TOTAL MARKUPS						1,050		45,487		0		2,270		7,262		0		58,957
	CONTINGENCY	0%					0		0		0		0		0		0		0
	TOTAL ESTIMATED COST						6,890		298,499		0		14,899		47,654		0		336,835

ATTACHMENT I

PROJECT NAME: YUCCA MOUNTAIN SITE CHARACTERIZATION

PROJECT ELEMENT: EXPLORATORY STUDIES FACILITY

WBS NO.: 1.2.8

TASK NAME: ESF TITLE III EVALUATION REPORT (TER), MATERIAL AND PERSONNEL HANDLING SYSTEM - TRACK REALIGNMENT AND GROUTING

ESTIMATOR: D. HONG

DATE: MAY 15, 1998

REVISED (#2) PER: THOMAS MISIAK

DATE: MAY 13, 1998

BILL OF QUANTITIES (TRACK REALIGNMENT & GROUTING)				7820 TNL LM			
ITEM NO.	DESCRIPTION	QTY	UNIT	REMARKS	MANHRS PER UNIT	TOTAL MANHRS	TOTAL SHIFTS
1.	DETACH AND REMOVE OUTER TWO RAILS:	5,820	TNL LM				
	REMOVE STD RAIL CLIP	12,732	EA		0.025	318	
	REMOVE JOINT BARS & TRACK BOLTS	1,158	PAIR		0.50	579	
	REMOVE ELASTOMERIC RAIL PAD	6,366	EA		0.015	95	
	REMOVE SHIMS - TRACK SUPPORT	6,366	EA		0.015	95	
	LT/UNL FASTENERS & ACCESSORIES	25	TON	LOAD/UNLOAD@5TONS/HR 3/3HR HN DL+1HR TRNSP/DAY	5	125	
	CUT OFF REBAR TIES	7,698	LOC	TORCH CUTTING #8 BAR	0.04	308	
	REMOVE CUT OFF REBAR TIES W/(1) RAIL SEAT	7,698	EA		0.025	192	
	LOAD/TRANSPORT/UNLOAD TIES & PLATES	93	TON	LOAD/UNLOAD@5TONS/HR 3/3HR HN DL+1HR TRNSP/DAY	5	465	
	SUBTOTAL					2,177 SAY	31.10 31 (10-MAN-CREW)
2.	TRANSPORT RAIL TO SURFACE	542	TON	LOAD/UNLOAD@15TONS/H 3/3HR HN DL+1HR TRNSP/DAY	2	1,084	
	SUBTOTAL					1,084 SAY	15.49 15 (10-MAN-CREW)
3.	CLEAN OUT INVERT BLOCKOUT, CHECK RAILS ALIGNMENT AND GROUT REBAR TIES:	7038	TNL LM				
	CLEAN OUT INVERT BLOCKOUT	5866	LM	4"X4"	0.05	293	
	CHECK RAILS ALIGNMENT	7,038	TNL LM		0.1	704	
	GROUT REBAR TIES	2,156	CF	0.56 CF EACH LOCATION	0.25	539	
	SUBTOTAL					1,536 SAY	27.43 27 (8-MAN-CREW)
4.	ANCHOR STEEL TIES TO INVERT:	782	TNL LM				
	DRILLING FOR ANCHOR BOLTS	856	LOC	1"DIA. HOLE FOR BOLT	0.1	86	
	ANCHOR BOLTS	856	EA	3/4"DIA.X6" INTERNAL THRD. EXP. ANCHOR	0.1	86	
	ANCHOR STEEL TIES W/CLAMPS	428	EA		0.5	214	
	SUBTOTAL					386 SAY	6.13 6 (9-MAN-CREW)
	TOTAL					5,183	79

PROJECT NAME: YUCCA MOUNTAIN SITE CHARACTERIZATION

PROJECT ELEMENT: EXPLORATORY STUDIES FACILITY

WBS NO.: 1.2.6

TASK NAME: ESF TITLE III EVALUATION REPORT (TER), MATERIAL AND PERSONNEL HANDLING SYSTEM - TRACK REALIGNMENT AND GR

ESTIMATOR: D. HONG

DATE: MAY 15, 1998

REVISED (#2) PER: THOMAS MISIAK

DATE: MAY 13, 1998

QTY. TAKEOFF (TRACK REALIGNMENT & GROUTING)		7820 TNL LM			
SPECS/ ITEM NO.	DESCRIPTION	QTY	UNIT	REMARKS	
1.	DETACH OUTER TWO RAILS & CUT OFF REBAR TIES:	5,820	TNL LM		
1.1	STD RAIL CLIP	12,732	EA	PANDROL e-2055	EST'D @ 2 LB/EA
1.2	JOINT BARS & TRACK BOLTS	1,158	PAIR		EST'D @ 12 LB/PAIR
1.3	ELASTOMERIC RAIL PAD	6,366	EA	5.25"X6"X1/4"THK	EST'D @ 0.5 LB/EA
1.4	SHIMS - TRACK SUPPORT	6,366	EA		EST'D @ 1 LB/EA
1.5	CUT OFF REBAR TIES	7,698	LOC	#8 rebar	
1.6	REMOVE CUT OFF REBAR TIES W/(1) RAIL SEAT	7,698	EA		24.00 LB EACH
2.	TRANSPORT RAIL TO SURFACE:	11,641	LM		542 TONS
3.	CLEAN OUT INVERT BLOCKOUT, CHECK RAILS ALIGNMENT AND GROUT REBAR TIES:	7,038	TNL LM		
3.1	CLEAN OUT INVERT BLOCKOUT	5,866	LM	4"X4"	
3.2	CHECK RAILS ALIGNMENT	7,038	TNL LM		
3.3	GROUT REBAR TIES	3,849	LOC	CEMENT GROUT	4" X 4" X5'
4.	ANCHOR STEEL TIES TO INVERT:	782	TNL LM		
4.1	ANCHOR STEEL TIES W/CLAMPS	428	LOC		
4.2	ANCHOR BOLTS	856	EA	3/4"DIA. X 8"	

CIVILIAN RADIOACTIVE WASTE MANAGEMENT SYSTEM: MANAGEMENT & OPERATING CONTRACTOR

PROJECT NAME: YUCCA MOUNTAIN SITE CHARACTERIZATION

ATTACHMENT I

PROJECT ELEMENT: EXPLORATORY STUDIES FACILITY

WBS NO.: 1.2.6

TASK NAME: ESF TITLE III EVALUATION REPORT (TER), MATERIAL AND PERSONNEL HANDLING SYSTEM - TRACK REALIGNMENT AND GROUTIN

ESTIMATOR: D. HONG

DATE: DECEMBER 23, 1997

CHECKED BY:

DATE:

CREW CODE/ I. D.	OPERATOION	QTY	UNIT	LABOR		EQUIPMENT				TOTAL COST
				RATE	COST	EOE RATE	EOE COST	CAPITAL PURCHASE RATE	CAPITAL PURCHASE COST	
1. & 2.	DETACH & REMOVE OUTER TWO RAILS AND TRANSPORT RAILS TO SURFACE:									
	TNL SHIFTER	1	SHIFT	309.23	309.23					309.23
	TUNNEL MINER	1	SHIFT	302.13	302.13					302.13
	BULL GANG	4	SHIFT	299.58	1198.32					1198.32
	EQP OPR 4	2	SHIFT	353.70	707.40					707.40
	BRAKEMAN	1	SHIFT	299.58	299.58					299.58
	LOCI OPER	1	SHIFT	353.70	353.70					353.70
	DIESEL LOCO 25T	6	HR	19.41	116.46	10.52	63.12	0.00	0.00	179.58
	FLAT CAR	24	HR	1.81	43.44	0.75	18.00	0.00	0.00	61.44
	MUCK CAR	12	HR	2.26	27.12	1.31	15.72	0.00	0.00	42.84
	MAN CAR	2	HR	2.71	5.42	0.96	1.92	0.00	0.00	7.34
	FORKLIFT	6	HR	4.51	27.06	3.56	21.36	0.00	0.00	48.42
	LOADER BOBCAT 742B	6	HR	3.16	18.96	3.28	19.68	0.00	0.00	38.64
	MISC. GENERAL EQUIP. ALLOW	6	HR	10.00	60.00	15.00	90.00	0.00	0.00	150.00
	TOTAL CREW-SHIFT RATE	10	MAN-SHIFT		3468.82		229.80		0.00	3698.62
	TOTAL DAYS	0	SGL-SHIFT-DAY							
	TOTAL MANHOURS	0								
	SUBTOTAL LABOR & EOE	1	SHIFT		3,469		230		0	3,699
	MISC. SUPPLIES @ 5% OF LABOR COST		5%		173					173
	TOTAL COST PER SHIFT				3,642		230		0	3,872
3.	CLEAN OUT INVERT BLOCKOUT, CHECK RAILS ALIGNMENT & GROUT REBAR TIES:									
	TNL SHIFTER	1	SHIFT	309.23	309.23					309.23
	TUNNEL MINER	2	SHIFT	302.13	604.26					604.26
	BULL GANG	3	SHIFT	299.58	898.74					898.74
	BRAKEMAN	1	SHIFT	299.58	299.58					299.58
	LOCI OPER	1	SHIFT	353.7	353.70					353.70
	DIESEL LOCO 25T	6	HR	19.41	116.46	10.52	63.12	0.00	0.00	179.58
	FLAT CAR	6	HR	1.81	10.86	0.75	4.50	0.00	0.00	15.36
	MAN CAR	2	HR	2.71	5.42	0.96	1.92	0.00	0.00	7.34
	GROUT MIXER	6	HR	1.35	8.10	3.25	19.50	0.00	0.00	27.60
	GROUT PUMP	6	HR	2.26	13.56	3.29	19.74	0.00	0.00	33.30
	MISC. GENERAL EQUIP. ALLOW	12	HR	10.00	120.00	15.00	180.00	0.00	0.00	300.00
	TOTAL CREW-SHIFT RATE	8	SHIFT		2739.91		288.78		0.00	3028.69
	TOTAL DAYS	0	SGL-SHIFT-DAY							
	TOTAL MANHOURS	0								
	SUBTOTAL LABOR & EOE	1	SHIFT		2,740		289		0	3,029
	MISC. SUPPLIES @ 5% OF LABOR COST		5%		137					137
	TOTAL COST PER SHIFT				2,877		289		0	3,166

PROJECT NAME: YUCCA MOUNTAIN SITE CHARACTERIZATION

ATTACHMENT I

PROJECT ELEMENT: EXPLORATORY STUDIES FACILITY

WBS NO.: 1.2.6

TASK NAME: ESF TITLE III EVALUATION REPORT (TER), MATERIAL AND PERSONNEL HANDLING SYSTEM - TRACK REALIGNMENT AND GROUTIN

ESTIMATOR:D. HONG

DATE: DECEMBER 23, 1997

CHECKED BY:

DATE:

CREW CODE/ I. D.	OPERATOION	QTY	UNIT	LABOR		EQUIPMENT				TOTAL COST
				RATE	COST	EOE		CAPITAL PURCHASE		
				RATE	COST	RATE	COST	RATE	COST	
4.	ANCHOR STEEL TIES TO INVERT:									
	TNL SHIFTER	1	SHIFT	309.23	309.23					309.23
	TUNNEL MINER	3	SHIFT	302.13	906.39					906.39
	BULL GANG	3	SHIFT	299.58	898.74					898.74
	BRAKEMAN	1	SHIFT	299.58	299.58					299.58
	LOCI OPER	1	SHIFT	353.70	353.70					353.70
	DIESEL LOCO 25T	6	HR	19.41	116.46	10.52	63.12	0.00	0.00	179.58
	FLAT CAR	6	HR	1.81	10.86	0.75	4.50	0.00	0.00	15.36
	MAN CAR	2	HR	2.71	5.42	0.96	1.92	0.00	0.00	7.34
	DRIFTER DRILL	18	HR	9.03	162.54	13.76	247.68	0.00	0.00	410.22
	MISC. GENERAL EQUIP. ALLOW	18	HR	10.00	180.00	15.00	270.00	0.00	0.00	450.00
TOTAL CREW-SHIFT RATE		9	MAN-SHIFT		3242.92		587.22		0.00	3830.14
TOTAL DAYS		0	SGL-SHIFT-DAY							
TOTAL MANHOURS		0								
SUBTOTAL LABOR & EOE		1	SHIFT		3,243		587		0	3,830
MISC. SUPPLIES @ 5% OF LABOR COST			5%		162					162
TOTAL COST PER SHIFT					3,405		587		0	3,992

ATTACHMENT II

UNDERGROUND ROLLING STOCK

ATTACHMENT II is provided as information only.

1. Underground rolling stock
2. Locomotive batteries and battery chargers
3. Equipment evaluation worksheet

UNDERGROUND ROLLING STOCK

YUCCA MTN PROJECT

12/31/97

B I N	Klewit	TRW	Description	Mfgr	Model	Acq Cost	Acq Yr	Transfer Order	Date Xlrd
(R.R.) CABLE CAR									
A01084	57-9970	A001084	CAR CABLE REEL RAIL MTD	ELGOOD MAYO		\$51,600.00	12/95	96-124-BECHTEL-39	06/19/96
(R.R.) DOE LOAN TO YMP									
NONE	57-9933		TRACK BENDER	REECO SHOP		\$0.00		LOAN ONLY	/ /
(R.R.) FLAT CAR									
072203	57-9940	A072203	CAR FLAT MINE 20 TON	WESTMONT INDUSTRIES	K-83102	\$4,115.60	01/84	95-346-REECO-20	03/15/96
072208	57-9965	A072208	CAR FLAT MINE 20 TON	WESTMONT INDUSTRIES	K-83102	\$4,115.60	01/84	96-058-BECHTEL-22	03/27/96
072207	57-9941	A072207	CAR FLAT MINE 20 TON	WESTMONT INDUSTRIES	K-83102	\$4,115.60	01/84	96-025-BECHTEL-05	03/20/96
072209	57-9929	A072209	CAR FLAT MINE 20 TON	WESTMONT INDUSTRIES	K-83102	\$4,115.60	01/84	96-114-BECHTEL-36	05/09/96
072216	57-9934	A072216	CAR FLAT W/OIL TANK MTD	WALT CAR & WHEEL COM	752C-14	\$5,704.65	01/88	96-144-BECHTEL-41	07/10/96
072328	57-9944	A072328	CAR FLAT W/LUBE SKID	SANFORD-DAY IRON WOR	FOUR WHEEL	\$4,650.00	01/79	96-180-BECHTEL-48	08/13/96
072993	57-9945		CAR FLAT 20T (NO WHEELS)	WESTMONT INDUSTRIES	K-83102	\$4,115.60	01/84	XFR-THEN RETIRE	/ /
072995	57-9946	A072995	CAR FLAT MINE 20 TON	WESTMONT INDUSTRIES	K-83102	\$4,115.60	01/84	96-025-BECHTEL-05	03/20/96
072997	57-9947	A072997	CAR FLAT MINE 20 TON	WESTMONT INDUSTRIES	K-83102	\$4,115.60	01/84	95-346-REECO-20	03/15/96
503103	57-9974	A503103	CAR FLAT W/CONVEYOR MTD	MARMON TRANSMOTIVE	NONE	\$6,375.00	01/82	96-144-BECHTEL-41	07/10/96
503108	57-9975		CAR FLAT MINE 20 TON	MARMON TRANSMOTIVE	NONE	\$6,375.00	01/82	96-144-BECHTEL-41	07/10/96
503110	57-9948	A503110	CAR FLAT MINE 20 TON	MARMON TRANSMOTIVE	NONE	\$6,375.00	01/82	96-025-BECHTEL-04	03/21/96
503117	57-9932	A503117	CAR FLAT MINE 20 TON	MARMON TRANSMOTIVE	NONE	\$6,375.00	01/82	96-058-BECHTEL-22	03/27/96
785070	57-9969		CAR 75T EQUIP TRANSPORT	ELGOOD MAYO	NONE	\$77,607.25	09/95	TRANSFER NOT REQD	/ /
A01098	29-9907	A001098	CONVEYOR 30X30 F/CAR MT	REUTER EQ (503103)		\$8,540.00	01/95	TRANSFER NOT REQD	/ /
A01443	55-9901	A001443	LUBE SKID FLAT CAR MTD	ORANGE COAST (72328)	THP-350	\$13,962.40	03/96	TRANSFER NOT REQD	07/08/96
A01444	57-9972	A001444	CAR FLAT	CARD	18	\$20,000.00	01/94	96-162-BECHTEL-46	07/10/96
A01445	57-9973	A001445	CAR FLAT	CARD	16	\$20,000.00	01/94	96-162-BECHTEL-46	07/10/96
A01451	57-9971	A001451	CAR FLAT	CARD	18	\$26,088.20	01/94	96-173-BECHTEL-47	08/13/96
(R.R.) GROUT CAR									
071879		A071879	CAR GROUT			\$4,111.00	01/64	96-236-BECHTEL-55	10/07/96
072300	57-9943	A072300	CAR AGITATOR CONCRETE	EIMCO MINING MACH		\$26,772.42	01/77	95-346-REECO-19C1	03/08/96
072879	57-9936	A072879	CAR AGITATOR 8 WHEELS	MORAN ENGINEERING CO	EMICO 270 M20	\$9,785.80	01/62	95-346-REECO-19C1	03/08/96
072880	57-9937	A072880	CAR AGITATOR 8 WHEELS	MORAN ENGINEERING CO		\$7,542.50	01/62	95-346-REECO-19C1	03/08/96

BIN	Klowl	TRW	Description	Mlgr	Model	Acq Cost	Acq Yr	Transfer Order	Date Xlrd
(R.R.) LOCOMOTIVE									
072150	57-9961	A072150	LOCOMOTIVE 12T MINE	PLYMOUTH LOCOMOTIVE	DMD 36GA	\$98,317.80	01/83	96-144-BECHTEL-41	07/10/96
072157	57-9939	A072157	LOCOMOTIVE 15T MINE	PLYMOUTH LOCOMOTIVE	DMD 36GA	100,374.63	01/87	96-025-BECHTEL-04	03/21/96
072158	57-9960	A072158	LOCOMOTIVE 15T MINE	PLYMOUTH LOCOMOTIVE	DMD 36GA	100,374.63	01/87	96-144-BECHTEL-41	07/10/96
072160	57-9905	A072160	LOCOMOTIVE 15T MINE	BROOKVILLE	BDC-15-UPS	\$93,439.00	01/88	95-346-REECO-19C1	03/08/96
072161	57-9906	A072161	LOCOMOTIVE 15T MINE	BROOKVILLE	BDC-15-UPS	\$93,439.00	01/88	95-346-REECO-19C1	03/08/96
(R.R.) MUCK									
072627			CAR MODIFIED FOR MUCK	REECO	UNKNOWN	\$1,684.45	01/61	96-144-BECHTEL-41	07/10/96
072636		A072636	CAR MODIFIED FOR MUCK	REECO	UNKNOWN	\$1,684.44	01/61	96-144-BECHTEL-41	07/10/96
503292	57-9950	A503292	CAR MUCKER TRANSPORT	MORAN ENGINEERING CO		\$8,160.00	01/83	96-025-BECHTEL-04	03/21/96
503293	57-9951	A503293	CAR MUCKER TRANSPORT	MORAN ENGINEERING CO		\$8,160.00	01/83	96-025-BECHTEL-04	03/21/96
503296	57-9952	A503296	CAR MUCKER TRANSPORT	MORAN ENGINEERING CO		\$8,160.00	01/83	96-025-BECHTEL-04	03/21/96
503297	57-9953	A503297	CAR MUCKER TRANSPORT	MORAN ENGINEERING CO		\$8,160.00	01/83	96-025-BECHTEL-04	03/21/96
503299	57-9955	A503299	CAR MUCKER TRANSPORT	MORAN ENGINEERING CO		\$8,160.00	01/83	96-025-BECHTEL-04	03/21/96
503300	57-9956	A503300	CAR MUCKER TRANSPORT	MORAN ENGINEERING CO		\$8,160.00	01/83	96-025-BECHTEL-04	03/21/96
503306	57-9957	A503306	CAR MUCKER TRANSPORT	MORAN ENGINEERING CO		\$8,160.00	01/83	96-025-BECHTEL-04	03/21/96
(R.R.) PERSONNEL CAR									
072773		A072773	CAR PERSONNEL MINE	UNKNOWN	UNKNOWN	\$1,696.89	01/62	96-144-BECHTEL-41	07/10/96
503943	57-9924	A503943	CAR PERSONNEL MINE	ATLAS MINE & MILL		\$3,975.00	01/81	95-346-REECO-20	03/15/96
503944	57-9925	A503944	CAR PERSONNEL MINE	ATLAS MINE & MILL	36GA-16 MAN1981	\$3,975.00	01/81	95-346-REECO-20	03/15/96
503945	57-9926	A503945	CAR PERSONNEL MINE	ATLAS MINE & MILL	36GA-16 MAN1981	\$3,975.00	01/81	96-025-BECHTEL-05	03/20/96
785069	57-9976		LOCOMOTIVE/MANTRIP	ELGOOD MAYO	24-PASSENGER	155,294.58	09/97	TRANSFER NOT REQD	09/24/97
A01081	57-9967	A001081	CAR PERSONNEL MINE	ELGOOD MAYO		\$37,554.65	12/95	96-124-BECHTEL-39	06/19/96
A01082	57-9968	A001082	CAR PERSONNEL MINE	ELGOOD MAYO		\$37,554.65	12/95	96-124-BECHTEL-39	06/19/96
A01083	57-9968	A001083	CAR PERSONNEL MINE	ELGOOD MAYO		\$37,554.65	12/95	96-124-BECHTEL-39	06/19/96
(R.R.) SANITATION CAR									
072468	57-9963	A072468	CAR FLAT SANITATION	REECO	TANK ONLY	\$3,323.50	01/61	96-144-BECHTEL-41	07/10/96
503104	57-9964	A503104	CAR FLAT SANITATION	MARMON TRANSMOTIVE	NONE	\$6,375.00	01/82	96-144-BECHTEL-41	07/10/96
(R.R.) SEGMENT CAR									
A01126	57-9908	A001126	CAR SEGMENT INVERT	CARD		\$17,611.50	01/94	96-124-BECHTEL-39	06/19/96
A01127	57-9910	A001127	CAR SEGMENT INVERT	CARD		\$17,611.50	01/94	96-124-BECHTEL-39	06/19/96
A01128	57-9907	A001128	CAR SEGMENT INVERT	CARD		\$17,611.50	01/94	96-124-BECHTEL-39	06/19/96

BIN	Klewit	TRW	Description	M/gr	Model	Acq Cost	Acq Yr	Transfer Order	Date Xlrd
A01452	57-9909	A001452	CAR SEGMENT INVERT	CARD		\$17,611.49	01/94	96-173-BECHTEL-47	08/13/96
(R.R.) VACUUM CAR									
535902	57-9938	A535902	CAR VACUUM SUPER SUCKER	ELGOOD MAYO	HIVAC	205,748.88	09/95	96-124-BECHTEL-40	06/19/96
TUNNEL SPT L H D									
072448	37-9903	A072448	LOADER FE 3-CY MUCKER	WAGNER MINING EQUIP	ST 3-1/2	115,713.41	01/85	95-346-REECO-19C1	03/08/96
502998	37-9901	A502998	LOADER FE 3-CY MUCKER	EIMCO MINING MACHRY	913	132,090.00	01/82	95-346-REECO-19C1	03/08/96
503342	37-9911	A503342	LOADER FE 3-CY MUCKER	EIMCO MINING	925	157,420.45	01/83	96-144-BECHTEL-41	07/10/96
TUNNEL SPT ALPINE									
503586	59-9910		MINER CONTINUOUS CRAWLER	VOEST-ALPINE MFG CO	AM75	805,000.00	01/84	96-180-BECHTEL-48	08/13/96
TUNNEL SPT JUMBO									
504420	49-9901	A504420	DRILL JUMBO 1-BOOM	ATLAS COPCO	H2261989	249,800.00	01/89	96-025-BECHTEL-04	03/21/96
A01093	49-9918	A001093	DRILL JUMBO 2 BOOM	TAMROCK EJC	H205DB	512,141.66	12/95	96-124-BECHTEL-39	08/19/96

FOR CONSIDERATION TO EXCESS.

LOCOMOTIVE BATTERIES and BATTERY CHARGERS

CONDITION: NEW (UNUSED) LOCATION: NTS - ESF LOWER STORAGE YARD

BIN	TRW	ITEM DESCRIPTION	MFGR	ACQ COST	ACQ YR	P.O.	TRANSFER ORDER	CONDITION
535913	A535913	BATTERY CHARGER ONLY	LA MARCHE	\$ 10,299.47	09/95	1848-1122	96-048-BECHTEL-07	NEW (UNUSED)
535914	A535914	BATTERY CHARGER ONLY	LA MARCHE	\$ 10,299.47	09/95	1848-1122	96-048-BECHTEL-07	NEW (UNUSED)
535915	A535915	BATTERY CHARGER ONLY	LA MARCHE	\$ 10,299.46	09/95	1848-1122	96-048-BECHTEL-07	NEW (UNUSED)
NONE	NONE	BATTERY MODEL E85-29	EXIDE	\$ 13,491.31	09/95	1848-1122	NOT INCLUDED CHECK UNCLASSIFIED	NEW (UNUSED)
NONE	NONE	BATTERY MODEL E85-29	EXIDE	\$ 13,491.31	09/95	1848-1122	NOT INCLUDED CHECK UNCLASSIFIED	NEW (UNUSED)
NONE	NONE	BATTERY MODEL E85-29	EXIDE	\$ 13,491.31	09/95	1848-1122	NOT INCLUDED CHECK UNCLASSIFIED	NEW (UNUSED)
NONE	NONE	BATTERY MODEL E85-29	EXIDE	\$ 13,491.31	09/95	1848-1122	NOT INCLUDED CHECK UNCLASSIFIED	NEW (UNUSED)
A02148	A002148	BATTERY CHARGER + BATTERY	LA MARCHE	\$ 25,071.91	07/95	1848-0582	96-124-BECHTEL-39	NEW (UNUSED)
A02149	A002149	BATTERY CHARGER + BATTERY	LA MARCHE	\$ 25,071.91	07/95	1848-0582	96-124-BECHTEL-39	NEW (UNUSED)
A02150	A002150	BATTERY CHARGER + BATTERY	LA MARCHE	\$ 25,071.92	07/95	1848-0582	96-124-BECHTEL-39	NEW (UNUSED)
TOTAL VALUE				\$160,079.38

EQUIPMENT EVALUATION WORKSHEET

YUCCA MOUNTAIN PROJECT

BIN 72150	K/PB 57-9961	DESCRIPTION LOCOMOTIVE 12T	
MFG PLYMOUTH LOCOMOTIVE		MODEL DMD 36GA	SN 7400
ACQ YR 1983	ACQ P.O. 0097CA01 3	ACQ COST \$98,317.80	

CONDITION CODE	FULL DEFINITION	BRIEF DEFINITION
1	UNUSED PROPERTY THAT IS USABLE WITHOUT REPAIRS AND IDENTICAL OR INTERCHANGABLE WITH NEW ITEMS FROM NORMAL SUPPLY SOURCES.	UNUSED - GOOD
2	UNUSED PROPERTY THAT IS USABLE WITHOUT REPAIRS BUT IS DETERIORATED OR DAMAGED TO THE EXTENT THAT UTILITY IS SOMEWHAT IMPAIRED	UNUSED - FAIR
3	UNUSED PROPERTY THAT IS USABLE WITHOUT REPAIR BUT IS CONSIDERABLY DETERIORATED OR DAMAGED. ENOUGH UTILITY REMAINS TO CLASSIFY THE PROPERTY BETTER THAN SALVAGE.	UNUSED - POOR
4	USED PROPERTY THAT IS USABLE WITH REPAIRS AND MOST OF ITS USEFUL LIFE REMAINS.	USED - GOOD
5	USED PROPERTY THAT MAY BE USED WITHOUT REPAIRS BUT IS CONSIDERABLY WORN OR DETERIORATED AND MAY SOON REQUIRE REPAIRS.	USED - FAIR
6	USED PROPERTY THAT MAY BE USED WITHOUT REPAIRS, BUT IS CONSIDERABLY WORN OR DETERIORATED TO THE DEGREE THAT REMAINING UTILITY IS LIMITED OR MAJOR REPAIRS WILL SOON BE REQUIRED.	USED POOR
7	REQUIRED REPAIRS ARE MINOR AND SHOULD NOT EXCEED 15 PERCENT OF ORIGINAL ACQUISITION COST.	0% - 15%
8	REQUIRED REPAIRS ARE CONSIDERABLE AND ARE ESTIMATED TO RANGE FROM 16 PERCENT TO 40 PERCENT OF ORIGINAL ACQUISITION COST.	16% - 40%
9	REPAIRS ARE MAJOR BECAUSE PROPERTY IS BADLY DAMAGED, WORN OR DETERIORATED, AND ARE ESTIMATED TO RANGE FROM 41 PERCENT TO 65 PERCENT OF ORIGINAL ACQUISITION COST.	41% - 65%
X	PROPERTY HAS SOME VALUE IN EXCESS OF ITS BASIC MATERIAL CONTENT BUT REPAIR OR REHABILITATION TO USE FOR THE ORIGINALLY INTENDED PURPOSE IS CLEARLY IMPRACTICAL. REPAIRS FOR ANY USE WOULD EXCEED 65 PERCENT OF THE ORIGINAL ACQUISITION COST.	ABOVE 65%
S	MATERIAL THAT HAS NO VALUE EXCEPT FOR ITS BASIC MATERIAL CONTENT	BASIC MATERIAL CONTENT

ASSESSMENT NOTES: Transmission needs to be replaced. Needs drive sprockets, axle blocks and wiring. Usage Hours: 3,789		
Major Safety Concern: Deadman does not function with loss of air pressure.		
ESTIMATED PARTS \$26,000	ESTIMATED LABOR \$6,000	TOTAL ESTIMATE \$32,000
ASSESSED CONDITION CODE: At 33% of acquisition cost: CODE 8		
SUGGESTED DISPOSITION:		
COMMENTS: Engine has 50% life remaining. Unit is Deadlined. Unit is of out-dated design.		

TECHNICAL INSPECTOR (SIGNATURE)_____
TECHNICAL INSPECTOR (PRINTED NAME)_____
DATE