III. UNION PACIFIC RAILROAD CORRIDOR

A. INTRODUCTION AND BACKGROUND

Eureka County contains a portion of one of the Union Pacific Railroad's major east-west routes. The Department of Energy (DOE) has indicated that transportation of spent nuclear fuel (SNF) and high-level radioactive waste (HLRW) to the proposed Yucca Mountain Nuclear Waste Repository will be conducted with a combination of rail and highway routes. DOE has considered the construction of a rail corridor route through Eureka County - the "Carlin Spur" – leaving the Union Pacific main line at Beowawe in Eureka County and running southwest through Crescent Valley, as an alternative for waste transport. While in 2005 the DOE selected an alignment leaving the main Union Pacific tracks at Caliente, in Lincoln County, as the only route currently to be studied for rail transportation to Yucca Mountain, there still is a possibility that the Carlin route might be used if the Caliente route proves unfeasible.

With the possibility that nuclear waste will be transported along the existing Union Pacific corridor, either to a Carlin Spur or to a proposed Caliente route, Eureka County wishes to understand the current operations of the railroad within and adjacent to the County so that impacts of potential waste transport in Eureka County can be assessed.

Study Procedure and Information Sources

The County wishes to develop information on railroad accidents, on the effects of weather on railroad operations, on existing and historical train frequencies, on the physical features of the line, and on the regulatory structure governing railroad operations. The County wishes to develop this information for the portion of the Union Pacific Railroad between Battle Mountain and Maggie Creek, a section approximately 60 miles long.

This information was obtained from a number of sources. (A detailed list of information sources is in **Appendix A**.) For railroad accidents the Federal Railroad Administration (FRA) was the principal source of information. FRA also provided information regarding railroad operations and train frequencies. A search of Union Pacific Corporation's website provided maps and information about overall operations and programs. Repeated attempts were made to directly interview a Union Pacific representative regarding rail operations in the county, but telephone calls and email massages asking for information were not returned.

Information on route profiles, overview of Nevada railroads, waste transportation issues, and the regulatory structure was obtained from previous reports commissioned by Eureka County, the State of Nevada, the DOE and by searching various websites, followed by research in the Code of Federal Regulations and other federal government sources. Information on Humboldt River flood flows and Eureka County weather was obtained from the U.S.

Geological Survey, the State of Nevada, and the Desert Research Institute. Maps were obtained from NDOT and Eureka County. A physical, on-the-ground survey of the rail line was not conducted, although the Program Coordinator of Eureka County's Yucca Mountain Information Office did take extensive photographs of the rail line in the Palisade Canyon and Carlin area. Several of these photographs are included in this report.

The Union Pacific Railroad

The Union Pacific Railroad was chartered by Congress in 1886 to build part of the nation's first transcontinental railroad line. Under terms of the Pacific Railroads Act, Union Pacific was authorized to build a line westward from Omaha, Nebraska, to the California-Nevada line, where it was to connect with the Central Pacific Railroad, to be built simultaneously from Sacramento, California. Construction of the Union Pacific was begun in Omaha in 1865, and after a succession of construction problems, Indian troubles and delays, on May 10, 1869, the Union Pacific joined the Central Pacific northwest of Ogden, Utah, thus completing the nation's first transcontinental railroad.

Fraud, mismanagement and overextensions left the Union Pacific with heavy financial burdens, and in 1893 the company went into receivership. The railroad was reincorporated in 1897 as the Union Pacific Railroad Company in Utah and, under the management of Edward H. Harriman, the railroad was expanded, improved, and stabilized.

Harriman added several railroads to his empire, eventually controlling railroads in much of the Northwest. Acquisitions continued through the twentieth century, with acquisition of the Missouri Pacific and Western Pacific Railroads in 1982, the M-K-T Railroad in 1988, the Chicago and North Western Railroad In 1995, and the Southern Pacific in 1996. By 1997 the much-expanded railroad was "plagued by accidents, late arrivals, and congested rail lines; federal regulators intervened, allowing two competing railroads to share Union Pacific's tracks, to keep shipments moving (the track-sharing order was lifted in 1998). Today the railroad is a subsidiary of the highly diversified Union Pacific Corporation..." (Columbia Electronic Encyclopedia, 6th ed. "*Union Pacific Railroad*")

Union Pacific is one of seven Class 1 railroads in the nation*. Measured by revenue, UPRR is the largest U.S. railroad, with revenues of over $1.5 billion in 2003. (American Association of Railroads, *Class 1 Railroad Statistics)* In the 2000's, UPRR reports "surging freight demand." The railroad reports that this demand "strained our network resources and slowed our system velocity, leaving us short of train crew personnel and locomotive power."

The Railroad has initiated programs to met this demand, reporting in the *2004 Annual Report*: "We graduated nearly 5,000 new conductors into service and acquired almost 400 new locomotives during 2004, but record volumes continued to overwhelm our system even as we added these resources."

According to Union Pacific, the steps being taken in 2005 meet this "unprecedented" high demand include a "comprehensive redesign of our transportation plan...The new plan is intended to simplify our operations, improve network velocity, and better manage the volume of traffic flowing on

* U.S. Class I Railroads are line haul freight railroads with operating revenue in excess of $277.7 million.

our network in the face of continued strong demand." (Union Pacific Corporation, *2004 Annual Report.*)

Union Pacific in Nevada and Eureka County

Two Union Pacific main lines cross Nevada. The first one runs across northern Nevada, linking central California with Salt Lake City. This is the line that runs through Eureka County. The other runs through the southern part of the State, including Las Vegas. That line connects Los Angeles-Long Beach with Salt Lake City and UP's transcontinental line to eastern destinations.

The railroad reports that major commodities handled by the railroad in Nevada include coal, chemicals, aggregates, lumber and consumer goods. The railroad's top customers in Nevada include Nevada Power, Pioneer Chlor Alkali, and General Motors. (Union Pacific Corporation, *U.S. Guide to the Union Pacific Railroad, Nevada.*)

In Reno and Sparks the railroad has participated in the growing warehousing industry made possible by the State's freeport laws. In southern Nevada, Union Pacific plays a key role in Las Vegas's construction boom, since the railroad is the primary conduit for building materials. Union Pacific is an important link to markets for the industrial complex at Henderson. Union Pacific also serves coal-fired power plants at Valmy in northern Nevada and Moapa in southern Nevada. The table below summarizes Union Pacific operations in Nevada:

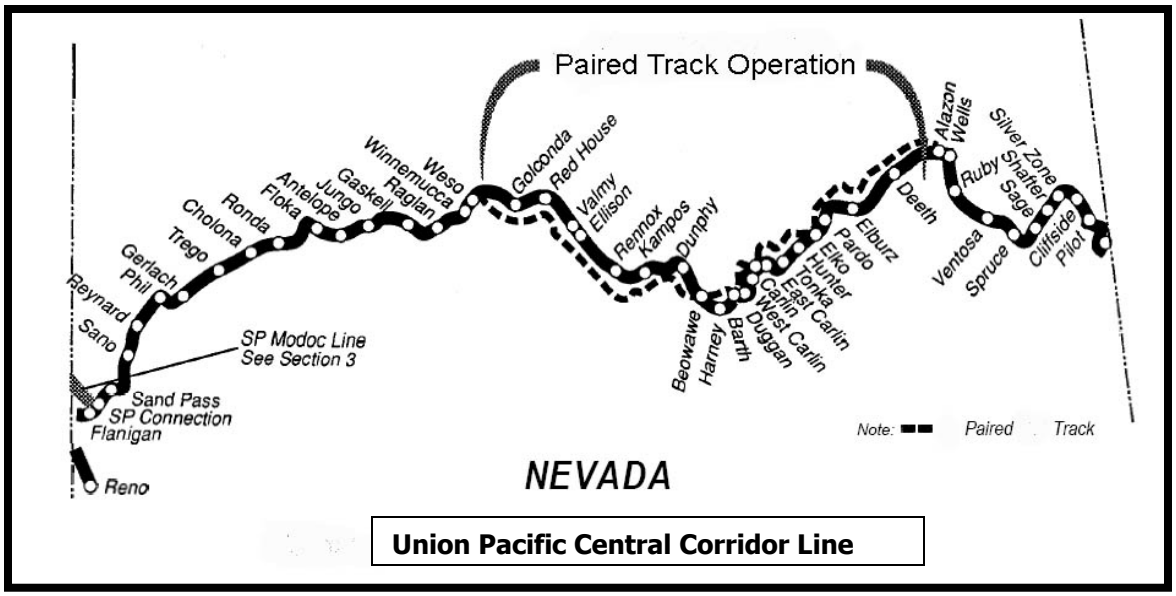
Figure III-a
Union Pacific Operations in Nevada

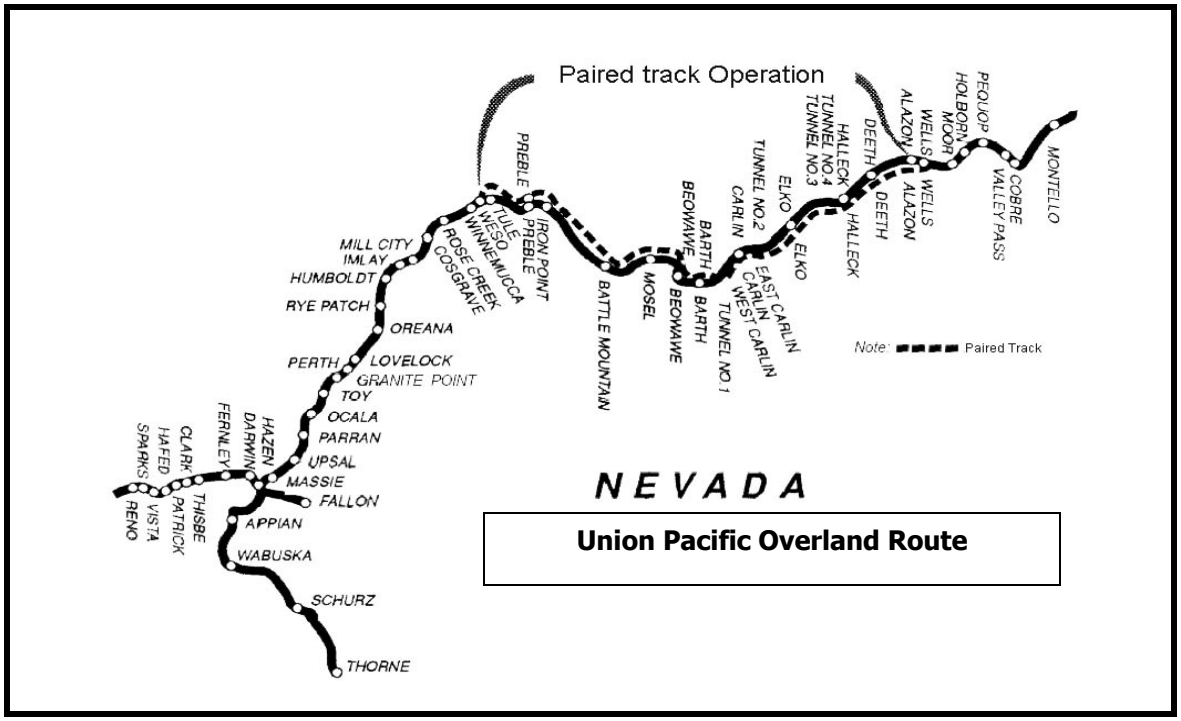
Miles of Track	**1,199**
Employees	**680**
Annual Payroll	**$44.4 million**
Purchases Made	**$8.1 million**

SOURCE: Union Pacific Corporation

Before Union Pacific acquired Southern Pacific in 1997, the two railroads operated separate tracks across northern Nevada. Between Weso, just east of Winnemucca, and Alazon, to the east of Elko, the two railroads operated dual trackage, with westbound traffic moving on one line and eastbound on the other. When Union Pacific acquired Southern Pacific, the east-west traffic separation continued. Eureka County is on this dual-track section. The two sketch maps reproduced on the following page show the Union Pacific lines across northern Nevada, with place names along the routes. The area of paired track also is shown. The lines through the Eureka County study area are described in more detail in Section E: Physical Features.

Figure III- b: Union Pacific Nevada Northern Routes





SOURCE: Hill, C.V., et al, *The Nevada Railroad System: Physical, Operational, and Accident Characteristics*, U.S. Department of Energy, September, 1991

B ACCIDENT DATA

Introduction To The Railroad Accident Reporting And Record-Keeping System

Statistics on railroad accidents in the United States are gathered and maintained by the Federal Railroad Administration (FRA), an agency of the U.S. Department of Transportation. Under the Accidents Reports Act of 1910, railroads were required to make a monthly report to the Secretary of Transportation of any accidents resulting in death, injury, or damage to equipment or the roadbed. The Occupational Health and Safety Act of 1970 (OSHA) required all employers, including railroads, to maintain records of and periodically report on all work-related accidents and illnesses. New rules that went into effect in 1975 consolidated requirements under these two laws, resulting in today's system of accident record-keeping and reporting. The FRA currently maintains an online database of reported railroad accidents/incidents from 1975 to the present. This database lists three types of reportable incidents:

1. Accidents with more than $6,700 damage to tracks or equipment
2. Highway/rail crossing accident/incident
3. Casualties

There may be some overlap in these categories: for example, a freight train hitting a cattle truck at a marked crossing might cause damage to both the truck and the train, hence the incident will be entered into both the accident and highway/rail crossing incident databases. But some accidents/incidents will appear on only one database: for example, if in the hypothetical truck/train accident only the truck were damaged, the incident would not be entered into the accident database, since no damage to railroad equipment or track occurred.

In building the following charts and graphs depicting accidents/incidents in the Eureka County study area, all three databases were used, with three exceptions as follows. First, it is not possible to search the casualty data base by county before the year 1997, as the original reports used to develop the database did not list the location of incident occurrence before 1997. It is known, however, from newspaper reports, that a fatal trespass incident took place in Palisade Canyon in Eureka County in 1983. This incident is included in the "Railroad Accidents in Eureka County" table and in graphs built from the table, but the exact time and location by milepost are not listed since the information was not available.

Second, the casualty database reports all casualties on railroad property, from fatalities to minor worker injuries. In Eureka County since 1997, there have been only two casualties reported in this database, both of them were minor sprains. These were not listed in the charts and tables because of the lack of equipment damage and the minor nature of the injury. Third, local sources (Elko

Free Press, Eureka County Yucca Mountain Information Office) reported a 2003 highway/rail crossing incident at Beowawe which is not on the FRA's highway/rail crossing incident database. This incident was added.

Four tables in **Appendix B** show:

- All reported railroad accidents in Eureka County between January 1975 and February 2005 (Including the 1983 Palisade Canyon trespass fatality).
- All reported railroad accidents in Lander County between Battle Mountain and the Eureka County line, between January 1975 and February 2005.
- All reported railroad accidents in Elko County from approximately Maggie Creek to the Eureka County line, between January1975 and February 2005*.
- All reported highway/rail crossing incidents in Eureka County, between January 1975 and February 2005 (including 2003 Beowawe incident).

On the following pages, major accidents are described, then bar graphs and tables are presented depicting various breakdowns of accident statistics, including a summary table, the year of the accident, reported cause of the accident, type of accident, the speed at which the accident occurred, the type of track upon which the accident occurred, the type of railroad equipment involved in the accident, the number of cars and locomotives derailed, whether any hazardous materials were involved and whether there were any releases. A derailment that took place at Carlin in May 2005, is described in the major accident section, but it is not included in any of the tables or charts, since a report on the accident had not yet been entered into the FRA database.

Major Rail Accidents in Eureka County and Vicinity, 1975 –2005

Described below are the major accidents that took place during the 30-year period. For the purposes of this report, major accidents are defined as accidents with more than $500,000 damage or a fatality.

June 9, 1980, near Barth

In this accident in Eureka County near Barth, irregular (buckled or sunken) tracks caused the derailment of a 3-locomotive, 115-car freight train. Twenty-six cars were derailed. Total damage to equipment was $841,600; to the track, $63,850. There were no fatalities, injuries or hazardous releases.

* Reported accidents included in this report extend east of Maggie Creek in order to capture all reported accidents in the Carlin area.

July 1983, Palisade Canyon

In this accident, a four-wheel-drive vehicle on the tracks in Palisade Canyon was struck by a freight train. Of the four passengers in the vehicle, three were injured, and a Carlin man, 26-year-old Donald Burke, was killed. (*Elko Daily Free Press.*) There was no reported damage to the freight train. This accident was not reported on the FRA accident database, since there was no damage to tracks or equipment. It was not a part of the highway/rail crossing incident database, since the incident did not take place at a crossing. It was reported in the casualty database.

May 28, 1984, Humboldt River near Dunphy

In this Eureka County accident, high water had eroded away part of an embankment, weakening the support structure of a bridge over the Humboldt River, and softening the trackbed west of the bridge. The bridge collapsed, causing the derailment of a 4-locomotive, 77-car freight train. A total of thirty cars and two locomotives were derailed. Total damage to the tracks and equipment was $1,298,000. There were no fatalities, injuries or hazardous releases.

January 8, 1992, near Mosel

In this accident near Mosel in Lander County, brakes apparently were set on a wheel of one of the locomotives on a 2-locomotive, 106-car freight train. This caused a flat spot to develop on the wheel, which rolled when it hit the west switch at Mosel, breaking the rail. Twenty-one cars were then derailed. Total damage to equipment and tracks was $818,237. Twenty-four cars on the train were carrying hazardous materials; none of these cars were damaged or derailed. There were no fatalities or injuries.

April 15, 1996 near Carlin

In this accident in Elko County near Carlin, 30 cars of a freight train carrying coal derailed. No cause was determined for the accident. Total damage to equipment was $653,104; to the track, $40,000. There were no fatalities, injuries or hazardous releases.

June 25, 2001, Battle Mountain

In this accident, which took place at 12:45 a.m. on June 25, 2001, near Battle Mountain, a broken rail caused the derailment of a 5-locomotive, 111-car freight train. Forty-three cars derailed, including a tank car carrying toluene, a

petrochemical and organic solvent. This tank car ruptured and approximately 1,541 gallons of the flammable liquid were spilled. Total damage to tracks and equipment was $1,749,338. There were no fatalities or injuries.

May 18, 2005, Carlin

At the time of this report, this accident had not yet been entered into the FRA accident database. Eureka County's Yucca Mountain Information Office Program Coordinator was able, however, to visit the scene of the accident, take photographs, and talk with railroad personnel at the scene. The description below comes from her observations (Marshall, pers com).

In this accident, a coal-carrying freight train derailed near Carlin, next to a propane storage facility. Fifteen cars were derailed. The accident was apparently equipment-caused: railroad personnel on site said that metal fatigue on the hub of one car's wheel caused the wheel to sheer off, derailed that car and the cars following. Two full propane tank cars were parked on a siding close to the accident location. The photograph below shows derailed cars with the propane storage facility and the tank cars in the background. More photographs of the accident are in **Appendix C**.

Figure III-c: Carlin derailment

Other Accidents

Table III - a

Summary Table Eureka County and Vicinity Reported Railroad Accidents and Highway/Rail Crossing Incidents January 1975- February 2005*	
Number of accidents with track damage	60
Number of accidents with equipment damage	66
Total number of cars derailed, all reported accidents	330
Total number of locomotives derailed, all reported accidents	22
Number of accidents with hazardous materials present	11
Number of accidents with hazardous releases	1
Number of accidents with injuries and/or fatalities	4
Number of injuries	6
Number of fatalities	1
Total accidents, Eureka County	27
Total accidents, Elko County portion of study area	26
Total accidents, Lander County portion of study area	16
Total highway/rail crossing incidents	4
Total number of reportable accidents and highway/rail crossing incidents in study area	**73**
Total damage to tracks and equipment	**$ 7,712,901**

*Includes1983 fatal trespass incident, 2003 crossing incident not on FRA database, but does not include two minor injuries in the FRA casualties database and May '05 Carlin derailment.

A total of 69 reportable railroad accidents occurred in the Eureka County study area between January 1975 and February 2005. This includes a collision between a freight train and a trespassing vehicle, resulting in a casualty but no track or equipment damage. In addition there were four highway/rail crossing incidents that did not result in damage to rail track or equipment, for a total number of reported incidents of 73 during this time period. In comparison to the major accidents described above, the average damage to tracks and equipment in other reported accidents during the 30-year period was $35,653.

Characteristics of Accidents

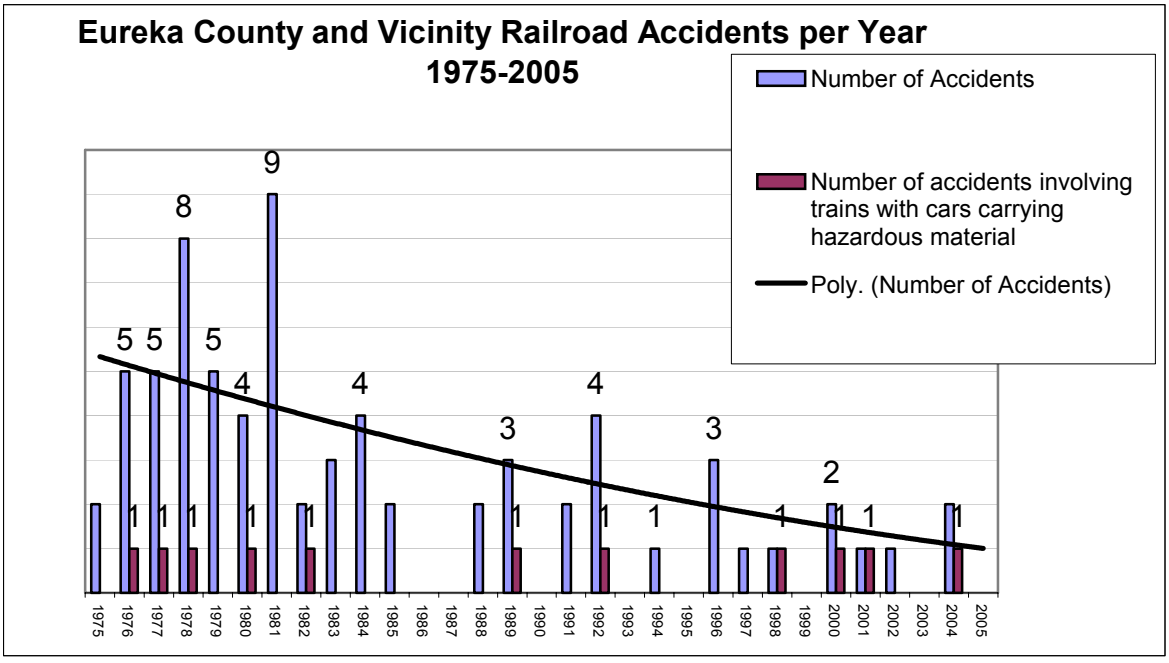
The following bar graphs illustrate characteristics of the reported accidents. Some of the graphs are built using only accidents from the "reportable accident" database, since sufficient information from the highway/rail crossing incidents was not available.

Accident Location

Exhibits 2a and 2b show approximate accident locations in the study area, based upon milepost locations given in FRA accident reports (**Appendix B**). There appear to be several areas where accidents are clustered: in and around Carlin, at Barth, at Beowawe, west of Mosel at around Mile 490 on the Overland ("Southern Pacific Railroad" on map), around Dunphy, and east of Battle Mountain. Palisade Canyon saw several accidents. The area between Dunphy and Beowawe had few accidents.

Accident Frequency

Figure III - d



Perhaps the most striking aspect of Eureka County railroad accidents is the significant decline in accidents after the early 1980's. It is the opinion of some rail experts that the decline in accidents nationwide has to do with changed rail

operations resulting from deregulation. The Staggers Rail Act of 1980 (named after Congressman Harley Staggers, D-WV, and passed under President Jimmy Carter) deregulated railroad operations. Before this Act, nine U.S. railroads were in bankruptcy, and others suffered poor returns. This led to deferred maintenance on both tracks and equipment. With the passage of the Staggers Act, railroads were able to abandon unprofitable lines and consolidate operations. Railroads were able to resume maintenance that had been deferred, and as maintenance increased accidents declined (Finkelstein, pers com).

The decreased accident rate also may be a result of the FRA's Safety Assurance and Compliance Program (SACP) which was initiated to address the problem of increased safety issues. In this program, the FRA works with major railroads to find root causes of safety problems, develops solutions cooperatively with the railroads, and enters into agreements with railroads to address specific issues to improve safety. (Moore, pers com.) Union Pacific initiated a Safety Assurance Compliance Program in 1997. In this program, Union Pacific management, 12 rail unions and the FRA address safety issues related to crew management, train dispatching, fatigue, training, culture, and inspections and testing.

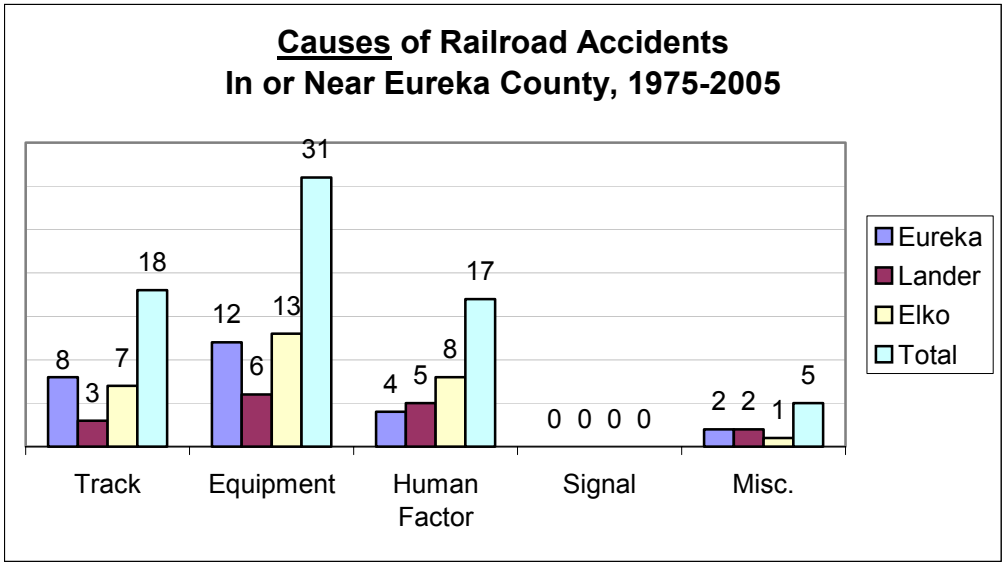
In an October 2004 *Las Vegas Sun* article, "Moving Deadly Cargo," it is reported, however, that after 20 years of steady declines in railroad accidents, with accidents nationwide hitting a low of 2,397 in 1997, the accident trend is again upward, with 2,958 reported accidents in 2003. Figure III-c shows, however, the overall accident trend in the Eureka study area is still down.

Deregulation eventually may also have some less positive safety impacts, reports the *Las Vegas Sun* article. Nevada nuclear waste transportation consultant Robert Halstead was quoted in the article: "deregulation caused major railroads to reduce the amount of track they use nationally from 165,000 miles to 100,000, resulting in heavier traffic along the tracks still in use...this increases the chances for train accidents."

Halstead was quoted as saying, "The desire of the railroads to maximize profits has led them to do things that have major safety implications, like having 110 cars per train instead of 100, and increasing the payload per train."

Accident Causes

Figure III - e



The FRA reporting system breaks down accidents by cause: equipment, track, human, miscellaneous, and signal. In the study area, 44% of accidents were equipment-caused; 25% were track-caused; 24% were human-caused; 7% had miscellaneous causes; and none were caused by signals. *

The percentage of human-caused accidents shown may be low. Other reports examining rail operations in Nevada conclude that human factors, such as rule violations by train crews and improper train handling, may be the greatest cause of railroad accidents, nationally and in Nevada, and causes attributed to human factors may be under-reported by the railroads (Meeker, 1992; Impact Assessment Report, 2001).

Of the 2,958 accidents nationwide in 2003, 1,197 were caused by human error, the most since 1993. The *Las Vegas Sun* article quoted United Transportation Union spokesman Frank Wilner, who said, "We have a lot of crews working 12-hour shifts and then given only 10 hours off. A lot of people

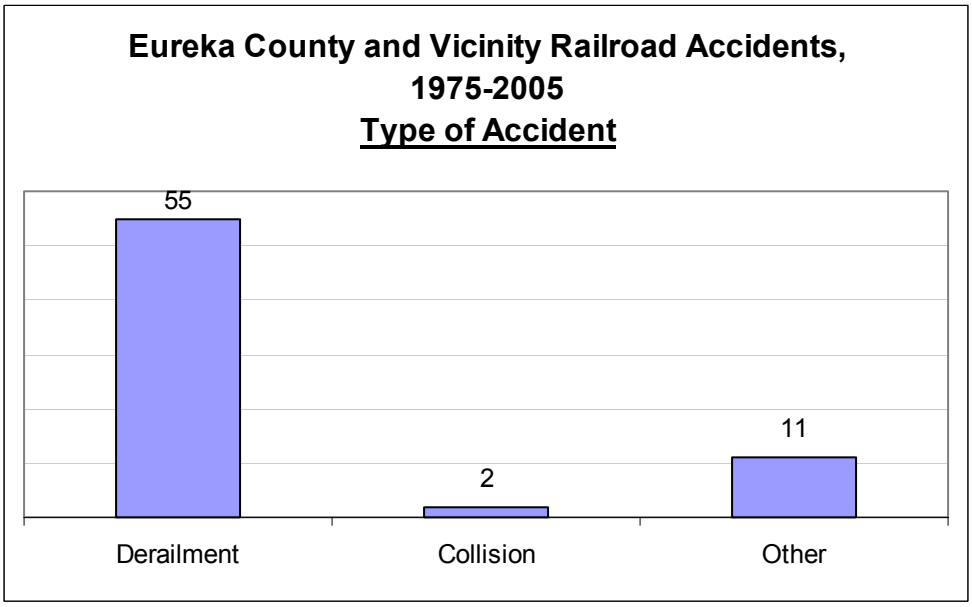
* The *equipment* category covers accidents caused by malfunction of some part of the train, including brakes, body parts, the coupler and draft system, truck components, axles and journal bearings, wheels, and locomotive failures. The *track* classification includes accidents caused by track, roadbed, or structures. Representative causes include defective track geometry, rail and joint bar problems, damaged switches, switches out of adjustment, and improperly operating signal and control systems. The *human factors* category includes accidents resulting from the improper use of brakes, an employee's physical condition, improper signaling or response to signaling, failure to comply with operating procedures, excessive speed, and improper use of switches. The fourth classification is *miscellaneous.* This includes accidents caused by events not covered in the other three categories, such as collision with a highway user at a rail-highway crossing; vandalism; shifting load; load falling from car; objects on or fouling the track; snow, ice, or mud on the track; improperly loaded cars; and other factors.

are getting only five or six hours of sleep a night. The problem is the railroads don't have enough crews. This has led to a significant reduction in morale and the increased potential for human error." Recent efforts by Union Pacific to recruit, hire and train additional personnel to meet high levels of demand may, however, alleviate this problem (Union Pacific Annual Report, 2004).

During the 30-year period in the study area, there were five major accidents (described above). While rail and equipment improvements carried out as a result of deregulation apparently were successful in cutting down the overall accident rate, in the study area all but one of the major accidents took place well after the 1980 deregulation. In accident reports the cause assigned to four of the major accidents was "track": bridge embankment and trackbed softening; broken rail; irregular track alignment compounded by human error in failing to cut out brake valves; and one unknown cause. The cause of the fifth major accident was assigned to "equipment:" a brake malfunction caused a wheel to flatten, breaking a switch and derailing the train.

Types of Accidents

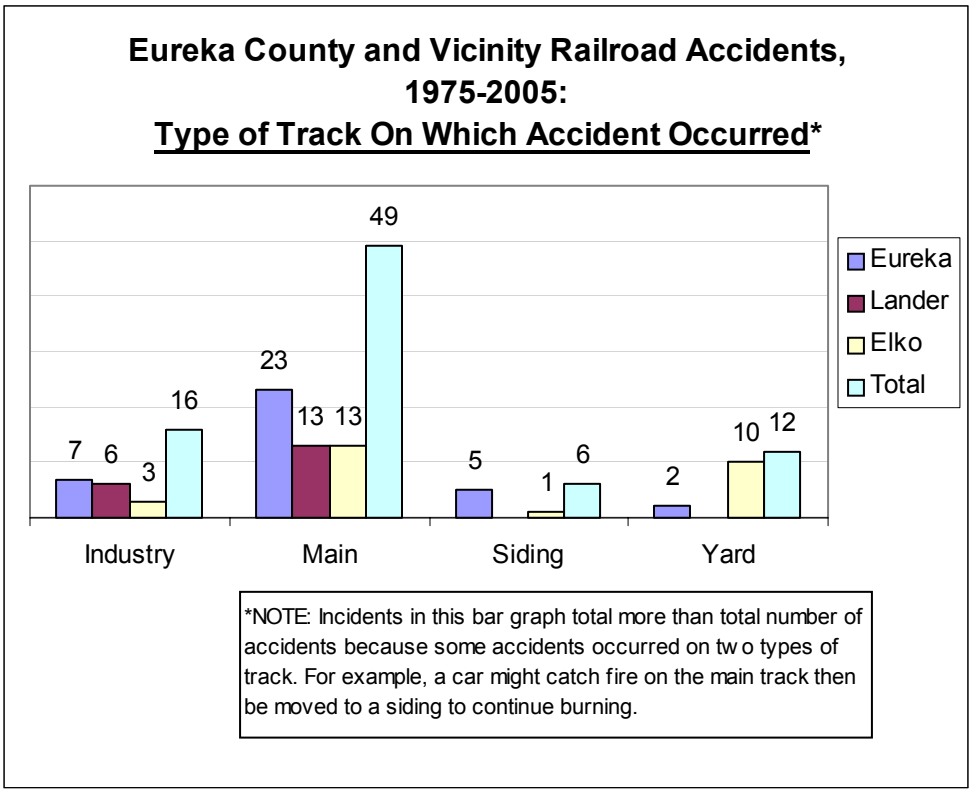
Figure III - f



Derailments were by far the most common type of accident in the study area, accounting for 81% of all accidents. An accident is classified as a derailment whenever on-track equipment leaves the rail for a reason other than a collision, explosion, or rail-highway crossing impact There were two collisions during the time period, and eleven accidents described as "other." Three of the "other" accidents were highway-rail collisions in which freight trains struck vehicles at crossings.

Type of Track on Which Accident Occurred

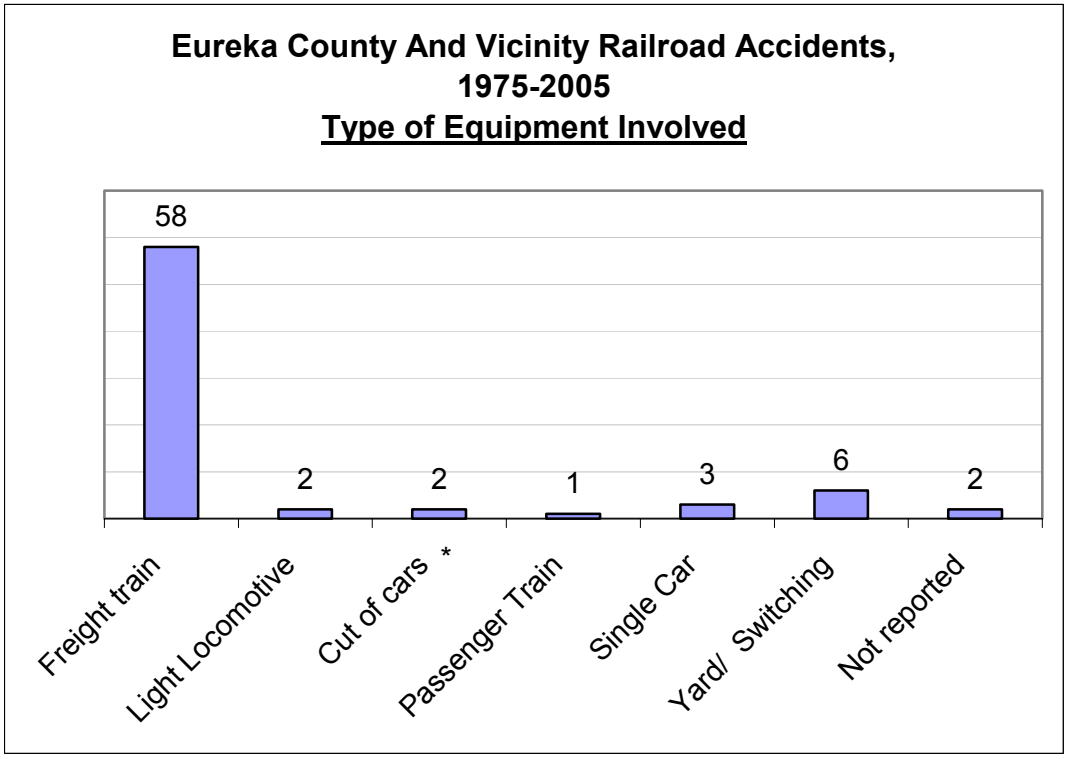
Figure III -g



Double tracks run throughout the study area, one used for eastbound traffic, one for westbound. Therefore, in comparison to areas with single track, there are few sidings used to allow trains to pass. In addition, there are fewer switching yards and industrial tracks in the study area than in more populated regions. Consistent with these conditions, 57% of accidents during the reporting period took place on the main track.

Type of Equipment Involved in Accident

Figure III - h



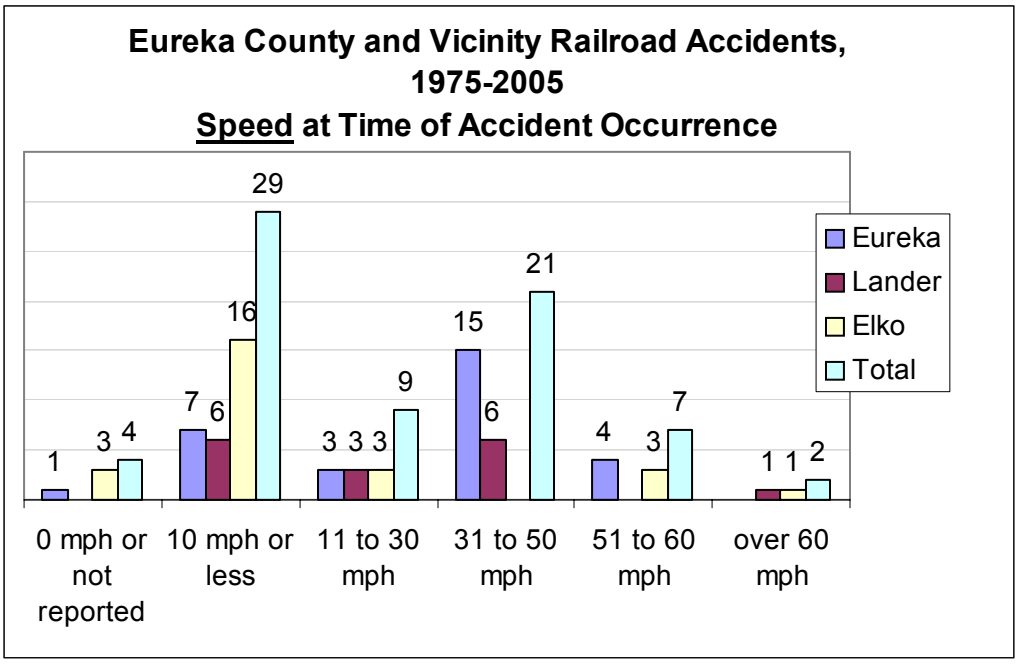
*

Regarding the type of equipment involved in accidents within the study area, seventy-nine percent of accidents involved freight trains. Again, this is consistent with the nature of the railroad through Eureka County, where most of the rail traffic is long-distance freight moving through the area, rather than switching, passenger trains, or other equipment configurations.

* "Cut of cars" is a group of railcars not yet assembled into a full freight train.

Speed

Figure III - i



The speed of equipment involved in accidents in the study area is generally low, with 59% traveling at 30 mph or less. The highest-speed accident that took place during the 30-year period was a collision of an Amtrak passenger train with a single rail car. The passenger train rounded a corner at 79 mph and struck the parked rail car, pushing it off the track. Total damage from this accident was $11,500, and there were no injuries or fatalities.

Accidents Involving Hazardous Materials

Table III - b

Eureka County and Vicinity Railroad Accidents, 1975 - 2005 Accidents Involving Hazardous Materials					
Year	Accidents involving trains carrying hazardous materials	Number of Hazmats Cars on train	Number of Hazmats Cars Derailed	Number of Hazmats Releases	Material Released
1976	1	1	0	0	
1977	1	1	1	0	
1978	1	1	0	0	
1980	1	2	0	0	
1982	1	2	0	0	
1989	1	2	0	0	
1992	1	24	0	0	
1998	1	13	0	0	
2000	1	1	1	0	
2001	1	1	1	1	toluene
2004	1	6	6	0	
Total	11	54	9	1	

The reporting system requires that the presence of hazardous materials in accidents be reported. In the thirty-year period, 11 accidents involved trains carrying hazardous materials in 54 cars. Of these cars, nine were derailed or damaged in the accidents. There was only one hazardous materials release during that time period, in the June 25, 2001 Battle Mountain accident described above.

This table does not include the May 2003 incident in which a freight train hit an empty cyanide truck in a crossing at Beowawe, as that incident was not a part of the database used to build this table. While hazardous materials were not actually present in that incident (the truck was empty), it does point out the potential presence of hazardous materials on highway rail crossings in rural Nevada, where such materials are being hauled to and from gold mining operations. It is important to note that this crossing is located adjacent to the Humboldt River, and the potential for a significant environmental disaster with a cyanide spill into the river would have been great if the cyanide truck had not been empty. The picture on the following page shows this accident.

Figure III-j Freight Train/ Chemical Truck Collision near Beowawe

Injuries and Fatalities

In the 30-year period there was one fatality and four injuries. In a July 1983 accident in Palisade Canyon, a Carlin man was killed when the pickup truck in which he was a passenger, on the tracks but not at a crossing, was struck by a freight train. Three other occupants of the vehicle were injured. In a June 20, 1996 accident in Eureka County near Dunphy, a tractor-trailer truck was high-centered on a private crossing. The truck was struck by a freight train, and the driver, attempting to move the truck, was injured.

Historic (pre-1975) accidents

Accident reports for the period before 1975 are not available. In addition, according to the FRA (Finkelstein, pers. com.), such records would not be useful to predict potential future accident rates since railroad operations have changed significantly since that time. However, one of Nevada's best-known historic rail accidents took place in Eureka County. In August, 1939, a passenger train, "The City of San Francisco," derailed off a bridge in Palisade Canyon and five cars plunged into Humboldt River. One hundred and twenty-one people were injured and 24 killed. Sabotage was suspected but never proven.

Estimated Accident Rate

In 2003, approximately 27 trains per day passed over the UP tracks in the study area. This traffic level has stayed approximately the same since 2001. (*Trains*, July 2004). Assuming that the rate was also similar in 2000 and 2004, it is possible to roughly calculate the yearly accident rate in the study area for the current decade.

Table III – c: Railroad Accident Rate

27	trains per day	X	365	days	=	9855	trains per year

The following table shows accidents in the current decade and the calculated accident rate:

Year	Reported Accidents/ Incidents*
2000	2
2001	1
2002	1
2003	1
2004	2
Average	**1.4**
* Includes 2003 Beowawe crossing incident, which was not in FRA database, but was reported by other sources	

Recent accident/incident rates show that an **average 1.4 accidents per year, or about 1.4 accidents per 9,855 trains, can be expected in the study area at current accident rates and traffic levels.** As the detailed accident tables show, the accident is most likely to be small, causing around $35,000 damage, no casualties, and no hazardous releases. It is important to note, however, that all but one of the five major accidents in the study area took place well after track and equipment improvements were carried out as a result of deregulation. The causes of all but one of these accidents were track failure of some kind. Consequently, while the average cost of an accident is only around $35,000, the potential for major accidents involving derailments, hazardous releases and injuries still remains, as the accident records demonstrate.

Wildland Fires

Eureka County firefighting personnel report that railroad operations in Eureka County and adjacent areas of Elko County may start almost 5 wildland fires per year; many of these may be ignited by sparks caused by friction between the equipment and the rail. (Tom Turk, pers com[*]) The table in **Appendix D** shows details of the wildland fire incidents, including the location.

[*] While local fire professionals are of the opinion that these fires were started by trains, the railroad does not acknowledge this possibility; hence the use of the verb "may start", "may have been ignited" in this report.

C. WEATHER EFFECTS

Extreme Heat and Cold

A 1991 statistical study of the 1984-1988 rail accident data nationwide (Lee, 1991) found that adverse weather conditions accounted for only 11.4% of accidents, with most (64%) accidents taking place in clear weather conditions. The study performed a statistical analysis of the data to determine whether daily accident *rates* were affected by any of the environmental risk factors in the database, including weather, temperature and visibility, in order to predict accidents based on the presence of these factors. The conclusion was that "if the analysis is restricted to these variables, accident prediction would be completely random." In other words, these environmental factors appeared to have no effect on the accident rate.

The study did find a relationship between extreme hot and cold weather and the amount of *damage* in a rail accident: specifically, at temperatures 0-10 degrees and over 100 degrees Fahrenheit, the mean percentage of cars damaged or derailed in accidents was up to 6% higher than in more moderate temperatures. The author of this study cautions (Saricks, pers. com.) however, "against applying paradigms developed from 1980's rail accident data and statistics to current conditions. Overall, quality of track is today much improved over what the general case was twenty years ago, so the entire issue of derailments and their relationships to temperature extremes needs to be re-examined."

Regarding this identified relationship between temperature extremes and derailment damage, the study concludes, "...a higher than usual degree of caution may be warranted in consigning [hazardous waste] shipments if ambient temperatures *en route* are expected to be either extremely high or extremely low." Again, however, this conclusion may no longer hold in light of recent rail improvements.

Weather records from Rand Ranch, Palisade, Nevada, from the period 1956-1981, show January and December average minimum temperatures of 9.3 and 9.9 degrees Fahrenheit, and average maximum temperatures in July and August of 88.8 and 86.3 degrees Fahrenheit. If there still exists some correlation between extreme temperature conditions and derailment accident damage, such conditions exist in the study area only at the low temperature extreme in the months of December and January, and not at the higher extreme.

Nevada Public Utilities Commission (PUCN) rail inspectors are aware of the potential effects of extreme heat and cold, as well as extreme daily temperature fluctuations on the condition of track, and they schedule track inspections in areas of the State, and at times when such extremes are likely to occur. Likewise, Union Pacific schedules its own inspections during extreme temperature periods (Steele, pers com.)

Delays Due to Storms

Events in 2005 show that weather can cause delays in rail movement. Union Pacific Corporation's 2004 Annual Report states that the January west coast storm in the Los Angeles Basin, Nevada and Utah, "severely limited...operations in that region for several weeks."

Flooding

In Eureka County, the two Union Pacific tracks run through Palisade Canyon along the Humboldt River. The tracks cross the river in numerous places. In some places both tracks are on one side of the river, in others, the tracks are on both sides. The tracks are often very close to the river; sometimes between the river and a cliff. (See photograph above)

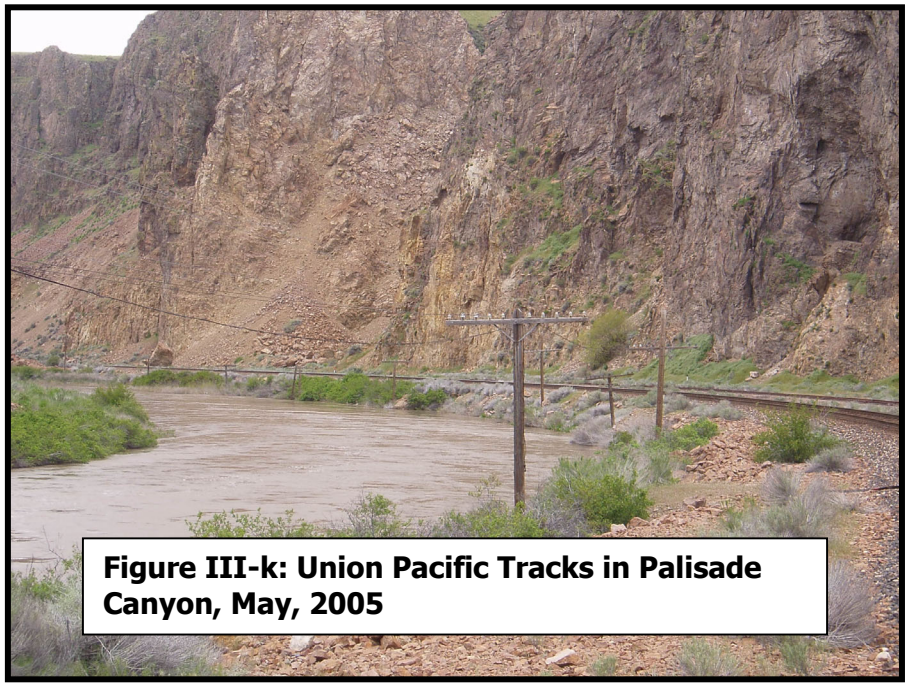
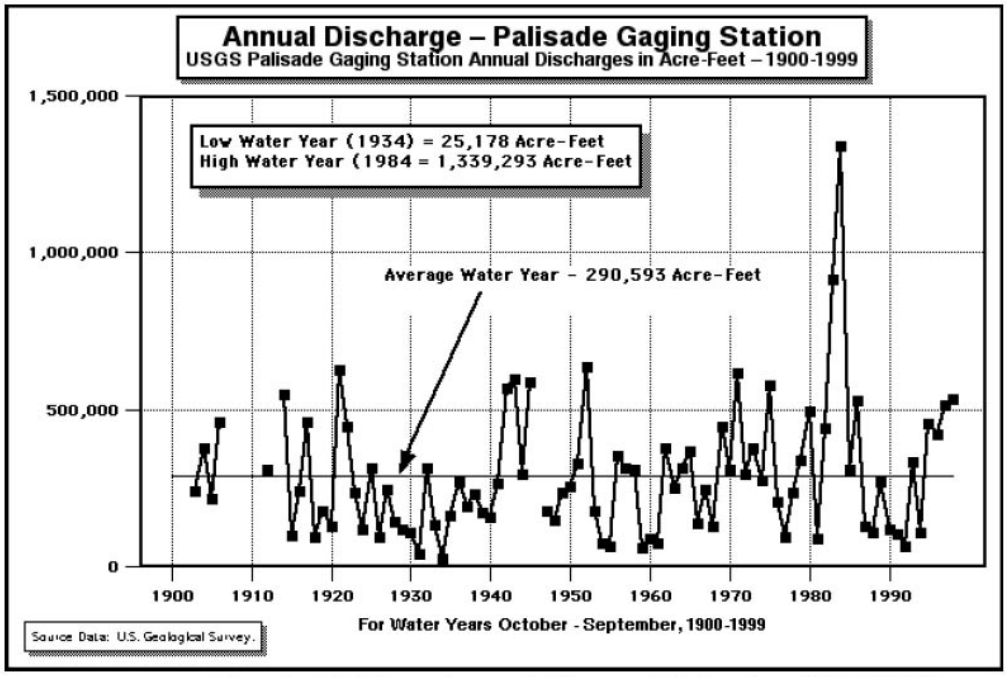


Figure III-k: Union Pacific Tracks in Palisade Canyon, May, 2005

The Humboldt River watershed covers 16,840 square miles of northeastern Nevada, including portions of Elko, Eureka, Lander, Humboldt, Pershing, White Pine, Nye, and Churchill Counties. From its headwaters in the Jarbidge, Independence and Ruby Mountains in Elko County, the river flows approximately 310 miles to its terminus in the Humboldt Sink in the desert of northwest Churchill County. The upper Humboldt drainage basin, defined by researchers as the drainage area upstream from a USGS stream gauge at Palisade, Nevada, covers approximately 5,040 square miles. The source of Humboldt River flow is typically in the form of snowpack runoff from upper elevation watersheds, primarily those in the Ruby Mountains, the Jarbidge Mountains and the Independence Mountains. During normal water years from Palisade downstream the flow in the Humboldt River gradually declines as few of the lower basin's principal tributary streams and drainage areas provide any surface water runoff to the river.

Figure III-l



Humboldt River Annual Flows at Palisade – 1900-1998

Figure III-k shows annual discharge, in acre feet, in the Humboldt River in most years in the 20th century. As the chart shows, annual discharge in the Humboldt River varies greatly, from a low water year of 25,178 acre feet in 1934, to a high water year of 1,339,293 acre feet in 1984. The river's flow varies greatly throughout the year as well, with 77% of the average year's discharge taking place in the four months of March, April, May, and June (Nevada Division of Water Resources, 2000).

During the 20th century, there were four floods in the upper Humboldt basin of greater than 50-year recurrence intervals*: a 100-year flood in February 1910; a 50-year flood in February 1962; a 50-year flood in April 1983; and a 100-year flood in May 1984. (Paulsen)

Flooding in the upper Humboldt River basin seems to be a result of two different hydrological/climatological conditions. In the first, warm winter storms bring rain to an existing snowpack, resulting in rapid thaw and runoff. The floods of 1910 and 1962 were this kind of flood. The second kind are snowmelt floods,

* A recurrence interval is the average interval in years between hydrological events equaling or exceeding a given magnitude. A 100-year flood, for example, would be expected to occur *on average* one time in a hundred years. (Dunne and Leopold)

resulting from spring melting of greater-than-average snowpack. The floods of 1983 and 1984 were spring snowmelt floods.

At least two of these flood events resulted in damage to the rail line and rail accidents. In the 1910 flood, both the intercontinental tracks in Palisade Canyon and the Eureka and Palisade Railroad from Palisade through Pine Valley were washed out. Contemporary photographs show water up to five feet deep inundating the town of Palisade, and a 30-mile-long lake filled Pine Valley. While the intercontinental railroads reopened soon after the flood, the Eureka and Palisade Railroad was closed for two years.

Figure III-m Water standing on railbed during May, 2005 flood event in Palisade Canyon

One of the most significant recent rail accidents in Eureka County took place in May 1984 (the $1.2 million Dunphy derailment described on page 14). This accident was caused by high flood waters weakening bridge abutments and softening adjacent trackbed.

Figure III-n: Union Pacific Track near Humboldt River, May, 2005

The June 9, 1980 derailment near Barth also possibly could have been a result of high water. June is one of the months of highest runoff in the Humboldt; the accident location was in Palisade Canyon, close to the river; 1980 was higher-than-average water year; and the accident was attributed to buckled or sunken tracks.

The photographs above were taken on May 18, 2005, during a high runoff period. Water can be seen in and around the track. These might be similar conditions to those that contributed to the 1984 derailment, although the May, 2005 flood was not as large as the one in 1984. During the May 18, 2005 high water event depicted in these photographs, the stream gauge height at the

USGS Palisade Humboldt River gauge was just under 8.5 feet; during the May 1984 event the stream gauge stood at 10.08 feet. Discharge in cubic feet per second (cfs) on May 18, 2005 was between 5000 and 6000 cfs , while on May 18, 1984, discharge was 7,870 cfs . Other pictures showing the flood event are in **Appendix E**.

During this 2005 flood event, Union Pacific apparently had to take special measures to protect tracks and equipment. Pictures in **Appendix E** show a section of Union Pacific track near Carlin where riprap and dirt has recently been placed to protect the track from the high water. Additionally, during this flood period, it was observed that all trains passing through Palisade Canyon were preceded by a pickup truck driving along the tracks, possibly to check for high water or water damage to the track. (Marshall, pers com).

While the May, 2005 event may not have been as large as the May, 1984 event, USGS data show that the Humboldt River was at or above flood stage for about 22 days in 2005, between about May 15 and June 5. These pictures, then, are a valuable record showing the condition of Union Pacific tracks during flood-stage flow in the Humboldt River in the Palisade Canyon area.

D. CURRENT AND HISTORICAL TRAIN FREQUENCY

Current (2003) Train Frequencies

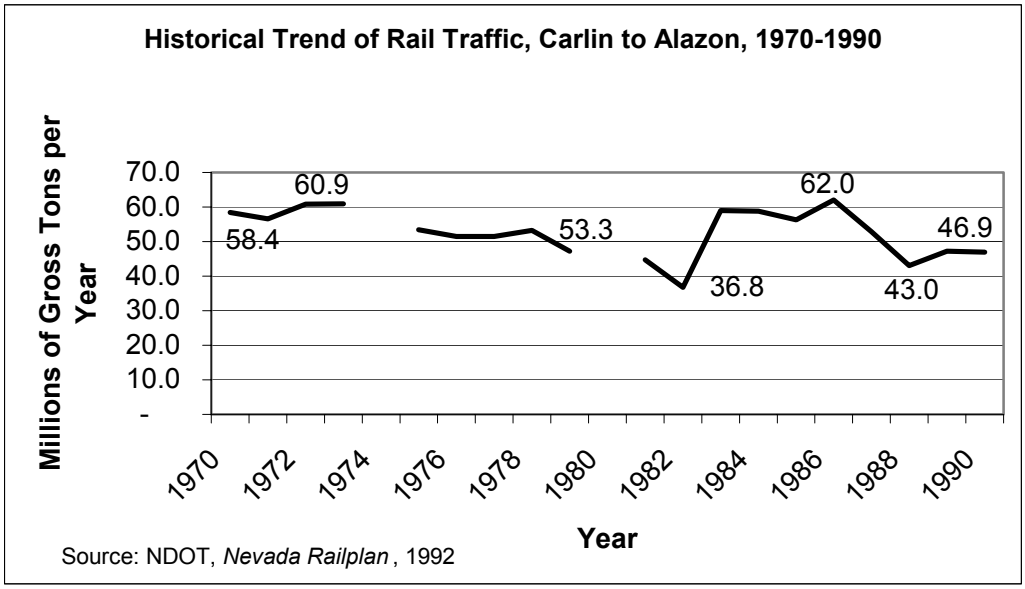
In 2003, Union Pacific dual tracks through the Eureka County study area carried 27 trains per day, with the average tonnage of each train between 5,000 and 6,999 tons. The train-per-day statistics do not differentiate between types of trains. For example, a light helper engine returning from helping a heavy coal train to the top of a grade counts the same as the coal train in these statistics, despite the huge difference between them in tonnage. In addition, two Amtrak passenger trains per day pass through the study area, a westbound California Zephyr train leaves Elko at 3:21 a.m. and arrives in Winnemucca at 6:13 a.m., and an eastbound California Zephyr leaves Winnemucca at 7:05 p.m., arriving in Elko at 9:40 p.m.

The density map in Union Pacific's 2004 Analyst Fact book shows the dual tracks through northern Nevada each receiving 49 million gross tons per mile or less. The number of trains per day has not changed significantly since 2000. (*Trains Magazine*, 2004)

Historical Train Frequencies

Information regarding historical trends in rail traffic along the northern Nevada route between 1970 and 1990 was obtained from the *Nevada Railplan* (NDOT, 1992) and reproduced in Figure III- n, below. As this graph shows, gross tons per year along the route were at a high of around 61 million tons per year in 1972-1974, dropped to a low of 36.8 million tons in 1982 (this is the year UP purchased WP) , rose to another high of 62 million tons in 1986, and fell again in the late 1980's.

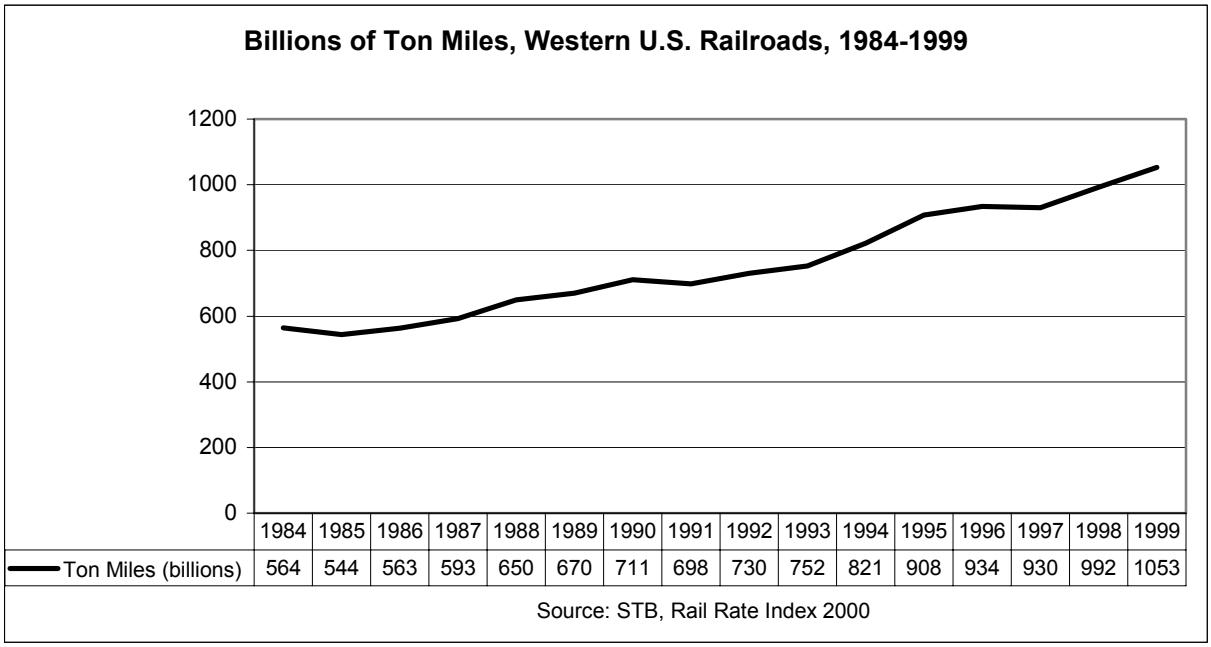
Figure III-o



NDOT did not produce rail plans showing historical railroad traffic in the 1990s to the early 2000's, and information on historic rail traffic in these years has proved difficult to obtain. Repeated calls and emails to Union Pacific contacts asking for information regarding historical train frequencies through the study area were not returned. Density maps on the Union Pacific Corporation website do show gross tonnage for the dual lines passing through the County in 2000-2004, but the data are aggregated in such a way that it is not possible to tell if there has been a change in ton miles on that portion of track during that time period: density maps for all four years show 49 million gross tons or less.

Data obtained from the Surface Transportation Board, shown in **Figure III-o**, below, show that overall rail ton-miles in the Western U.S. increased by 93% between 1984 and 1999. Ton-miles increased in all categories, but the biggest increase, and the largest category overall, was coal. This is probably due to the development of the Powder River Basin coal area in eastern Wyoming: the line from this area to routes accessing the East and Midwest is one of Union Pacific's busiest. This coal traffic, with the exception of trains bringing coal to the Valmy power plant, does not pass through the study area. Nonetheless, since all other categories of western rail ton-miles also increased, it is reasonable to assume that there was some increase in tonnage in the study area during the 1984-1999 time period.

Figure III-p



	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Ton Miles (billions)	564	544	563	593	650	670	711	698	730	752	821	908	934	930	992	1053

Source: STB, Rail Rate Index 2000

E. PHYSICAL FEATURES

Union Pacific operates dual trackage in Nevada where the UP's Overland (former Southern Pacific) and Central Corridor routes come together between Weso, east of Winnemucca, and Alazon, east of Elko (See **Figure III-b**) This section functions as a double track, with eastbound trains using one track and westbound the other. The lines are block signaled only for the direction of traffic, and reverse movements are rare. Although the lines are roughly parallel, the rights-of-way often diverge for several miles. The Central Corridor route is slightly shorter than the Overland Route through Nevada. (178.2 miles versus 183.0 miles). Crossovers to allow detour movements are located at points where the lines are in proximity.

East of Weso, the Overland and Central Corridor follow the Humboldt River Valley. The Central Corridor route is initially on the north side of the river. The alignment ascends slightly, but overall the profile is very gentle. Valmy (ME 572.2) is the site of Sierra Pacific Power's North Valmy generating station, which receives coal shipments from Utah via the railroad. Just east of Barth (Ml 630.5), the Humboldt River flows through the narrow Palisade Canyon. The two tracks are forced close together, and the two lines switch sides of the river. In the next 20 miles, the railroad passes through four short tunnels necessitated by the canyon walls. The curves in the canyon limit train speeds to 45 mph. The narrow canyon forces the Central Corridor line to fly over the Overland line (shown in **Figure III-q**, above) and the Central Corridor remains to the south of the Overland the rest of the way to Alazon.

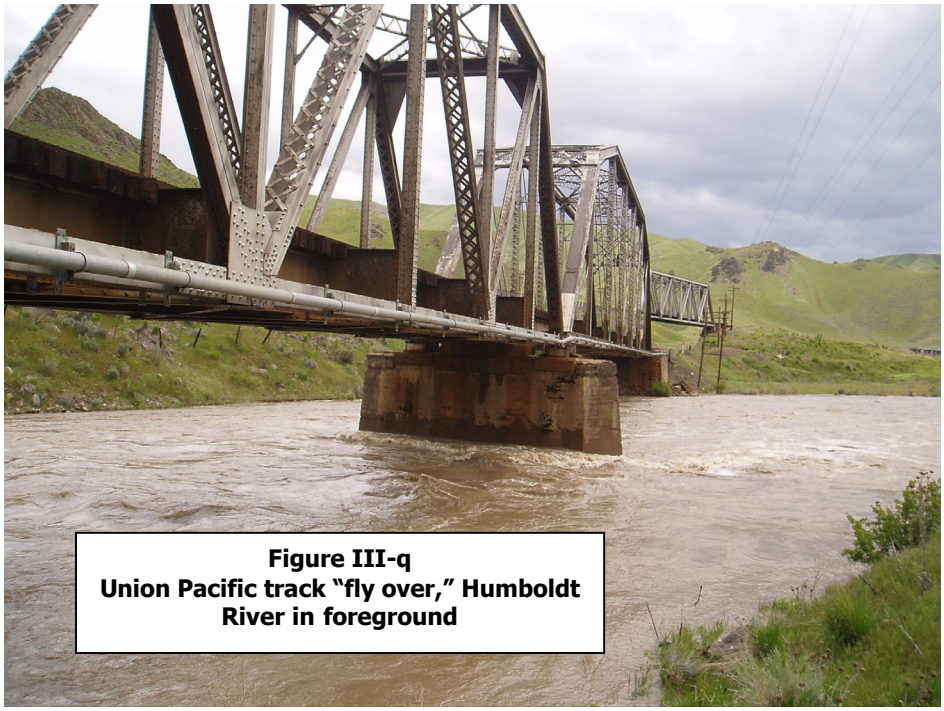


Figure III-q
Union Pacific track "fly over," Humboldt River in foreground

Between Weso and Alazon, control is by automatic block signals (ABS). Trains receive warrants from the dispatcher to occupy track within the dual line limits. Passing sidings are located along the double track, but at greater spacing

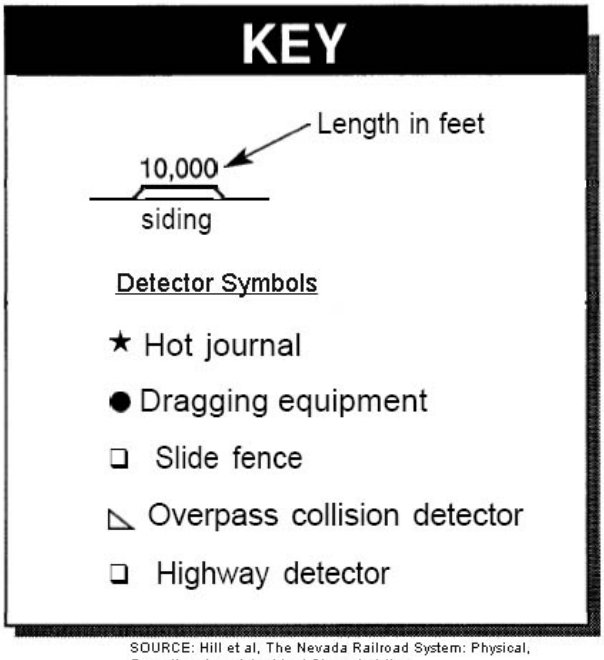
than on the single track because they are normally needed only for overtaking movements.

Two maps at the end of Section IIIE (**Exhibits 2a and 2b**) show the general alignment of the track in relation to the surrounding area, as well as mileposts and approximate accident locations. Three critical features are circled on the maps. Photographs of two these features (**Figures III- w and x**) follow the maps. The three features shown in the photographs are:

- The Dunphy interchange area where the dual railroad tracks, Interstate Highway 80 and the Humboldt River all come together (**Figure III – w**, on page 37).
- The "flyover" east of Barth where one track crosses the other (**Figure III – q,** on page 31).
- Railroad bridges at Palisade (**Figure III – x**, on page 37).

The track profile drawings reproduced on the following two pages show features of the two tracks in the study area There are four profile drawings. The first two show western and eastern portions of the Central Corridor tracks through the study area and the second two show western and eastern portions of the Overland tracks. Along the top of the profile drawings there are depictions of the tracks showing sidings, places where the tracks cross, and the location of detection equipment. The line in the middle of the drawing shows the grade of the track and tunnels. Mileposts and station place names* are shown along the bottom of the drawings. **Figure III-r** shows symbols used in the drawings.

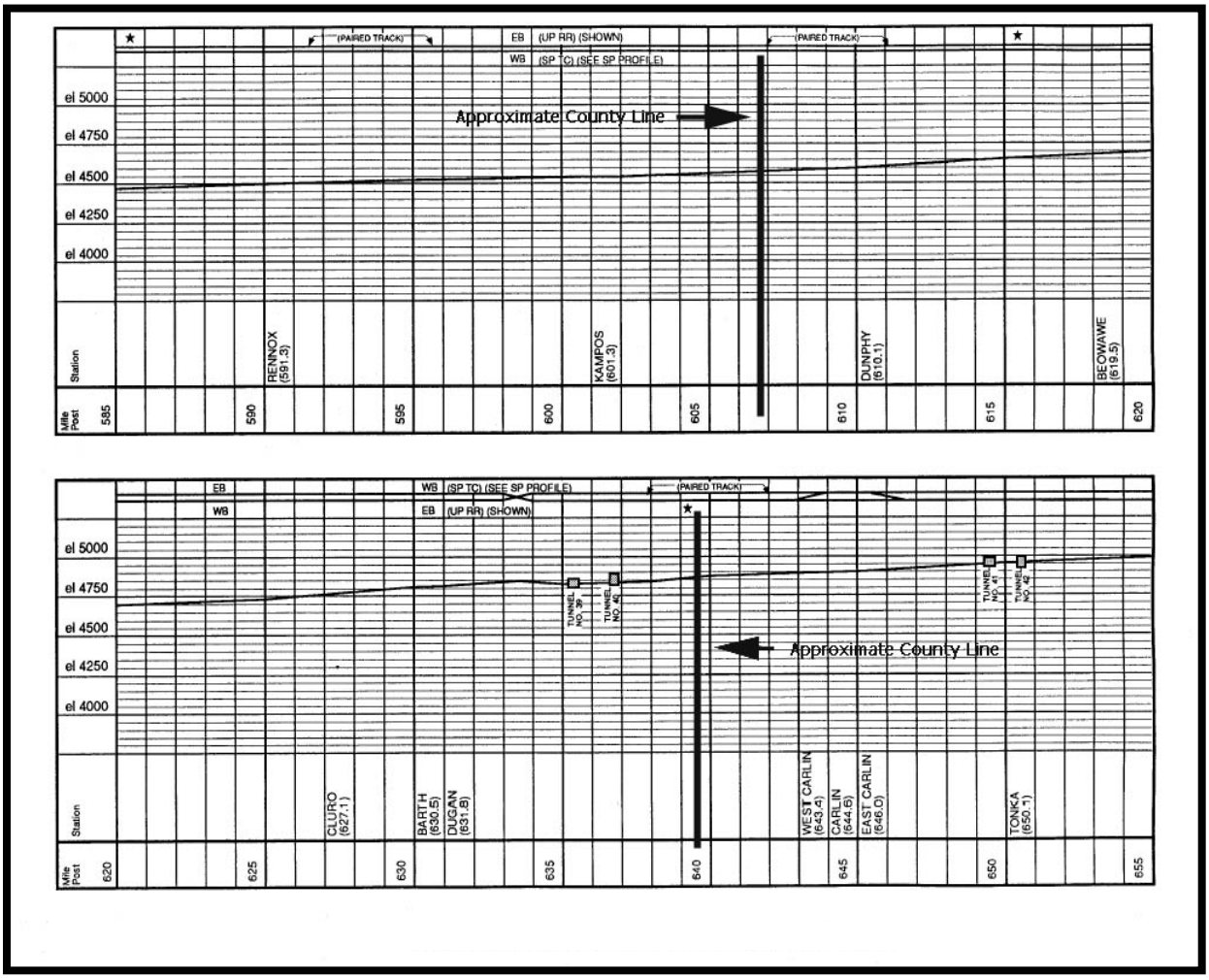
Figure III-r



SOURCE: Hill et al, The Nevada Railroad System: Physical, Operational, and Accident Characteristics

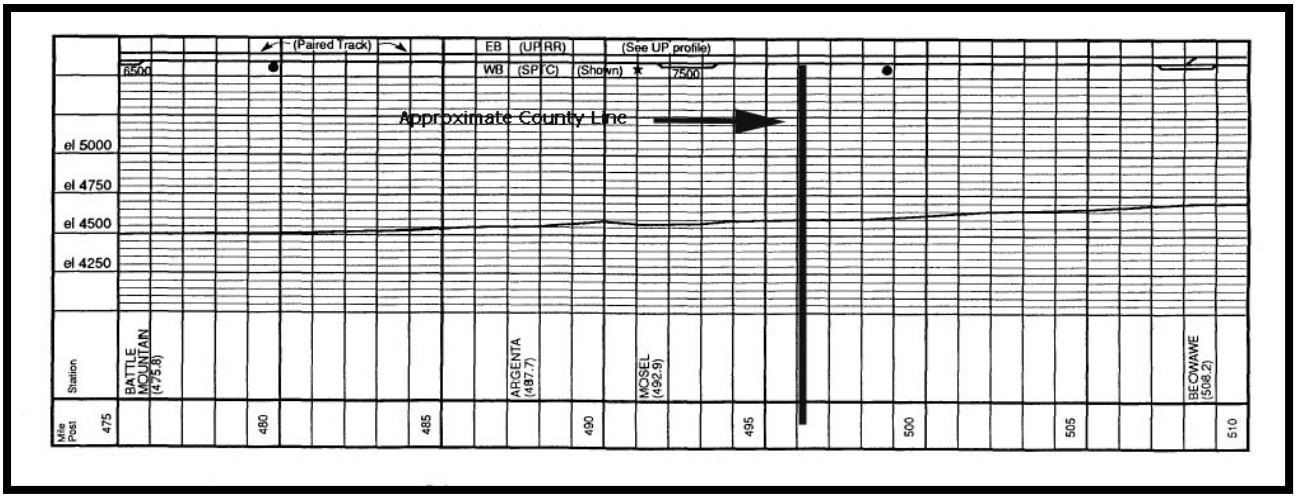
* A station is a named location on the railroad. It might be no more than a sign, with no buildings or structures present.

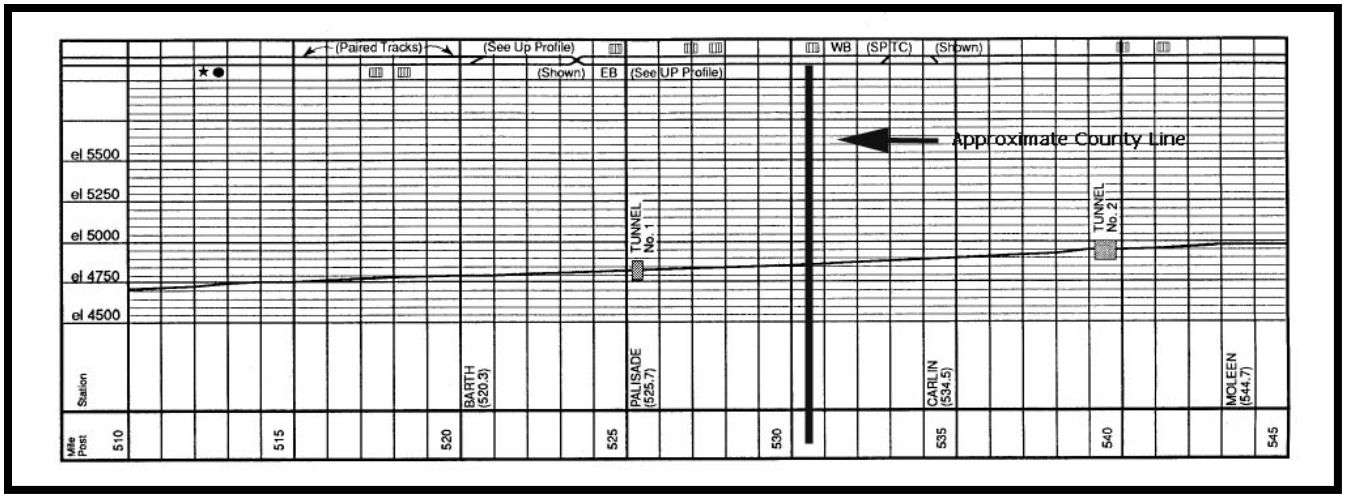
Figure III–s: Profiles of Union Pacific Central Corridor Route Through Eureka County



SOURCE, figures III- s and t: Hill, C.V., *The Nevada Railroad System: Physical, Operational, and Accident Characteristics*, September, 1991

Figure III–t: Profiles of Union Pacific Overland Route Through Eureka County





As the track profiles show, going from west to east, both tracks climb gently in elevation through the study area, with the elevation of the tracks ranging between 4,500 and 5,000 feet. There are two tunnels in Eureka County on the Central Corridor line and one on the Overland line. Two of the tunnels are shown in the photograph on the next page. The tracks cross between Barth and Palisade, at approximately Mile 524 on the Overland line, and approximately Mile 634 on the Central Corridor line. (**Figure III – q** shows this crossing).There are sidings at Mosel (in Lander County) and Beowawe. At Carlin (Elko County)

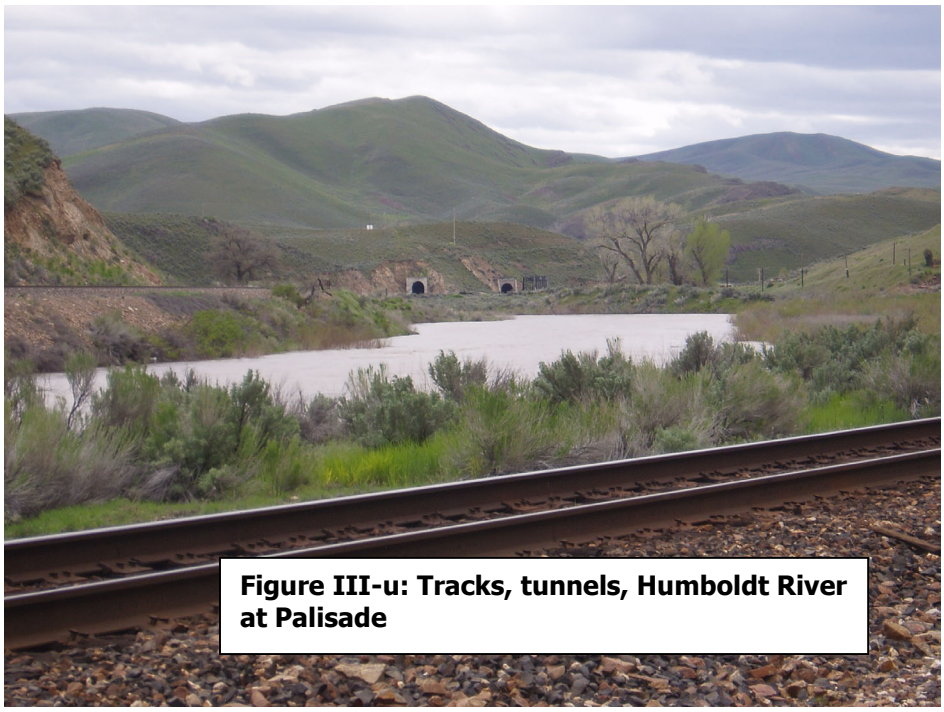


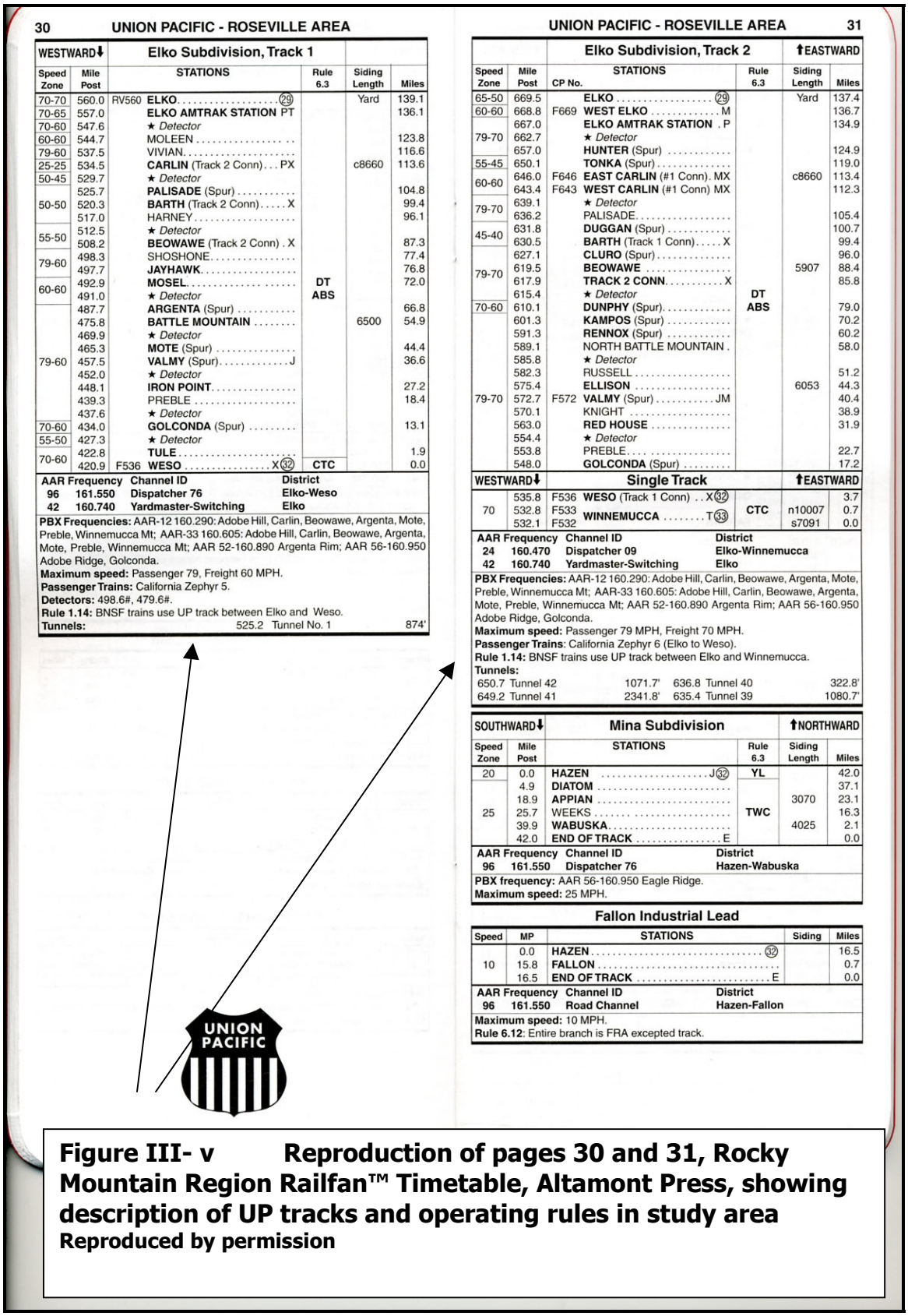
Figure III-u: Tracks, tunnels, Humboldt River at Palisade

there are switching tracks allowing passage from one track to the other. There are five hot journal detectors and three dragging equipment detectors within the study area.*

Figure III-v, on the next page, shows two pages reproduced from a Railfan Timetable™ of the Rocky Mountain region, describing the rail routes through the study area. On the left of each page are speed zones by milepost. Stations (place names) and automatic detectors are listed in the middle column. Stars signify talking detectors. "X" by a station name (at Carlin, Barth, Beowawe) means a crossover. "M" means manual interlocking. "P" means passenger stop (at Carlin).

The type of track operating rule is the next column to the right. As the timetable shows, the rule is "DT ABS," dual track automatic block signal, through the study area. Location of sidings and their length are in the next column to the right. Below each subdivision profile is a set of special instructions for that subdivision. These list the radio frequencies used by train crews to communicate with the dispatcher, yardmaster and control operator; PBX or mobile telephone frequencies used by crews; passenger trains using the line; detectors; maximum speed; rules applicable to operation on the subdivision; and tunnel location and length.

* A dragging equipment detector is a track device which detects the passage of train wheels that are not properly mated to the rails. A hot journal detector is a track device which measures the relative temperatures of passing journal bearings. Hot journal detectors transmit bearing temperatures to wayside stations, where the information is monitored by personnel who can act to stop a train if an overheated journal is discovered. Some detectors will automatically drop the next signal to a stop indication if an overheated condition is noted.



30 UNION PACIFIC - ROSEVILLE AREA

WESTWARD↓ — Elko Subdivision, Track 1

Speed Zone	Mile Post	STATIONS	Rule 6.3	Siding Length	Miles
70-70	560.0	RV560 **ELKO** (29)		Yard	139.1
70-65	557.0	**ELKO AMTRAK STATION** PT			136.1
70-60	547.6	★ *Detector*			
60-60	544.7	MOLEEN			123.8
79-60	537.5	VIVIAN			116.6
25-25	534.5	**CARLIN** (Track 2 Conn) PX		c8660	113.6
50-45	529.7	★ *Detector*			
	525.7	**PALISADE** (Spur)			104.8
50-50	520.3	**BARTH** (Track 2 Conn) X			99.4
	517.0	HARNEY			96.1
55-50	512.5	★ *Detector*			
	508.2	**BEOWAWE** (Track 2 Conn) X			87.3
79-60	498.3	SHOSHONE			77.4
	497.7	**JAYHAWK**			76.8
60-60	492.9	**MOSEL**	DT		72.0
	491.0	★ *Detector*	ABS		
	487.7	**ARGENTA** (Spur)			66.8
	475.8	**BATTLE MOUNTAIN**		6500	54.9
	469.9	★ *Detector*			
	465.3	**MOTE** (Spur)			44.4
79-60	457.5	**VALMY** (Spur) J			36.6
	452.0	★ *Detector*			
	448.1	**IRON POINT**			27.2
	439.3	PREBLE			18.4
	437.6	★ *Detector*			
70-60	434.0	**GOLCONDA** (Spur)			13.1
55-50	427.3	★ *Detector*			
70-60	422.8	**TULE**			1.9
	420.9	F536 **WESO** X (32)	CTC		0.0

AAR Frequency	Channel ID	District
96 161.550	Dispatcher 76	Elko-Weso
42 160.740	Yardmaster-Switching	Elko

PBX Frequencies: AAR-12 160.290: Adobe Hill, Carlin, Beowawe, Argenta, Mote, Preble, Winnemucca Mt; AAR-33 160.605: Adobe Hill, Carlin, Beowawe, Argenta, Mote, Preble, Winnemucca Mt; AAR 52-160.890 Argenta Rim; AAR 56-160.950 Adobe Ridge, Golconda.
Maximum speed: Passenger 79, Freight 60 MPH.
Passenger Trains: California Zephyr 5.
Detectors: 498.6#, 479.6#.
Rule 1.14: BNSF trains use UP track between Elko and Weso.
Tunnels: 525.2 Tunnel No. 1 874'

UNION PACIFIC - ROSEVILLE AREA 31

Elko Subdivision, Track 2 — ↑EASTWARD

Speed Zone	Mile Post	CP No.	STATIONS	Rule 6.3	Siding Length	Miles
65-50	669.5		**ELKO** (29)		Yard	137.4
60-60	668.8	F669	**WEST ELKO** M			136.7
	667.0		**ELKO AMTRAK STATION** P			134.9
79-70	662.7		★ *Detector*			
	657.0		**HUNTER** (Spur)			124.9
55-45	650.1		**TONKA** (Spur)			119.0
60-60	646.0	F646	**EAST CARLIN** (#1 Conn) MX		c8660	113.4
	643.4	F643	**WEST CARLIN** (#1 Conn) MX			112.3
79-70	639.1		★ *Detector*			
	636.2		PALISADE			105.4
45-40	631.8		**DUGGAN** (Spur)			100.7
	630.5		**BARTH** (Track 1 Conn) X			99.4
	627.1		**CLURO** (Spur)			96.0
79-70	619.5		**BEOWAWE**		5907	88.4
	617.9		**TRACK 2 CONN** X			85.8
	615.4		★ *Detector*	DT		
70-60	610.1		**DUNPHY** (Spur)	ABS		79.0
	601.3		**KAMPOS** (Spur)			70.2
	591.3		**RENNOX** (Spur)			60.2
	589.1		NORTH BATTLE MOUNTAIN			58.0
	585.8		★ *Detector*			
	582.3		RUSSELL			51.2
	575.4		**ELLISON**		6053	44.3
79-70	572.7	F572	**VALMY** (Spur) JM			40.4
	570.1		KNIGHT			38.9
	563.0		**RED HOUSE**			31.9
	554.4		★ *Detector*			
	553.8		PREBLE			22.7
	548.0		**GOLCONDA** (Spur)			17.2

WESTWARD↓ — Single Track — ↑EASTWARD

70	535.8	F536	**WESO** (Track 1 Conn) X (32)	CTC		3.7
	532.8	F533	**WINNEMUCCA** T (33)		n10007	0.7
	532.1	F532			s7091	0.0

AAR Frequency	Channel ID	District
24 160.470	Dispatcher 09	Elko-Winnemucca
42 160.740	Yardmaster-Switching	Elko

PBX Frequencies: AAR-12 160.290: Adobe Hill, Carlin, Beowawe, Argenta, Mote, Preble, Winnemucca Mt; AAR-33 160.605: Adobe Hill, Carlin, Beowawe, Argenta, Mote, Preble, Winnemucca Mt; AAR 52-160.890 Argenta Rim; AAR 56-160.950 Adobe Ridge, Golconda.
Maximum speed: Passenger 79 MPH, Freight 70 MPH.
Passenger Trains: California Zephyr 6 (Elko to Weso).
Rule 1.14: BNSF trains use UP track between Elko and Winnemucca.
Tunnels:

650.7	Tunnel 42	1071.7'	636.8	Tunnel 40	322.8'
649.2	Tunnel 41	2341.8'	635.4	Tunnel 39	1080.7'

SOUTHWARD↓ — Mina Subdivision — ↑NORTHWARD

Speed Zone	Mile Post	STATIONS	Rule 6.3	Siding Length	Miles
20	0.0	**HAZEN** J (32)	YL		42.0
	4.9	**DIATOM**			37.1
	18.9	**APPIAN**		3070	23.1
25	25.7	WEEKS	TWC		16.3
	39.9	**WABUSKA**		4025	2.1
	42.0	**END OF TRACK** E			0.0

AAR Frequency	Channel ID	District
96 161.550	Dispatcher 76	Hazen-Wabuska

PBX frequency: AAR 56-160.950 Eagle Ridge.
Maximum speed: 25 MPH.

Fallon Industrial Lead

Speed	MP	STATIONS	Siding	Miles
10	0.0	**HAZEN** (32)		16.5
	15.8	**FALLON**		0.7
	16.5	**END OF TRACK** E		0.0

AAR Frequency	Channel ID	District
96 161.550	Road Channel	Hazen-Fallon

Maximum speed: 10 MPH.
Rule 6.12: Entire branch is FRA excepted track.

Figure III- v Reproduction of pages 30 and 31, Rocky Mountain Region Railfan™ Timetable, Altamont Press, showing description of UP tracks and operating rules in study area
Reproduced by permission

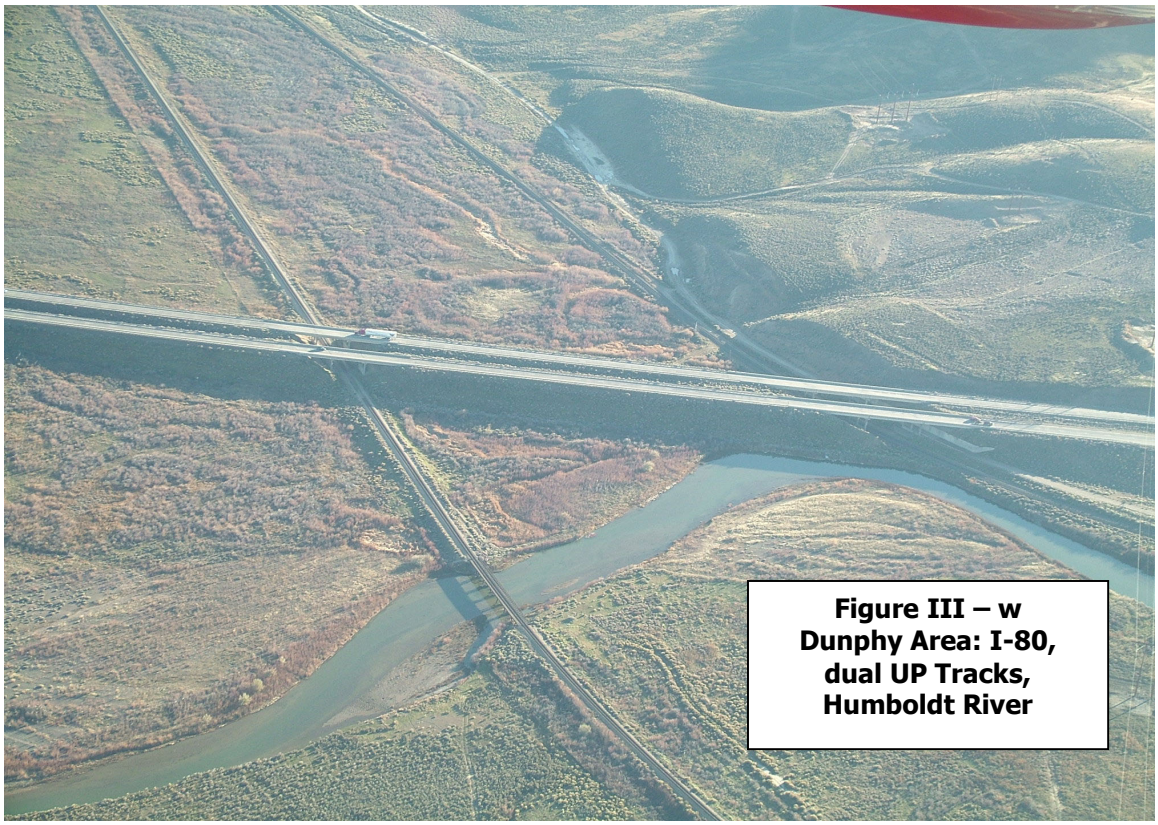


Figure III – w
Dunphy Area: I-80, dual UP Tracks, Humboldt River

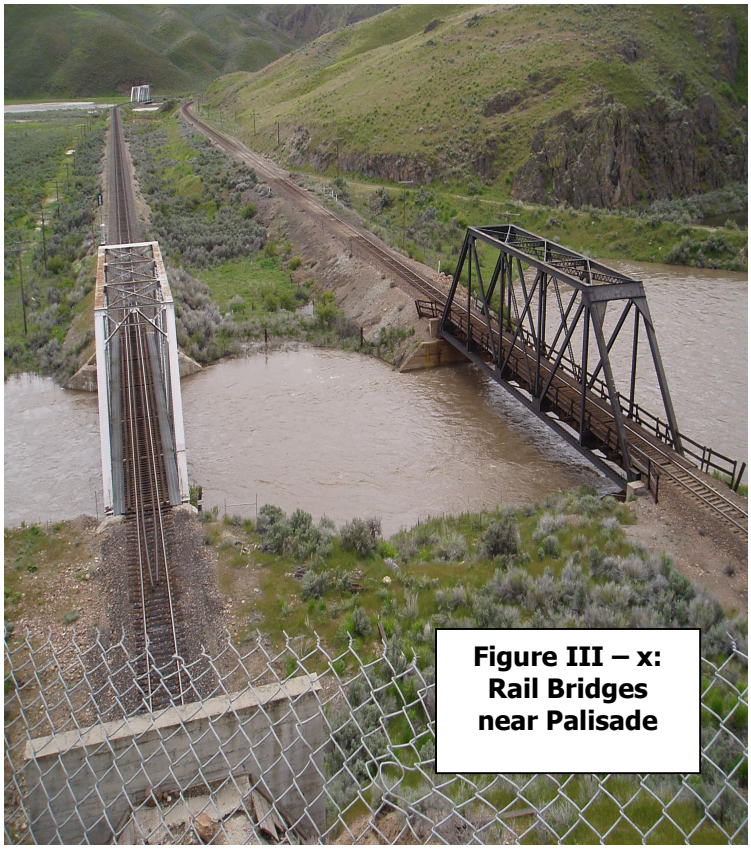


Figure III – x:
Rail Bridges near Palisade

F. OPERATIONS AND REGULATORY STRUCTURE

The purpose of the first part of this section is to describe how the railroad system works. The capacity of the rail line, rail operations, safety, inspection, handling of hazardous material, security and emergency response procedures are described. In July, 2005, the DOE issued a policy statement stating that dedicated trains will be used for the shipment of waste to Yucca Mountain, so this section also includes a description of dedicated trains.

The second part of this section describes the regulatory structure: which agencies are responsible for various regulatory or oversight activities, and what they do to carry out these responsibilities.

Operations – Union Pacific Railroad

Capacity of the Rail Line

The graphic on the following page, reproduced from the Union Pacific website, shows the allowable gross weight on the UPRR lines through Nevada. As the graphic shows, both lines are capable of accommodating the heaviest trains.

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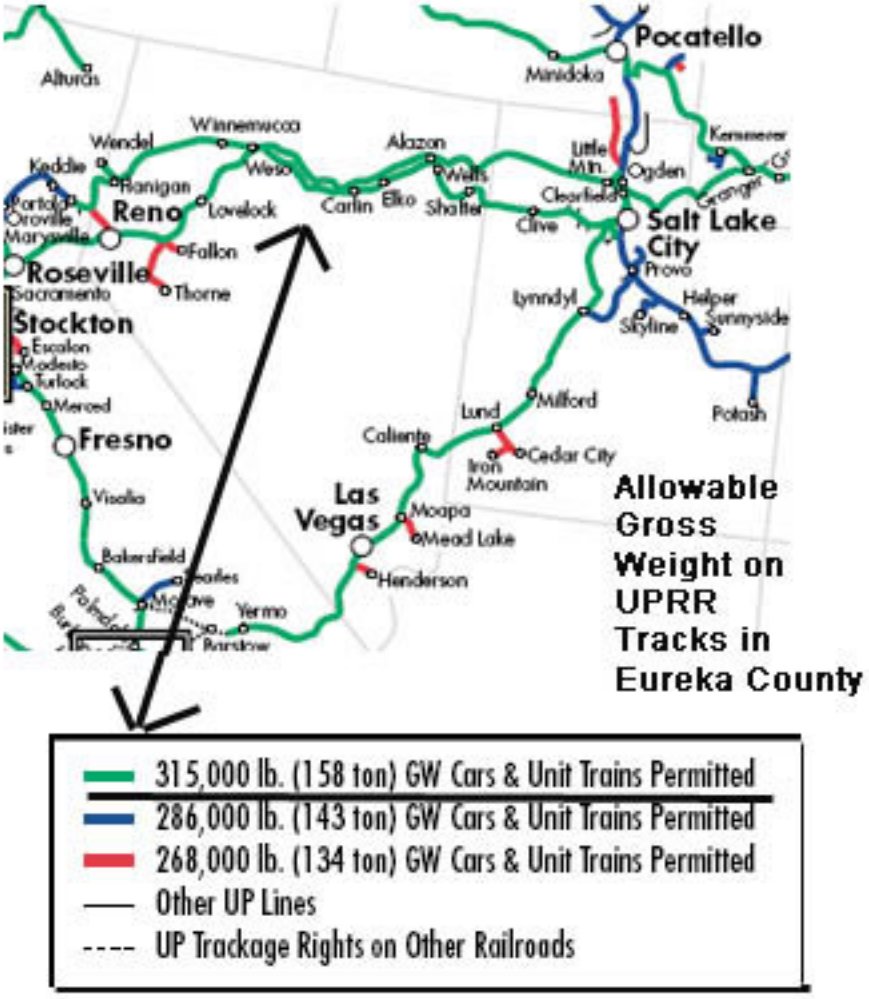

SOURCE: Union Pacific Corporation, *2003 Analyst Fact Book*

Figure III – y: Allowable Gross Weight on Union Pacific Tracks in Eureka County

Train speeds are affected by alignment, consist*, and signal systems, but many miles of the Union Pacific lines in Nevada allow freight train speeds of 70 mph and passenger train speeds of 79 mph. According to previous reports, (Hill, 1991) "The line probably has the capacity to handle 50 or more trains per day," almost double the estimated current (2003) volume of 27.

* Consist is a railroad term for any configuration of one or more connected rail cars and/or locomotives, either in motion or not, on rail tracks. A consist may or may not include a locomotive.

Union Pacific has recently made changes to its computer system that allow it to more closely identify the heaviest shipments. All cars are reviewed along routes in order to determine whether gross weight limitations for that route are exceeded. If a car exceeds the gross weight limit for its requested route, it is placed on hold at the place of origin, and the shipper can either reduce the weight or change the route to one that will accommodate the weight. According to the railroad, this new system "helps address safety issues and to prevent damage, or potentially catastrophic failure, to track or a bridge structure." (Union Pacific Corporation, *2004 Annual Report*)

Operations

Trains through Nevada (and throughout the nation) are operated according to regularly published timetables, supplemented by special orders or instructions. Any train needs to have some sort of permission to occupy a main track*. The required permission depends on the type of operation in effect for that main track; the type of operation for each section of track is listed in the timetable. The timetable also lists milepost-to-milepost speed limits and other information. Special orders or instructions supplement the timetable. These might include, for example, a requirement for a lower speed limit in a certain area - a "slow order" – due to track defects spotted during a track inspection. The main categories of railroad operation are:

- *Centralized Traffic Control (CTC)*
- An occupancy permission system, either
  - *Track Warrant Control (TWC)*
  - *Direct Traffic Control (DTC)*
  - *Occupancy Control System (OCS)*
- *Automatic Block Signaling (ABS)*, often in conjunction with an occupancy permission system
- *Restricted Limits (RL)*

On the dual Union Pacific tracks through the study area, train movement is controlled by an Automatic Block Signal (ABS) system, with warrants from a dispatcher. In an ABS system the railroad is divided into sections known as *blocks*. Two trains are not allowed to be in the same block at the same time. A train cannot enter a block until it is permitted, generally by a signal that the block ahead is empty. The lines through the study area are block signaled only for the direction of traffic, and reverse movements are rare. Train crews are in radio contact with a Union Pacific dispatcher in Omaha, Nebraska.

* A *Main Track* is a track that must not be occupied without a permission to do so. Other tracks are *Secondary Track*s. A Track used for meeting or passing trains is called a *Siding*. Sidings can be Main or Secondary tracks. (Lundsten)

In addition to the timetables and special instructions, railroads also operate according to a General Code of Operating Rules (GCOR). Federal regulations (49 CFR 218) contain detailed operating practices which railroads are required to follow, but each railroad can also prescribe additional practices in its operating rules, timetables, or special instructions. Railroads are required to carry out regular programs to instruct employees in the railroad's operating rules. Timetables, special instructions, codes of operating instructions, and any amendments to them must be filed with the FRA.

Train Crews

Union Pacific maintains crew change points and related facilities at Sparks, Elko, Winnemucca and Las Vegas. North Reno is the site of a switchyard and intermodal facility.

Freight trains traveling through the Eureka study area have two-person crews, an engineer and a conductor.The engineer is responsible for operating the train in compliance with operating procedures, signals, timetables, and special orders. The conductor is responsible for tracking the cars on the train. Cars taken onto and taken off of the train are entered into a computer, which relays the information to dispatchers in Omaha, Nebraska. The conductor also is responsible for inspection of the train in response to indications of potentially hazardous situations from trackside detectors(see below). In addition to the two-person crews, freight trains have electronic boxes at the rear of each train.These boxes receive electronic signals from trackside detectors and relay the signals to the train crew. These boxes have replaced the former cabooses, and carry out the functions formerly carried out by human caboose crews.

Train crews travel between Sparks and Elko, or Elko and Sparks. Once at either crew change point, the train is handed off to other crews whose home terminals are to the west or east. Crews are required to rest for at least eight hours before taking charge of another train. Depending upon the direction and flow of traffic, a crew member will either work a train or "deadhead*" back to his home terminal.

The railroad also stations other employees along the routes. These employees, called maintenance and way inspectors, are responsible for inspecting and maintaining sections of the rail route. (Garro, pers. com.)

Crew Training

The general qualifications which must be met before a man or woman becomes eligible for the position of locomotive engineer are:

- At least 21 years of age.
- Minimum education of high school or equivalent.

* A railroad employee traveling as a passenger

- Good physical condition with excellent hearing and eyesight.
- Completion of locomotive engineer training.

Other qualifications to enter into the service of a railroad company for the purpose of becoming a locomotive engineer may apply and often vary between railroads. A new employee usually enters train operating service as a brakeman or conductor, positions in which he or she works and trains for the locomotive engineer's position. On-the-job training and classroom instruction is offered by various railroads; sometimes it is contracted out to education and training companies. If the railroad's training and examinations are passed, the trainee is then a qualified locomotive engineer awaiting promotion.

Also, effective January 1,1992, the Federal Railroad Administration issued extensive certification and licensing requirements for locomotive engineers. Engineers in the U.S. must be certified pursuant to the provisions of Part 240 of Title 49 of the Code of Federal Regulations (49CFR Part 240). Under 49CFR Part 240 each railroad must have in place an FRA-approved certification program. An individual railroad's certification program must meet minimum federal safety requirements for the eligibility, training, testing, certification and monitoring of its locomotive engineers. (BLET, website)

Track and Equipment Operating Tests and Inspection

Union Pacific is required (49 CFR 217.9) to prepare a written program of operating tests and inspections. The railroad must carry out the operational tests and inspections to determine the extent of its compliance with operating rules, timetables, and special instructions. Results of the tests and inspections then must be made available to the FRA. Annual reports on tests and inspections are also required.

Train Defect Detectors

Train defect detectors are installed along the Union Pacific main lines in Nevada. These detectors include *hot journal* [*] and *dragging equipment* detectors. Hot journal and dragging equipment detectors transmit a radio announcement to the train crew that the detector is being passed. Once passed, the detector transmits another announcement to the train crew with the observations. If a hot journal is detected, the train is required to stop, and the conductor inspects both sides of the train five cars forward and five cars back of the reported hot journal. The train is then authorized by GCOR to proceed at 5 mph to the next detector. if the hot journal is not detected there, the train can proceed at regular speed. (Steele, pers. com.)

[*] A *journal bearing* is a combination of rollers and braces or a block of metal, usually brass or bronze, in contact with the end of the axle and on which the load rests. A *journal* is the part of an axle or shaft on which the journal bearing rests.

Hazardous Materials

The standards and procedures followed by railroads in transporting hazardous materials are laid out in federal regulations (see below) and in the railroad's operating rules. The Association of American Railroads (AAR), an industry trade group representing the freight railroads of North America, publishes and updates a circular (Circular Number 0T-55-G) that lays out recommended railroad operating practices for the transport of hazardous material; railroads can use these procedures as the basis for their hazardous materials operations. The circular presents a system of operating practices that includes the designation of key trains and key routes for hazardous waste transport; a system for community response and notification; procedures for handling time-sensitive hazardous materials; and criteria for shipper notification.

The latest version of this circular is included in this report as **Appendix F**. The circular contains a recommended form to be used by railroads in response to community requests for information about the flow of hazardous materials through the community. These requests for information must be made by a Local Emergency Planning Committee (LEPC).*

According to the Union Pacific website, "Union Pacific Railroad has developed and implemented a security plan in compliance with the Department of Transportation Final Rule 49 CFR Part 172 Hazardous Materials (HM 232): Security Requirements for Offerors and Transporters of Hazardous Materials".

Emergency Response

All railroad employees are required (49 CFR 220.13) to "immediately report by the quickest means available derailments, collisions, storms, washouts, fires, obstructions to tracks, and other hazardous conditions which could result in death or injury, damage to property or serious disruption of railroad operations."

Railroad timetables contain procedures for reporting emergencies. Union Pacific also has an overall Emergency Response Plan. In the study area, emergencies would be reported by the train crew via radio to Union Pacific dispatch in Omaha, Nebraska. The dispatcher then calls the nearest emergency response unit. The closest Union Pacific emergency response units to the study area are in Roseville, California, and Salt Lake City, Utah. Response units coordinate with the Nevada State Division of Emergency Management. (Steele, pers com)

* An LEPC is a committee appointed by the State Emergency Response Commission, which develops comprehensive emergency plans for Local Emergency Planning Districts. Every county in Nevada, including Eureka County, has an LEPC.

Security

With a system that transports critical cargo over thousands of miles of track through all kinds of terrain, security has always been a concern of American railroads. It has taken on added significance since the September, 2001 terrorist attack, when the vulnerability of many of America's transportation systems became clear. Immediately post 9-11, railroads were in a heightened state of alert, increasing track patrols, hiring additional security personnel, and stationing people at key points of vulnerability. In the longer term, the American Association of Railroads and the FRA have instituted various programs to identify and address security risks. The railroads themselves, however, retain most of the responsibility for security (unlike the aviation industry, where the federal government is now providing a corps of security personnel).

The following quote from Louis J. Wagner, General Director of Chemical Transportation Safety for Union Pacific, taken from a February 2003 article in the *Journal of Homeland Security* (Dunham, 2003), describes Union Pacific's augmented security program:

> "The railroad has engaged a security and intelligence specialist to provide expertise, compared employee records to FBI lists, continued background checks on new employees, and conducted security awareness briefings.
>
> Besides increased security presence and inspections, the Union Pacific has rerouted certain hazmat where appropriate, limited certain hazmat near public events, and increased tracking and awareness of certain hazmat and munitions. The railroad also holds weekly teleconferences of railroad hazmat staff. The railroad also coordinates with the food and chemical industries, works with shippers on supply chain logistics, periodically checks new procedures, and holds daily railroad police teleconferences. Furthermore, railroad personnel have talked to the National Guard for possible support, have increased coordination with military traffic managers, have coordinated security clearances, and have worked with the Department of Defense to procure secure phones.
>
> In other moves to protect its communications and computers, Union Pacific has removed sensitive information from websites; instituted password protection for access to hazmat, military, and spent nuclear fuel shipment tracking and emergency response information; required that passwords be routinely changed; changed all user ID's; and deleted inactive user ID's. The railroad has also implemented encryption technology for selected data communications and has increased physical security and restricted access to communication, computer and dispatching centers."

Waste Shipment on Dedicated Trains

On July 18, 2005, the DOE announced a decision to use *dedicated trains* to transport SNF and HLW to the proposed Yucca Mountain nuclear waste repository. In the policy statement (attached as **Appendix G),** DOE cites safety, security, cost, and operational advantages to waste shipments via dedicated trains. Following is a discussion of dedicated trains: how the trains are different from regular service; what a dedicated train carrying nuclear waste would consist of, and the safety, security, and operational differences between dedicated trains and regular service.

General commerce and dedicated trains are two types of rail service available. General commerce trains, also referred to as regular trains, comprise the majority of rail traffic today and travel set routes on one carrier's tracks at a regular schedule (WIEB 1995). General commerce trains represent the majority of rail traffic. Regular trains carry all kinds of goods, including hazardous materials. They stop at rail yards and sidings along the way to add or remove cars. The schedule for a shipment made by regular train is dependent on the carrier's timetable, which may result in shipments being delayed en route waiting for the next train traveling in its direction.

A dedicated train is a train that carries only one commodity from origin to destination, stopping to refuel, to change crews, and, if more than one carrier is required, to change locomotives. Dedicated trains are usually considered to be a subset of regular train service that is characterized by homogeneity of the cargo (WIEB 1995, DOT 1998). Because all the cars in a dedicated train are traveling to the same destination, dedicated trains usually bypass classification yards. Layover times en route are usually minimal which may result in much shorter travel times for the goods being shipped by dedicated train. The typical consist, or makeup, of a dedicated train for spent nuclear fuel includes the locomotives, a 100 ton buffer car, cask cars, another 100 ton buffer car, and a security car for the escort personnel. (Moore, pers. com.)

The DOE decision cites advantages of dedicated train shipments including

- Increased safety due to decreased transit time
- Avoidance of lengthy "dwell time" in rail yards
- Better command and control capabilities, since the shorter dedicated trains allow more effective visual monitoring of cars by train crews
- Significant cost savings due to reduced fleet size
- Increased operational flexibility and capability due to decreased transit times.

In April 25, 2002 testimony before the House Subcommittee on Highway, Transit, and Railroads, Edward Hamberger, president and CEO of the American Association of Railroads, cited other safety advantages of dedicated shipments. Hamberger describes several safety features that could be used on dedicated trains. These include electronically controlled pneumatic brakes that reduce the risk of a derailment, and premium car suspensions to reduce lateral and vertical

forces that could potentially result in derailment. Hamberger says that mixing the heavier waste cask cars in a general train can cause significant in-train forces as the trains brake, accelerate, and operate on curved or undulating terrain. These forces could potentially result in derailment. Such forces would not be generated as much in dedicated trains because the trains are shorter, and also the heavy cask cars are not mixed with lighter general freight cars. Hamberger says that decreased switching time is another safety advantage of using the dedicated trains, as "switching increases the handling of cars and the more a car has to be handled, the greater the risk of an accident."

While both DOE and the railroad industry are on record as preferring waste shipments on dedicated trains, both organizations continue to state that rail shipping of hazardous waste, either by general or dedicated trains, is safe. Additionally, DOE appears to "leave the door open" for waste shipments in general trains in the July 2005 policy statement: "DOE shipments have been and *will continue to be* [italics added] made securely using both DTS and general freight service."

In a letter to DOE in response to the July, 2005 policy statement (attached as **Appendix H**), Nevada Senators John Ensign and Harry Reid ask the DOE to "explain how the use of general freight service is compatible with the decision to use dedicated trains. Also, please explain the circumstances under which DOE would use general freight service instead of dedicated train service."

The senators also ask for clarification of a number of other issues involving the proposed waste transport in dedicated trains, and conclude, "The policy statement is riddled with gaps and inconsistencies and provides no sound justification or support for its conclusions."

Regulatory Structure

In the following sections, the regulatory structure is described for different activities or functions of the railroad. While several federal agencies and a Nevada State agency have responsibility for carrying out regulatory activities, the Federal Railroad Administration (FRA), an agency of the U.S. Department of Transportation, is the agency chiefly responsible for regulating railroad operations and safety.

To supplement the information presented below, **Appendix I**, *Rail and Highway Regulations Relative to the Transportation of Radioactive Materials and Their Applicability to States, Tribes, Shippers, and Carriers*, prepared by DOE's "Transportation External Coordination Working Group, Rail Topic Group," offers a detailed matrix showing which federal regulations pertain to specified aspects of the shipment of radioactive materials. The matrix is comprehensive, covering not only the shipment of hazardous materials, but also more routine operations such as general safety inspection and enforcement, training, operations and emergency response. Prepared in 1998, it is somewhat out of date, but with the citation of relevant sections of the Code of Federal Regulations, it still serves as a useful reference.

General Railroad Operations

As described in the above sections, the FRA is the agency chiefly responsible for regulating and overseeing the operations of railroads. Authority for this regulatory activity is contained in 49 CFR 200-299. As described above, a code of general operating rules for railroads is contained in federal regulations (49 CFR 218). Each railroad's operating rules, current timetables and special instructions must be filed with the FRA.

Safety and Safety Inspections

The FRA is responsible for administering the National Railroad Safety Program. The purpose of the National Railroad Safety Program is to promote safety in all areas of railroad operations The program is carried out in part through the issuance of mandatory federal safety requirements and through inspection efforts designed to monitor compliance with those requirements. FRA and state inspections determine the extent to which the railroads, shippers, and manufacturers have fulfilled their obligations with respect to inspection, maintenance, training and supervision. The FRA and participating states do not conduct inspections *for* the railroads, but they do carry out routine inspections, accident investigations, formal and informal educational efforts, complaint investigations, safety assessments, special inquiries, regulatory development, research and similar initiatives. (49 CFR 212.101-212.103)

States participate in railroad safety inspections through agreements with the FRA. Nevada has such an agreement. The Nevada Rail Safety Program is administered by the Safety And Quality Assurance Division of the Nevada Public Utilities Commission. Under the agreement, the FRA trains, certifies and oversees the activities of state safety inspectors. All standards for the program, and for the equipment, operations and materials being inspected, are laid out in 49 CFR 170-185 (hazardous materials) and 49 CFR 200-299 (equipment, track, operating practices).

The State of Nevada has four inspectors for the entire state, three located in Las Vegas and one in Carson City. There is one inspector for each of the four programs covered: motive power and equipment, track, operating practices and hazardous materials. Nevada does not have a signal inspector. The Nevada inspectors submit all inspection reports to the FRA. The FRA also gets violation reports, and if there is a violation, it is the FRA that prosecutes, not the State. (Steele, pers. com.) FRA inspectors also conduct inspections within Nevada. The FRA has an inspection-equipped locomotive, the "T-2000" which is brought to Nevada two to three times per year.

In general, the Motive Power and Equipment (MPE) inspections cover freight cars, locomotives and passenger cars. All parts of rolling stock have tolerance standards; the inspector determines whether the equipment is within

the tolerances. These inspections usually are done in switching yards. Track inspectors look at such things as correct curvature of track, changes in curvature, cross slope consistent with design speed, changes in gauge, rail-to-tie fastenings, and the condition of the ballast.

Operating Practices include how the train crews observe the code of operating rules, accident reporting, communication, and working in yards. Operating Practices inspectors may occasionally work covertly, or they may ride along in trains. Finally, in Hazardous Materials inspections, the placarding, securing, labeling, appropriate use of cars, closure of containers, and shipping papers are inspected. Yards and facilities of the shippers and consignees of hazardous materials are also inspected.

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FRA records show the following inspections in Nevada in 2004.

Table III-d

Railroad Inspections in Nevada, 2004				
State Inspectors				
Types of inspections were:	Number	Defects	Units	Ratio (D/U)
Track	113	253	3,681	0.0687
Signal	9	0	171	0
Operating practices	173	37	636	0.0582
MPE (locos/cars, etc)	297	588	13,392	0.0439
Hazardous material	183	58	1,826	0.0318
Miscellaneous areas	1	2	2	1
Total	**776**			
Federal Inspectors				
Types of inspections were:	Number	Defects	Units	Ratio (D/U)
Track	56	84	1,793	0.0468
Signal	31	105	710	0.1479
Operating practices	75	516	146	3.5342
MPE (locos/cars, etc)	65	581	4,412	0.1317
Hazardous material	81	95	2,033	0.0467
Miscellaneous areas	0	0	0	
Total	**308**			

SOURCE: FRA Office of Safety Analysis website (http://safetydata.fra.dot.gov/OfficeofSafety/Default.asp), Accident/Incident and Inspection Query, Railroad Inspections, Inspection Defect Ratios

As the table shows, State inspectors conducted over twice as many inspections in Nevada as federal inspectors did in 2004. It is the railroads themselves, however, that conduct the most inspections. Under the CFR sections cited above, railroads are required to have a regular, written schedule of inspections, and to make the schedule and the inspection results available to the FRA. The FRA and State programs, then, can be seen as an oversight program, in which FRA "inspects the inspectors" (Moore, pers. com.). Inspections by FRA

and State inspectors are to supplement, oversee, and monitor the railroad's inspections.

Hazardous Materials

Under authority delegated by the Secretary of Transportation, the FRA administers a safety program that oversees the movement of hazardous materials (including dangerous goods), such as petroleum, chemical and nuclear products, throughout the Nation's rail transportation system, including shipments transported to and from international organizations. The FRA's Hazardous Materials Division also has authority to oversee the movement of a package marked to indicate compliance with a Federal or international hazardous materials standard, even if the package does not contain a hazardous material.

Regulations regarding transport of hazardous materials by rail are contained in 49 CRF 174. In general, the requirements of the chapter are as follows:

- Railroads must inspect all cars carrying hazardous materials at the location where the material is accepted for shipment.
- Railroads must expedite shipments of hazardous materials.
- Consignees must expeditiously remove hazardous materials from the carrier's yard or premises.
- Hazardous materials must be accompanied by shipping papers.
- Train crews must have a document showing the position in the train of cars carrying hazardous materials.
- Leaking packages may not be shipped until they are repaired.
- Packages carrying hazardous materials must be located so they do not slide or fall.
- Cars and/or packages containing hazardous materials must be marked and placarded.

Hazardous materials shipping regulations also govern loading and unloading, car cleaning, train speed, placement of cars, incidents involving leakage, special handling requirements for radioactive materials, and more.

Emergency Response

Nevada's State Emergency Response Commission (SERC) was established in 1986 to comply with the Federal Emergency Planning and Community Right-to-Know Act (EPCRA). The mission of the SERC is to "protect the citizens of the State of Nevada against the negative effects of hazardous materials." The main functions of the SERC include: coordination and supervision of the activities of the Local Emergency Planning Committees (LEPCs); ensure each LEPC has an approved Hazardous Materials Emergency Response Plan; collection of chemical inventory reports; providing grant funding through grants, and processing requests for public information. (SERC website http://www.serc.nv.gov/)

Eureka County has a LEPC. The county has planned for, but does not yet have the capability for a hazardous materials emergency response program, including the capability of responding to transportation accidents involving HLW or SNCF (Moore, 2003).

On the federal level, The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) is the federal government's blueprint for responding to both oil spills and hazardous substance releases. Under this system, hazardous spills are reported to a National Response Center (NRC) which is staffed 24 hours a day by the U.S. Coast Guard. The NRC evaluates all reports and notifies the appropriate agency. Within certain parameters established by law (49 CFR 171), all hazardous waste incidents must be reported. For the Federal Railroad Administration, the NRC maintains the 24-hour Rail Emergency Hotline (1-800-424-0201). The purpose of this hotline is to take reports of railroad incidents involving hazardous materials, grade crossing fatalities, accidents resulting in injury or death of railroad employees, and the refusal of railroad employees to submit to required toxicological testing.

The EPA (land) or the Coast Guard (water) designate "Federal On-site Coordinators" for hazardous release incidents. These officials coordinate all federal containment, removal, disposal efforts, and resources. (EPA website, 2005.)

Accident/Incident Reporting

As described in section III B of this report, rail carriers must file a report with the Secretary of Transportation (FRA), not later than 30 days after the end of each month in which an accident or incident occurs, that states the nature, cause, and circumstances of the reported accident or incident. The format for the reports is provided by the FRA. The current criteria for a reportable accident or incident are:

- Impact between railroad on-track equipment and a motorized or non-motorized highway or farm vehicle, a pedestrian, or other highway user at a highway-rail crossing.
- Collision, derailment, fire, explosion, act of God, or other event involving the operation of standing or moving on-track equipment results in aggregate damage (to on-track equipment, signals, track and/or other track structures and/or roadbed) of more than $6,300 (as of 1998).
- An event arising from railroad operation results in the death of one or more persons, injury to one or more persons, other than railroad employees, requiring medical treatment, injury to one or more employees requiring medical treatment or resulting in restriction of work or motion for one or more days, one or more lost work days, transfer to another job, termination of employment, or loss of consciousness, and/or any occupational illness of a railroad employee diagnosed by a physician.

FRA also requires the submittal of a monthly status report, even if there were no reportable events during the month. All accidents and incidents must be reported on the FRA standardized form, but certain types of incidents require immediate telephone notification. Logs of both reportable injuries and on-track incidents must be maintained by each railroad on which they occur, and a listing of such events must be posted and made available to employees and to the FRA, along with required records and reports, on request. The data entries extracted from the FRA reporting forms are consolidated into an accident/ incident database which separates reportable accidents, grade-crossing incidents, and casualties. This database is available online (See **Appendix A**: References) The statistics also are annually published as a *Accident/Incident Bulletin.*

Rail Rate Structure, Mergers

Rail rates and rail mergers are subject to the regulatory oversight of the Surface Transportation Board. The Surface Transportation Board (STB) was created in the Interstate Commerce Commission Termination Act of 1995 and is the successor agency to the Interstate Commerce Commission. The STB is an economic regulatory agency that Congress charged with the fundamental missions of resolving railroad rate and service disputes and reviewing proposed railroad mergers. The STB is decisionally independent, although it is administratively affiliated with the Department of Transportation.

G. SUMMARY AND CONCLUSION

Union Pacific Railroad operates dual lines through Eureka County. In the study area (from Battle Mountain in Lander County to approximately Maggie Creek in Elko County, a distance of about sixty miles), the lines follow the Humboldt River, passing through Palisade Canyon in Eureka County. The lines cross once, just east of Barth in Palisade Canyon, go through several tunnels, and cross the Humboldt River on bridges several times.

The Union Pacific dual lines through the Eureka County study area are part of a major corridor rated for the heaviest trains. In 2003, 27 trains per day passed through the study area, as well as two passenger trains. Principal commodities carried by Union Pacific in Nevada are coal, chemicals, aggregates, lumber and consumer goods. Rail traffic fluctuated during the 1970's and 1980's in the study area, reaching a high in 1986. While it was not possible to obtain rail traffic data for the study area for the 1990's, data obtained from the Surface Transportation Board for the Western U.S. as a whole show that during the 1990's rail ton miles throughout the west increased, so it is assumed that ton miles also increased in the study area during that time period.

There were 73 rail accidents or incidents in the study area between 1975 and 2005 and total reported damage to tracks and equipment in the accidents was $7,702,901. The largest accident that took place in the study area, in terms of dollar damage, was a derailment and chemical spill near Battle Mountain in 2001.

The number of rail accidents in the study area has dropped since the early 1980's, possibly as a result of track and equipment improvements carried out after industry deregulation, combined with newly-instituted safety programs.

Forty-four percent of accidents in the study area were equipment-caused; 25% were track-caused; 24% were human-caused and 7% had miscellaneous causes. Derailments were the most common type of accidents in the study area, accounting for 81% of all accidents. Most accidents occurred on the main track, and most accidents involved freight trains. Eleven accidents involved trains carrying hazardous materials, but there was only one hazardous spill during the 1975-2005 time period. In addition to accidents, Eureka County firefighting personnel report that rail operations may ignite wildland fires, these fires may be caused by sparks resulting from friction between the equipment and the rail.

Two potential weather effects which might affect rail operations in the study area were identified. First, extreme hot and cold weather may cause increased damage in derailment accidents. Temperatures within the range that may have an effect exist in the study area only at the cold extreme, not at the hot extreme. The author of the study cited in this report cautions that these results may no longer apply in light of track improvements made in recent decades.

Floods in the Humboldt River represent a more serious weather effect in the study area. Flooding caused at least one of the major accidents during the

referenced time period. In addition, a 1910 flood washed away the tracks entirely. Photographs taken in May 2005, when the Humboldt River was about 2000 cfs above flood stage, show water standing on or around the tracks. (Some of these photographs are included in **Appendix E** of this report.)

On the dual Union Pacific tracks through the study area, train movement is controlled by an Automatic Block Signal (ABS) system in which the railroad is divided into sections, known as blocks. A train cannot enter a block until it is permitted, generally by a signal that the block ahead is empty, or by warrant from the train dispatcher.

Union Pacific operates trains in accordance with a code of operating procedures and timetables supplemented by special instructions. General operating procedures are laid out in federal regulations implemented by the Federal Railroad Administration (FRA), but each railroad has its own code which may include additional practices.

In a July, 2005 policy statement the DOE announced a decision to use dedicated trains to transport SNF and HLW to the proposed Yucca Mountain nuclear waste repository. AAR and DOE say that these dedicated trains are the safest way to ship the waste, but some questions about the use of dedicated train remain, including whether waste shipment will be solely by dedicated trains or by a mix of dedicated and general trains.

Railroads are responsible for regular inspection of all track, equipment, and operations. Each railroad must make written schedules of inspections, as well as inspection results, available to the FRA. The FRA and the Nevada Public Utilities Commission (PUCN) also conduct regular inspections, but these inspections function more as oversight for the railroad's own inspection program.

Standards and procedures for transporting hazardous materials are laid out in federal regulations; railroads implement the hazardous materials management in their codes of operating procedures. Responsibility for response to hazardous spills is shared by the railroad, the federal government, and state and local agencies.

Union Pacific has an emergency management plan to guide emergency response and emergency procedures also are in the timetables carried by each train crew. The closest Union Pacific emergency response crews to the study area are located in Roseville, California and Salt Lake City, Utah.

The railroads themselves are responsible for security of railroad operations, property and cargo, unlike the aviation industry, where the federal government provides security personnel. Union Pacific has increased security in several ways since the 9/11 terrorist attack.

Recommendations for Further Study or Follow-up

It is possible for Local Emergency Planning Committees (LEPC's) to obtain information on the flow of hazardous materials through their communities by submitting a request for such information on a form provided by the railroad (See **Appendix F, American Association of Railroads Circular No. OT-55-**

G for a generic copy of this form from the American Association of Railroads.) This information, if regularly obtained by Eureka County's LEPC, would not only supplement this report, but help in the County's hazardous response planning efforts.

Additionally, it is recommended that the Eureka County LEPC obtain information from Union Pacific on the railroad's emergency management plan and emergency management procedures that apply to the Eureka County area. This would also aid the County in emergency and hazardous waste incident response planning efforts.