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Supplier Date: 04/30/07

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Section I. Submittal Information (includes above information)

Submittal Description and Revision Summary for Entire Submittal:

This document is the FINAL submittal of the *Operations and Maintenance Report, Mina Rail Corridor*. This report describes those aspects of railroad operations and maintenance that are unique to the MRC. For those aspects that are common to both the MRC and CRC, data is not duplicated here but instead the reader is referred to the appropriate section of the various CRC reports.

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Section II. Data File Information (Add lines below if needed for additional files. Indicate "Last item" or "End of list" on last line used.)

Filename	Rev.	File Size	Description (File description and revision summary for file)	Application and Version/ Add-in or Extension and Version
T15_Cover_30April2007 ~~26March20 07~~.ppt	00	701 KB	Report cover for *Operations and Maintenance Report, Mina Rail Corridor* - NRP-R-SYSW-OM-0003-00, Rev. 00	Microsoft Powerpoint 2003
T15_O&M_FINAL_30 April2007_Rev00.doc	00	18,419 KB	Main text with all imbedded graphics and *appendices Operations and Maintenance Report, Mina Rail Corridor* - NRP-R-SYSW-OM-0003-00, Rev. 00	Microsoft Word 2003
T15_O&M_FINAL_30 April2007_Rev00.pdf	00	5,074 KB	Scanned version of the complete document with all imbedded graphics and *appendices Operations and Maintenance Report, Mina Rail Corridor* - NRP-R-SYSW-OM-0003-00, Rev. 00	Adobe Acrobat 7.0 Standard Version
T15_O&M_FINALR eadonly_30April2007 _Rev00.doc	00	18,421 KB	Main text (Read Only) with all graphics and appendices *Operations and Maintenance Report, Mina Rail Corridor* - NRP-R-SYSW-OM-0003-00, Rev. 00	Microsoft Word 2003
T15_O&M_FINALR edlines_30April2007 _Rev00.pdf	00	4,465 KB	Scanned redline version of the complete document with all imbedded graphics and appendices *Operations and Maintenance Report, Mina Rail Corridor* - NRP-R-SYSW-OM-0003-00, Rev. 00	Adobe Acrobat 7.0 Standard Version
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Section III. Metadata

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Operations and Maintenance Report
Mina Rail Corridor

Task 15: Operations & Maintenance Planning Support
Rev.00
Document No. NRP-R-SYSW-OM-0003-00

prepared by:

NEVADA RAIL PARTNERS

prepared for:

BECHTEL SAIC COMPANY LLC

Nevada Rail Line Conceptual Design
Subcontract NN-HC4-00239
April 30, 2007

Operations and Maintenance Report
Mina Rail Corridor

Task 15: Operations and Maintenance Planning Support

Rev. 00

Document No. NRP-R-SYSW-OM-0003-00

Nevada Rail Line Conceptual Design

Subcontract NN-HC4-00239

30 April 2007

Prepared for:
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Acronyms

AAR	Association of American Railroads
ATM	assistant trainmaster
BSC	Bechtel SAIC Company, LLC
CFR	Code of Federal Regulations
CMF	cask maintenance facility
CRC	Caliente Rail Corridor
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
EOL	end-of-line
FRA	Federal Railroad Administration
HLW	high-level radioactive waste
hp	horsepower
MOW	maintenance-of-way
mph	miles per hour
MRC	Mina Rail Corridor
NRL	Nevada Rail Line
NRP	Nevada Rail Partners
NTOC	National Transportation Operations Center
RA EIS	Rail Alignment Environmental Impact Statement
Repository	Yucca Mountain Geologic Repository
RIP	repair-in-place
ROW	right-of-way
SG	siding
SNF	spent nuclear fuel
SSC/WP	site-specific cask/waste package
TCC	train control center
TM	trainmaster
TPC	train performance calculation
UPRR	Union Pacific Railroad
WSA	Wilbur Smith Associates
YM	yardmaster

1.1 PURPOSE

The project addressed in this report is the Nevada Rail Line (NRL), which would connect the existing national rail system with the U.S. Department of Energy's (DOE's) potential Yucca Mountain Geologic Repository (Repository). The site would be the nation's first geological repository designed to store and dispose of spent nuclear fuel (SNF) and high-level radioactive waste (HLW). The NRL would provide a means of transporting the waste by rail to the Repository as well as transporting materials by rail to support Repository construction and operations. Two potential corridors between the existing national rail system and the Repository have been evaluated: 1) the Caliente Rail Corridor (CRC), beginning near Caliente, Nevada, and 2) the Mina Rail Corridor, beginning near Fort Churchill, Nevada.

This report describes the operations and maintenance for the Mina Rail Corridor (MRC). The primary objective of this report is to provide operations and engineering data for DOE's Rail Alignment Environmental Impact Statement (RA EIS) Contractor to support preparation of the RA EIS. The information herein describes the operational characteristics of the NRL as well as the manner in which the capital facilities are to be maintained and made compliant with Federal Railroad Administration (FRA) regulations, as applicable. Figure 1-A presents the proposed NRL corridor and alternate rail segments. The heavy blue line indicates the alignment that is used as the basis for analysis[1] to estimate train performance and runtimes (Nevada Rail Partners [NRP] 2007e). Other route segments are under consideration and are indicated by red lines.

1.2 CONTENTS

Key topics addressed in this report are:

- Train types and traffic projections
- Train movements
- Train control and communications
- Operational interfaces
- Shipping documentation
- Railroad facilities
- Maintenance
- Staffing
- Operating and maintenance costs

This report provides:

- Documentation and support for the conceptual operations and maintenance planning strategies
- A working document for ongoing refinement of the train and yard operating procedures and maintenance strategies presented herein
- Initial input for DOE's RA EIS Contractor
- Documentation of the interfaces and agreements among the Nevada Department of Transportation, National Transportation Operations Center (NTOC), and Repository site development engineering personnel, including functional, procedural, operational, and other interface information.

[1] Throughout this and other Nevada Rail Partners (NRP) reports, the phrase "basis for analysis" is used to provide a frame of reference for NRP's evaluations of the alignment's construction engineering and operational characteristics.

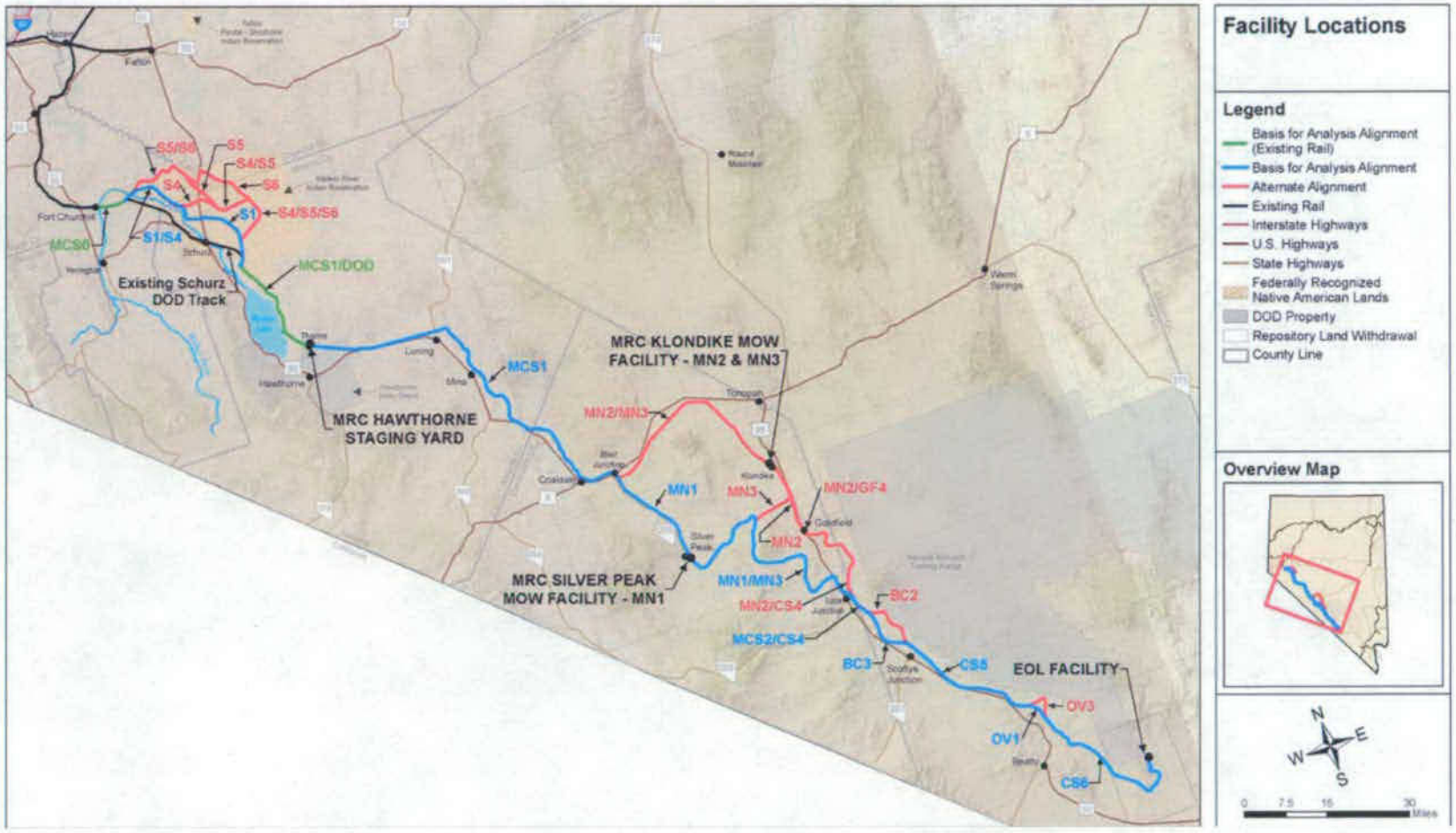

Figure 1-A. MRC Basis for Analysis Alignment and Facility Locations

All of the NRL facilities have concepts based on conventional freight rail operations. There are no specific components, infrastructure, or systems to accommodate the practices associated with nuclear materials handling, storage, or operations. In addition, no specific security components, infrastructure, or systems are included in the current NRL concepts.

This report is not intended to be a stand-alone document. Sections that overlap with or duplicate information contained in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g) reference the location of the data in the CRC document.

The following six appendices to this report contain information supporting the operations and maintenance information contained herein. (Refer to *Operations and Maintenance Report, Caliente Rail Corridor* [NRP 2007g] for Appendices A, C, E, and F):

- Appendix A – Responsibilities of a Common Carrier Railroad
- Appendix B – Estimated Gross Tons by Category for Nevada Rail Line
- Appendix C – Assumptions for Determining Numbers of Trains
- Appendix D – Train Meet Locations, Fort Churchill to Yucca Mountain[2]
- Appendix E – Consideration for Fencing along the Nevada Rail Line
- Appendix F – Bridge Loading Analysis

This report is one of several prepared to support and provide initial input to the draft of the RA EIS. The other reports are as follows:

- *Air Quality Emission Factors and Socioeconomic Input, Mina Rail Corridor* (NRP 2007a)
- *Alignment Development Report, Mina Rail Corridor* (NRP 2007b)
- *Comparative Cost Estimates, Mina Rail Corridor* (NRP 2007c)
- *Construction Plan, Mina Rail Corridor* (NRP 2007d)
- *Facilities–Design Analysis Report, Mina Rail Corridor* (NRP 2007f)
- *Route Sections and Structures Report, Caliente Rail Corridor* (NRP 2007h)

Each report covers a specific topic for a specific purpose. Accordingly, each report utilizes data from various sources in varying levels of detail and precision, as appropriate, as well as in different contexts. Although the reports are consistent in overall conceptual design, numerical values for certain parameters may vary from one report to another. This variation is due to the conceptual nature of the reports and their distinct areas of focus; it should not be considered an abnormal situation or an indication of error.

[2] Because of location parameters that apply to the MRC sidings but not to the CRC sidings, the graphic contained in this appendix of *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g) is not applicable to *Operations and Maintenance Report, Mina Rail Corridor.*

2.1 GENERAL PURPOSE OF RAIL LINE

The primary purpose of the NRL is transport of SNF and HLW to the Repository located at Yucca Mountain, Nevada. SNF includes both DOE and commercial shipments. In addition, the NRL would handle shipments supporting the construction of the Repository facilities as well as shipments of waste disposal packages; site-specific casks; fuel oil; and other, infrequent miscellaneous shipments.

2.2 ROUTE LENGTH

The MRC basis for analysis alignment used for this *Operations and Maintenance Report, Mina Rail Corridor* extends between the Union Pacific Railroad (UPRR) rail line in the vicinity of Fort Churchill and the Repository site at the end-of-line (EOL) facility, a distance of approximately 281 miles. This includes 27 miles of existing U.S. Department of Defense (DOD) track in addition to the proposed nominal 254 miles of track addressed in *Construction Plan, Mina Rail Corridor* (NRP 2007d). Except for this *Operations and Maintenance Report, Mina Rail Corridor*, the NRP reports provide data for all alternate alignment segments so that other alignment segment combinations can be considered. For purposes of this report, however, the difference in distances between the longest combination of alternates (309 miles) and the shortest (281 miles) is small (approximately 10 percent) when compared to the overall length. Thus, these variations have no substantial impact on the overall operations analysis and cost estimates presented.

The 281-mile basis for analysis alignment between Fort Churchill and the EOL facility is used to estimate the maintenance costs presented herein with respect to track, right-of-way (ROW), and systems. It is envisioned, however, that UPRR would interchange traffic at Hawthorne, Nevada; therefore, the basis for analysis alignment extending between Hawthorne and the EOL facility, a distance of approximately 223 miles, is used for operations planning and operating costs.

2.3 COMMON CARRIER OPERATION

Refer to Section 2.3 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

2.4 SINGLE-TRACK RAILROAD

Refer to Section 2.4 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

2.5 HAWTHORNE ARMY DEPOT TRAIN OPERATION

The Hawthorne Army Depot, located in the town of Hawthorne, NV, is a major DOD facility dedicated to the handling, storage and processing of ammunition. There is an existing railroad alignment between the town of Hazen, NV, and the Hawthorne Army Depot. The rail yard at the Hawthorne Army Depot is referred to as Thorne, and Hazen is the connection point to the national rail network (UPRR and BNSF Railway).

The DOD owns the track from Fort Churchill to Thorne, the former being located about 53 railroad miles north of Thorne. The Hazen–Fort Churchill segment (about 43 miles long) is owned by the UPRR and is referred to as the Mina Subdivision. UPRR operates over the DOD-owned Fort Churchill–Thorne segment through an agreement executed with the DOD. Current rail traffic consists of 1-2 trains per week (round trip) between Hazen and Thorne.

For clarification, the Thorne rail yard is located approximately 0.5 mile west of the proposed Hawthorne staging yard.

3.0 General Train Use Strategies for Track Construction

Trains would be used extensively to support track construction activities by delivering rail, ballast, ties, and other track material. Track construction would begin when the grading and subballast are complete. Ties would be placed on the subballast by rubber-tired vehicles. Welded rail would then be pulled from trains into place on the ties, using rollers and other special equipment. Ballast would be dumped from trains on the new track, and the track subsequently would be lifted and the ballast compacted beneath it. This would occur in three passes in order to support the track on 12 inches of ballast.

The general approach for train movement is for the rail trains to operate two days a week and the ballast trains to operate five days a week during the track construction phase.

It is anticipated that 80-foot rails would be delivered by train from the mills to a portable welding plant in the Hawthorne area, for welding into 1,440-foot strings. MRC-dedicated rail trains would distribute the rail from the welding plant to the end of the track. It is estimated that two 20-string, 1,440-foot-long rail trains would be needed per week. During track construction, the welding plant would be moved from time to time along the route to be in reasonable proximity of the end of track.

Track construction would require about 2.7 million tons of ballast. Ballast would be obtained from commercially available sources, new quarries developed along the MRC alignment, or a combination of these two alternatives; a final determination has yet to be made. During further refinement of construction train operations, the use of two potential ballast rock quarries (Garfield Hills and Malpais Mesa South), which are on the basis for analysis alignment, may be assumed.

Assuming 5,000-ton ballast trains and a five-day distribution period per week, about 12 ballast trains per week would be needed during the track construction phase. The number of trains needed to support track construction on a daily basis, as discussed in the above paragraphs, demonstrates the need for careful consideration of siding locations, both temporary and permanent, to support construction train movements.

4.1 TRAFFIC PROJECTIONS

Table 4-1 presents estimated traffic projections of carloads and trains annually by eight traffic categories for the 50 year life of the NRL. The eight traffic categories are commercial SNF, HLW, DOE SNF and Navy cask shipments; and site-specific cask/waste package (SSC/WP), Repository construction-related, fuel oil, and commercial shared use shipments. Seven of the categories are DOE related. The source of the traffic numbers for SNF, HLW, Navy, fuel oil, and SSC/WP shipments is the *Nevada Transportation Requirements Document* (Bechtel SAIC Company, LLC [BSC] 2005). For the traffic estimates for trains supporting the construction of Repository facilities, there is not a source document to reference; however, these traffic estimates represent the latest planning assumptions based on discussions with Repository planning personnel. Commercial traffic was estimated by an outside consultant under contract to Nye County, Nevada, in *Rail Transportation Economic Impact Evaluation & Planning* (Wilbur Smith Associates [WSA] 2005). From these carload data and tonnage projections, train counts and gross tons were estimated by year. The data are contained in Appendix B.

Various cask car and cask design refinements are still underway. Therefore, shipments of SNF, HLW, and Navy HLW to the Repository are not finalized and vary between approximately 11,056 and 9,995 cask cars over the projected SNF/HLW program. In terms of railroad movements and tonnages, the difference between assumptions is not significant; it amounts to about seven six-car cask trains per year as compared to hundreds of trains per year spread over the 25-year period (see Table 4-1). For purposes of this report, it is assumed that about 10,000 cask cars are shipped over this period.

In addition, because of business planning uncertainties, possible commercial traffic may vary between 5,000 to 15,000 cars per year or between 130 to 390 trains per year. This report is based on 10,293 cars, which would be approximately 260 trains per year, or five trains per week. If the higher level were to occur, the number of trains per week would increase by two to three.

Further, SNF traffic is projected to move to the Repository for a period of approximately 33 years, or could move throughout the 50-year waste acceptance period. Waste disposal containers would continue to move to the Repository for about an additional three years after the last SNF traffic is received. Fuel oil trains to support Repository operations, and potential commercial shared-use traffic, are projected through the 50-year life of the NRL. Maintenance-of-way (MOW) trains are not included.

The variation in cask shipments or commercial use is easily absorbed in the normal ebb and flow of the railroad operations

4.2 NEVADA RAIL GROSS TONNAGE PROJECTION

Refer to Section 4.0 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

4.3 GROSS TONNAGE SUMMARY

Refer to Section 4.0 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

Table 4-1. Estimated Traffic Projections of Carloads and Trains

Year	Commercial SNF		HLW		DOE SNF		Navy		SSC	WP (2/car)		Reposit. Construct'n		Fuel Oil		Comm'l Shared Use		TOTAL	
	Cars	Trains	Cars	Trains	Cars	Trains	Cars	Trains	Cars	Cars	Trains	Cars	Trains	Cars	Trains	Cars	Trains	Cars	Trains
1	30	10	39	20	2	2	3	1	200	27	33	1,467	37	122	13	4,440	156	6,317	272
2	80	27	77	39	4	4	3	1	200	47	36	1,467	37	163	26	6,630	208	8,648	378
3	114	29	77	39	9	9	6	1	200	65	38	1,467	37	163	26	7,970	260	10,039	439
4	224	45	77	39	14	14	6	1	200	89	41	1,467	37	163	26	9,010	260	11,206	463
5	314	53	77	39	18	18	12	2	200	122	40	1,467	37	163	26	10,293	260	12,605	475
6	365	61	77	39	24	12	13	3	200	123	40	1,467	37	163	26	10,293	260	12,664	478
7	326	55	77	39	27	14	14	3	200	120	40	1,467	37	163	26	10,293	260	12,627	474
8	329	55	77	39	28	14	15	3	200	123	40	1,467	37	163	26	10,293	260	12,634	474
9	312	52	86	43	28	14	15	3	200	123	41	1,467	37	163	26	10,293	260	12,626	476
10	316	53	130	44	28	14	15	3	200	142	43	1,467	37	163	26	10,293	260	12,683	480
11	316	53	130	44	28	14	15	3	100	142	35	1,467	37	163	26	10,293	260	12,583	472
12	323	54	130	44	28	14	15	3		140	46			163	26	10,293	260	11,022	447
13	345	58	139	46	28	14	15	3		145	48			163	26	10,293	260	11,056	455
14	338	57	144	48	30	15	15	3		144	48			163	26	10,293	260	11,055	457
15	330	55	148	50	34	17	14	3		147	49			163	26	10,293	260	11,056	460
16	341	57	153	51	42	14	14	3		123	41			163	26	10,293	260	11,068	452
17	335	56	153	51	47	16	14	3		148	50			163	26	10,293	260	11,079	462
18	366	61	86	29	47	16	14	3		130	43			163	26	10,293	260	11,034	438
19	351	59			47	16	14	3		118	40			163	26	10,293	260	10,927	404
20	354	59			47	16	14	3		119	40			163	26	10,293	260	10,931	404
21	336	56			48	16	14	3		119	40			163	26	10,293	260	10,914	401
22	333	56			48	16	14	3		105	35			163	26	10,293	260	10,904	396
23	342	57			48	16				109	37			163	26	10,293	260	10,901	396
24	231	39			49	17				86	29			163	26	10,293	260	10,779	371
25	40	7								26	9			163	26	10,293	260	10,509	302
26										17	6			163	26	10,293	260	10,465	292
27										12	5			163	26	10,293	260	10,462	291
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Notes: 1) This table lists inbound carload and train totals; multiply by 2 for round trip data. 2) These numbers represent mid-range estimates for commercial shared-use traffic.

5.1 ESTIMATED END-POINT-TO-END-POINT RUNTIMES

The design objective is to provide a transit time between the Fort Churchill area and the EOL facility within a continuous 10-hour period (BSC 2005). Achieving an expeditious runtime is a critical element of the cost of operating the railroad. The FRA hours of service regulations (49 *Code of Federal Regulations* [CFR] 228) limit train and engine crews to 12 hours on duty. If the operating characteristics do not permit one crew to move a train across the line comfortably within the allotted time, a second crew is required. Of further consideration is that the crew must go on duty in advance of the train's departure, thus consuming some of the allotted 12 hours of service time.

Getting a train over the rail line with a single crew is substantially cheaper than using two. Operating with two crews means paying additional fringe benefits to the additional employees. There also would likely need to be a crew change facility at an intermediate point on the line. Building, operating, and supplying such a facility in a remote location represents costs that are better avoided.

Computer simulations (train performance calculations [TPCs]) were used to estimate the runtimes of trains over the MRC route. TPCs use train route characteristics (such as route length, gradient, and curvature) and train characteristics (such as locomotive tractive effort, tonnage, and braking) to determine the theoretical runtime over the route for a particular train. At the writing of this report, many alternate alignments are possible for the MRC. For the TPC data presented herein, a group of alignment segments was selected to serve as the basis for analysis alignment so that train performance could be estimated. The basis for analysis alignment is presented in Figure 1-A.

A six-car cask train (including two buffer cars and an escort car) was used in the simulations. This train would have a trailing weight of approximately 1,821 tons. This train consist was selected to evaluate the upper limit capabilities of a cask train powered by two locomotives, considering the possibility for one locomotive to become inoperable during the trip. Cask trains of up to 12 cars are being considered, but additional locomotives would be needed for these trains. Two-locomotive cask trains could vary between one and six cask cars. Three-car cask trains may become the most common train consist.

The TPC runtimes cited in the text below are for trains operating between Hawthorne, the site of the interchange with UPRR, and the EOL facility. This alignment is about 223 miles long. It should be noted; however, that the TPC graphs (Figures 5-A through 5-F) include the Fort Churchill-to-Hawthorne segment. These segments are included so that operations on the Schurz by-pass route (Schurz 1) could also be evaluated.

Two runs of a six-car loaded cask train were simulated from Hawthorne to the EOL facility. The consist of each train was assumed to be identical: two 4,000-horsepower (hp) locomotives, a buffer car, six cask cars, a buffer car, and an escort car. In the first run, both locomotives were assumed to be operative, and the resultant theoretical runtime was five hours and 10 minutes (5:10), at an average speed of 44 miles per hour (mph). In the second run, it was assumed that one locomotive was inoperative. This run was to test and verify that one locomotive was capable of pulling the train over the route in case the other locomotive failed. Operating with one locomotive, the six-car cask train required 6:28, at an average speed of 35 mph. In both cases, the runtime was assumed to include no opposing train traffic. The performance of both trains is illustrated in Figure 5-A, the speed-distance plot for a 1,821-ton loaded cask train from Fort Churchill to the EOL facility. In all train graphs (Figures 5-A through 5-F), the blue line represents the train with all locomotives operating and the orange line is the train with one failed locomotive.

Two similar simulations were run for empty six-car cask trains traveling between the EOL facility and Hawthorne. For the train having two operating locomotives, the transit time was 5:04, at an average speed of 45 mph; for the train with one operative locomotive, the transit time was 6:18, at an average speed of 36 mph. The performance of these trains is illustrated in Figure 5-B.

In the same manner, loaded and empty runs were simulated for the Navy six-car cask trains. For the southbound loaded trains, the train with both locomotives operating had a transit time of 5:35, at an average speed of 41 mph, and the train having one operating locomotive had transit time 7:29, at an average speed of 38 mph. The performance of these trains is illustrated in Figure 5-C.

For the return empty movement between the EOL facility and Hawthorne, the Navy cask train with both locomotives operating had a transit time of 5:30, at an average speed of 44 mph, and the train having one operating locomotive had a transit time of 7:28, at an average speed of 30 mph. The performance of these trains is illustrated in Figure 5-D.

It should be noted that loaded DOE and Navy cask trains operating with one locomotive were lugging uphill, in the 10 to 20 mph speed range, at a number of locations. This type of operation approaches the maximum performance limits for the locomotive, and there is the possibility that the train could stall under adverse rail adhesion conditions (rain or snow).

The next set of simulations tested the performance of typical trains that could be used to support MRC and Repository construction and maintenance, or commercial shared-use trains. A 5,320-ton train powered by four locomotives was simulated twice, the second time with one locomotive having failed. As before, the loaded runs were from Hawthorne to the EOL facility and the empty runs (1,320 tons) were from the EOL facility to Hawthorne. The loaded southbound train from Hawthorne, powered by four locomotives, took 5:11, at an average speed of 43 mph. The train with three locomotives took 5:47, at an average speed of 39 mph. The performance of these trains is illustrated in Figure 5-E. The empty return trip from the EOL facility to Hawthorne with four locomotives resulted in a runtime of 4:48, at an average speed of 47 mph. With three locomotives, there was no appreciable difference because of the light weight of the empty train. It should be noted that the railroad alignment is designed to support 60 mph operations; thus, the speed of the empty return train exceeded that of the empty cask trains, which are limited to a maximum speed of 50 mph.

Further, it should be noted that a TPC run represents a theoretical performance; that is, it presents the maximum (perfect) performance. In actuality, locomotives may not perform to peak efficiency, train engineers vary in train handling skills, and en route delays may occur, such as those caused by bad weather. Therefore, the actual runtime would be somewhat longer. Typically, a 7 percent contingency (pad) is incorporated into scheduling to allow for such variances. This does not include delays as a result of trains meeting each other, slow orders for track maintenance, mechanical breakdown, or similar causes. A runtime of about 5:30 is more realistic for the loaded six-car cask train with two operating locomotives than the theoretical TPC time of 5:10.

An additional consideration that has not been assessed is train braking. The unique configuration and gross weight of the cask cars (not yet designed) leaves braking as an undefined issue to be analyzed in the future, and may have an effect on the operational characteristics identified in this document.

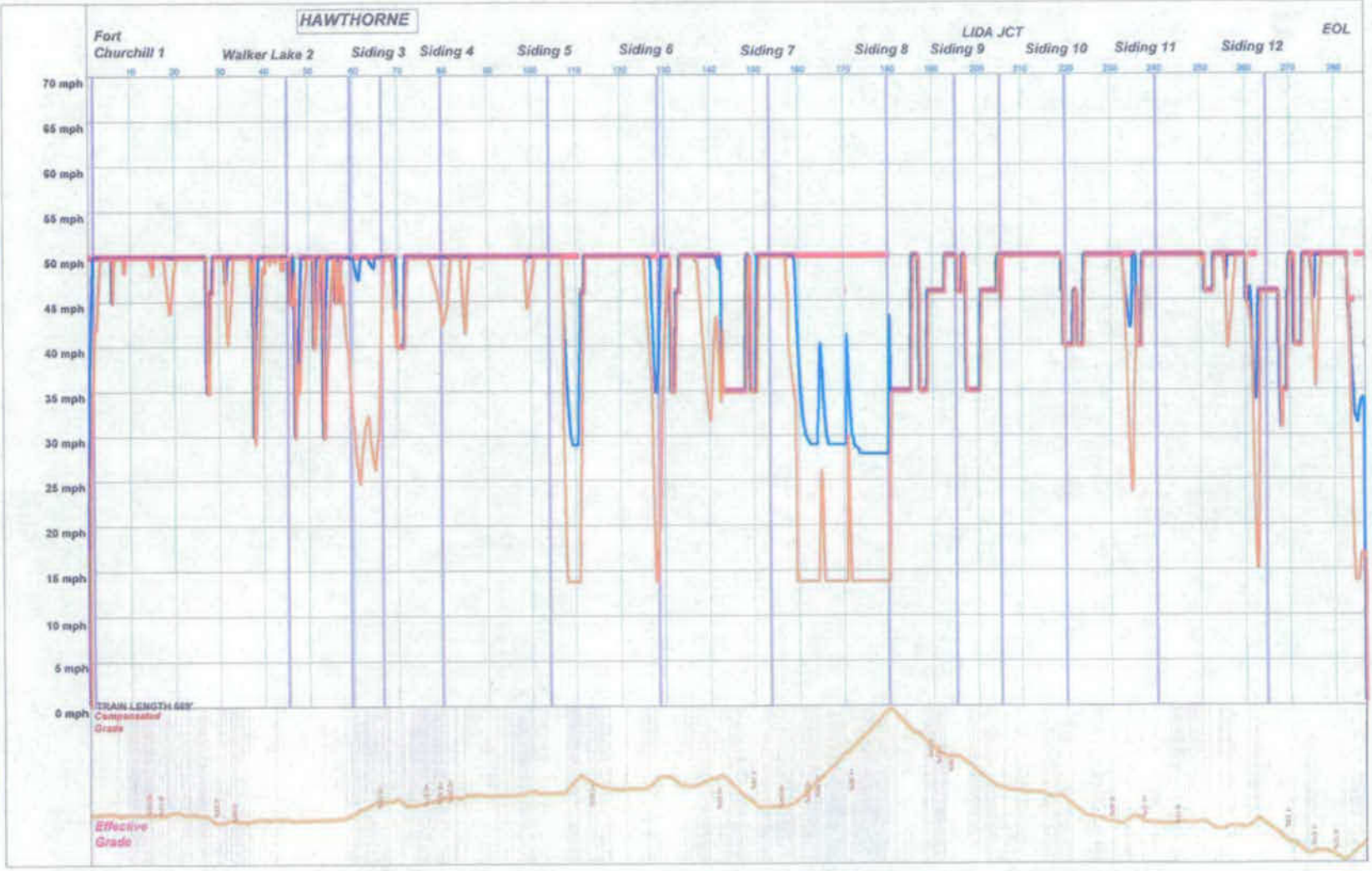


Figure 5-A. Loaded Cask Train, 1,821 Tons, Fort Churchill to EOL

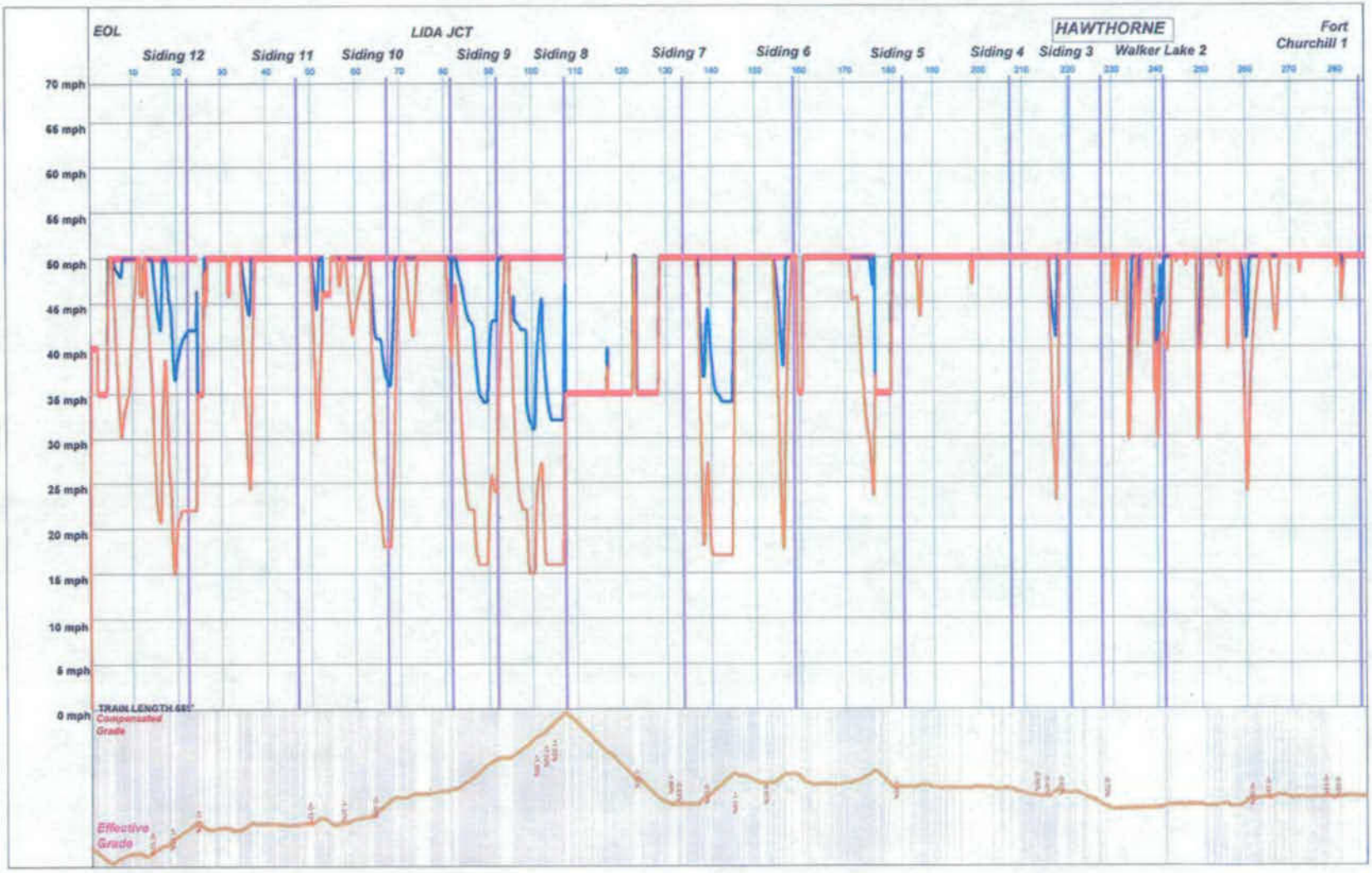


Figure 5-B. Empty Cask Train, 1,584 Tons, EOL to Fort Churchill

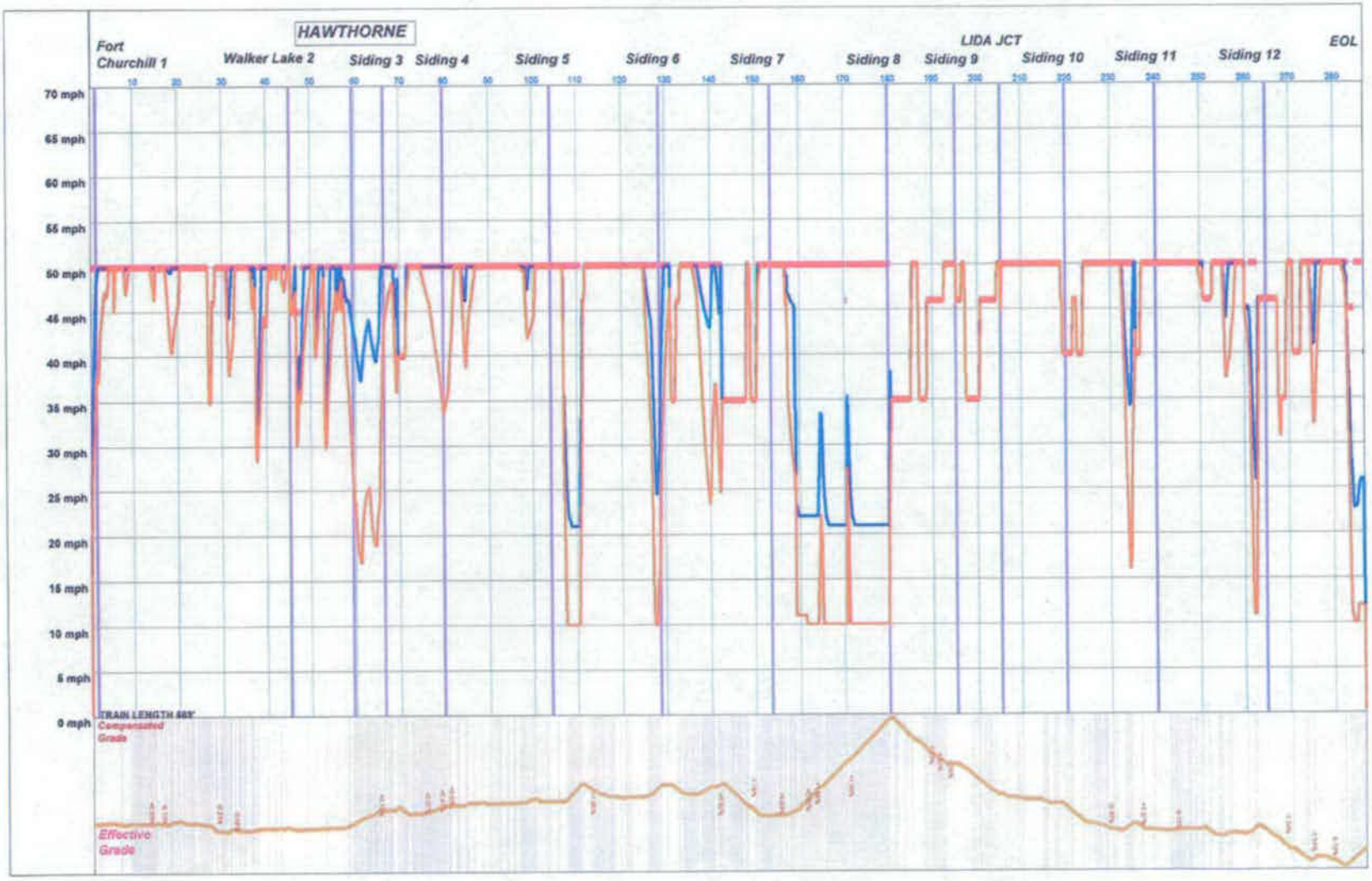


Figure 5-C. Loaded Navy Cask Train, 2,815 Tons, Fort Churchill to EOL

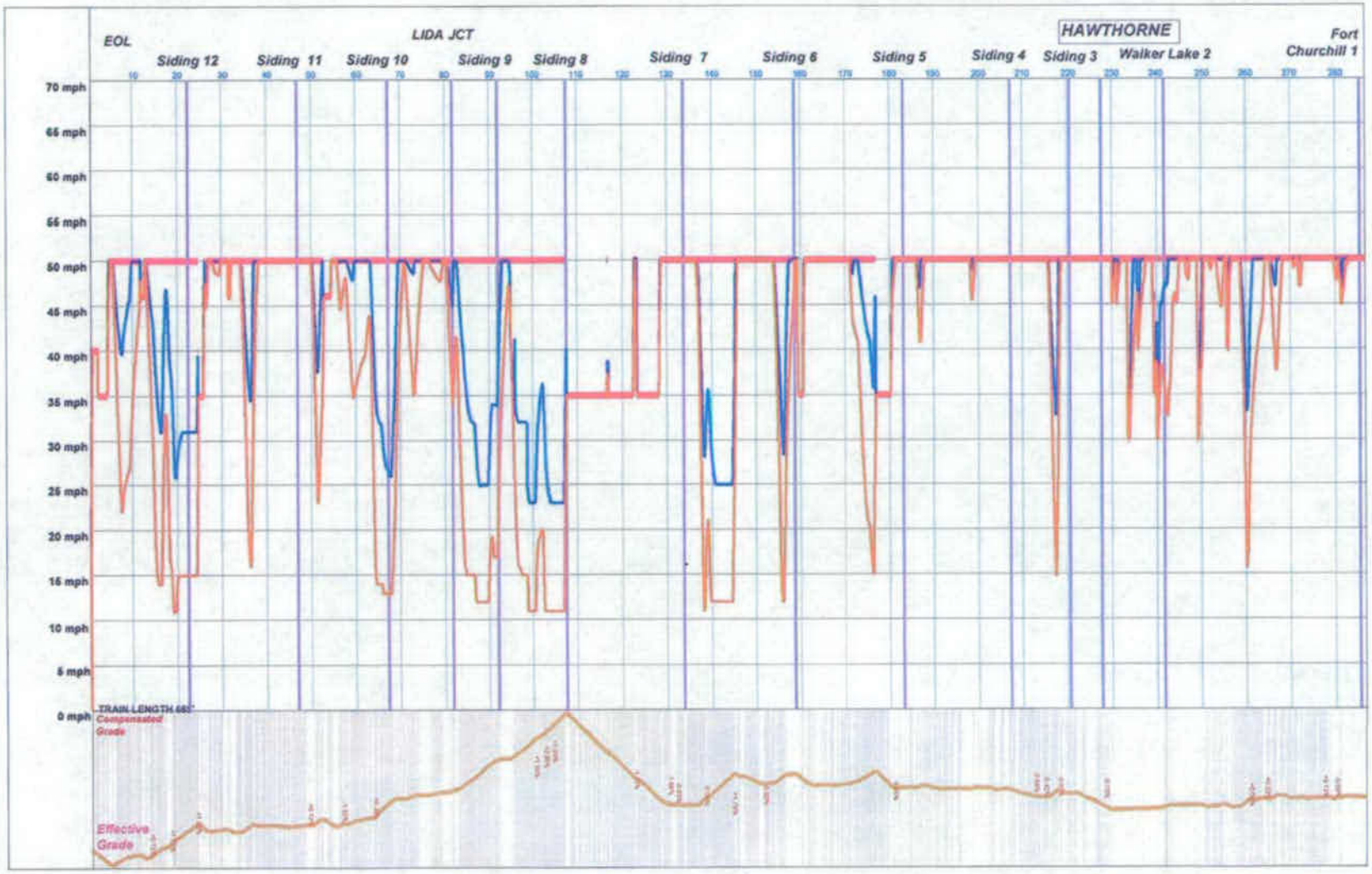


Figure 5-D. Empty Navy Cask Train, 2,607 Tons, EOL to Fort Churchill

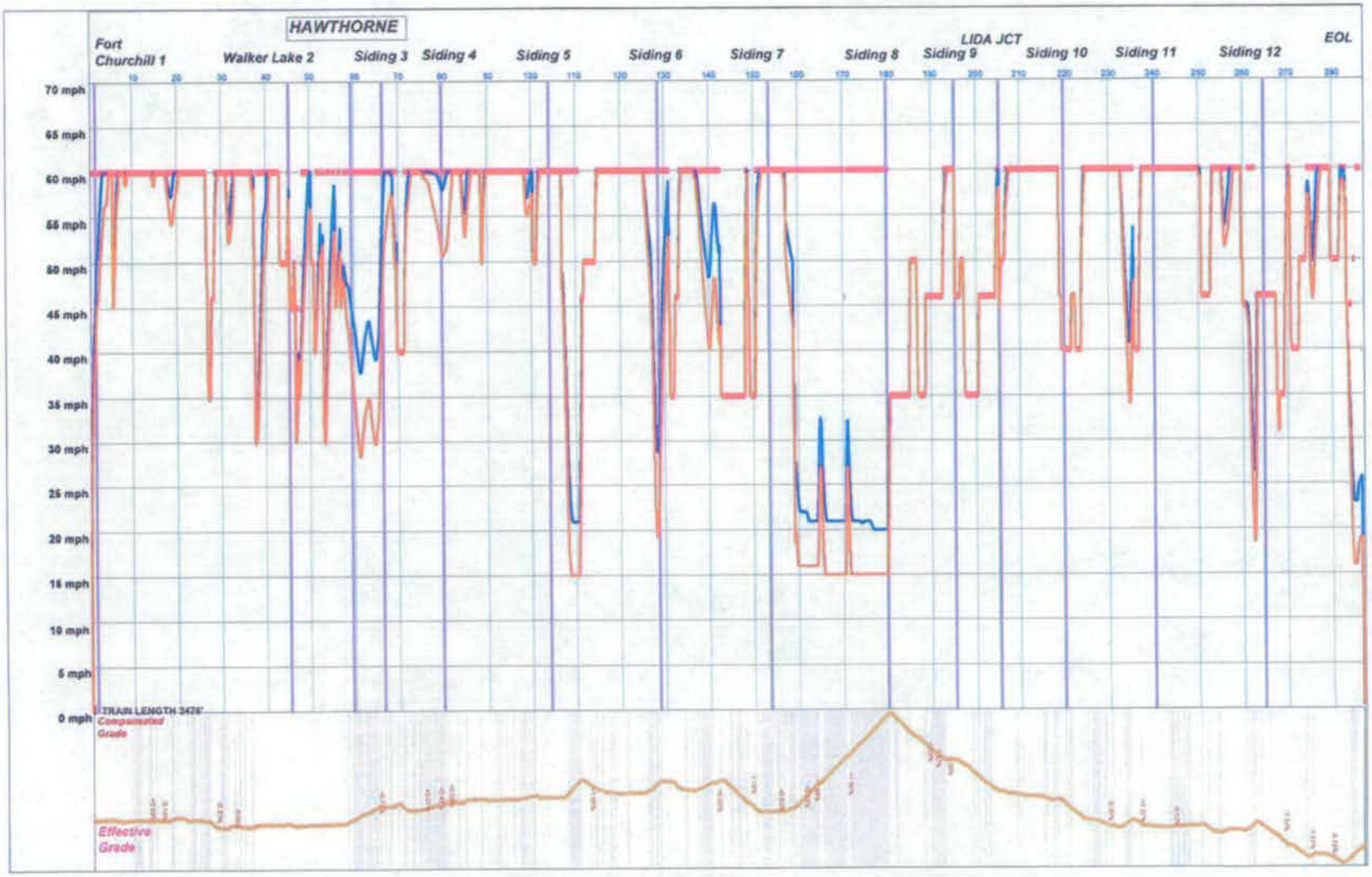


Figure 5-E. Loaded Ballast/Commercial Shared-Use Train, 5,320 Tons, Fort Churchill to EOL

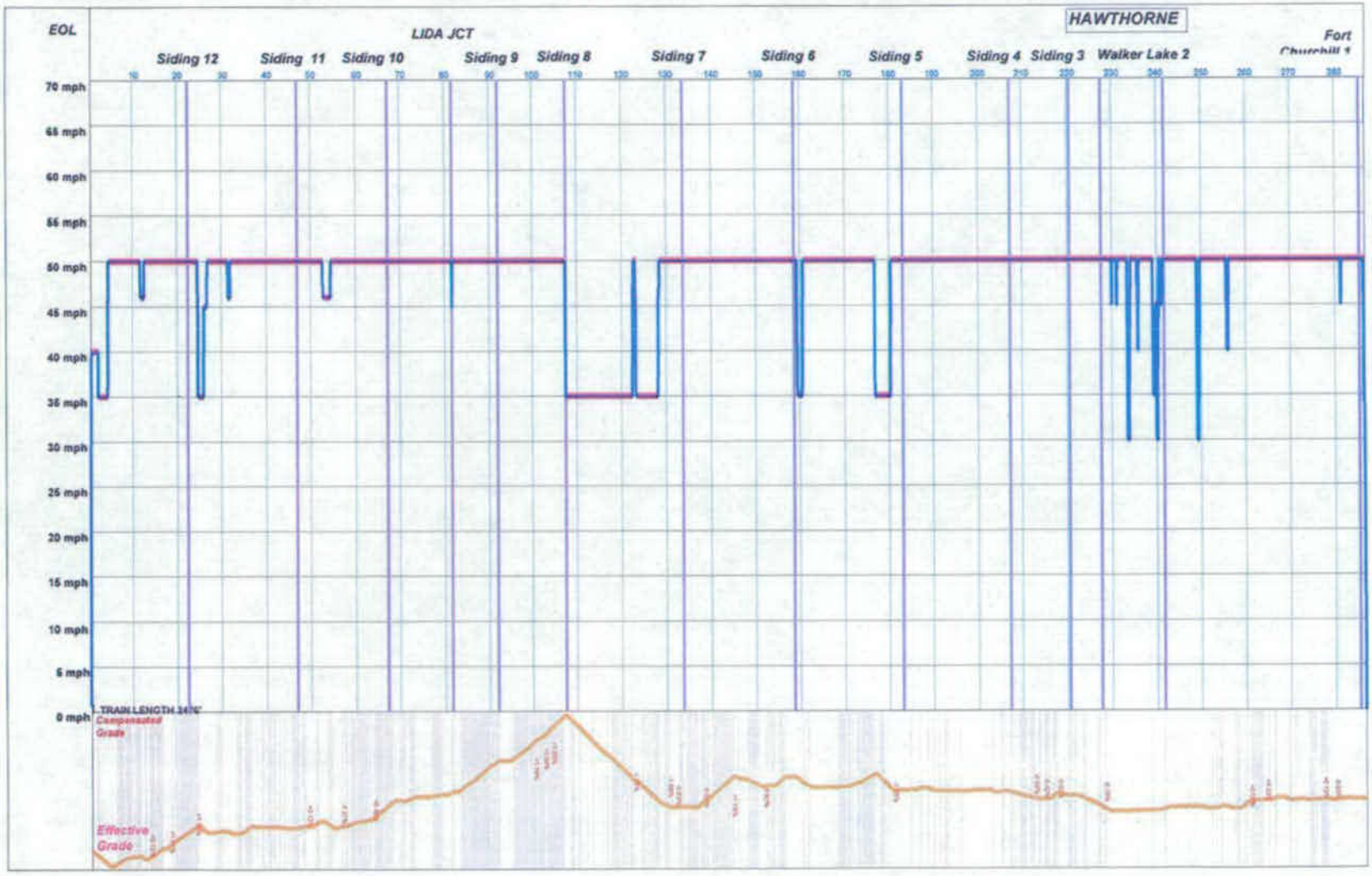


Figure 5-F. Empty Ballast/Commercial Shared-Use Train, 1,320 Tons, EOL to Fort Churchill

5.2 TRAIN CHARACTERISTICS

Refer to Section 5.2 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

5.2.1 Mina Rail Corridor Alignment

Because the MRC runtime between the Hawthorne staging yard and the EOL facility is significantly reduced from that of the CRC runtime, this CRC subsection is not relevant to the MRC.

5.2.2 Six-Cask Car Design Train

Refer to Section 5.2.2 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

5.2.3 Road Power for Six-Car DOE Cask Train

Refer to Section 5.2.3 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

5.2.4 Maximum Cask Train Length

Refer to Section 5.2.4 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

5.2.5 Switching Locomotives for Local Yard Work

Refer to Section 5.2.5 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

5.3 SIDING SPACING

Avoiding potential delays en route is a very important consideration in maximizing train crew utilization. Considering the single-track configuration of the NRL, one common delay to be expected is for a train to wait on a siding to meet an opposing train. A siding is a short section of railroad track connected by switches with a main track. Although there are no specific criteria for specifying siding spacing, it is readily apparent that any frequently occurring waits would inhibit efficient crew utilization and could result in the train crew's time expiring under the 12-hour limit in the FRA hours of service regulations. If this happens, the train must stop and the train crew must be replaced with a new crew. Because of the remoteness of the route, crew replacement could take several hours.

Considering the approximate distance of 223 miles between the Hawthorne staging yard and the EOL facility as well as the desirability of using a single train crew on a round-trip basis within the FRA hours of service, spacing the sidings for about a one-hour maximum wait time is a reasonable compromise between the transit time objectives and the construction cost of sidings.

TPC data were consulted to determine the approximate number and location of sidings, based on a one-hour delay time. Initial siding locations were then evaluated by considering the following factors:

- Runtime between sidings – a goal of maximum of one hour
- Presence of highway/rail at-grade crossings – avoidance of stopped trains that block highway crossings for an extended period.
- Presence of difficult terrain that would require bridges, high fills, long cuts, etc.
- Difficult starting conditions for a stopped train – steep upgrade and/or sharp curvature
- Road access – accessibility to turnouts and signaling equipment for maintenance purposes, and to trains for running repairs, re-crewing, or incident recovery
- Ability to extend the siding for future needs

As a result of this evaluation, 12 siding locations have been identified and are listed in Table 5-1. The three factors limiting siding locations proved to be constructability, gradient, and attempts to avoid the

Walker River Indian Reservation. As noted in Table 5-1, siding lengths range between 5,000 and 19,000 feet. Again, these lengths are necessitated by engineering and train operations factors.

Table 5-1. Siding Locations

Siding (SG)	Distance from Fort Churchill (miles)	Length (feet)
SG 1	5	5,000
SG 2	45	7,000
SG 3	67	7,000
SG 4	80	7,000
SG 5	104	7,000
SG 6	128	7,000
SG 7	153	7,000
SG 8	180	19,000
SG 9	195	10,000
SG 10	220	10,500
SG 11	240	7,000
SG 12	265	7,500

5.4 WEEKLY TRAIN OPERATIONS

Figures 5-G, 5-H, and 5-I present a theoretical characterization of a week's train movements over the MRC system in Years 2, 10, and 20 of operation. Year 10 reflects the highest yearly train count projected for the MRC and is based on the projections presented in Table 1 of *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g). For the sake of illustration, the commercial trains are run to the EOL facility; in actual practice, however, the trains would probably go to a destination short of the EOL facility.

Trains projected in Figures 5-G, H and I, portray round-trip movements. As no schedule exists for the train movements, the departure day and time for each train was selected randomly. It is emphasized that the figures are meant to portray a hypothetical week or random train movements for the years indicated. The figures do not represent a rigorous analysis showing train delay at sidings or runtimes for dispatching purposes; they do, however, indicate some important characteristics:

- Extended periods without mainline train activity
- Train movements that tend to bunch

Concerning train meets, the following should be noted:

- The week in Year 2 had six meets, two involving loaded cask trains.
- The week in Year 10 had six meets, one involving a loaded cask train.
- The week in Year 20 had five meets, three involving loaded cask trains.
- One siding location (SG 8) had a total of seven meets for the three weeks simulated.
- One siding location (SG 2) had four meets.
- One siding location (SG 1) had three meets.
- Six sidings (SG 3, SG 4, SG 5, SG 6, SG 10, and SG 12) had no meets.

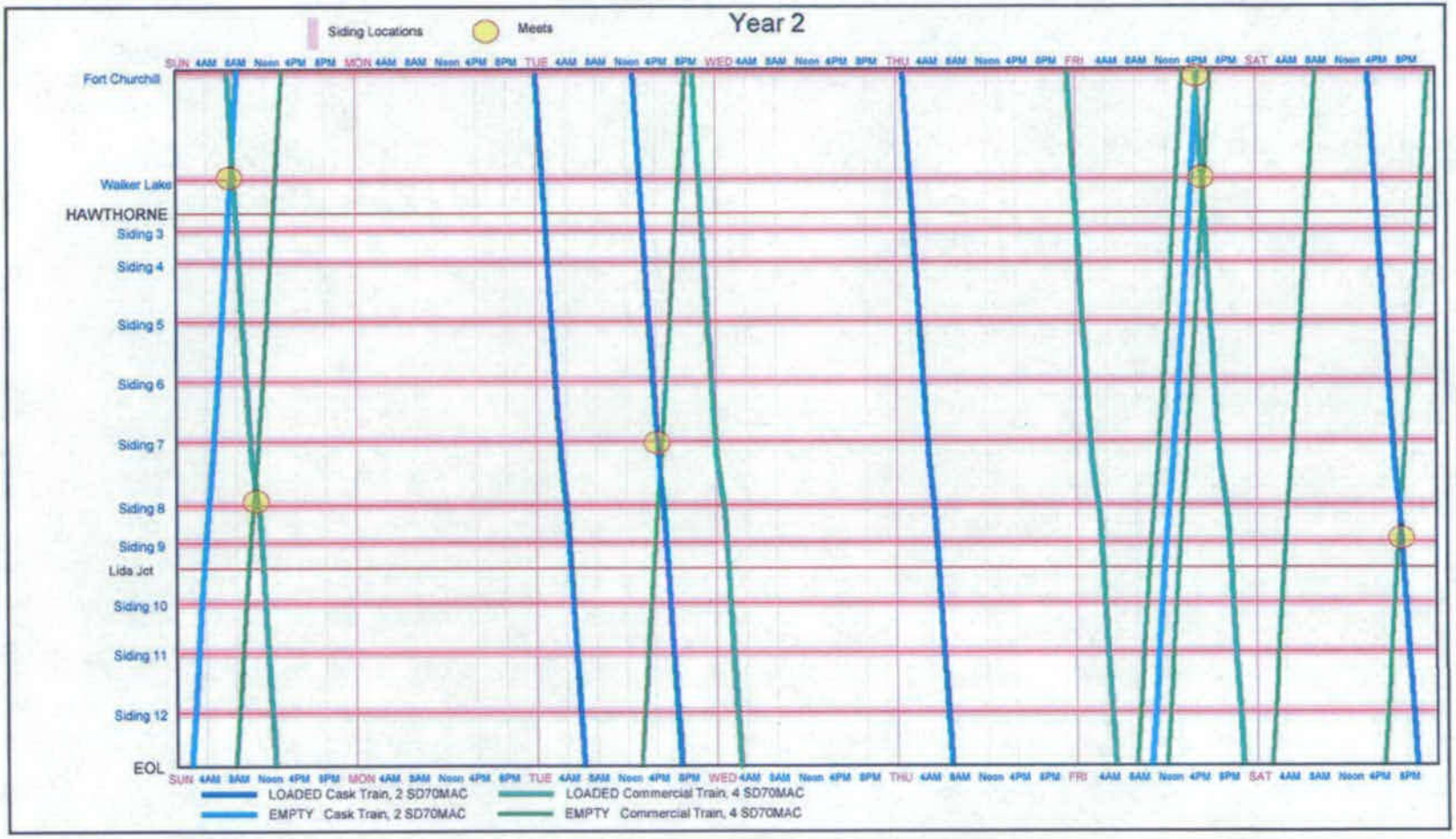


Figure 5-G. Train Activity – Random Week, Year 2

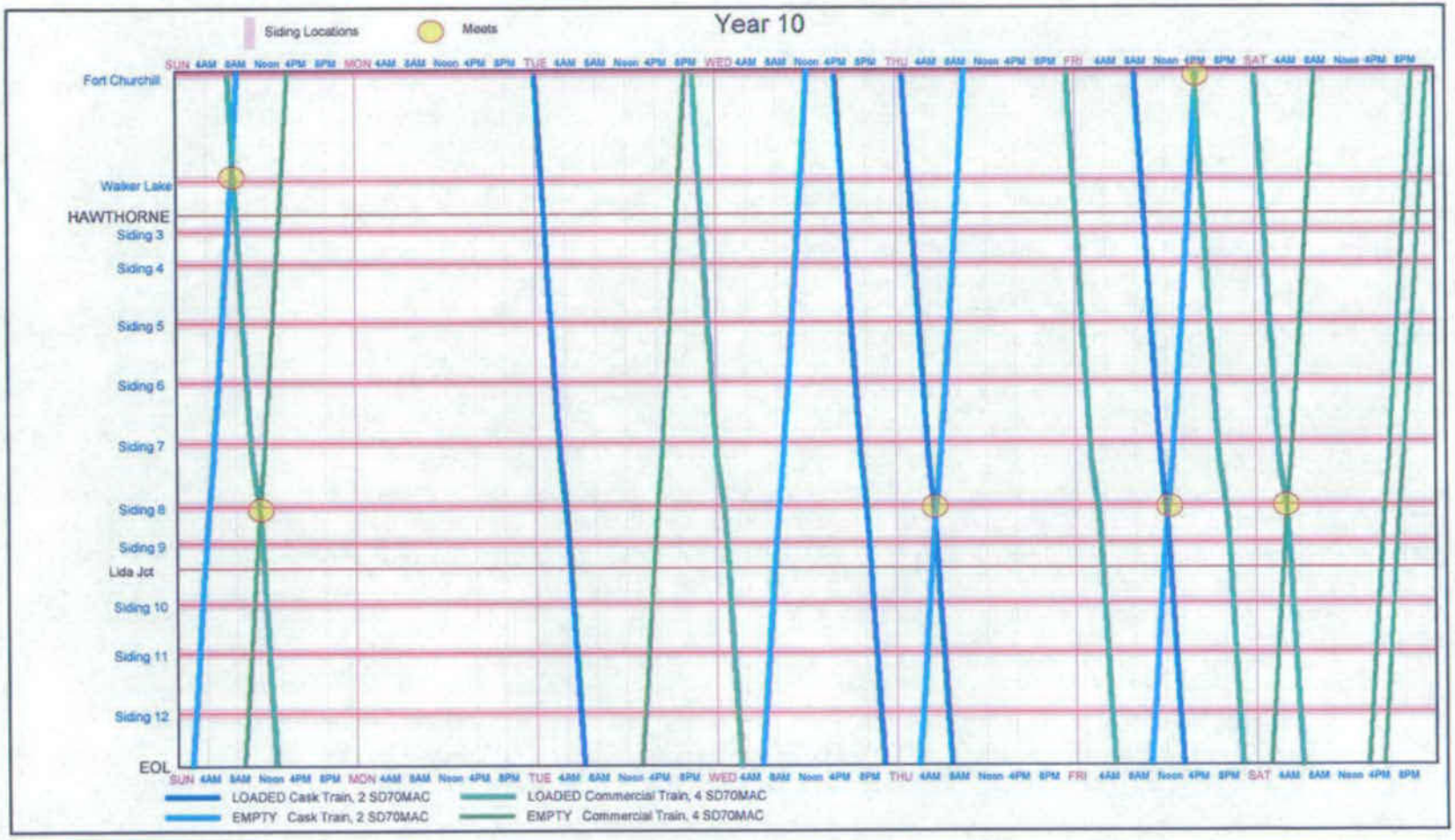


Figure 5-H. Train Activity – Random Week, Year 10

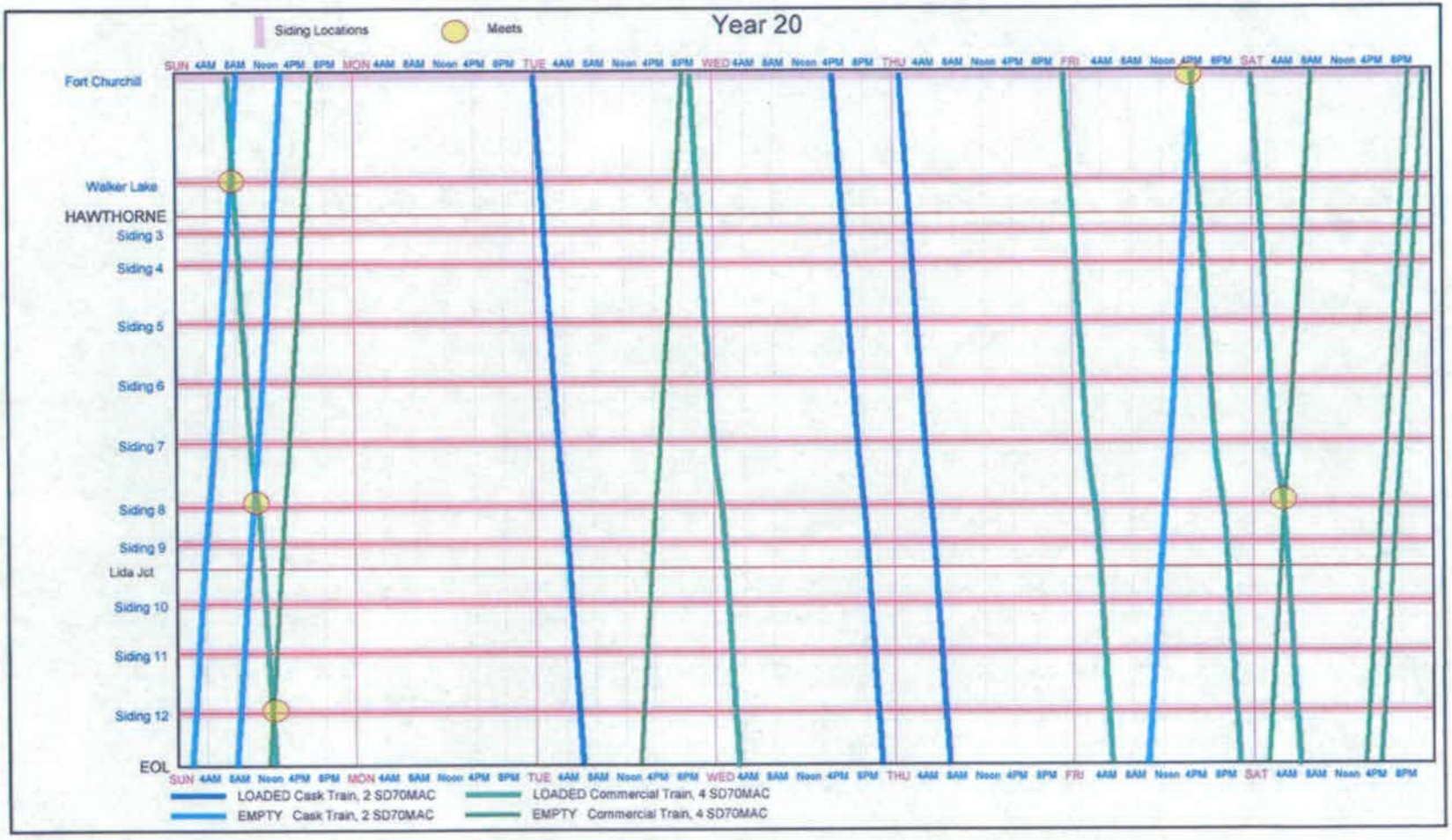


Figure 5-I. Train Activity – Random Week, Year 20

Although these three weekly random train movement samples cannot be interpreted as scientifically conclusive, there are notable meet activities at SG 8, Montezuma Summit (seven meets); SG 2, Walker Lake (four meets); and SG 1, Fort Churchill (three meets).

The Montezuma Summit siding would be located at the highest elevation on the MRC route, and the alignment approaching it would cause slow running because of heavy grades and numerous curves. The slow speed operation would create a bottleneck, with a tendency for trains to bunch in this area. Concerning the meet activity at Walker Lake and Fort Churchill, there is a distance of about 40 miles between these two sidings. Again, there is a tendency for train bunching to occur because of this distance. The long distance between these two sidings results from an effort to minimize new construction on the Walker River Indian Reservation.

As noted in Section 5.1 of this report, three-car cask trains may become the most common train consist. Additional analysis was completed to estimate the meets under this operating scenario. Year 10 was used because it reflects the period of heaviest traffic. It was found that a sample week in Year 10 had 13 meets. Of those, three involved loaded and empty cask trains and three involved loaded cask trains and commercial trains. The balance involved meets of commercial trains with other commercial trains or empty cask trains with commercial trains. (The six-car cask train scenario had six meets, two of which involved loaded and empty cask trains; the balance was commercial/commercial meets or empty cask train/commercial meets). With the three-car cask train scenario, five trains encountered two meets en route, whereas with the six-car cask train scenario, two trains encountered two meets en route. It should be noted that these data are based on random train occurrences and would vary from week to week.

Regarding train meets, it can be argued that meets could be reduced by holding trains at end points and then releasing them so that meets would be closely timed. However, the overall fluidity of train movements would not benefit from this procedure. It matters little to fluidity if a train is held in a yard or on a siding. While the train is held in a yard, however, a train crew is not needed on duty.

5.5 ROAD LOCOMOTIVE UTILIZATION

Based on the random weekly train movements for Years 7 through 14 (six loaded/empty cask trains and 13 to 14 loaded/empty DOE support trains, commercial trains, and MOW trains), a fleet of 10 road locomotives (four locomotives per train for two train sets and two locomotives for one train set) is required to prevent delays in train departures from terminals. For this fleet size, it is assumed that there are no "light" engine movements (that is, locomotives that are moved without a train); considering the random arrival of trains, however, some repositioning of locomotives is likely to be necessary at some time.

Considering DOE-only traffic (that is, commercial trains excluded), and random scheduling, the fleet requirement is six locomotives (three sets of two locomotives). Table 5-2 summarizes the locomotive fleet requirements and utilization rate. The locomotive utilization rate is defined as the number of locomotive hours in a specific time period (such as day, week, or year) that a locomotive is performing productive service, expressed as a percentage of total hours available in that time period.

Table 5-2. Summary of Locomotive Requirements and Utilization

Operating Scenario	Trains per Week	Number of Road Locomotives in Fleet	Locomotive Utilization Rate
Random schedule	19 – 20	10	18%
Random schedule DOE trains (without commercial trains)	14	6	13%

In the DOE-only scenario, each power set makes about 2.3 round trips per week. Although this level of utilization may seem low, the six locomotives would be needed to make sure that road power is available to expedite cask train movements, light locomotive movements are minimized, a spare locomotive is available when others undergo maintenance, and units are available to make a three- or four-locomotive consist to power a 4,000- to 5,000-ton construction train for the Repository.

The 20 trains-per-week scenario results in a total of approximately 789,000 annual locomotive miles and 79,000 annual miles per locomotive. The DOE-only scenario results in a total of approximately 325,000 miles and 54,000 annual miles per locomotive. For these scenario-related data, it is assumed that locomotives are rotated to equalize mileage.

5.6 YARD AND MAINTENANCE-OF-WAY LOCOMOTIVE REQUIREMENTS

In the first few years of operations, at least one switching locomotive would be required at the staging yard and at the EOL yard. The switching locomotive at the staging yard would switch the UPRR interchange traffic and handle other miscellaneous tasks such as sorting and classifying cars and positioning MOW cars. It is noted that trains to and from the UPRR would be handled by UPRR locomotives into and out of interchange tracks at the staging yard.

The switching locomotive at the EOL yard would be used to move cars to and from the Repository, to perform other movements such as positioning fuel oil cars and Repository construction materials cars for unloading, and to make up empty cars into return trains.

An additional switching locomotive should be available for use on occasional MOW trains and as a spare in the event of servicing or breakdown of one of the other two switching locomotives. A fourth (optional) switching locomotive may be necessary to handle switching to and from the cask maintenance facility (CMF). At this writing, the location and activities to take place at the CMF are not fully defined, so switching requirements are uncertain.

7.1 HAWTHORNE STAGING YARD OPERATIONS AND UPRR INTERCHANGE

The MRC staging yard at Hawthorne is where interchange cars from the UPRR freight trains would be placed for delivery to the NRL or picked up from the NRL. The staging yard is also where NRL cars would be held and sorted into trains. Any train or cars can be assigned to any yard track.

Loaded inbound cask trains would proceed directly into the staging yard. There, the UPRR locomotives would be exchanged for NRL locomotives. The UPRR locomotives would lay over at the staging yard, couple onto an empty cask train (if available), or exit the staging yard with no train. Upon completion of interchange administrative and car inspection procedures, estimated to take about two hours, the cask train would depart for the Repository. The time for radiological inspection of the cask cars, if required, is not accounted for in the two-hour interchange processing period. NRL road crews would be called for duty based on the estimated departure time of the cask train. Movement of the cask train through the interchange process is to be accomplished as quickly as possible.

General freight arriving for the Repository (such as construction materials, fuel oil, site-specific casks, and waste packages) would arrive in UPRR freight trains and be placed on a track or tracks by the UPRR freight train crew. Interchanger inspection and administrative processing would then take place. After these processes are completed, these cars may be combined with other general freight cars present in the yard to form a train, or the cars, as a train, may be dispatched for the trip to the EOL yard.

Interchange from the NRL to UPRR would be accomplished by reversing the movements described above.

For efficient interchange with UPRR, pre-notification of all train/car movements to and from UPRR would be required. This would be accomplished, in part, by drawing on the UPRR movement control system.

The staging yard would have perimeter fencing.

7.2 INTERCHANGE INSPECTION OF CARS AND LOCOMOTIVES

All inbound and outbound cars received at the Hawthorne staging yard would receive an inspection in accordance with FRA regulations. All inspections would be performed by qualified car inspectors assigned at the staging yard. The inspection would include:

- Suspension system
- Car body
- Draft system
- Air brakes
- Two-way end-of-train devices
- Wheels

An initial terminal road train air brake test would be conducted. The train's engineer would be notified that the test has been satisfactorily conducted. Permanent records of the inspections would be maintained at Hawthorne staging yard.

7.3 TRANSFER OPERATIONS WITH THE REPOSITORY

Refer to Section 7.3 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

8.0 Shipping Documentation

Refer to Section 8.0 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

9.1 UPRR INTERCHANGE YARD

The MRC would not have a separate interchange yard. Therefore, reference to *Operations and Maintenance Report, Caliente Rail Corrido*r (NRP 2007g) is not applicable.

9.2 MINA RAIL CORRIDOR STAGING YARD

The MRC staging yard at Hawthorne is the location where railroad cars would be held and sorted into trains for delivery to the EOL facility (inbound) and for UPRR interchange (outbound). At the staging yard, loaded cask trains would also exchange UPRR locomotives for NRL locomotives. Loaded cask trains would be processed intact. Interchange documentation and car/train inspection functions would be accomplished in the staging yard. Facilities at the staging yard would include a locomotive fuel and sanding rack, maintenance warehouse, locomotive shop area, MOW satellite facility office, lay-down area for materials, and yard office with the potential for the train control center (TCC) and the NTOC.

9.2.1 Track Layout

The basic track configuration of the staging yard consists of nine tracks, including a lead track, an inbound track, an outbound track, four switching tracks, a runaround track, a repair-in-place (RIP) track, and a locomotive track. Twenty-five-foot spacing between yard tracks is planned to enable an access road for car and train inspection. The staging yard would be double ended, permitting switching from either end. Figure 9-A illustrates the general configuration of the Hawthorne staging yard.

Although all the yard tracks have been given functional titles, the switching, inbound, and outbound tracks are functionally interchangeable. Actual use of these tracks would be decided by the yardmaster (YM)/station clerk based on current conditions. The RIP track is where light running repairs (such as brake shoe change-out, wheel change-out, and door repair) would take place for railcars. The locomotive track is where NRL and, if applicable, UPRR locomotives would be held between road haul assignments. The assigned switching locomotives for the staging yard would also be fueled and sanded on the locomotive track. Fuel oil would be supplied by a contractor-operated truck. Sand and other supplies would also be furnished by truck.

During construction of the MRC, the staging yard would be used for holding, sorting, and dispatching cars carrying ballast, rail, ties, and other construction materials.

9.2.2 Staging Yard Functional Parameters

Refer to Section 9.2.2 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

9.2.3 Yard Office

The yard office would house the YM/station clerk and other operations as well as mechanical personnel to handle the administrative functions involved with interchanging trains between MRC and UPRR. The yard office is also the potential location for the TCC and the NTOC.

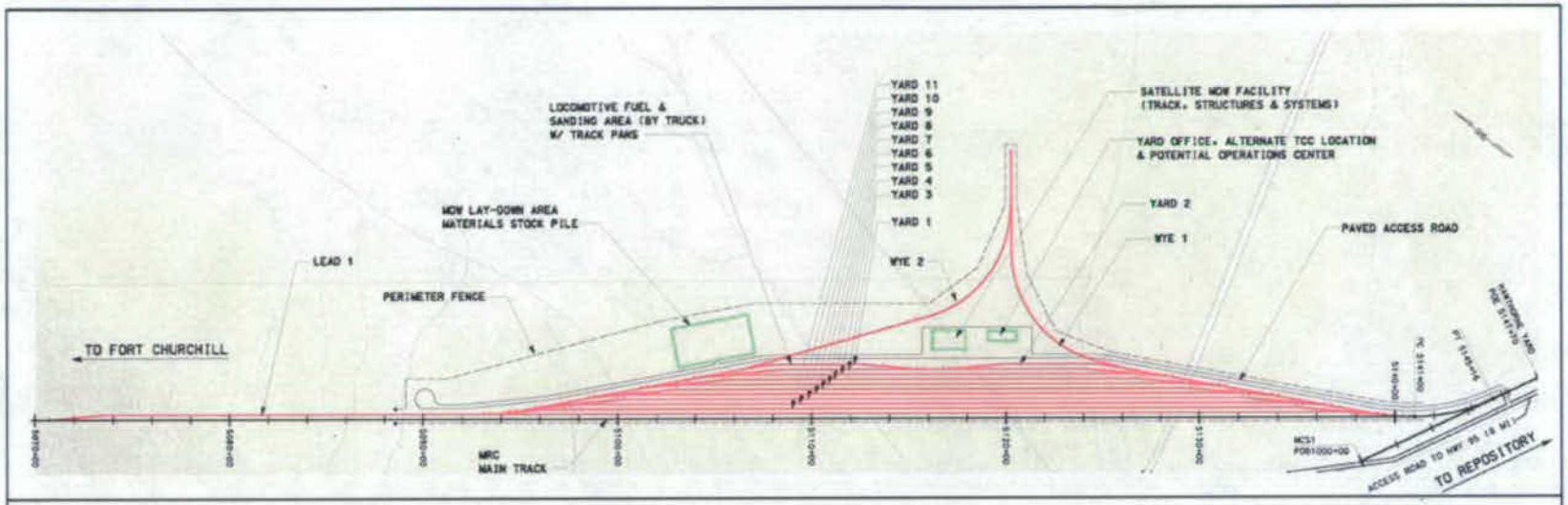
9.2.4 Satellite Maintenance-of-Way Facility

A satellite MOW facility would be established to enable NRL track, systems, and ROW maintenance. This satellite facility would be used on an as-needed basis by maintenance staff based at the MOW facility. Amenities to be provided at the satellite facility include an office, a material lay-down area, and a storage area.

6.0 Train Control and Communications

Refer to Section 6.0 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

The train control and communications systems referenced above would be emplaced between Fort Churchill and the EOL facility.



MRC HAWTHORNE STAGING YARD TRACK TABLE

TRACK NAME / NO.	CLEAR LENGTH	CAPACITY (60-ft cars)	CAPACITY (90-ft cars)	FUNCTION
YARD 1	695	11	7	LOCOMOTIVE TRACK
YARD 2	695	11	7	RIP TRACK
YARD 3	1,814	30	20	RUNAROUND TRACK
YARD 4	2,373	39	26	SWITCHING
YARD 5	2,360	39	26	SWITCHING
YARD 6	2,950	49	32	SWITCHING
YARD 7	2,907	48	32	SWITCHING
YARD 8	3,500	58	38	SWITCHING
YARD 9	3,454	57	38	SWITCHING
YARD 10	4,010	66	44	OUTBOUND
YARD 11	4,098	68	45	INBOUND
WYE 1	1,260	21	14	WYE - CAR AND LOCOMOTIVE TURNING
WYE 2	1,526	25	16	WYE - CAR AND LOCOMOTIVE TURNING
LEAD 1	6,680	111	74	LEAD TRACK
TOTAL	38,322	633	419	

Figure 9-A. Hawthorne Staging Yard Site Plan

9.3 END-OF-LINE FUNCTIONS

NRL trains carrying casks loaded with SNF and HLW would travel from the Hawthorne staging yard to the NRL southern terminus (the EOL yard). The EOL yard is to be located approximately 1 mile south of the cask car receipt security station within the Repository. The EOL yard has three tracks on 50-foot centers to enable longer-term holding of cask cars if needed. However, the operational plan is to move the cask cars to the Repository as soon as possible.

The purpose of the EOL yard is to provide:

- A termination point for the main track movement of cask trains
- Rearrangement of train consists and delivery of loaded cask cars to the Repository receipt security station
- Holding of buffer cars
- Receipt (from the Repository) and temporary storage of empty cask cars, casks on railcars, and bad order railcars requiring repair
- Assembly of outgoing trains destined for the staging yard
- Receipt and delivery to the Repository of waste packages, construction materials, and fuel oil, including dedicated construction tracks
- A potential base for the TCC and NTOC
- A building for support of operations and maintenance, including the servicing, inspection, and maintenance of diesel locomotives
- A base for the support of escort cars and personnel associated with incoming (and possibly outgoing) cask train movements
- A location for a locomotive light running repair facility for locomotives

9.3.1 Track Layout

As shown in Figure 9-B, the tracks identified below make up the EOL yard. The source of this EOL yard site plan is *Facilities–Design Analysis Report, Caliente Rail Corridor* (NRP 2007f).

- CMF access tracks
- Runaround track
- Isolated inbound receiving tracks
- Outbound departure track
- Yard switching tracks
- Escort car servicing tracks
- Locomotive and car shop
- Locomotive servicing track
- Construction material unloading tracks
- Construction material tracks
- Repository access tracks
- Wash track
- Oil spur track
- Tracks forming a wye configuration (for turning cars and locomotives)

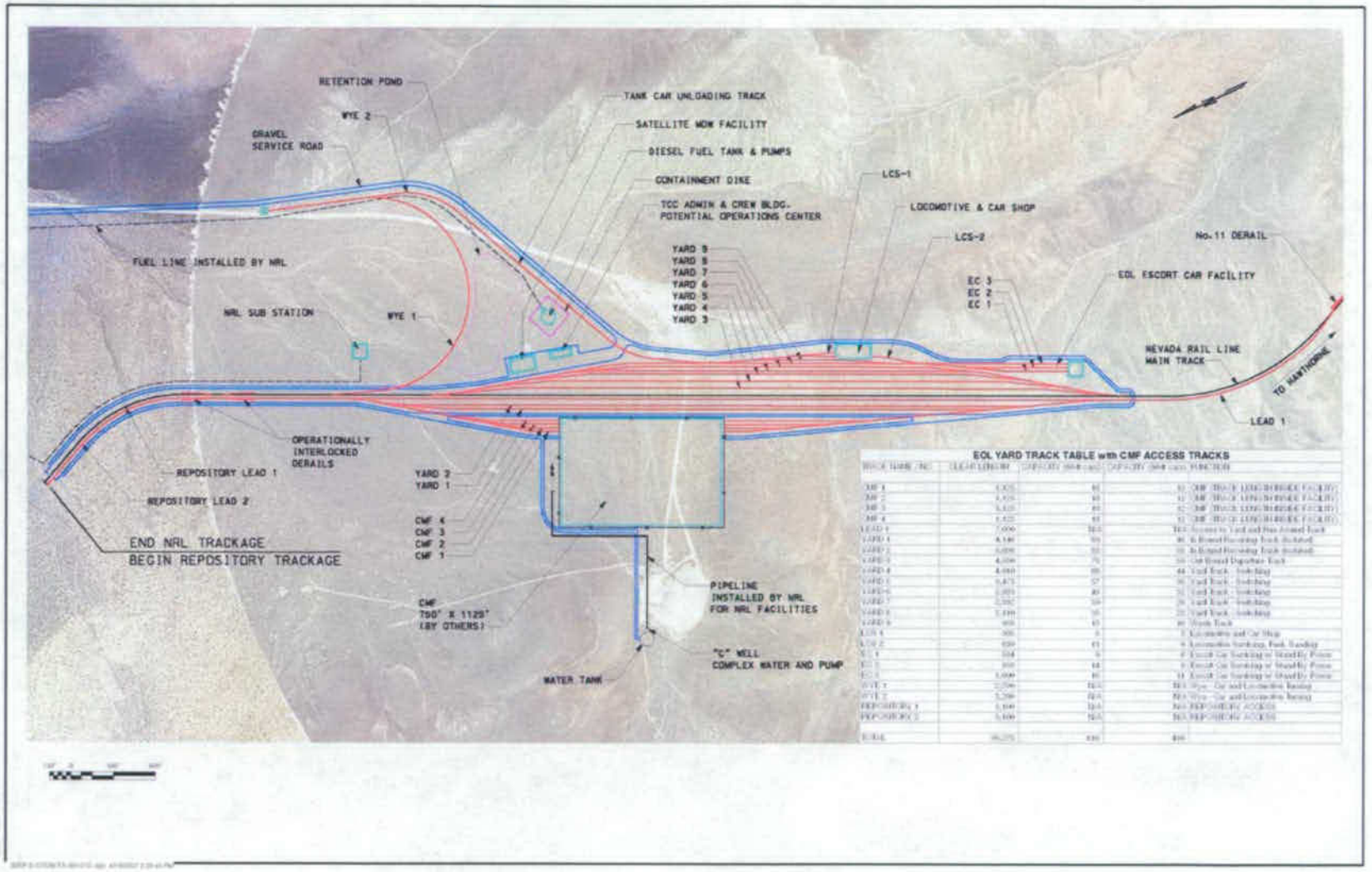


Figure 9-B. EOL Yard Site Plan

9.3.2 Locomotive Light Running Repair Facility

As many as 10 locomotives (six road locomotives, one spare, and three switching locomotives) would be available for train movements between Fort Churchill and the Repository, for MOW functions, and for yard switching services. This number excludes potential commercial shared-use service.

The American Railway Engineering and Maintenance of Way Association defines light running repair and service for locomotives as consisting of any work involving oiling, lubricating, testing, minor adjustments, semi-annual and monthly inspections, and repairs. Light running repairs, FRA-required safety inspections, and NRL inspections of locomotives would be performed at a repair facility at the EOL facility which have the following provisions:

- Lubricating oil supply
- Lubricating oil drainage and disposal
- Used oil filters disposal area
- Water supply systems (raw and treated)
- Radiator water and radiator water reclaim system
- Sanitary sewer separated from industrial waste system
- Compressed air system
- Anti-slip floors in specific areas
- Fire protection
- Natural gas or propane
- Light repair shops provided with pits, elevated platforms, and light-capacity cranes
- Office area
- Locker, lunch, and toilet facilities
- Store room for tools and parts
- Welding equipment
- Hazardous material storage
- Locomotive toilet servicing
- Locomotive fueling, sanding, and washing functions

Heavy repair of locomotives would be performed on a scheduled basis and for major breakdowns at an off-site commercial locomotive repair facility. Locomotives would be transported by rail to the repair facility.

9.3.3 Locomotive Inspections and Tests

Locomotive inspections and tests by qualified personnel, along with written reports, would be conducted in accordance with FRA regulations, as follows:

- Daily inspection – including repairs to correct noncompliance conditions before a locomotive is returned to service
- Periodic inspections – conducted at facilities equipped for a complete underbody inspection, at periods not to exceed 92 days, with results recorded on prescribed FRA forms
- Tests at periodic inspection – including all gauges, electrical devices and visible insulation, cable connections, and event recorders
- Annual tests – including cleaning and repair or replacement of the air brake system
- Biennial tests – including cleaning, repair or replacement, and testing of all valve components
- Main reservoir tests – conducted at intervals not to exceed 736 days

9.3.4 Other EOL Buildings and Facilities

TCC and NTOC – The EOL yard is being considered as a potential site for the TCC and NTOC. The TCC would be responsible for the dispatching and monitoring of MRC train movements and for coordination of the interchange operations involving the UPRR. All on-track maintenance activities would also be coordinated from this office. In addition, the TCC would be responsible for calling train crews that would report at the EOL yard or the staging yard for work assignments. The TCC building would also support other administrative functions of the MRC.

Satellite MOW Office – This facility would support maintenance activities in conjunction with the MOW headquarters and would be staffed on an as-needed basis. This facility would support the maintenance needs of the EOL yard. There would be an outside area for spare parts storage, tools, and small track machinery.

Escort Car Layover Facility – This facility would support the servicing of escort cars. It would provide for the cleaning of cars, restocking of supplies, and servicing of toilets. This facility would also be equipped with "standby power" for supplying electricity to the escort cars to maintain air conditioning, heating, and lighting.

Tank Farm and Locomotive Fueling – A fuel tank and fuel delivery system would be provided within the EOL facility. A 237,000-gallon tank size for locomotive fuel is assumed, based on a one-month supply reserve. Diesel fuel would be delivered to the storage tank using rail tank cars.

10.1 MAINTENANCE OPERATIONAL CONCEPT

Refer to Section 10.1 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

10.2 MAINTENANCE-OF-WAY HEADQUARTERS

The MOW headquarters facility would be combined with the MOW facility for the MRC; therefore, reference to Section 10.2 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g) is not applicable.

10.3 MAINTENANCE-OF-WAY BUILDING AND FACILITIES

Maintenance of the track, bridges, tunnels, culverts, grade crossings, signal equipment, communications equipment, and other wayside facilities and equipment would be performed and coordinated from the headquarters at the MOW facility located at either Silver Peak (the basis for analysis location) or Klondike. In addition, the MOW headquarters staff would be responsible for responding to rail-related accidents and derailments, where the track conditions may have been compromised, and for helping with coordination of activities that may require recovery of locomotives, railcars, casks, and other equipment derailed from the track. The building would have space for the storage of spare parts, tools, and small track maintenance machines.

The MOW facility would include a building for administrative purposes, inside storage of spare parts and small tools, a shop area, and an outside storage area for heavy maintenance materials (such as rail, ties, and ballast). The MOW facility would have access to the MRC mainline for the handling of railcars carrying heavy and bulk materials, and for movement of on-track maintenance machines. The MOW building would contain administrative, welfare, and shop/storage spaces.

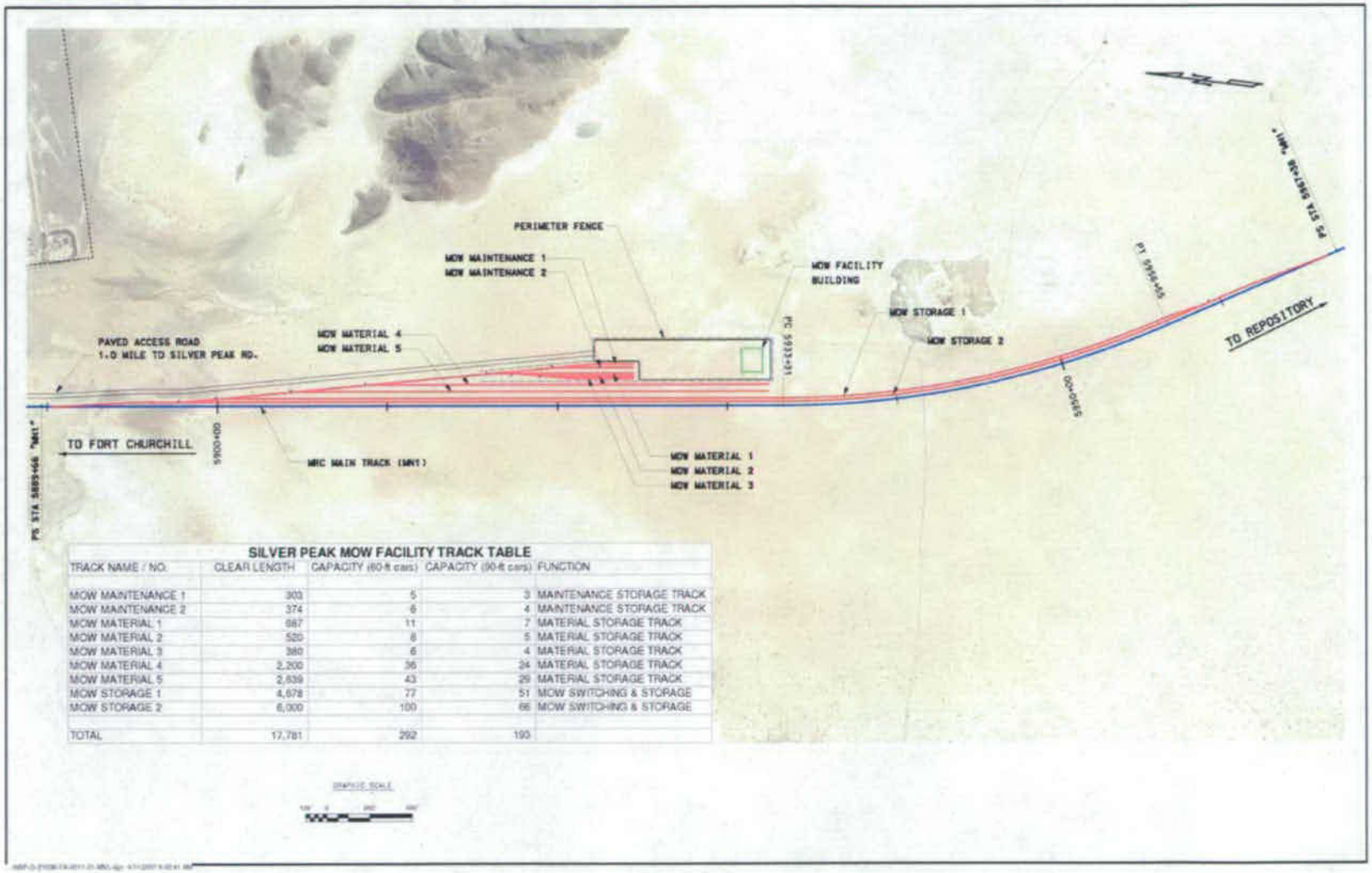
Refer to Figures 10-A and 10-B for schematic layouts of the MOW facilities at Silver Peak and Klondike, respectively. The source of these figures is *Facilities–Design Analysis Report, Mina Rail Corridor* (NRP 2007f).

Additionally, there would be the satellite MOW facilities located at the Hawthorne staging yard and at the EOL yard. The satellite facilities would be on a smaller scale, with fewer functions.

It is intended that portions of the MOW facility be constructed early in the project to support construction activities to build the rail line. For example, if construction plans dictate, a temporary rail welding plant, ballast loading, or other material staging facility could be located at this facility during the construction.

The purpose of the MOW facility is to provide for the following:

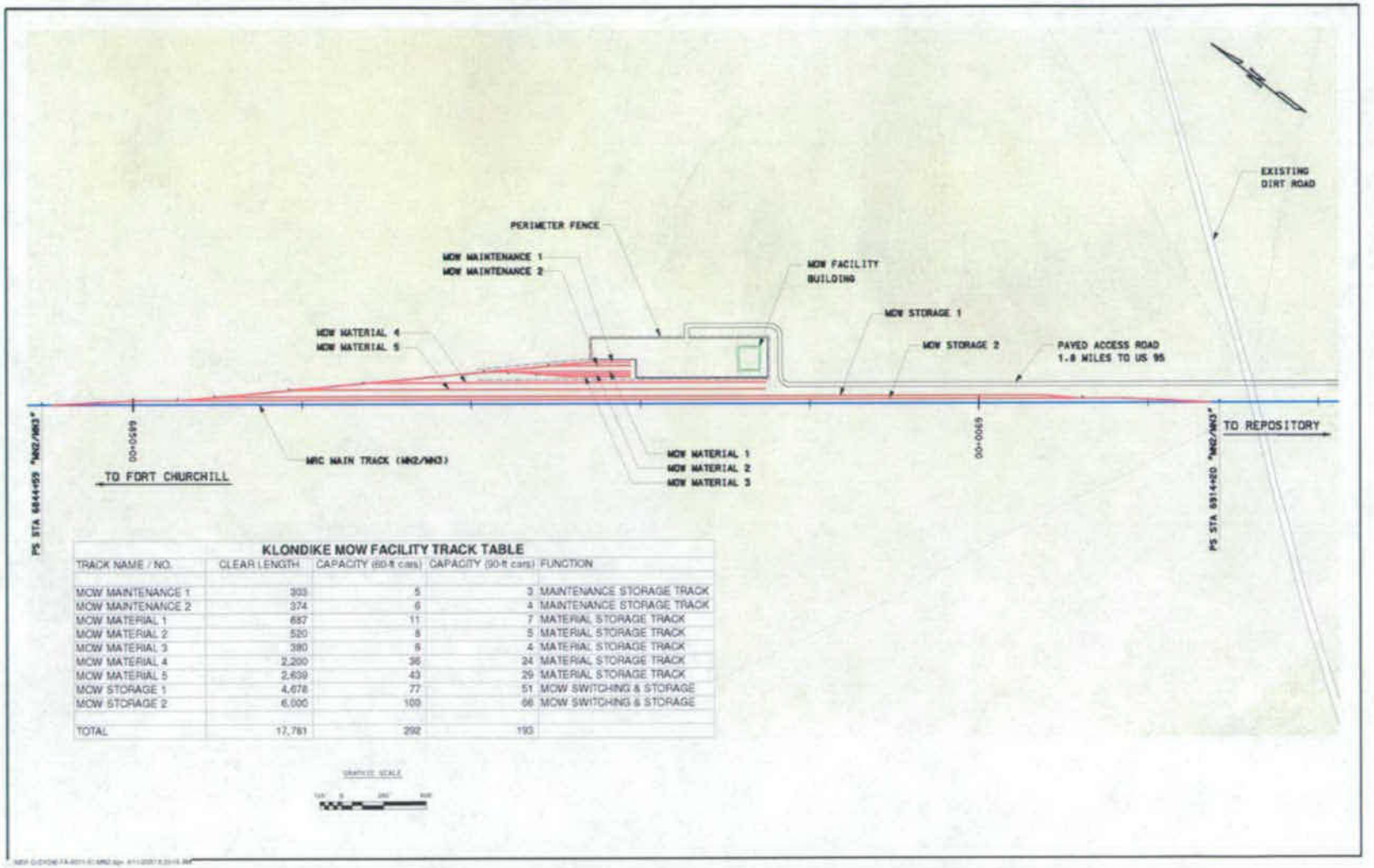
- Storage and maintenance of on-track rail equipment
- Hi-rail vehicle access to the main track
- Temporary facilities to support construction activities
- Storage of maintenance materials
- MOW building office with the following provisions:
  - Lockers
  - Toilet, wash, and shower facilities
  - Private offices for two to three staff members
  - General open office area
  - Training/conference room
  - Shop area



SILVER PEAK MOW FACILITY TRACK TABLE

TRACK NAME / NO.	CLEAR LENGTH	CAPACITY (60-ft cars)	CAPACITY (50-ft cars)	FUNCTION
MOW MAINTENANCE 1	303	5	3	MAINTENANCE STORAGE TRACK
MOW MAINTENANCE 2	374	6	4	MAINTENANCE STORAGE TRACK
MOW MATERIAL 1	687	11	7	MATERIAL STORAGE TRACK
MOW MATERIAL 2	520	8	5	MATERIAL STORAGE TRACK
MOW MATERIAL 3	380	6	4	MATERIAL STORAGE TRACK
MOW MATERIAL 4	2,200	36	24	MATERIAL STORAGE TRACK
MOW MATERIAL 5	2,639	43	29	MATERIAL STORAGE TRACK
MOW STORAGE 1	4,678	77	51	MOW SWITCHING & STORAGE
MOW STORAGE 2	6,000	100	66	MOW SWITCHING & STORAGE
TOTAL	17,781	292	193	

Figure 10-A. Silver Peak MOW Facility Site Plan



KLONDIKE MOW FACILITY TRACK TABLE

TRACK NAME / NO.	CLEAR LENGTH	CAPACITY (60-ft cars)	CAPACITY (90-ft cars)	FUNCTION
MOW MAINTENANCE 1	303	5	3	MAINTENANCE STORAGE TRACK
MOW MAINTENANCE 2	374	6	4	MAINTENANCE STORAGE TRACK
MOW MATERIAL 1	687	11	7	MATERIAL STORAGE TRACK
MOW MATERIAL 2	520	8	5	MATERIAL STORAGE TRACK
MOW MATERIAL 3	380	6	4	MATERIAL STORAGE TRACK
MOW MATERIAL 4	2,200	36	24	MATERIAL STORAGE TRACK
MOW MATERIAL 5	2,639	43	29	MATERIAL STORAGE TRACK
MOW STORAGE 1	4,678	77	51	MOW SWITCHING & STORAGE
MOW STORAGE 2	6,000	100	66	MOW SWITCHING & STORAGE
TOTAL	17,781	292	193	

Figure 10-B. Klondike MOW Facility Site Plan

10.4 TRACK MAINTENANCE

10.4.1 General

Basic track maintenance would be performed to meet the requirements of FRA track safety standards. The MOW forces would be equipped to handle minor rail, tie, and turnout replacement as well as routine ballasting and surfacing tasks. Minor quantities of steel, concrete, ballast, and other nationally sourced materials would be required for routine maintenance activities. According to the Association of American Railroads (AAR), the national rail system in 2005 exceeded 140,000 miles in length and included 562 different railroad companies (AAR 2006). The nominal length of the MRC, approximately 254 miles, is a small part (approximately 0.18 percent) of the national rail system. Therefore, the maintenance and operations needs of the MRC would have minimal impact on the national demand for these materials.

All MOW vehicles and equipment would be equipped with a radio for communication. A supply of replacement track and bridge material would be placed at the MOW facility, the EOL facility, and the staging yard.

The following track and bridge maintenance functions would be performed by outside contractors on an as-need basis:

- Ultrasonic rail testing (annually)
- Rail grinding
- Spot brush and weed control (annually or as needed)
- Vehicle and work equipment maintenance
- Track surfacing (out of face)

10.4.2 Track Inspection

Refer to Section 10.4.2 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

10.4.3 Fencing

Refer to Section 10.4.3 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

10.5 SIGNALS AND COMMUNICATIONS MAINTENANCE

10.5.1 General

Refer to Section 10.5.1 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g). Signal maintainers would be headquartered at the MOW facility.

10.5.2 Interlocking Inspection and Tests

Refer to Section 10.5.2 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

10.6 BRIDGE AND BUILDING MAINTENANCE

Refer to Section 10.6 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

10.7 ROLLING STOCK MAINTENANCE

Refer to Section 10.7 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

10.8 EMERGENCY RESPONSE

Refer to Section 10.8 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

10.9 EMERGENCY RESPONSE PROCESS

Refer to Section 10.9 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

11.1 ORGANIZATION

Refer to Section 11.1 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

11.2 TRAIN OPERATIONS

Figure 11-A presents the initial MRC operations organization.

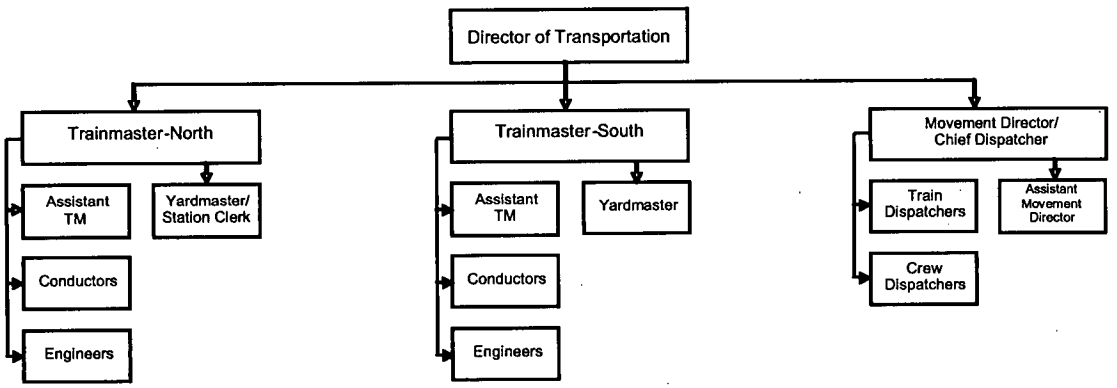


Figure 11-A. Initial MRC Operations Organization

A director of transportation would be in charge of the functional department that manages operations. The director would have responsibility for the movement of trains over the line and for switching movements in the yards. The department would consist of two groups:

- Movement control and dispatching
- Train crews and supervision

A movement director/chief dispatcher would be in charge of generating train movements, directing trains to move over the line, and managing crew availability. Movement control is the process of deciding what has to be moved, where it needs to go, and when the best time is to move it. This involves the larger picture of looking at what cars are to be moved and deciding what trains to originate, when to originate them, and what cars they should contain. This office also has the responsibility of establishing MOW work windows in advance to minimize potential disruption to through-train movements and to maximize the available time for MOW work.

Train dispatching is the practical process of prioritizing the interactions of various trains that must share the railroad. Crew dispatching involves controlling crew assignments and train employees, and filling assignments with available employees. The movement director would also supervise the train dispatchers and crew dispatchers.

Train dispatchers would handle the practical process of prioritizing the interactions of various trains that must share the railroad. They also would manage the safe movement of MOW personnel on the rail line. They would coordinate with the operations staffs at the Repository, the CMF, and the NTOC. Train dispatchers, together with crew dispatchers, would monitor the hours of service of each train crew employee on duty and would ensure that employees are relieved before their hours of service expire. Should a train crew expire before reaching its terminal, the dispatcher would arrange for a relief crew, plus transportation of the relief crew, to the train and for transportation of the expired crew to a terminal to rest.

Crew dispatchers are responsible for monitoring the availability of conductors and engineers while they are off duty and notifying them when they are needed to perform service. Crew dispatchers maintain a record of all available conductors and engineers, including each individual's current qualifications and contact information as well as immediately preceding work assignments. This database is constantly updated so that information regarding the next personnel to be called to fill assignments is always available. Depending on the scale of road and yard operations, crew dispatching might be handled by movement directors and train dispatchers.

Trainmasters (TMs) would be directly in charge of train crews and yard operations, with the territory divided between north and south. They would be assisted by assistant trainmasters (ATMs) and YMs/station clerks. Both TMs and ATMs are qualified to operate trains, have specialized knowledge of locomotive systems, and are responsible for the supervision of train crews and their activities. Their primary responsibility is to see that trains are moved over the line efficiently and safely, in accordance with the established rules and procedures.

The YMs/station clerks have a similar supervisory responsibility regarding car movements within the yards (switching). Their function is different in that while they devise and oversee the program of car movements to be made by yard train crews, they do not assume a field position and are not qualified to operate trains. To perform their duties, YMs/station clerks would have direct communication with the TCC to coordinate train and yard operations.

A YM/station clerk would be assigned at the EOL yard. In addition to managing the switching activities, the YMs/station clerks would handle the interface with the Repository rail operation, involving the hand-off of cask cars and waste disposal cars.

A YM/station clerk would also be assigned at the Hawthorne staging yard. In addition to managing the switching activities there, the YM/station clerk would handle the required record keeping and reporting. The YM/station clerk would be responsible for billing; ordering and furnishing of cars; reporting of overages, shortages, damage to cars and lading; and the filing of interchange reports.

Train crews would actually move the trains over the line, or shift cars in the yards, under the direction of the TMs and YMs/station clerks. A crew would consist of an engineer and a conductor. The engineer would operate the locomotives to move cars in yards or to pull trains over the line. The conductor would operate switches, would couple and uncouples cars, and would handle necessary record keeping pursuant to a yard shift's activities or a train movement.

In the yards, the train crew would perform switching to move cars among the tracks to assemble or disassemble trains, and to access particular cars for placement or delivery. Should remote control be adopted, the locomotive engineer's position could be eliminated on some yard crews. In commercial service, train crews place cars for loading and unloading at the facilities of shippers and consignees.

Positions for the traditional station clerks would be minimal because it is assumed that record keeping would be done through electronic means, and that database access would be available to all personnel, including conductors and engineers. Personnel would be equipped with laptops and able to access information on car locations and train makeup, and to update it directly.

11.3 TRAIN CREW MANAGEMENT

In developing a typical pattern of train crew activity, some basic assumptions were made:

- Train crews would consist of a conductor and an engineer.
- Train crews would rotate on a first-in-first-out basis.
- All road crews would be based at the Hawthorne staging yard.

The rotation of crews is developed to accommodate the randomly generated pattern of train movements in year 20, which would include two cask trains, two other DOE-related trains and five to six commercial shared-use trains per week. A flat five hours and thirty minutes was assumed on each run, which corresponds to the crew rotation depicted in Figure 11-B. This includes preparation time and runtime. In this example, it was assumed that crews handling commercial trains would operate to the EOL facility, although this is unlikely to be the case.

An examination of the rotation indicates several factors to be faced in providing crews to move trains. The situation presented here is challenging in its unbalanced distribution of train movements. Nonetheless, this situation is realistic and needs to be addressed.

The characteristics in this particular random distribution are a lack of southbound movements, combined with the presence of two northbound trains on Wednesday and a multiplicity of movements on Monday and Tuesday. It is important to note that these concentrations and gaps occur with no regular pattern, and not necessarily on any particular day. Although the scenario addresses only one week, it does reflect the type of operations that can be expected on the NRL throughout the year.

The imbalance of train movements throughout the week would cause some deadheading to position crews, either by bringing them home to Hawthorne for assignment to other southbound trains or by bringing northbound trains back to Hawthorne. Some crews would work on "split time." That is, they would take a minimum of four hours' rest at the EOL, permitting them to work the balance of the 12-hour period on a northbound run. Thus, if they took 5:30 to run south and a minimum of four hours off at a proper rest facility, they could work the remaining 6:30 of the allowable 12 hours, beginning from when they returned to duty.

There also may be additional labor costs in housing crews at the outlying terminal. Although there are no labor agreements in effect, standard practice in the industry is to pay crews for time at the layover point, typically whatever part of the last eight hours of each 24-hour period is incurred. Thus, the crew with the 57-hour layover would make two full days' pay and would cause the operator to incur the cost of the crew's lodging as well, yet the crew would be totally unproductive during that period.

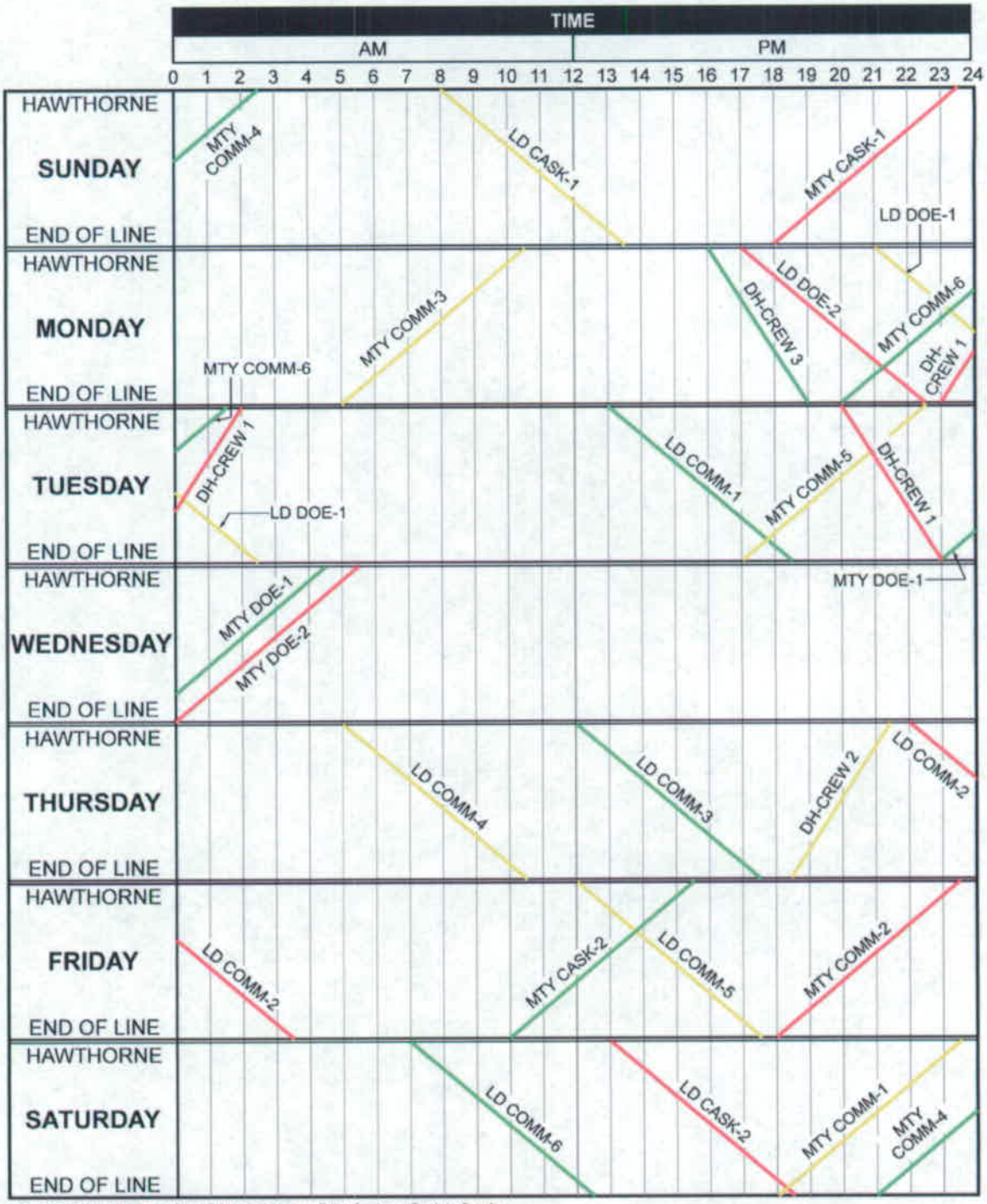
The alternative is to deadhead the crew when there appears to be little chance of working it back, and to deadhead a crew out for a return trip, when necessary. At some point, the cost to house a crew can exceed the cost of deadheading. This issue should be addressed through further analysis.

11.4 TRAIN CREW STAFFING REQUIREMENTS

The number of engineers and conductors required is based on a combination of the number of road crews required and the number of yard crew assignments. It is assumed that a crew would consist of one engineer and one conductor. In addition, a number of "extra" (substitute) personnel must be kept available to fill vacancies and unscheduled assignments.

Three train crews would be required to handle the hypothetical week's worth of road train movements discussed above. A total of nine yard crews would be required to cover all yard assignments, plus an extra crew working one day at each location. This assumes that a yard crew would be on duty on each shift, seven days per week, at both the Hawthorne staging yard and the EOL facility. In addition, a second crew would work five days each week at the EOL facility.

Extra Crews – Basic to the nature of railroad operations is a need to assign personnel on short notice due to sickness, vacation, unpaid leave, extra trains required for unexpected traffic, and work trains.



Assumes 5 Hour Constant Transit Time, Trains on Saturday Loop Back to Sunday

Legend: Crew 1 = Crew 2 = Crew 3 =

MTY = Empty, LD = Loaded, COMM = Commercial, DOE = Department of Energy Related, DH = Deadhead

YUCCA06

Figure 11-B. Typical Train Crew Rotation

Unexpected delays can disrupt crew rotation and require that other employees be called to fill in. To manage this properly, unassigned operating employees are kept ready to be called when needed on short notice. They are referred to as "extra" employees. An "extra list" is maintained, consisting of qualified employees available for duty on short notice. Extra employees work in rotation: when one goes off duty at the end of an assignment, that employee is then placed at the bottom of the list. As vacant assignments come close to their start time, the first employees available are called and instructed where to report, and for what assignment.

Relief Crews – To provide a viable service that satisfies the needs of the service, it would be necessary to operate the full schedule every day, seven days a week. Crews would have to be assigned to fill all of the scheduled trips. It is assumed that employees would work five days each week. Therefore, days off would have to be covered by other crews. These assignments could be filled by extra employees, or by relief crews, which work a different assignment on each of five days, covering the off days of five regular crews.

Given the requirement of three train crews and nine yard crews, a total or 12 engineers and 12 conductors would be required for regular road train and yard service, not counting the two extra yard assignments. Considering the need to cover vacancies resulting from sickness, vacation, unpaid leave, and extra trains and yard assignments, an extra list would need to be maintained at each end of the NRL. The list would be larger at the Hawthorne staging yard because train assignments originate there.

Given these assumptions, an extra list consisting of three extra engineers and three extra conductors would be maintained at the Hawthorne staging yard, and an extra list of one engineer and one conductor would be maintained at the EOL facility. This would result in a total a 16 engineers and 16 conductors for all road and yard services, including extras.

11.5 DISPATCHER STAFFING REQUIREMENTS

The above discussion assumes that train and crew dispatcher positions would need to be filled on a three-shift/seven-day basis, with minor exceptions. The odd shifts left over after the relief assignments would not be filled. No extra positions would be maintained, and regularly assigned employees would be asked to fill irregular vacancies on their days off. Therefore, in the same manner as yard crews, there would be relief assignments for train dispatchers and crew dispatchers, in addition to the regular assignments.

Another possibility for consideration is the cross training of engineers, conductors, and dispatchers, and a combined extra list to cover all positions.

11.6 MAINTENANCE-OF-WAY FACILITIES AND ROLLING STOCK

Facility maintenance includes the process of maintaining the track and ROW to required standards. It also includes maintaining the necessary structures. Other areas of maintenance include communications (telephone and radio) and signaling. Signaling includes the specialized traffic signals that govern the movements of trains, the associated interlockings that control the power-operated switches at sidings, highway/rail at-grade crossing warning devices, maintenance of the asset protection devices (such as slide fences), and emergency response on a 24/7 basis.

It is expected that major work would be performed by contracting. This discussion includes only the basic requirements for daily inspection, responding to emergencies, and light repair; the forces for this work would be based at the MOW facility. A discussion of the presumed activities follows. Figure 11-C presents an initial MRC organization chart of the maintenance function.

11.7 TRACK AND STRUCTURES MAINTENANCE

The following is assumed:

- Hi-rail set-off pads would be located, at a minimum, at each interlocking. Each pad would have a 32-foot-long concrete crossing surface. These would be used to permit maintenance trucks equipped to ride on the rails to mount and dismount.
- (Annual) bridge inspections would be performed by an outside consultant.
- Building and structures maintenance would be performed by outside contractors to a large extent. A very small force would be retained to perform minor repairs.
- An 800-foot-long stub track would be located off each siding for the storage of MOW equipment.

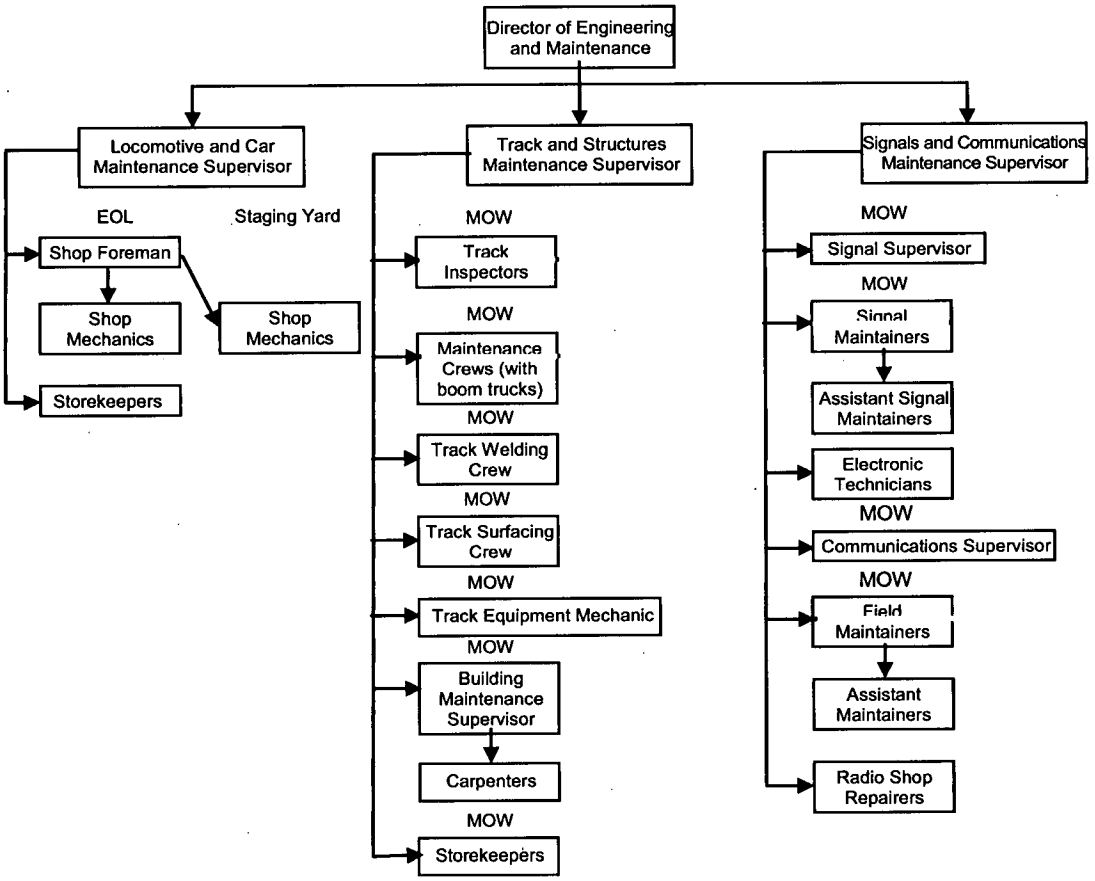


Figure 11-C. Initial MRC Maintenance Organization

Personnel would include a maintenance supervisor at the MOW facility, in charge of the following:

- Track inspectors
- Maintenance crews with hi-rail boom trucks

The following crews would perform all routine track and structures maintenance of the mainline, including the yard tracks at the Hawthorne staging yard and at the Repository/EOL yard:

- Track welding crews, each consisting of at least the following:
  - A track welder and helper
  - A backhoe with operator
- Spot-surfacing crews, each consisting of at least the following:
  - A tamper operator
  - A regulator/broom operator
  - A truck driver with a hi-rail crew cab truck with lubrication and fuel equipment
- Maintenance equipment mechanics
- Building maintenance crew
  - Building maintenance supervisor
  - Carpenters
- Storekeepers

11.8 SIGNALS AND COMMUNICATIONS MAINTENANCE

The personnel required to maintain the signals and communications facilities are based on the following assumptions:

- Interlockings at both ends of each siding
- Wayside signals and/or signal control cases located about every 3 miles
- Asset protection devices located as needed
- Hi-rail set-off pads
- Communications – very high frequency, microwave, and satellite
- Microwave or radio control at each end of siding

The signals maintenance staff would consist of the following:

- One signal supervisor to supervise the following, all based at the MOW facility:
  - Signal maintainers
  - Assistant signal technicians (as needed to cover vacations, holidays, etc.)
  - Electronic technicians

The communications maintenance staff would consist of the following:

- Communications supervisor
- Field communications maintainers, under the supervision of the communications supervisor
- Assistant communications maintainer
- Radio shop technicians to service vehicle radios, wayside equipment, and locomotive radios

11.9 ROLLING STOCK MAINTENANCE

Refer to Section 11.9 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

11.10 INITIAL MINA RAIL CORRIDOR STAFFING REQUIREMENTS

As noted in the beginning of this section, the need for some departments depends on the relationship with a larger organization that has not yet been defined. Therefore, staffing for operations and maintenance has been estimated based on the anticipated amount of work that would need to be done regardless of where the positions are located in an organizational structure. Staffing requirements at each facility are summarized in Table 11-1. The satellite MOW shops at the Hawthorne staging yard and the EOL facility would be intermittently staffed by personnel headquartered at the MOW facility. In addition, approximately 15 TCC employees are included in the EOL staffing total.

Table 11-1. Staffing Matrix Summary

Staff Position	Primary Location			
	Staging Yard	MOW Facility	EOL Facility	Total
Professional	4	5	11	20
Labor	35	30	25	90
Clerical	1	5	4	10
Total	**40**	**40**	**40**	**120**

12.1 BASIS OF DEVELOPMENT FOR THE MINA RAIL CORRIDOR OPERATING AND MAINTENANCE COST ESTIMATE

12.1.1 Objective

Refer to Section 12.1.1 in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

12.1.2 Organization of Estimate

Two spreadsheets are presented at the end of this section. The first spreadsheet presents the estimated MRC operations and maintenance costs for DOE-related traffic and the mid-level commercial traffic presented in *Rail Transportation Economic Impact Evaluation & Planning*, prepared for Nye County, Department of Natural Resources and Federal Facilities (WSA 2005). This spreadsheet, Table 12-1, is referred to as the MRC Operating and Maintenance Costs, DOE and Commercial Traffic. The second spreadsheet, Table 12-2, presents the estimated costs for only the DOE traffic and is referred to as MRC Operating and Maintenance Costs, DOE Only.

The portion of the spreadsheets relating to operating and maintenance costs is divided into three sections: Operations, MOW, and Mechanical. Appropriate line items are quantified in each section. Costs are presented annually for the 50-year life of the NRL.

12.1.3 Basis of Estimate

The costs presented herein are considered order of magnitude and are based on the traffic projections presented in Section 4.1 of this report. Further, numerous operating assumptions were made to develop the cost estimates presented herein. These assumptions may change as the project advances and, consequently, could affect the estimated costs.

The costs presented in the spreadsheets reflect 2005 dollars and are constant through the presentation. No attempt has been made to escalate the cost figures over the 50-year operating period. A 35 percent contingency has been added to the total costs, resulting in a grand total. Further, no costs have been quantified for the administrative functions of a commercial-type operation such as marketing, sales, finance, law, information systems, insurance, and depreciation.

Staffing costs are based on the levels itemized in the staffing matrix summary in Table 11-1. Annual staffing levels have been estimated by adjusting the staffing levels in Table 11-1 to match the number of trains handled for the particular year. All wage data include fringe benefits.

It should be noted that some costs are relatively fixed regardless of the volume of trains handled. For example, signals and communications costs are principally fixed because the system remains constantly operating and must be inspected and tested regardless of the number of trains handled. Upper management costs are also relatively fixed, as the general manager position is not dependent on train volume, and TMs are assigned a geographic area to supervise operations. Other costs are stair-stepped in nature. For example, a given number of mechanics would be able to maintain one to five locomotives; yet to maintain six locomotives, additional mechanics would be required. However, the resultant crew would be able to maintain six to 10 locomotives. Some data in the spreadsheets reflect these cost trends.

The cost totals generally follow the volume trend of train movements. Between Years 1 and 3, there would be a general ramp-up of train movements and costs. Between Years 4 and 17, there would be a fairly stable rate of traffic. Beginning in Year 18, traffic would begin to decline slightly to Year 25. By Year 26, the vast majority of DOE traffic would cease and total traffic levels would take a significant dip. The lower traffic levels would remain steady for the balance of the NRL's life to Year 50.

The following paragraphs describe the individual line items quantified in the spreadsheets.

Operations

Administrative – This item includes wages for the general manager, director of operations, TMs, YMs, dispatchers, and other personnel directly involved with the direction or supervision of train movements.

Train Crew – This item includes the wages for the train crew. A train crew consisting of an engineer and a conductor is assumed. The number of crews required varies and is dependent on the volume of train and switching movements each year.

Materials/Contracts – This item includes the costs for materials and support contracts required by the Operating Department. Costs include an allowance for maintaining the escort car fleet (20 cars).

Support materials include the operating and maintenance costs of auto, hi-rail, and other vehicles supporting operations as well as supplies, such as office supplies, computer support, and gasoline for all NRL vehicles. An allowance has been included to cover the cost of utilities for the facilities located in Hawthorne, in Silver Peak/Klondike, and at the EOL.

It is envisioned the contracts would be negotiated to cover the following items:

- Intermediate and major level building repairs
- Building cleaning
- Maintenance and repair of paved highways serving MRC facilities
- Snow removal
- Auto and truck maintenance
- Computer support
- Vegetation control
- Fencing repair

Maintenance-of-Way

Track – This item includes wages for supervisory and labor personnel such as the maintenance supervisor, track inspectors/maintainers, welders, machine operators (tamper, ballast regulator), and other miscellaneous personnel. Minor adjustments to staffing levels have been made to reflect changing traffic patterns.

Signals – This item includes signals and communications supervisory and labor personnel such as the supervisor, signal maintainers, communications supervisor, electronic technician, and field maintainer. It should be noted that in the DOE-only case, the signal system would be deactivated from Year 26 to Year 50. This is because the NRL would handle only the fuel oil train and a very occasional other DOE-related train. The communications system would remain operative during this period for train dispatching and other uses.

Bridge and Building – This item includes supervisory and labor personnel such as supervisors, carpenters, and storekeepers.

Materials – This item is an allowance for consumable supplies and replacement parts for the track, signals and communications, and bridge and building departments.

Contract Work – This is an allowance for contract work that is beyond the capabilities of the in-house maintenance staff. Contracts include services for annual bridge inspections and rail flaw detection. An amount of $500,000 is budgeted for a surfacing program in year three (to correct post-construction spot settlement) and every five years through Year 25. An amount of $500,000 is budgeted for rail grinding in the 15th year. This grinding program covers the heavy grade areas (1.75 to 2.0 percent) should track

corrugation begin to develop. Considering the low overall gross tonnage projected for the NRL, it is unlikely that rail grinding would be necessary on other segments of the track route.

Mechanical

Administrative/Labor – This item includes supervisory and labor personnel such as the locomotive maintenance supervisor, shop mechanics, escort car maintenance personnel, and storekeeper.

Materials – This item is an allowance for locomotive repair and maintenance parts such as traction motors, spare truck components, air filters, electrical equipment, oil, and lubricants.

Locomotive Maintenance – FRA safety inspections and other routine maintenance (such as air filter changes and oil and lubricants) are assumed to be accomplished by NRL forces. An allowance of $50,000 per locomotive is programmed for brake overhaul every five years. Locomotive trucks are programmed for overhaul every 10 years at $100,000 per locomotive. The locomotives would reach the 1,000,000-mile mark in about 15 to 16 years. At that interval, a $200,000 engine overhaul is programmed.

For the DOE and commercial traffic option, 13 locomotives are assumed between Years 1 and 21: 10 road locomotives and three switchers. Between Years 22 and 25, two road locomotives would be deleted because of decreasing traffic. At Year 25, a significant traffic decrease would take place, and the locomotive fleet would be reduced to five road locomotives and three switchers.

For the DOE-only case, nine locomotives (six road units and three switchers) are assumed between Years 1 and 21. Between Years 22 and 25, a road locomotive would be deleted because of decreasing traffic. At Year 25, a significant traffic decrease would take place, and the locomotive fleet would be reduced to two road locomotives. The road locomotives can accomplish any switching that may be needed.

Table 12-1. MRC Operating and Maintenance Costs, DOE and Commercial Traffic

	Years 1 through 10									
Year	1	2	3	4	5	6	7	8	9	10
Operations										
Administrative/Security	1,300,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Train Crew	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Fuel	1,921,000	2,420,000	2,775,000	2,851,000	2,890,000	2,899,000	2,886,000	2,886,000	2,893,000	2,906,000
Materials/Contracts	490,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000	1,050,000
Subtotal	*4,711,000*	*5,620,000*	*5,975,000*	*6,051,000*	*6,090,000*	*6,099,000*	*6,086,000*	*6,086,000*	*6,093,000*	*6,456,000*
Maintenance-of-Way										
Track	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Signals	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
Bridge and Building	323,000	323,000	323,000	323,000	323,000	323,000	323,000	323,000	323,000	323,000
Materials	140,000	210,000	280,000	280,000	280,000	280,000	420,000	560,000	700,000	840,000
Contract Work	245,000	245,000	595,000	245,000	595,000	245,000	280,000	420,000	560,000	1,120,000
Subtotal	*2,308,000*	*2,378,000*	*2,798,000*	*2,448,000*	*2,798,000*	*2,448,000*	*2,623,000*	*2,903,000*	*3,183,000*	*3,883,000*
Mechanical										
Administrative/Labor	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000
Materials	540,000	1,530,000	1,530,000	1,530,000	1,530,000	1,530,000	1,530,000	1,530,000	1,530,000	1,530,000
Locomotive Heavy Maintenance					550,000					1,650,000
Subtotal	*1,440,000*	*2,430,000*	*2,430,000*	*2,430,000*	*2,980,000*	*2,430,000*	*2,430,000*	*2,430,000*	*2,430,000*	*4,080,000*
Total	***8,459,000***	***10,428,000***	***11,203,000***	***10,929,000***	***11,868,000***	***10,977,000***	***11,139,000***	***11,419,000***	***11,706,000***	***14,419,000***
Contingency = 35%	***2,960,650***	***3,649,800***	***3,921,050***	***3,825,150***	***4,153,800***	***3,841,950***	***3,898,650***	***3,996,650***	***4,097,100***	***5,046,650***
Grand Total	***11,419,650***	***14,077,800***	***15,124,050***	***14,754,150***	***16,021,800***	***14,818,950***	***15,037,650***	***15,415,650***	***15,803,100***	***19,465,650***
DOE-related										
Train trips (in and return)	232	340	358	406	430	436	428	428	432	440
Tons	420,793	527,131	556,036	642,544	711,637	746,307	723,577	726,735	724,501	754,503
Trains per week	4	7	7	8	8	8	8	8	8	8
Commercial (Shared-Use)										
Train Trips (in and return)	312	416	520	520	520	520	520	520	520	520
Tons	1,230,793	1,484,843	1,660,594	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500
Trains per week	6	8	10	10	10	10	10	10	10	10
Total DOE and Commerical										
Total Train trips (in and return)	544	756	878	926	950	956	948	948	952	960
Tons	1,651,586	2,011,974	2,216,630	2,520,044	2,589,137	2,623,807	2,601,077	2,604,235	2,602,001	2,632,003
Total trains per week	*10*	*15*	*17*	*18*	*18*	*18*	*18*	*18*	*18*	*18*

Table 12-1 (continued). MRC Operating and Maintenance Costs, DOE and Commercial Traffic

	Years 11 through 20									
Year	11	12	13	14	15	16	17	18	19	20
Operations										
Administrative/Security	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Train Crew	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	3,000,000	1,000,000	1,000,000	1,000,000
Fuel	2,881,000	2,687,000	2,712,000	2,718,000	2,727,000	2,723,000	2,734,000	2,658,000	2,550,000	2,550,000
Materials/Contracts	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000
Subtotal	*6,431,000*	*6,237,000*	*6,262,000*	*6,268,000*	*6,277,000*	*6,273,000*	*8,284,000*	*6,208,000*	*6,100,000*	*6,100,000*
Maintenance-of-Way										
Track	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Signals	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
Bridge and Building	323,000	323,000	323,000	323,000	323,000	323,000	323,000	323,000	323,000	323,000
Materials	980,000	1,120,000	1,120,000	1,120,000	1,120,000	1,120,000	1,120,000	1,120,000	1,120,000	1,120,000
Contract Work	770,000	770,000	770,000	770,000	1,470,000	770,000	770,000	770,000	770,000	1,190,000
Subtotal	*3,673,000*	*3,813,000*	*3,813,000*	*3,813,000*	*4,513,000*	*3,813,000*	*3,813,000*	*3,813,000*	*3,813,000*	*4,233,000*
Mechanical										
Administrative/Labor	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000
Materials	1,530,000	1,530,000	1,530,000	1,530,000	1,530,000	1,530,000	1,530,000	1,530,000	1,530,000	1,530,000
Locomotive Heavy Maintenance					1,500,000	1,250,000				1,500,000
Subtotal	*2,430,000*	*2,430,000*	*2,430,000*	*2,430,000*	*3,930,000*	*3,680,000*	*2,430,000*	*2,430,000*	*2,430,000*	*3,930,000*
Total	***12,534,000***	***12,480,000***	***12,505,000***	***12,511,000***	***14,720,000***	***13,766,000***	***14,527,000***	***12,451,000***	***12,343,000***	***14,263,000***
Contingency = 35%	***4,386,900***	***4,368,000***	***4,376,750***	***4,378,850***	***5,152,000***	***4,818,100***	***5,084,450***	***4,357,850***	***4,320,050***	***4,992,050***
Grand Total	***16,920,900***	***16,848,000***	***16,881,750***	***16,889,850***	***19,872,000***	***18,584,100***	***19,611,450***	***16,808,850***	***16,663,050***	***19,255,050***
DOE-related										
Train trips (in and return)	424	374	390	394	400	384	404	356	288	*288*
Tons	733,444	458,920	482,523	485,514	486,709	491,359	499,946	459,841	372,885	*374,372*
Trains per week	8	7	8	8	8	7	8	7	6	*6*
Commercial (Shared-Use)										
Train Trips (in and return)	520	520	520	520	520	520	520	520	520	*520*
Tons	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	*1,877,500*
Trains per week	10	10	10	10	10	10	10	10	10	*10*
Total DOE and Commerical										
Total Train trips (in and return)	944	894	910	914	920	904	924	876	808	*808*
Tons	2,610,944	2,336,420	2,360,023	2,363,014	2,364,209	2,368,859	2,377,446	2,337,341	2,250,385	*2,251,872*
Total trains per week	*18*	*17*	*18*	*18*	*18*	*17*	*18*	*17*	*16*	*16*

Table 12-1 (continued). MRC Operating and Maintenance Costs, DOE and Commercial Traffic

	Years 31 through 40									
Year	31	32	33	34	35	36	37	38	39	40
Operations										
Administrative/Security	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000
Train Crew	700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000
Fuel	1,945,000	1,945,000	1,945,000	1,945,000	1,945,000	1,945,000	1,945,000	1,945,000	1,945,000	1,945,000
Materials/Contracts	350,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000
Subtotal	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*
Maintenance-of-Way										
Track	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Signals	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
Bridge and Building	323,000	323,000	323,000	323,000	323,000	323,000	323,000	323,000	323,000	323,000
Materials	560,000	560,000	560,000	560,000	560,000	800,000	800,000	800,000	800,000	560,000
Contract Work	420,000	420,000	420,000	770,000	840,000	420,000	420,000	420,000	420,000	770,000
Subtotal	*2,303,000*	*2,303,000*	*2,303,000*	*2,653,000*	*2,723,000*	*2,543,000*	*2,543,000*	*2,543,000*	*2,543,000*	*2,653,000*
Mechanical										
Administrative/Labor	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
Materials	720,000	720,000	720,000	720,000	720,000	720,000	720,000	720,000	720,000	720,000
Locomotive Heavy Maintenance					400,000				1,600,000	1,200,000
Subtotal	*1,320,000*	*1,320,000*	*1,320,000*	*1,320,000*	*1,720,000*	*1,320,000*	*1,320,000*	*1,320,000*	*2,920,000*	*2,520,000*
Total	***7,518,000***	***7,518,000***	***7,518,000***	***7,868,000***	***8,338,000***	***7,758,000***	***7,758,000***	***7,758,000***	***9,358,000***	***9,068,000***
Contingency = 35%	***2,631,300***	***2,631,300***	***2,631,300***	***2,753,800***	***2,918,300***	***2,715,300***	***2,715,300***	***2,715,300***	***3,275,300***	***3,173,800***
Grand Total	***10,149,300***	***10,149,300***	***10,149,300***	***10,621,800***	***11,256,300***	***10,473,300***	***10,473,300***	***10,473,300***	***12,633,300***	***12,241,800***
DOE-related										
Train trips (in and return)	52	52	52	52	52	52	52	52	52	52
Tons	29,145	29,145	29,145	29,145	29,145	29,145	29,145	29,145	29,145	29,145
Trains per week	1	1	1	1	1	1	1	1	1	1
Commercial (Shared-Use)										
Train Trips (in and return)	520	520	520	520	520	520	520	520	520	520
Tons	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500
Trains per week	10	10	10	10	10	10	10	10	10	10
Total DOE and Commerical										
Total Train trips (in and return)	572	572	572	572	572	572	572	572	572	572
Tons	1,906,645	1,906,645	1,906,645	1,906,645	1,906,645	1,906,645	1,906,645	1,906,645	1,906,645	1,906,645
Total trains per week	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*

Table 12-1 (continued). MRC Operating and Maintenance Costs, DOE and Commercial Traffic

	Years 41 through 50										Total
Year	41	42	43	44	45	46	47	48	49	50	
Operations											
Administrative/Security	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	59,800,000
Train Crew	700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000	44,500,000
Fuel	1,945,000	1,945,000	1,945,000	1,945,000	1,945,000	1,945,000	1,945,000	1,945,000	1,945,000	1,945,000	115,887,000
Materials/Contracts	350,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000	31,640,000
Subtotal	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*	*3,895,000*	251,827,000
Maintenance-of-Way											
Track	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	35,000,000
Signals	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	30,000,000
Bridge and Building	323,000	323,000	323,000	323,000	323,000	323,000	323,000	323,000	323,000	323,000	16,150,000
Materials	560,000	560,000	560,000	560,000	560,000	560,000	560,000	280,000	140,000	70,000	34,420,000
Contract Work	420,000	420,000	770,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	29,540,000
Subtotal	*2,303,000*	*2,303,000*	*2,653,000*	*2,303,000*	*2,303,000*	*2,303,000*	*2,303,000*	*2,023,000*	*1,883,000*	*1,813,000*	145,110,000
Mechanical											
Administrative/Labor	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	37,500,000
Materials	720,000	720,000	720,000	720,000	720,000	720,000	720,000	720,000	720,000		54,090,000
Locomotive Heavy Maintenance					400,000						14,750,000
Subtotal	*1,320,000*	*1,320,000*	*1,320,000*	*1,320,000*	*1,720,000*	*1,320,000*	*1,320,000*	*1,320,000*	*1,320,000*	*600,000*	106,340,000
Total	***7,518,000***	***7,518,000***	***7,868,000***	***7,518,000***	***7,918,000***	***7,518,000***	***7,518,000***	***7,238,000***	***7,098,000***	***6,308,000***	***503,277,000***
Contingency = 35%	***2,631,300***	***2,631,300***	***2,753,800***	***2,631,300***	***2,771,300***	***2,631,300***	***2,631,300***	***2,533,300***	***2,484,300***	***2,207,800***	***176,146,950***
Grand Total	***10,149,300***	***10,149,300***	***10,621,800***	***10,149,300***	***10,689,300***	***10,149,300***	***10,149,300***	***9,771,300***	***9,582,300***	***8,515,800***	***679,423,950***
DOE-related											
Train trips (in and return)	52	52	52	52	52	52	52	52	52	52	10,055
Tons	29,145	29,145	29,145	29,145	29,145	29,145	29,145	29,145	29,145	29,145	13,521,554
Trains per week	1	1	1	1	1	1	1	1	1	1	
Commercial (Shared-Use)											
Train Trips (in and return)	520	520	520	520	520	520	520	520	520	520	25,688
Tons	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	1,877,500	92,618,730
Trains per week	10	10	10	10	10	10	10	10	10	10	
Total DOE and Commerical											
Total Train trips (in and return)	572	572	572	572	572	572	572	572	572	572	35,743
Tons	1,906,645	1,906,645	1,906,645	1,906,645	1,906,645	1,906,645	1,906,645	1,906,645	1,906,645	1,906,645	106,140,284
Total trains per week	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	

Table 12-2. MRC Operating and Maintenance Costs, DOE Only

		Years 1 through 10									
	Year	1	2	3	4	5	6	7	8	9	10
Operating & Maintenance Costs	Operations										
	Administrative/ Security	1,000,000	1,300,000	1,300,000	1,300,000	1,300,000	1,300,000	1,300,000	1,300,000	1,300,000	1,300,000
	Train Crew	360,000	480,000	480,000	480,000	480,000	480,000	480,000	480,000	480,000	480,000
	Fuel	943,000	1,114,000	1,142,000	1,218,000	1,261,000	1,261,000	1,261,000	1,261,000	1,261,000	1,261,000
	Materials/contracts	350,000	560,000	560,000	560,000	560,000	560,000	560,000	560,000	560,000	700,000
	Subtotal	*2,653,000*	*3,454,000*	*3,482,000*	3,558,000	*3,601,000*	*3,601,000*	*3,601,000*	*3,601,000*	*3,601,000*	*3,741,000*
	Maintenance-of-Way										
	Track	920,000	920,000	920,000	920,000	920,000	920,000	920,000	920,000	920,000	920,000
	Signals	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
	Bridge and Building	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Materials	100,000	200,000	300,000	300,000	300,000	300,000	500,000	500,000	630,000	800,000
	Contract Work	300,000	300,000	800,000	300,000	800,000	300,000	350,000	400,000	650,000	1,000,000
	Subtotal	*2,070,000*	*2,170,000*	*2,770,000*	*2,270,000*	*2,770,000*	*2,270,000*	*2,520,000*	*2,570,000*	*2,950,000*	*3,470,000*
	Mechanical										
	Administrative/Labor	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000
	Materials and Minor Repairs	600,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
	Locomotive Heavy Maintenance					450,000					1,350,000
	Subtotal	*1,500,000*	*2,400,000*	*2,400,000*	*2,400,000*	*2,850,000*	*2,400,000*	*2,400,000*	*2,400,000*	*2,400,000*	*3,750,000*
	Total	***6,223,000***	***8,024,000***	***8,652,000***	***8,228,000***	***9,221,000***	***8,271,000***	***8,521,000***	***8,571,000***	***8,951,000***	***10,961,000***
	Contingency = 35%	***2,178,050***	***2,808,400***	***3,028,200***	***2,879,800***	***3,227,350***	***2,894,850***	***2,982,350***	***2,999,850***	***3,132,850***	***3,836,350***
	Grand Total	***8,401,050***	***10,832,400***	***11,680,200***	***11,107,800***	***12,448,350***	***11,165,850***	***11,503,350***	***11,570,850***	***12,083,850***	***14,797,350***
Train Traffic	**Total DOE-related**										
	Train trips (in and return)	232	340	358	406	430	436	428	428	432	440
	Tons	420,793	527,131	556,036	642,544	711,637	746,307	723,577	726,735	724,501	754,503
	Total trains per week	4	7	7	8	8	8	8	8	8	8

Table 12-2 (continued). MRC Operating and Maintenance Costs, DOE Only

		Years 11 through 20									
	Year	11	12	13	14	15	16	17	18	19	20
Operating & Maintenance Costs	Operations										
	Administrative/ Security	1,300,000	1,300,000	1,300,000	1,300,000	1,300,000	1,300,000	1,300,000	1,300,000	1,300,000	1,300,000
	Train Crew	480,000	480,000	480,000	480,000	480,000	480,000	480,000	480,000	480,000	480,000
	Fuel	1,228,000	1,055,000	1,080,000	1,080,000	1,095,000	1,071,000	1,102,000	1,026,000	18,000	918,000
	Materials/contracts	700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000
	Subtotal	*3,708,000*	*3,535,000*	*3,560,000*	*3,560,000*	*3,575,000*	*3,551,000*	*3,582,000*	*3,506,000*	*2,498,000*	*3,398,000*
	Maintenance-of-Way										
	Track	920,000	920,000	920,000	920,000	920,000	920,000	920,000	920,000	920,000	920,000
	Signals	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
	Bridge and Building	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Materials	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000
	Contract Work	700,000	700,000	700,000	700,000	1,300,000	600,000	600,000	600,000	600,000	1,000,000
	Subtotal	*3,270,000*	*3,270,000*	*3,270,000*	*3,270,000*	*3,870,000*	*3,170,000*	*3,170,000*	*3,170,000*	*3,170,000*	*3,570,000*
	Mechanical										
	Administrative/Labor	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000
	Materials and Minor Repairs	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
	Locomotive Heavy Maintenance	0				1,250,000	1,000,000				1,350,000
	Subtotal	*2,400,000*	*2,400,000*	*2,400,000*	*2,400,000*	*3,650,000*	*3,400,000*	*2,400,000*	*2,400,000*	*2,400,000*	*3,750,000*
	Total	***9,378,000***	***9,205,000***	***9,230,000***	***9,230,000***	***11,095,000***	***10,121,000***	***9,152,000***	***9,076,000***	***8,068,000***	***10,718,000***
	Contingency = 35%	***3,282,300***	***3,221,750***	***3,230,500***	***3,230,500***	***3,883,250***	***3,542,350***	***3,203,200***	***3,176,600***	***2,823,800***	***3,751,300***
	Grand Total	***12,660,300***	***12,426,750***	***12,460,500***	***12,460,500***	***14,978,250***	***13,663,350***	***12,355,200***	***12,252,600***	***10,891,800***	***14,469,300***
Train Traffic	**Total DOE-related**										
	Train trips (in and return)	424	374	390	394	400	384	404	356	288	288
	Tons	733,444	458,920	482,523	485,514	486,709	491,359	499,946	459,841	372,885	374,372
	Total trains per week	8	7	8	8	8	7	8	7	6	6

Table 12-2 (continued). MRC Operating and Maintenance Costs, DOE Only

		Years 21 through 30									
	Year	21	22	23	24	25	26	27	28	29	30
Operating & Maintenance Costs	Operations										
	Administrative/ Security	1,130,000	1,130,000	1,130,000	1,130,000	500,000	500,000	500,000	500,000	500,000	500,000
	Train Crew	480,000	480,000	480,000	480,000	180,000	180,000	180,000	180,000	180,000	180,000
	Fuel	910,000	880,000	880,000	810,000	592,000	560,000	557,000	557,000	312,000	312,000
	Materials/contracts	700,000	700,000	700,000	700,000	700,000	400,000	400,000	400,000	400,000	400,000
	Subtotal	*3,220,000*	*3,190,000*	*3,190,000*	*3,120,000*	*1,972,000*	*1,640,000*	*1,637,000*	*1,637,000*	*1,392,000*	*1,392,000*
	Maintenance-of-Way										
	Track	920,000	920,000	920,000	920,000	920,000	360,000	360,000	360,000	360,000	360,000
	Signals	600,000	600,000	600,000	600,000	600,000	285,000	285,000	285,000	285,000	285,000
	Bridge and Building	150,000	150,000	150,000	150,000	56,000	56,000	56,000	56,000	56,000	56,000
	Materials	900,000	900,000	900,000	900,000	200,000	200,000	200,000	200,000	200,000	200,000
	Contract Work	600,000	600,000	600,000	600,000	700,000	300,000	300,000	300,000	300,000	300,000
	Subtotal	*3,170,000*	*3,170,000*	*3,170,000*	*3,170,000*	*2,476,000*	*1,201,000*	*1,201,000*	*1,201,000*	*1,201,000*	*1,201,000*
	Mechanical										
	Administrative/Labor	900,000	900,000	900,000	900,000	700,000	262,500	262,500	262,500	262,500	262,500
	Materials and Minor Repairs	1,500,000	1,400,000	1,400,000	1,400,000	900,000	30,000	30,000	30,000	30,000	30,000
	Locomotive Heavy Maintenance					150,000					100,000
	Subtotal	*2,400,000*	*2,300,000*	*2,300,000*	*2,300,000*	*1,750,000*	*292,500*	*292,500*	*292,500*	*292,500*	*392,500*
	Total	***8,790,000***	***8,660,000***	***8,660,000***	***8,590,000***	***6,198,000***	***3,133,500***	***3,130,500***	***3,130,500***	***2,885,500***	***2,985,500***
	Contingency = 35%	***3,076,500***	***3,031,000***	***3,031,000***	***3,006,500***	***2,169,300***	***1,096,725***	***1,095,675***	***1,095,675***	***1,009,925***	***1,044,925***
	Grand Total	***11,866,500***	***11,691,000***	***11,691,000***	***11,596,500***	***8,367,300***	***4,230,225***	***4,226,175***	***4,226,175***	***3,895,425***	***4,030,425***
Train Traffic	**Total DOE-related**										
	Train trips (in and return)	241	272	272	222	84	64	62	62	52	52
	Tons	362,908	355,364	348,965	264,447	66,467	35,116	33,910	33,910	29,145	29,145
	Total trains per week	5	5	5	4	2	1	1	1	1	1

Table 12-2 (continued). MRC Operating and Maintenance Costs, DOE Only

		Years 31 through 40									
	Year	31	32	33	34	35	36	37	38	39	40
Operating & Maintenance Costs	Operations										
	Administrative/ Security	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
	Train Crew	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000
	Fuel	312,000	312,000	312,000	312,000	312,000	312,000	312,000	312,000	312,000	312,000
	Materials/contracts	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Subtotal	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*
	Maintenance-of-Way										
	Track	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000
	Signals	285,000	285,000	285,000	285,000	285,000	285,000	285,000	285,000	285,000	285,000
	Bridge and Building	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000
	Materials	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Contract Work	300,000	300,000	300,000	600,000	300,000	300,000	300,000	300,000	300,000	300,000
	Subtotal	*1,201,000*	*1,201,000*	*1,201,000*	*1,501,000*	*1,201,000*	*1,201,000*	*1,201,000*	*1,201,000*	*1,201,000*	*1,201,000*
	Mechanical										
	Administrative/Labor	262,500	262,500	262,500	262,500	262,500	262,500	262,500	262,500	262,500	262,500
	Materials and Minor Repairs	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Locomotive Heavy Maintenance					150,000					150,000
	Subtotal	*292,500*	*292,500*	*292,500*	*292,500*	*442,500*	*292,500*	*292,500*	*292,500*	*292,500*	*442,500*
	Total	***2,885,500***	***2,885,500***	***2,885,500***	***3,185,500***	***3,035,500***	***2,885,500***	***2,885,500***	***2,885,500***	***2,885,500***	***3,035,500***
	Contingency = 35%	***1,009,925***	***1,009,925***	***1,009,925***	***1,114,925***	***1,062,425***	***1,009,925***	***1,009,925***	***1,009,925***	***1,009,925***	***1,062,425***
	Grand Total	***3,895,425***	***3,895,425***	***3,895,425***	***4,300,425***	***4,097,925***	***3,895,425***	***3,895,425***	***3,895,425***	***3,895,425***	***4,097,925***
Train Traffic	**Total DOE-related**										
	Train trips (in and return)	52	52	52	52	52	52	52	52	52	52
	Tons	29,145	29,145	29,145	29,145	29,145	29,145	29,145	29,145	29,145	29,145
	Total trains per week	1	1	1	1	1	1	1	1	1	1

Table 12-2 (continued). MRC Operating and Maintenance Costs, DOE Only

		Years 41 through 50										Total
	Year	41	42	43	44	45	46	47	48	49	50	
Operating & Maintenance Costs	**Operations**											
	Administrative/ Security	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	43,220,000
	Train Crew	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	16,080,000
	Fuel	312,000	312,000	312,000	312,000	312,000	312,000	312,000	312,000	312,000	312,000	34,266,000
	Materials/contracts	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	26,030,000
	Subtotal	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*	*1,392,000*	119,596,000
	Maintenance-of-Way											
	Track	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	32,000,000
	Signals	285,000	285,000	285,000	285,000	285,000	285,000	285,000	285,000	285,000	285,000	22,125,000
	Bridge and Building	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	5,056,000
	Materials	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	21,730,000
	Contract Work	300,000	300,000	700,000	300,000	300,000	300,000	300,000	300,000	300,000		23,700,000
	Subtotal	*1,201,000*	*1,201,000*	*1,601,000*	*1,201,000*	*1,201,000*	*1,201,000*	*1,201,000*	*1,201,000*	*1,201,000*	*901,000*	104,611,000
	Mechanical											
	Administrative/Labor	262,500	262,500	262,500	262,500	262,500	262,500	262,500	262,500	262,500	262,500	28,862,500
	Materials and Minor Repairs	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000		36,420,000
	Locomotive Heavy Maintenance					150,000						6,100,000
	Subtotal	*292,500*	*292,500*	*292,500*	*292,500*	*442,500*	*292,500*	*292,500*	*292,500*	*292,500*	*262,500*	71,382,500
	Total	***2,885,500***	***2,885,500***	***3,285,500***	***2,885,500***	***3,035,500***	***2,885,500***	***2,885,500***	***2,885,500***	***2,885,500***	***2,555,500***	***295,589,500***
	Contingency = 35%	***1,009,925***	***1,009,925***	***1,149,925***	***1,009,925***	***1,062,425***	***1,009,925***	***1,009,925***	***1,009,925***	***1,009,925***	***894,425***	***103,456,325***
	Grand Total	***3,895,425***	***3,895,425***	***4,435,425***	***3,895,425***	***4,097,925***	***3,895,425***	***3,895,425***	***3,895,425***	***3,895,425***	***3,449,925***	***399,045,825***
Train Traffic	**Total DOE-related**											
	Train trips (in and return)	52	52	52	52	52	52	52	52	52	52	10,055
	Tons	29,145	29,145	29,145	29,145	29,145	29,145	29,145	29,145	29,145	29,145	13,521,554
	Total trains per week	1	1	1	1	1	1	1	1	1	1	

13.0 References and Applicable Documents

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NRP. 2007a. *Air Quality Emission Factors and Socioeconomic Input, Mina Rail Corridor.* Las Vegas, NV: NRP. Rev. 00, 20 April 2007.

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_____. 2007h. *Route Sections and Structures–Typical Concepts of Structural Features, Caliente Rail Corridor.* Las Vegas, NV: NRP. Rev. 03, 15 May 2007.

WSA. 2005. *Rail Transportation Economic Impact Evaluation & Planning.* San Francisco, CA: Wilbur Smith Associates. 10 May 2005.

Appendix A
Responsibilities of a Common Carrier Railroad

Refer to Appendix A in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

Appendix B
Estimated Gross Tons by Category for Nevada Rail Line

Table B-1. Estimated Gross Tons by Category by Year for the NRL – Loaded and Empty Trains

Year	Commercial SNF	Commercial HLW	DOE SNF	Navy	SSC/WP	Repository Construct'n	Fuel Oil	Commerc'l Shared Use	TOTAL
1	26,809	43,195	3,376	3,229	55,266	266,874	19,982	830,263	1,248,995
2	71,887	84,702	6,753	3,229	60,182	266,874	28,908	1,227,008	1,749,543
3	91,146	84,702	15,194	5,478	64,249	266,874	28,908	1,480,102	2,036,653
4	164,812	84,702	23,635	5,478	69,841	266,874	28,908	1,655,862	2,300,112
5	219,016	84,702	30,388	10,955	74,906	266,874	28,908	1,872,768	2,588,518
6	253,864	84,702	26,215	12,685	75,075	266,874	28,908	1,872,768	2,621,091
7	227,356	84,702	30,088	13,435	74,568	266,874	28,908	1,872,768	2,598,699
8	228,845	84,702	30,584	14,184	75,075	266,874	28,908	1,872,768	2,601,941
9	216,832	93,936	30,584	14,184	75,587	266,874	28,908	1,872,768	2,599,674
10	220,009	116,966	30,584	14,184	79,823	266,874	28,908	1,872,768	2,630,117
11	220,009	116,966	30,584	14,184	58,825	266,874	28,908	1,872,768	2,609,119
12	224,675	116,966	30,584	14,184	47,221		28,908	1,872,768	2,335,307
13	240,362	123,817	30,584	14,184	49,091		28,908	1,872,768	2,359,714
14	235,696	128,682	32,768	14,184	48,922		28,908	1,872,768	2,361,929
15	229,341	133,051	37,138	13,435	49,941		28,908	1,872,768	2,364,582
16	237,185	136,725	37,532	13,435	41,787		28,908	1,872,768	2,368,340
17	233,015	136,725	42,398	13,435	50,622		28,908	1,872,768	2,377,871
18	254,360	77,249	42,398	13,435	43,995		28,908	1,872,768	2,333,113
19	244,532		42,398	13,435	40,430		28,908	1,872,768	2,242,471
20	246,021		42,398	13,435	40,599		28,908	1,872,768	2,244,129
21	233,511		42,894	13,435	40,599		28,908	1,872,768	2,232,116
22	232,022		42,894	13,435	35,672		28,908	1,872,768	2,225,700
23	237,681		42,894		37,372		28,908	1,872,768	2,219,624
24	161,135		44,582		29,388		28,908	1,872,768	2,136,781
25	28,196				9,004		28,908	1,872,768	1,938,877
26					5,946		28,908	1,872,768	1,907,623
27					4,589		28,908	1,872,768	1,906,266
28					4,589		28,908	1,872,768	1,906,266
29							28,908	1,872,768	1,901,677
30							28,908	1,872,768	1,901,677
31							28,908	1,872,768	1,901,677
32							28,908	1,872,768	1,901,677
33							28,908	1,872,768	1,901,677
34							28,908	1,872,768	1,901,677
35							28,908	1,872,768	1,901,677
36							28,908	1,872,768	1,901,677
37							28,908	1,872,768	1,901,677
38							28,908	1,872,768	1,901,677
39							28,908	1,872,768	1,901,677
40							28,908	1,872,768	1,901,677
41							28,908	1,872,768	1,901,677
42							28,908	1,872,768	1,901,677
43							28,908	1,872,768	1,901,677
44							28,908	1,872,768	1,901,677
45							28,908	1,872,768	1,901,677
46							28,908	1,872,768	1,901,677
47							28,908	1,872,768	1,901,677
48							28,908	1,872,768	1,901,677
49							28,908	1,872,768	1,901,677
50							28,908	1,872,768	1,901,677
TOTAL	4,978,315	1,817,189	769,446	261,260	1,343,163	2,935,618	1,436,479	91,340,583	104,882,053

Note: These figures represent mid-range estimates for commercial shared-use traffic.

Table B-2. Commercial Shared-Use Traffic – Nevada Rail Line

Year	Caliente Team Track		Tonopah T.T.		Amargosa Valley T.T.		Ponderosa Dairy A.V.		Pinoche - Natural Poz		Y.Mt. Cind-R-Lite		US Ecology Beatty		D&H Mining Beatty		Farland Refin Wrm Sprngs		Dry Lake V. Power		Total	
	Tons	Carloads	Tons	Carloads	Tons	Carloads	Tons	Carloads	Tons	Carloads	Tons	Carloads	Tons	Carloads	Tons	Carloads	Tons	Carloads	Tons	Carloads	Tons	Carloads
1	10,000	100	2,000	20	2,000	20	15,000	150	100,000	1,000	15,000	150	50,000	500	50,000	500	200,000	2,000	0	0	444,000	4,440
2	20,000	200	4,000	40	4,000	40	30,000	300	150,000	1,500	30,000	300	75,000	750	100,000	1,000	250,000	2,500	0	0	663,000	6,630
3	30,000	300	6,000	60	6,000	60	40,000	400	150,000	1,500	45,000	450	100,000	1,000	150,000	1,500	270,000	2,700	0	0	797,000	7,970
4	40,000	400	8,000	80	8,000	80	45,000	450	150,000	1,500	50,000	500	125,000	1,250	200,000	2,000	275,000	2,750	0	0	901,000	9,010
5	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
6	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
7	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
8	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
9	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
10	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
11	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
12	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
13	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
14	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
15	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
16	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
17	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
18	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
19	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
20	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
21	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
22	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
23	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
24	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
25	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
26	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
27	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
28	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
29	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
30	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
31	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
32	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
33	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
34	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
35	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
36	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
37	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
38	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
39	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
40	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
41	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
42	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
43	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
44	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
45	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
46	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
47	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
48	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
49	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
50	48,000	480	12,000	120	12,000	120	50,000	500	150,000	1,500	54,000	540	153,750	1,538	254,000	2,540	295,597	2,956	0	0	1,029,347	10,293
TOTAL	2,308,000	23,080	572,000	5,720	572,000	5,720	2,430,000	24,300	7,450,000	74,500	2,624,000	26,240	7,422,500	74,225	12,184,000	121,840	14,592,462	145,925	0	0	50,154,962	501,550

Appendix C
Assumptions for Determining Numbers of Trains

Refer to Appendix C in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

Appendix D
Train Meet Locations, Fort Churchill to Yucca Mountain

Because of location parameters that apply to the MRC sidings but not to the CRC sidings, the graphic contained in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g) is not applicable to *Operations and Maintenance Report, Mina Rail Corridor*.

Appendix E
Consideration for Fencing along the Nevada Rail Line

Refer to Appendix E in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).

Appendix F
Bridge Loading Analysis

Refer to Appendix F in *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007g).