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Executive Summary

Amtrak has the right to operate its passenger services on freight railroads as long as Amtrak pays the incremental cost to use these railroads. Declines in freight service on the BNSF freight line between Newton, Kansas (KS) and Dalies, New Mexico (NM) have led to BNSF determining that it no longer needs to maintain these lines to Class 4 levels, and BNSF is seeking to have Amtrak pay the incremental cost of maintaining the line to Class 4 in its next host railroad operating agreement. A major factor in BNSF's determination to downgrade the track speed is that high speed priority freights no longer use this line as in the past. They have been re-routed to other lines. A fair volume of freight traffic traverses the line east of La Junta, but is typically heavy tonnage bulk (coal, grain, crude oil, and ethanol) and general merchandise commodities suited to the lower Class speeds. Trains have been re-routed entirely between Raton and Lamy to avoid the Raton Pass and Glorieta Pass grades.

This study reviews and evaluates Amtrak's assessment of the routine operational and capital maintenance necessary to continue Class 4 Southwest Chief operations on the BNSF-owned portions of the railroad line between Newton, KS and Dalies, NM. The study provides assessments for both 10-year and 20-year horizons. It is noted that the NMDOT-owned and maintained portion of this line, between Lamy, NM and Isleta, NM, was excluded from the scope, since New Mexico is committed to providing the maintenance for this segment under its own operating agreement with Amtrak. Cost estimates include both estimates of maintenance costs for the track within New Mexico and estimates of maintenance costs for the overall BNSF line between Newton, KS and Dalies, NM. Amtrak has indicated a payment of \$4 million (annually) each by New Mexico, Kansas, Colorado, BNSF, and Amtrak over the next 10 years (\$20 million total per year) would enable continued Class 4 operations.

The Southwest Chief, formerly the Southwest Limited and Super Chief, is a long-distance intercity passenger rail service operating on a 2,265-mile route from Chicago, Illinois to Los Angeles, California. The route it travels was constructed in the late 1800s and has been in service for over 120 years. Passenger rail service on this route was operated by the Atchison, Topeka and Santa Fe Railway Company (ATSF) until Amtrak took over operation in May of 1971. The Southwest Chief name was established in 1984 with permission of the ATSF.



Table 1 summarizes the most recent ridership information available that was provided by Amtrak.

Table 1: Summary of Ridership

Station/Community	FY 11 Boardings & Lightings	FY 12 Boardings & Lightings	FY 13 Boardings & Lightings
Kansas			
Hutchinson	5,185	5,239	5,303
Dodge City	5,149	5,174	5,149
Garden City	7,511	7,887	7,355
Colorado			
Lamar	1,840	1,936	1,823
La Junta	6,653	6,566	6,711
Trinidad	4,535	4,770	4,765
New Mexico			
Raton	16,749	16,292	15,733
Las Vegas	4,952	5,653	5,376
Lamy	12,579	12,589	12,551

The Federal Railroad Administration (FRA) has established multiple classes of track, each of which has their own maximum allowable speeds for passenger rail and freight rail operations. Each class of track has “minimum level” of condition that the government has determined must be present for safe railroad operations on that track. FRA has also established the minimum frequency of inspections and the methods of record keeping as well as how railroads are to respond to exceptions and violations of the standards when found. Class 4 is the normal class for passenger rail operations as it is the lowest class that allows for the operations of a 79 mph passenger train, the maximum speed allowable without equipping the trains and track with additional safety devices that add significantly to the maintenance costs of the line. The added costs of maintaining track for higher classification reflect a greater emphasis on preventing derailments, more stringent requirements for the conditions of ties, ballast, rail and track geometry at higher speeds, increased traffic density with the additional wear and tear this results in, and correspondingly reduced windows for performing track maintenance.

This study will provide an independent review of the maintenance costs for the following segments between Newton, KS and Dalies, NM:

- **Kansas** (271 miles)
 - Newton, KS to Kansas-Colorado State Line – 271 miles BNSF La Junta Subdivision;
- **Colorado** (182 miles)
 - Kansas-Colorado State Line to Las Animas – 63 miles BNSF La Junta Subdivision;
 - Las Animas to La Junta – 22 miles BNSF Boise City Subdivision;



Amtrak Southwest Chief Maintenance Cost
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- La Junta to Colorado-New Mexico State Line – 97 miles BNSF Raton Subdivision;
- **New Mexico** (197 miles)
 - Colorado-New Mexico State Line to Las Vegas – 118 miles BNSF Raton Subdivision;
 - Las Vegas to Lamy – 64 miles BNSF Glorieta Subdivision;
 - Isleta to Dalies – 15 miles BNSF Glorieta Subdivision.

The Location Map on [Figure 1](#) shows these segments and their relationship to the three states.



Figure 1: Location Map

Routine and capital maintenance costs were evaluated for each segment. The definition of maintenance costs include:

- 1) *Capital Maintenance* – replacement of relatively large portions of track structure materials and components, bridge replacement and signal upgrades;
- 2) *Routine (Operational) Maintenance* – ordinary maintenance for operating expense – frequent inspections, rail lubrication / grinding, ballast tamping and minor repairing of track, signal and structures.



The cost of maintenance is heavily dependent on the following: traffic usage; number, length, and degree of curves; number, length, and type of bridges; size of rail and whether it is continuous welded rail or jointed; and the number of at-grade crossings and sidings.

The following Table 2 shows the estimated maintenance costs for each segment of rail based on Wilson & Company's independent review

Table 2: Estimated Average Annual Costs for Maintaining Class 4 Operations 2016-2025

Segment	Length (miles)	# Freight	Track		Signal		Bridge		Total		Combined Total
			Oper.	Capital	Oper.	Capital	Oper.	Capital	Oper.	Capital	
Kansas											\$ 9,822
La Junta Sub	271	16	\$ 2,672	\$ 2,924	\$ 1,966	\$ 1,361	\$ 82	\$ 817	\$ 4,720	\$ 5,102	
Colorado											\$ 9,470
La Junta Sub	63	16-22	\$ 621	\$ 1,418	\$ 448	\$ 1,059	\$ 30	\$ 300	\$ 1,099	\$ 2,777	
Boise City Sub	22	16-22	\$ 210	\$ 878	\$ 195	\$ 185	\$ 15	\$ 149	\$ 420	\$ 1,212	
Raton Sub	97	0	\$ 573	\$ 762	\$ 726	\$ 1,402	\$ 45	\$ 454	\$ 1,344	\$ 2,618	
New Mexico											\$ 9,376
Raton Sub	118	0	\$ 700	\$ 1,087	\$ 1,047	\$ 2,038	\$ 82	\$ 824	\$ 1,829	\$ 3,949	
Glorieta Sub	79	0	\$ 472	\$ 717	\$ 721	\$ 1,425	\$ 24	\$ 239	\$ 1,217	\$ 2,381	
Total			\$ 5,248	\$ 7,786	\$ 5,103	\$ 7,470	\$ 278	\$ 2,783	\$ 10,629	\$ 18,039	\$ 28,668

Note - Costs are in thousand dollars of year of expenditure dollars. Note the signal costs assume no PTC.

The above estimates did take into account the TIGER grant received by Garden City, KS to relay approximately 55 miles of track on the La Junta Subdivision. The assumption was that these improvements would be completed in 2015 prior to the renewal of the Amtrak – BNSF joint use agreement evaluated in this study.



Table 2A: Estimated Average Annual Costs for Maintaining Class 4 Operations 2026-2035

Segment	Length (miles)	# Freight	Track		Signal		Bridge		Total		Combined Total
			Oper.	Capital	Oper.	Capital	Oper.	Capital	Oper.	Capital	
Kansas											\$ 12,571
La Junta Sub	271	16	\$ 3,420	\$ 3,742	\$ 2,517	\$ 1,742	\$ 104	\$ 1,046	\$ 6,041	\$ 6,530	
Colorado											\$ 12,122
La Junta Sub	63	16-22	\$ 795	\$ 1,816	\$ 573	\$ 1,355	\$ 38	\$ 384	\$ 1,406	\$ 3,555	
Boise City Sub	22	16-22	\$ 268	\$ 1,124	\$ 248	\$ 426	\$ 19	\$ 191	\$ 535	\$ 1,741	
Raton Sub	97	0	\$ 734	\$ 975	\$ 932	\$ 1,606	\$ 58	\$ 580	\$ 1,724	\$ 3,161	
New Mexico											\$ 12,003
Raton Sub	118	0	\$ 896	\$ 1,391	\$ 1,340	\$ 2,609	\$ 106	\$ 1,055	\$ 2,342	\$ 5,055	
Glorieta Sub	79	0	\$ 604	\$ 918	\$ 923	\$ 1,824	\$ 31	\$ 306	\$ 1,558	\$ 3,048	
Total			\$ 6,717	\$ 9,966	\$ 6,533	\$ 9,562	\$ 356	\$ 3,562	\$ 13,606	\$ 23,090	\$ 36,696

Note - Costs are in thousand dollars of year of expenditure dollars. Note the signal costs assume no PTC.

Based on the above cost data, it is estimated that the average maintenance cost for the next 10 years will be \$28.7 million per year to maintain Class 4 operations. These costs can be extracted for the following 10 years (2026 to 2035) using an inflation factor since there are no foreseen major capital costs on the horizon.

The current 20-year BNSF and Amtrak joint use agreement expires in January of 2016. Under this agreement, BNSF is responsible for the full cost of maintaining all subdivisions to Class 4 standards. BNSF and Amtrak are negotiating a joint use agreement that will cover the next 10 years. In the next joint use agreement, BNSF is insisting on the following funding division:

La Junta Subdivision:

- BNSF funds to 30 mph
- Amtrak supplements to 79 mph

Boise City Subdivision and the Colorado portion of the Raton Subdivision:

- BNSF funds to 79 mph

New Mexico portion of the Raton Subdivision and Glorieta Subdivision (excluding the NMDOT-owned portion):

- Amtrak funds to 79 mph



Amtrak Southwest Chief Maintenance Cost
Between Newton, KS and Dalies, NM

Table 3 below shows the projected average annual maintenance costs for the 10-year period from 2016 to 2025 based on the funding division BNSF is proposing.

Table 3: Average Annual Operational and Capital Maintenance Costs for BNSF and Amtrak 2016-2025

Segment	Track		Signal		Bridge		Total		Combined Total
	BNSF	Amtrak	BNSF	Amtrak	BNSF	Amtrak	BNSF	Amtrak	
Kansas									\$ 9,822
La Junta Sub	\$4,477	\$1,119	\$3,327	\$0	\$899	\$0	\$8,703	\$1,119	
Colorado									\$ 9,471
La Junta Sub	\$1,631	\$408	\$1,507	\$0	\$330	\$0	\$3,468	\$408	
Boise City Sub	\$1,088	\$0	\$380	\$0	\$164	\$0	\$1,632	\$0	
Raton Sub	\$1,154	\$182	\$0	\$2,128	\$0	\$499	\$1,154	\$2,809	
New Mexico									\$ 9,375
Raton Sub	\$0	\$1,787	\$0	\$3,085	\$0	\$906	\$0	\$5,778	
Glorieta Sub	\$0	\$1,188	\$0	\$2,146	\$0	\$263	\$0	\$3,597	
Total	\$ 8,350	\$ 4,684	\$5,214	\$7,359	\$1,393	\$1,668	\$14,957	\$13,711	\$ 28,668

Note – costs are in thousand dollars of year of expenditure dollars

Table 3A: Average Annual Operational and Capital Maintenance Costs for BNSF and Amtrak 2026-2035

Segment	Track		Signal		Bridge		Total		Combined Total
	BNSF	Amtrak	BNSF	Amtrak	BNSF	Amtrak	BNSF	Amtrak	
Kansas									\$ 12,571
La Junta Sub	\$5,730	\$1,432	\$4,259	\$0	\$1,150	\$0	\$11,139	\$1,432	
Colorado									\$ 12,122
La Junta Sub	\$2,089	\$522	\$1,928	\$0	\$422	\$0	\$4,439	\$522	
Boise City Sub	\$1,392	\$0	\$674	\$0	\$210	\$0	\$2,276	\$0	
Raton Sub	\$1,476	\$233	\$0	\$2,538	\$0	\$638	\$1,476	\$3,409	
New Mexico									\$ 12,003
Raton Sub	\$0	\$2,287	\$0	\$3,949	\$0	\$1,161	\$0	\$7,397	
Glorieta Sub	\$0	\$1,522	\$0	\$2,747	\$0	\$337	\$0	\$4,606	
Total	\$ 10,687	\$ 5,996	\$6,891	\$9,234	\$1,782	\$2,136	\$19,330	\$17,366	\$ 36,696

Note – costs are in thousand dollars of year of expenditure dollars



For the 2016-2025 period, the average annual maintenance costs to the BNSF to maintain the line to standards required for existing freight rail operations would be approximately \$15 million per year and an additional \$13.7 million per year is needed from Amtrak to maintain the line to Class 4 standards. The BNSF freight traffic has declined significantly on this route since the current 20-year Amtrak joint use agreement was executed in 1996, and BNSF is insisting on a higher reimbursement from Amtrak in the next long-term operating agreement to maintain passenger service at Class 4 on this rail route. A major reason for the track downgrade is also because the high-speed priority freight trains use other routes and do not use this route as they did in the past. Amtrak indicates that it does not have the budget and is seeking alternative funding sources.



Introduction

Amtrak has the right to operate passenger services on freight railroads as long as the incremental cost of using these railroads is paid. Amtrak and the BNSF have been in negotiations over the past few years to develop a new joint use agreement to replace the current agreement that has been in place since 1996 and will expire in January 2016. BNSF freight traffic has declined significantly on the route between Lamy and Newton since 1996 since high-speed priority freights no longer use this line as in the past and the coal mine in northeast New Mexico that was the primary freight generator between Trinidad and Lamy closed. The freight traffic traversing the line east of La Junta is typically heavy tonnage bulk (coal, grain, crude oil, etc.) suited to the lower Class speeds. BNSF has no freight business between Raton and Lamy, with Amtrak the only rail user between these points. Consequently, BNSF is seeking higher reimbursement from Amtrak for the incremental cost of maintaining this track to Class 4 for Amtrak passenger service when lower track classes would be appropriate for the volumes and types of freight currently utilizing this line. Amtrak has indicated that it does not have the budget to fund these increased maintenance costs and will have to look for alternative funding sources.

This study will provide an independent review of the maintenance costs for the following segments between Newton, KS and Dalies, NM:

- **Kansas** (271 miles)
 - Newton, KS to Kansas-Colorado State Line – 271 miles BNSF La Junta Subdivision;
- **Colorado** (182 miles)
 - Kansas-Colorado State Line to Las Animas – 63 miles BNSF La Junta Subdivision;
 - Las Animas to La Junta – 22 miles BNSF Boise City Subdivision;
 - La Junta to Colorado-New Mexico State Line – 97 miles BNSF Raton Subdivision;
- **New Mexico** (197 miles)
 - Colorado-New Mexico State Line to Las Vegas – 118 miles BNSF Raton Subdivision;
 - Las Vegas to Lamy – 64 miles BNSF Glorieta Subdivision;
 - Isleta to Dalies – 15 miles BNSF Glorieta Subdivision.

The BNSF, as an option, has proposed to reroute the Southwest Chief onto the Transcon alignment through Amarillo, TX, Clovis, NM and Belen, NM. The Transcon is maintained to Class 4 standards or higher because of this route's heavy volume and high-speed freight traffic. Use of the Transcon by Amtrak will present scheduling conflicts that it does not have on the current route. Amtrak prefers to remain on the current alignment and has proposed that the incremental cost of maintaining the track to Class 4 standards be shared equally by five parties – Amtrak, BNSF, Kansas, Colorado, and New Mexico. The funding plan outlined by Amtrak to stakeholders for the Southwest Chief proposes a \$4 million per year contribution by each of the five parties for 10 years, beginning January, 2016. Amtrak has indicated that it is not clear if additional annual funding will be required of the other parties after this 10-year period.



In November 2013, Amtrak presented the above proposal to the New Mexico Legislature Interim Transportation Infrastructure Revenue Subcommittee requesting consideration of legislation to commit the \$4 million per year for 10 years. Subsequently, the New Mexico Department of Transportation (NMDOT) offered to conduct two studies:

- 1) An Economic Study to evaluate the impact of moving the Southwest Chief Passenger Service to the Transcon route; and
- 2) An Engineering Study to review and evaluate Amtrak's assessment of the routine operational and capital maintenance needed to continue Class 4 operations on the BNSF line between Newton, KS and Dalies, NM. The NMDOT-owned portion of this line between Lamy, NM and Isleta, NM was excluded from this study since New Mexico is committed to the maintenance of this segment.

The purpose of this study is to provide item 2 above - an independent review and development of an estimate for the maintenance costs both routine and capital for the Kansas, Colorado, and New Mexico segments of the route, excluding the NMDOT-owned segment. The estimates will be for the 10-year period between 2016 and 2025 and an additional 10-year period from 2026 to 2035.

Data Collection

The estimated maintenance costs in this study are based on historic data provide by the BNSF for the years 2004 through mid-2009 for the La Junta, Raton, and Glorieta Subdivisions. The data provided by BNSF was the same data Amtrak used to develop their estimates and included:

- 1) Operating and Capital Costs 2004 to mid-2009 and Labor Costs for June 2010;
- 2) Track miles of Jointed Rail;
- 3) Historic Labor Details for the 18-month period of January 2010 to June 2011; and
- 4) The six-year capital plan for each Subdivision for the years 2010 to 2015.

In addition, the State Rail Plans, track charts, and aerial imagery were evaluated to obtain bridge, crossings, and track data. This study's assessment did not include any physical inspections of the railroad line. Additional data such as derailment reports, surfacing reports, geometry car information, Raton Tunnel reports, and bridge reports were requested from BNSF but were not available for this study. The Amtrak analysis and assumptions for their evaluation of the maintenance cost was requested but declined, citing a desire for this assessment to independently arrive at its own conclusions without being biased by Amtrak's conclusions.

The detailed information used to develop the estimated maintenance costs (routine operational and capital) for the Study Segments are included in the [Appendix A](#). A summary of the data is as follows:



1) **Traffic** – Daily for 2012

Kansas: <i>La Junta Subdivision</i>	16 Freights Trains	2 Amtrak Trains
Colorado: <i>La Junta and Boise City Subdivisions</i>	16-22 Freight Trains	2 Amtrak Trains
Colorado: <i>Raton Subdivision</i>	0* Freight Trains	2 Amtrak Trains
New Mexico: <i>Raton and Glorieta Subdivisions</i>	0 Freight Trains	2 Amtrak Trains

*The La Junta to Trinidad Segment may have 1-2 freight trains if the mines re-open.

2) **Track Maintenance Activities** – Data collected from January 2010 to June 2011 from BNSF (See [Appendix A](#)).

3) **Bridges**

Kansas	12,047 Track Feet (TF)
Colorado	13,172 Track Feet
New Mexico	10,283 Track Feet

4) **Tunnels**

2,800 TF Raton Pass (New Mexico)

5) **Grade Crossings**

	<u>Public Signalized</u>	<u>Public Unsignalized</u> <u>Cross Buck</u>	<u>Private Unsignalized</u> <u>Cross Buck</u>
Kansas	105	121	63
Colorado	24	54	39
New Mexico	11	30	41

6) **Historic Routine Operational and Capital Expenditures 2004 to mid 2009 Average (source BNSF)**

<i>Hutchinson to Las Animas</i>	Operation \$2,712k/year	Capital \$4,048k /year
<i>La Junta to Lamy</i>	Operation \$2,616k/year	Capital \$12,226k/year

Evaluations

The following sections describe the data, assumptions, and methodology used to develop the estimated maintenance costs for the State Segments for routine operational and capital.

In our review of the capital maintenance, the jointed rail is anticipated to be replaced in the 10-year period as noted in the Amtrak evaluation. The signals in the New Mexico segment are obsolete and will need replacement within the 20-year horizon. Any track maintenance depends on the volume of freight traffic, tight curve alignments (high rail), number of turnouts, at-grade crossings, and condition of the



ties. Once the relay of rail is completed on this route the rail life will be well beyond the 20-year horizon. Ties are expected to have a life of 50 years with 10 to 20 years for ballast surfacing. At-grade crossings will need to be resurfaced on a 30-year cycle. Bridges typically will need replacement/reconstruction at a rate of 1.0% per year. The evaluation and estimates considered all of the above factors. An annual 2.5% cost increase due to inflation was used in these evaluations.

The routine and capital maintenance costs were evaluated for each segment. The definition of maintenance costs are:

- 1) **Capital Maintenance** – replacement of relatively large portions of track structure materials and components, bridge replacement and signal upgrades;
- 2) **Routine Operational Maintenance** – ordinary maintenance for operating expense – frequent inspections, rail lubrication/grinding, ballast tamping and minor repairing of track, signal and structures.

The routine operation maintenance should be relatively consistent once the capital improvements are completed. This expense consists primarily of inspections, rail lubrication/grinding, ballast tamping, and minor repairs of track, signal and structures. As stated, this expense should be relatively consistent for the 20-year horizon after considering inflation.

Track Evaluation

Assessment Methodology and Limits of Review

The assessment of potential track maintenance costs was completed predominantly by reviewing track chart data, aerial imagery, and existing data received from the NMDOT and the Amtrak related studies, see [Appendix A](#) for this data. Observations on maintenance needs and existing practices were made by reviewing rail size; date installed; jointed versus welded rail areas; ballast; number of at-grade crossings; labor data on the Raton Subdivision from June 1, 2010 to June 26, 2010; and by considering the FRA rules for inspection and track geometry parameters outlined for railroads in the Code of Federal Regulations, Part 213 Track Safety Standards. Wilson & Company's assessment was completed strictly by reviewing the existing documents provided; no physical inspection was completed of the track segments. Other information requested from the BNSF Railway Company, such as the geometry car information, ultrasonic testing records; maintenance reports (rail grinding, surfacing, FRA inspection reports, bridge inspection reports, signal inspection reports, derailment reports) were not available for inclusion in the assessment.

Acceptable Track Conditions for FRA Class 4 Tracks

Each class of track has a maximum allowable speed for passenger and freight operations associated with it, with higher classes having higher maximum speeds. The minimum FRA requirements for Class 4 track, the most common class for passenger rail operations, are defined by the Code of Federal Regulations, Part 213 Track Safety Standards. While this is a minimum safety standard, railroad's such as BNSF, often have standards that exceed the FRA minimum standards. The speed over a specific



segment of track is dictated by the Railroad Timetable for a specific railroad subdivision. The railroad's Employee Timetable dictates the maximum operating speed over the subdivision and specifies specific speed restrictions over curves and switches (potentially a lower FRA Class of track) as dictated by curve geometry or turnout size. If the track does not meet FRA Class 4 standards, the mandated remedial action is to lower the FRA Class of track immediately to the FRA Class of track it does meet and to place a temporary slow order on the affected track limits.

FRA Class 4 track standards are specific to roadbed, track geometry, track structure, track appliances and track-related devices, and durations between inspections. FRA Class 4 track standards require certain maintenance and capital expenditures that are needed to maintain the track over the course of the life cycle of the track structure components. The life cycle of the track components are dependent on the amount of mechanical wear and fatigue placed upon them; the exposure to environmental damage and decay placed upon the track components in various regions of the Country; and to a certain extent the obsolescence of the individual track components as new materials and maintenance practices are established by the railroad industry.

Maintenance Costs

Detailed maintenance costs for different line segments of track have been developed over time by the owning railroads. Each is specific to topography, track geometry and weather conditions of a specific geographic area. The average cost of maintaining a specific line segment of track is also greatly influenced by the railroad traffic (tonnage) over the track. Many studies have been conducted by the railroad industry to establish an "on average" maintenance cost of the different FRA Classes of track. Adjusting for inflationary costs, the **average cost per heavy haul railway track mile** to maintain FRA Class 2 track, in 2014 dollars, is roughly **\$11,345 per mile**, and the cost to maintain FRA Class 4 track is **\$14,226 per mile** (1). Using these costs as a baseline, the incremental maintenance cost increase from FRA Class 2 to FRA Class 4 is approximately 25%. The average cost per heavy haul railway track mile costs includes operational maintenance and capital costs combined. Actual costs will vary depending on tonnage and a variety of other factors. ***Areas along the Southwest Chief route where freight traffic is absent or where there is low freight traffic will incrementally reduce the estimated track maintenance costs between Class 2 and Class 4 track because of train frequency and overall tonnage placed upon the track structure.***

Capital Maintenance Costs

Capital costs are costs above and beyond the day to day track maintenance practices performed by the railroads to maintain a specific track segment to an FRA Class of track. Capital maintenance costs are typically associated with a major replacement of a track structure component such as rail, ties, ballast, rail fastenings, surfacing, at grade crossing improvements, and turnout replacements. These activities are typically programmed and scheduled on a capital maintenance plan for a specific line segment or railroad subdivision. Capital programs are also greatly influenced by topography, track geometry, weather conditions and depend on railroad traffic (tonnage). These programs are location specific and were only considered for general information in the assessment methodology.



20-Year Projection of Track Maintenance and Capital Maintenance Costs

Projected track capital and routine operational maintenance costs for each subdivision were developed using a 2014 baseline estimate and a projected annual escalation in cost of 2.5% annually, as shown in [Table 4](#) and in [Table 4A](#). These tables show the cost to maintain the railroad to Class 4 standards and show the portion of this cost that would be attributable to Amtrak.



Amtrak Southwest Chief Maintenance Cost
Between Newton, KS and Dalies, NM

Table 4: Estimated Track Operational and Capital Maintenance Cost

Year	La Junta Sub., KS BNSF Class 2, Public Class 4				La Junta Sub., CO BNSF Class 2, Public Class 4				Boise City Sub., CO, Sole BNSF			
	Total Operational	Amtrak Operational	Total Capital	Amtrak Capital	Total Operational	Amtrak Operational	Total Capital	Amtrak Capital	Total Operational	Amtrak Operational	Total Capital	Amtrak Capital
2016	\$2,385,000	\$477,000	\$2,609,500	\$521,900	\$554,000	\$110,800	\$1,266,060	\$253,212	\$187,000	\$0	\$784,000	\$0
2017	\$2,444,625	\$488,925	\$2,674,738	\$534,948	\$567,850	\$113,570	\$1,297,712	\$259,542	\$191,675	\$0	\$803,600	\$0
2018	\$2,505,741	\$501,148	\$2,741,606	\$548,321	\$582,046	\$116,409	\$1,330,154	\$266,031	\$196,467	\$0	\$823,690	\$0
2019	\$2,568,384	\$513,677	\$2,810,146	\$562,029	\$596,597	\$119,319	\$1,363,408	\$272,682	\$201,379	\$0	\$844,282	\$0
2020	\$2,632,594	\$526,519	\$2,880,400	\$576,080	\$611,512	\$122,302	\$1,397,493	\$279,499	\$206,413	\$0	\$865,389	\$0
2021	\$2,698,409	\$539,682	\$2,952,410	\$590,482	\$626,800	\$125,360	\$1,432,431	\$286,486	\$211,573	\$0	\$887,024	\$0
2022	\$2,765,869	\$553,174	\$3,026,220	\$605,244	\$642,470	\$128,494	\$1,468,241	\$293,648	\$216,863	\$0	\$909,200	\$0
2023	\$2,835,016	\$567,003	\$3,101,875	\$620,375	\$658,532	\$131,706	\$1,504,947	\$300,989	\$222,284	\$0	\$931,930	\$0
2024	\$2,905,891	\$581,178	\$3,179,422	\$635,884	\$674,995	\$134,999	\$1,542,571	\$308,514	\$227,841	\$0	\$955,228	\$0
2025	\$2,978,538	\$595,708	\$3,258,908	\$651,782	\$691,870	\$138,374	\$1,581,135	\$316,227	\$233,537	\$0	\$979,109	\$0
2016-2025	\$26,720,066	\$5,344,013	\$29,235,225	\$5,847,045	\$6,206,673	\$1,241,335	\$14,184,154	\$2,836,831	\$2,095,032	\$0	\$8,783,451	\$0
2026	\$3,053,002	\$610,600	\$3,340,381	\$668,076	\$709,167	\$141,833	\$1,620,664	\$324,133	\$239,376	\$0	\$1,003,586	\$0
2027	\$3,129,327	\$625,865	\$3,423,890	\$684,778	\$726,896	\$145,379	\$1,661,180	\$332,236	\$245,360	\$0	\$1,028,676	\$0
2028	\$3,207,560	\$641,512	\$3,509,487	\$701,897	\$745,068	\$149,014	\$1,702,710	\$340,542	\$251,494	\$0	\$1,054,393	\$0
2029	\$3,287,749	\$657,550	\$3,597,225	\$719,445	\$763,695	\$152,739	\$1,745,278	\$349,056	\$257,782	\$0	\$1,080,753	\$0
2030	\$3,369,943	\$673,989	\$3,687,155	\$737,431	\$782,787	\$156,557	\$1,788,910	\$357,782	\$264,226	\$0	\$1,107,771	\$0
2031	\$3,454,191	\$690,838	\$3,779,334	\$755,867	\$802,357	\$160,471	\$1,833,632	\$366,726	\$270,832	\$0	\$1,135,466	\$0
2032	\$3,540,546	\$708,109	\$3,873,817	\$774,763	\$822,416	\$164,483	\$1,879,473	\$375,895	\$277,603	\$0	\$1,163,852	\$0
2033	\$3,629,060	\$725,812	\$3,970,663	\$794,133	\$842,977	\$168,595	\$1,926,460	\$385,292	\$284,543	\$0	\$1,192,949	\$0
2034	\$3,719,786	\$743,957	\$4,069,929	\$813,986	\$864,051	\$172,810	\$1,974,622	\$394,924	\$291,656	\$0	\$1,222,772	\$0
2035	\$3,812,781	\$762,556	\$4,171,678	\$834,336	\$885,652	\$177,130	\$2,023,987	\$404,797	\$298,948	\$0	\$1,253,342	\$0
2026-2035	\$34,203,943	\$6,840,789	\$37,423,559	\$7,484,712	\$7,945,067	\$1,589,013	\$18,156,916	\$3,631,383	\$2,681,819	\$0	\$11,243,560	\$0



Amtrak Southwest Chief Maintenance Cost
Between Newton, KS and Dalies, NM

Table 4 Continued: Estimated Track Operational and Capital Maintenance Cost

Year	Raton Sub., CO 105 Miles Sole BNSF, 13.2 Miles Sole Amtrak				Raton Sub., NM				Glorieta Sub., NM				Total		Amtrak		
	Total Operational	Amtrak Operational	Total Capital	Amtrak Capital	Total Operational	Amtrak Operational	Total Capital	Amtrak Capital	Total Operational	Amtrak Operational	Total Capital	Amtrak Capital	Total Operational	Total Capital	Amtrak Operational	Amtrak Capital	Amtrak Total
2016	\$512,000	\$69,675	\$680,000	\$92,536	\$625,000	\$625,000	\$970,000	\$970,000	\$421,000	\$421,000	\$640,000	\$640,000	\$4,684,000	\$6,949,560	\$1,703,475	\$2,477,648	\$4,181,123
2017	\$524,800	\$71,417	\$697,000	\$94,849	\$640,625	\$640,625	\$994,250	\$994,250	\$431,525	\$431,525	\$656,000	\$656,000	\$4,801,100	\$7,123,299	\$1,746,062	\$2,539,589	\$4,285,651
2018	\$537,920	\$73,202	\$714,425	\$97,221	\$656,641	\$656,641	\$1,019,106	\$1,019,106	\$442,313	\$442,313	\$672,400	\$672,400	\$4,921,128	\$7,301,381	\$1,789,713	\$2,603,079	\$4,392,792
2019	\$551,368	\$75,032	\$732,286	\$99,651	\$673,057	\$673,057	\$1,044,584	\$1,044,584	\$453,371	\$453,371	\$689,210	\$689,210	\$5,044,156	\$7,483,916	\$1,834,456	\$2,668,156	\$4,502,612
2020	\$565,152	\$76,908	\$750,593	\$102,142	\$689,883	\$689,883	\$1,070,699	\$1,070,699	\$464,705	\$464,705	\$706,440	\$706,440	\$5,170,260	\$7,671,014	\$1,880,318	\$2,734,860	\$4,615,177
2021	\$579,281	\$78,831	\$769,358	\$104,696	\$707,130	\$707,130	\$1,097,466	\$1,097,466	\$476,323	\$476,323	\$724,101	\$724,101	\$5,299,516	\$7,862,789	\$1,927,326	\$2,803,231	\$4,730,557
2022	\$593,763	\$80,802	\$788,592	\$107,313	\$724,808	\$724,808	\$1,124,903	\$1,124,903	\$488,231	\$488,231	\$742,204	\$742,204	\$5,432,004	\$8,059,359	\$1,975,509	\$2,873,312	\$4,848,821
2023	\$608,607	\$82,822	\$808,306	\$109,996	\$742,929	\$742,929	\$1,153,025	\$1,153,025	\$500,437	\$500,437	\$760,759	\$760,759	\$5,567,804	\$8,260,843	\$2,024,896	\$2,945,145	\$4,970,041
2024	\$623,822	\$84,892	\$828,514	\$112,746	\$761,502	\$761,502	\$1,181,851	\$1,181,851	\$512,948	\$512,948	\$779,778	\$779,778	\$5,706,999	\$8,467,364	\$2,075,519	\$3,018,774	\$5,094,292
2025	\$639,418	\$87,015	\$849,227	\$115,565	\$780,539	\$780,539	\$1,211,397	\$1,211,397	\$525,771	\$525,771	\$799,272	\$799,272	\$5,849,674	\$8,679,048	\$2,127,407	\$3,094,243	\$5,221,650
2016-2025	\$5,736,131	\$780,596	\$7,618,300	\$1,036,716	\$7,002,114	\$7,002,114	\$10,867,280	\$10,867,280	\$4,716,624	\$4,716,624	\$7,170,164	\$7,170,164	\$52,476,640	\$77,858,574	\$19,084,681	\$27,758,036	\$46,842,717
2026	\$655,403	\$89,190	\$870,457	\$118,454	\$800,053	\$800,053	\$1,241,682	\$1,241,682	\$538,916	\$538,916	\$819,254	\$819,254	\$5,995,916	\$8,896,024	\$2,180,592	\$3,171,599	\$5,352,191
2027	\$671,788	\$91,420	\$892,219	\$121,415	\$820,054	\$820,054	\$1,272,724	\$1,272,724	\$552,388	\$552,388	\$839,735	\$839,735	\$6,145,814	\$9,118,425	\$2,235,107	\$3,250,889	\$5,485,996
2028	\$688,583	\$93,705	\$914,524	\$124,451	\$840,556	\$840,556	\$1,304,542	\$1,304,542	\$566,198	\$566,198	\$860,729	\$860,729	\$6,299,459	\$9,346,386	\$2,290,984	\$3,332,161	\$5,623,146
2029	\$705,798	\$96,048	\$937,388	\$127,562	\$861,569	\$861,569	\$1,337,156	\$1,337,156	\$580,353	\$580,353	\$882,247	\$882,247	\$6,456,946	\$9,580,045	\$2,348,259	\$3,415,465	\$5,763,724
2030	\$723,443	\$98,449	\$960,822	\$130,751	\$883,109	\$883,109	\$1,370,585	\$1,370,585	\$594,862	\$594,862	\$904,303	\$904,303	\$6,618,369	\$9,819,546	\$2,406,966	\$3,500,852	\$5,907,817
2031	\$741,529	\$100,910	\$984,843	\$134,020	\$905,186	\$905,186	\$1,404,849	\$1,404,849	\$609,734	\$609,734	\$926,911	\$926,911	\$6,783,829	\$10,065,035	\$2,467,140	\$3,588,373	\$6,055,513
2032	\$760,067	\$103,433	\$1,009,464	\$137,370	\$927,816	\$927,816	\$1,439,970	\$1,439,970	\$624,977	\$624,977	\$950,084	\$950,084	\$6,953,424	\$10,316,661	\$2,528,818	\$3,678,082	\$6,206,901
2033	\$779,069	\$106,019	\$1,034,700	\$140,804	\$951,011	\$951,011	\$1,475,970	\$1,475,970	\$640,601	\$640,601	\$973,836	\$973,836	\$7,127,260	\$10,574,577	\$2,592,039	\$3,770,034	\$6,362,073
2034	\$798,545	\$108,669	\$1,060,568	\$144,325	\$974,787	\$974,787	\$1,512,869	\$1,512,869	\$656,616	\$656,616	\$998,182	\$998,182	\$7,305,441	\$10,838,942	\$2,656,840	\$3,864,285	\$6,521,125
2035	\$818,509	\$111,386	\$1,087,082	\$147,933	\$999,156	\$999,156	\$1,550,691	\$1,550,691	\$673,032	\$673,032	\$1,023,136	\$1,023,136	\$7,488,077	\$11,109,915	\$2,723,261	\$3,960,892	\$6,684,153
2026-2035	\$7,342,733	\$999,228	\$9,752,068	\$1,327,084	\$8,963,297	\$8,963,297	\$13,911,038	\$13,911,038	\$6,037,677	\$6,037,677	\$9,178,417	\$9,178,417	\$67,174,536	\$99,665,557	\$24,430,005	\$35,532,633	\$59,962,638



Freight Rail versus Passenger Maintenance Costs

The typical tonnage the Amtrak Southwest Chief (two locomotives and nine passenger cars) is around 940 tons. The average freight train per the Association of American Railroads is around 6,441 tons. A few of the freight trains running along the Amtrak Southwest Chief route have an upward total tonnage of between 12,000 to 16,000 tons. A recent study on “Estimating Maintenance Costs for Mixed High-Speed Passenger and Freight Rail Corridors” (2) has considered the varying impacts and costs freight trains and passenger trains have on a mixed traffic rail corridors. The study shows a large variance in track maintenance costs that can be attributed to freight versus passenger train tonnages. This variance is significant in looking at the overall maintenance costs that should be attributed to each traffic type.

Comparison of probable maintenance costs versus the Southwest Chief Route – State Summary Report

The average freight train daily traffic volumes for the assessment area are summarized in Table 5. (Million Gross Tons (MGT) per year was calculated using 6,441 tons as the average freight train weight and 940 tons as the average passenger train weight).

Table 5: Average Train Daily 2012 Traffic Volumes

Location	Trains per Day		MGT per Year
	Freight	Passenger	
Newton, KS to Hutchinson, KS	16	2	42.3
Hutchinson, KS to Dodge City, KS	12	2	32.9
Dodge City, KS to Las Animas, CO	16	2	42.3
Las Animas, CO to La Junta, CO	22	2	56.4
La Junta, CO to Trinidad, CO	0	2	0.69
La Junta, CO to Lamy, NM	0	2	0.69
Isleta, NM to Dalies, NM	0	2	0.69

Using the historical maintenance data provided by BNSF for assessment, the data in Table 5, and the conclusions of several studies on railroad maintenance (capital and maintenance costs per mile), a cost per mile for maintenance costs was developed. The annual track maintenance cost per mile for joint use areas where both freight and passenger trains run is estimated to be approximately \$8,800. Passenger train-only track segments were estimated to have track maintenance costs per mile of \$5,280. The passenger train-only track segment costs was estimated higher than normal due to the high degree of curves and track grades found in that track segment that will require heavier routine maintenance expenditures.

Without the benefit of additional information, capital costs for track maintenance used in Table 2 have been projected for the specific track segments with available data. It is also assumed that over the course of a 20-year capital cycle that 1/3 of the ties within the track structure would need to be



replaced. A replacement cost per tie of \$95 dollars was used to establish the capital cost for this capital activity.

Bridge Evaluation

Assessment Methodology and Limits of Review

The assessment of potential bridge maintenance and capital costs was completed predominantly by reviewing track chart data, aerial imagery, and existing data received from the NMDOT or the Amtrak related study. Observations on maintenance and capital needs and existing practices were made by determining replacement value for each subdivision and labor data from Amtrak on the Raton Sub-Division, from June 1, 2010 to June 26, 2010. This assessment was completed strictly by reviewing the existing documents provided; no physical inspection was completed of the track segments reviewed. Other information requested from the BNSF Railway Company (bridge inspection reports, derailment reports) were not readily available for inclusion in the assessment.

Bridge Maintenance Cost

Annual bridge maintenance cost is a function of bridge age, structure type, railroad tonnage, train velocity, climate, extreme weather, and seismic activity. Typically timber bridges can have a life expectancy of 75 years, while steel and concrete bridges have a life expectancy of 100 years with routine maintenance. The route traversed by the Southwest Chief was constructed in the late 1800s and has been in service for over 120 years. Typically initial construction of a rail route was accomplished with construction of temporary low cost structures, usually timber trestles. After initial service, the longer and more capital intensive structures were replaced with permanent structures. This business model allowed for a lower initial capital expenditure by investors. Typically rail lines replaced temporary bridges within 30 years of initial operations. Newer structures experience lower maintenance costs, while older structures are more maintenance intensive. Railroad tonnage is directly related to maintenance cost, higher tonnage equals higher maintenance costs. Higher tonnage for steel bridges also results in higher capital cost due to increase loading cycles and fatigue. Higher velocity for steel and concrete bridges results in higher impact forces experienced by bridges. Climate also affects maintenance cost although most of the route traverses semi-arid to arid terrain the impact of climate for this route is minimal. Extreme weather and seismic activity increase maintenance costs due stream erosion, scour, and shifted bearings.

This study evaluates the variables that affect bridge maintenance costs and the values assigned to each subdivision as a percentage of replacement value, summarized in [Table 6](#). Since bridge inspection reports were not available to evaluate structure conditions and a hi-rail assessment was not completed, this study could only assume a condition level for maintenance and capital expenditure. All bridge maintenance dollars are for year 2016. Values for the Glorieta Subdivision do not include the NMDOT-owned portion from Lamy, NM to Isleta, NM as the NMDOT maintains this track.



Table 6: Year 2016 Estimated Operational Bridge Maintenance

Subdivision	TF of Bridge	Replacement Value (RV)	% of RV	Maintenance Cost
La Junta	16,163	\$96,699,000	0.10	\$96,699
Boise City	2,192	\$13,335,000	0.10	\$13,335
Raton, CO	6,854	\$40,462,000	0.10	\$40,462
Raton, NM	9,713	\$73,533,000	0.10	\$73,533
Glorieta	3,360	\$21,354,000	0.10	\$21,354
Totals	38,282	\$245,383,000	0.10	\$245,383

Bridge Capital Maintenance Costs

Capital costs are costs above and beyond the day-to-day bridge maintenance practices performed by the railroads. Capital costs are typically associated with replacement of bridges as the useful life expectancy approaches and maintenance cost become cost prohibitive to continue to maintain service upon the existing bridge. Using a 100-year life cycle it is estimated 1% of the bridges will require replacement each year. Larger bridges typically will have a service life extended by replacement of floor systems and timber structures are renewed or replaced with concrete structures. Typically, railroads will package several bridge replacements over a segment of track to obtain more competitive bidding and capital programs will vary in intensity each year. Estimated bridge capital program for the base year of 2016 is summarized in Table 7.

Table 7: Year 2016 Estimated Capital Bridge Maintenance

Subdivision	TF of Bridge	Replacement Value (RV)	% of RV	Capital Cost
La Junta	16,163	\$96,699,000	1.00	\$966,990
Boise City	2,192	\$13,335,000	1.00	\$133,350
Raton, CO	6,854	\$40,462,000	1.00	\$404,620
Raton, NM	9,713	\$73,533,000	1.00	\$735,330
Glorieta	3,360	\$21,354,000	1.00	\$213,540
Totals	38,282	\$245,383,000	1.00	\$2,453,830

20 Year Projection of Bridge Maintenance and Capital Maintenance Costs

Projected bridge capital and maintenance cost for each subdivision were developed using a 2014 baseline estimate and a projected annual escalation in cost of 2.5% annually, as shown in Table 8.



Amtrak Southwest Chief Maintenance Cost
Between Newton, KS and Dalies, NM

Table 8: Estimated Bridge Operational Maintenance and Capital Maintenance Cost

Year	La Junta Sub., KS		La Junta Sub., CO		Boise City Sub., CO		Raton Sub., CO		Raton Sub., NM		Glorieta Sub., NM		Total	
	Operational	Capital	Operational	Capital	Operational	Capital	Operational	Capital	Operational	Capital	Operational	Capital	Operational	Capital
2016	\$72,913	\$729,134	\$26,786	\$267,857	\$13,335	\$133,351	\$40,462	\$404,622	\$73,533	\$735,332	\$21,354	\$213,540	\$248,383	\$2,483,835
2017	\$74,736	\$747,362	\$27,455	\$274,553	\$13,668	\$136,684	\$41,474	\$414,738	\$75,372	\$753,716	\$21,888	\$218,878	\$254,593	\$2,545,931
2018	\$76,605	\$766,046	\$28,142	\$281,417	\$14,010	\$140,101	\$42,511	\$425,106	\$77,256	\$772,559	\$22,435	\$224,350	\$260,957	\$2,609,579
2019	\$78,520	\$785,197	\$28,845	\$288,453	\$14,360	\$143,604	\$43,573	\$435,734	\$79,187	\$791,873	\$22,996	\$229,959	\$267,481	\$2,674,819
2020	\$80,483	\$804,827	\$29,566	\$295,664	\$14,719	\$147,194	\$44,663	\$446,627	\$81,167	\$811,669	\$23,571	\$235,708	\$274,168	\$2,741,689
2021	\$82,495	\$824,948	\$30,306	\$303,055	\$15,087	\$150,874	\$45,779	\$457,793	\$83,196	\$831,961	\$24,160	\$241,600	\$281,023	\$2,810,231
2022	\$84,557	\$845,572	\$31,063	\$310,632	\$15,464	\$154,646	\$46,924	\$469,237	\$85,276	\$852,760	\$24,764	\$247,640	\$288,048	\$2,880,487
2023	\$86,671	\$866,711	\$31,840	\$318,398	\$15,851	\$158,512	\$48,097	\$480,968	\$87,408	\$874,079	\$25,383	\$253,831	\$295,249	\$2,952,499
2024	\$88,838	\$888,379	\$32,636	\$326,358	\$16,247	\$162,475	\$49,299	\$492,993	\$89,593	\$895,931	\$26,018	\$260,177	\$302,631	\$3,026,312
2025	\$91,059	\$910,588	\$33,452	\$334,516	\$16,653	\$166,537	\$50,532	\$505,317	\$91,833	\$918,329	\$26,668	\$266,682	\$310,196	\$3,101,970
2016-2025	\$816,876	\$8,168,764	\$300,090	\$3,000,902	\$149,392	\$1,493,977	\$453,313	\$4,533,134	\$823,821	\$8,238,210	\$239,236	\$2,392,365	\$2,782,729	\$27,827,353
2026	\$93,335	\$933,353	\$34,288	\$342,879	\$17,069	\$170,700	\$51,795	\$517,950	\$94,129	\$941,288	\$27,335	\$273,349	\$317,951	\$3,179,519
2027	\$95,669	\$956,687	\$35,145	\$351,451	\$17,496	\$174,968	\$53,090	\$530,899	\$96,482	\$964,820	\$28,018	\$280,182	\$325,900	\$3,259,007
2028	\$98,060	\$980,604	\$36,024	\$360,238	\$17,933	\$179,342	\$54,417	\$544,172	\$98,894	\$988,940	\$28,719	\$287,187	\$334,047	\$3,340,482
2029	\$100,512	\$1,005,119	\$36,924	\$369,244	\$18,382	\$183,825	\$55,778	\$557,776	\$101,366	\$1,013,664	\$29,437	\$294,367	\$342,399	\$3,423,994
2030	\$103,025	\$1,030,247	\$37,847	\$378,475	\$18,841	\$188,421	\$57,172	\$571,720	\$103,901	\$1,039,005	\$30,173	\$301,726	\$350,959	\$3,509,594
2031	\$105,600	\$1,056,003	\$38,794	\$387,937	\$19,312	\$193,131	\$58,601	\$586,013	\$106,498	\$1,064,981	\$30,927	\$309,269	\$359,733	\$3,597,334
2032	\$108,240	\$1,082,403	\$39,763	\$397,635	\$19,795	\$197,960	\$60,066	\$600,664	\$109,161	\$1,091,605	\$31,700	\$317,001	\$368,726	\$3,687,267
2033	\$110,946	\$1,109,463	\$40,758	\$407,576	\$20,290	\$202,909	\$61,568	\$615,680	\$111,890	\$1,118,895	\$32,493	\$324,926	\$377,944	\$3,779,449
2034	\$113,720	\$1,137,200	\$41,777	\$417,765	\$20,797	\$207,981	\$63,107	\$631,072	\$114,687	\$1,146,868	\$33,305	\$333,049	\$387,393	\$3,873,935
2035	\$116,563	\$1,165,630	\$42,821	\$428,209	\$21,317	\$213,181	\$64,685	\$646,849	\$117,554	\$1,175,539	\$34,138	\$341,375	\$397,078	\$3,970,783
2026-2035	\$1,045,671	\$10,456,708	\$384,141	\$3,841,409	\$191,234	\$1,912,417	\$580,280	\$5,802,795	\$1,054,561	\$10,545,605	\$306,243	\$3,062,429	\$3,562,129	\$35,621,364



Comparison of Historical Data for Maintenance and Capital Maintenance Costs and Projected Cost Estimates

Historical routine operational and capital maintenance cost were provided by BNSF for 2004 through June of 2009. The cost data included the Hutchinson, KS to Las Animas, CO segment, La Junta, CO to Lamy, NM, and Isleta, NM to Dalies, NM. The historical costs were annualized and adjusted to our 2016 baseline cost estimate. The Hutchinson, KS to Las Animas, CO cost data was adjusted to also reflect the additional segment from Hutchinson, KS to Newton, KS. Operating cost data from January 2010 through June of 2011 for the Colorado portion of the Raton subdivision as well as Bridge Capital Improvement for 2010 to 2014 program for the Raton Subdivision are evaluated. A summary of our projected base line maintenance (operating) and capital cost is summarized in [Table 9](#).

Table 9: Comparison of Annualized Historical Data and Projected Cost 2016 Baseline Year

Segment	Operational Maintenance Cost		Capital Maintenance Cost	
	Historical	Projected	Historical	Projected
Newton to Las Animas Jct	\$191,920	\$96,699	\$208,640	\$966,991
La Junta to Lamy	\$160,827	\$113,995	\$1,511,456 ¹	\$1,139,950
Isleta to Dalies	\$8,434	\$725	\$0	\$7,250
Raton, CO 2010-2014	-	-	\$396,306	\$404,622
Raton, CO 1/10-6/11	\$16,008	\$40,462	-	-
Raton, NM 2010-2014	-	-	\$751,867	\$735,332

Unless noted, data is 2004-2009

¹ 2004-2014 data. 2004-2009 \$2,210,418 annually; 2010-2014 \$751,867 annually.

The information provided above compares annualized historical data and projected expenditures for the various segments.

The Newton, KS to Las Animas, CO historically has spent above baseline projections for bridge maintenance and less on capital maintenance. This would indicate a tendency to defer capital expenditure and spend increased amounts on maintenance. It should also be noted the historical data is for a five year period and may not be capturing actual long term expenditure. As noted previously, it is not uncommon for railroads to defer bridge capital improvement for several years and then release funds for several bridge projects in one year. The historical data indicates annual expenditures of more than \$400,000 in year 2007 and 2008 and minimal or no expenditure in years 2004, 2005, 2006, and 2009.

Historical data for La Junta, CO to Lamy, NM segment compares well with our projected costs as well as the data for the Raton Subdivision.

Historical data for Isleta, NM to Dalies, NM varies because the segment length is 15 miles and contains only seven structures.



Signal Evaluation

Assessment Methodology and Limits of Review

The assessment of potential signal maintenance and capital costs was completed by reviewing existing track chart data and existing data received from the NMDOT and Amtrak related studies. Maintenance estimates for each subdivision accounted for the daily usage of personnel and equipment for testing, repair and replacement of existing wayside signal equipment as required. Capital improvements for each subdivision were reviewed with the following assumptions:

- Between Sears, KS (Dodge City) and Newton, KS, the signal locations are being completely upgraded and therefore no additional capital improvements are foreseen.
- Capital improvement costs between Sears, KS (Dodge City) and Lamy, NM assumes a complete upgrade of every wayside signal location due to the age of existing equipment and the lack of replacement parts.
- Capital improvement costs anticipate that over the next 20 years, 20% of the highway at-grade crossings with existing active warning devices will be upgraded, requiring new active warning devices and equipment enclosures to be installed.

The signal maintenance and capital improvement cost assessment was completed by Pacific Railway Enterprises, Inc. (PRE). Their assessment was completed strictly by reviewing the existing documents provided; no physical inspection was completed of the track segments reviewed. Other information requested from the BNSF Railway Company such as FRA inspection reports and signal inspection reports were not readily available for inclusion in the assessment. The Estimated Average Annual Signal Costs are below in [Table 10](#).

Table 10: Estimated Average Annual Signal Costs

Segment	Year 1-10		Year 11-20	
	Operational	Capital	Operational	Capital
Kansas	\$ 1,966	\$ 1,361	\$ 2,517	\$ 1,742
Colorado	\$ 1,369	\$ 2,646	\$ 1,753	\$ 3,387
New Mexico	\$ 1,768	\$ 3,463	\$ 2,263	\$ 4,433
TOTAL	\$ 5,103	\$ 7,470	\$ 6,533	\$ 9,562

Note – costs are in thousand dollars of year of expenditure dollars

20 Year Projection of Signal Maintenance and Capital Maintenance Costs

Projected signal capital and maintenance cost for each subdivision were developed using a 2014 baseline estimate and a projected annual escalation in cost of 2.5% annually, as shown in [Table 11](#).



Amtrak Southwest Chief Maintenance Cost
Between Newton, KS and Dalies, NM

Table 11: Estimated Signal Operational Maintenance and Capital Maintenance Cost

Year	La Junta Sub., KS		La Junta Sub., CO		Boise City & Raton Sub., CO		Raton Sub., NM		Glorieta Sub., NM		Total	
	Operational	Capital	Operational	Capital	Operational	Capital	Operational	Capital	Operational	Capital	Operational	Capital
2016	\$1,755,181	\$1,214,980	\$399,756	\$945,116	\$822,421	\$1,416,345	\$934,206	\$1,819,185	\$643,764	\$1,271,720	\$4,555,328	\$6,667,346
2017	\$1,799,060	\$1,245,355	\$409,750	\$968,743	\$842,981	\$1,451,754	\$957,561	\$1,864,665	\$659,858	\$1,303,513	\$4,669,211	\$6,834,029
2018	\$1,844,037	\$1,276,488	\$419,994	\$992,962	\$864,056	\$1,488,047	\$981,500	\$1,911,281	\$676,355	\$1,336,101	\$4,785,941	\$7,004,880
2019	\$1,890,138	\$1,308,401	\$430,494	\$1,017,786	\$885,657	\$1,525,249	\$1,006,038	\$1,959,063	\$693,263	\$1,369,503	\$4,905,590	\$7,180,002
2020	\$1,937,391	\$1,341,111	\$441,256	\$1,043,231	\$907,799	\$1,563,380	\$1,031,189	\$2,008,040	\$710,595	\$1,403,741	\$5,028,230	\$7,359,502
2021	\$1,985,826	\$1,374,638	\$452,288	\$1,069,311	\$930,494	\$1,602,464	\$1,056,968	\$2,058,241	\$728,360	\$1,438,834	\$5,153,936	\$7,543,489
2022	\$2,035,472	\$1,409,004	\$463,595	\$1,096,044	\$953,756	\$1,642,526	\$1,083,393	\$2,109,697	\$746,569	\$1,474,805	\$5,282,784	\$7,732,077
2023	\$2,086,358	\$1,444,229	\$475,185	\$1,123,445	\$977,600	\$1,683,589	\$1,110,477	\$2,162,439	\$765,233	\$1,511,675	\$5,414,853	\$7,925,379
2024	\$2,138,517	\$1,480,335	\$487,064	\$1,151,531	\$1,002,040	\$1,725,679	\$1,138,239	\$2,216,500	\$784,364	\$1,549,467	\$5,550,225	\$8,123,513
2025	\$2,191,980	\$1,517,344	\$499,241	\$1,180,320	\$1,027,091	\$1,768,821	\$1,166,695	\$2,271,913	\$803,973	\$1,588,204	\$5,688,980	\$8,326,601
2016-2025	\$19,663,960	\$13,611,885	\$4,478,624	\$10,588,490	\$9,213,893	\$15,867,854	\$10,466,267	\$20,381,024	\$7,212,334	\$14,247,565	\$51,035,079	\$74,696,817
2026	\$2,246,780	\$1,555,277	\$511,722	\$1,209,828	\$1,052,768	\$1,813,041	\$1,195,863	\$2,328,711	\$824,072	\$1,627,909	\$5,831,205	\$8,534,766
2027	\$2,302,949	\$1,594,159	\$524,515	\$1,240,073	\$1,079,087	\$1,858,367	\$1,225,759	\$2,386,928	\$844,674	\$1,668,607	\$5,976,985	\$8,748,135
2028	\$2,360,523	\$1,634,013	\$537,628	\$1,271,075	\$1,106,064	\$1,904,827	\$1,256,403	\$2,446,602	\$865,791	\$1,710,322	\$6,126,410	\$8,966,838
2029	\$2,419,536	\$1,674,863	\$551,069	\$1,302,852	\$1,133,716	\$1,952,447	\$1,287,813	\$2,507,767	\$887,436	\$1,753,080	\$6,279,570	\$9,191,009
2030	\$2,480,024	\$1,716,735	\$564,845	\$1,335,423	\$1,162,059	\$2,001,258	\$1,320,009	\$2,570,461	\$909,622	\$1,796,907	\$6,436,559	\$9,420,785
2031	\$2,542,025	\$1,759,653	\$578,967	\$1,368,809	\$1,191,110	\$2,051,290	\$1,353,009	\$2,634,722	\$932,362	\$1,841,830	\$6,597,473	\$9,656,304
2032	\$2,605,576	\$1,803,645	\$593,441	\$1,403,029	\$1,220,888	\$2,102,572	\$1,386,834	\$2,700,590	\$955,671	\$1,887,875	\$6,762,410	\$9,897,712
2033	\$2,670,715	\$1,848,736	\$608,277	\$1,438,105	\$1,251,410	\$2,155,136	\$1,421,505	\$2,768,105	\$979,563	\$1,935,072	\$6,931,470	\$10,145,155
2034	\$2,737,483	\$1,894,954	\$623,484	\$1,474,058	\$1,282,696	\$2,209,015	\$1,457,043	\$2,837,308	\$1,004,052	\$1,983,449	\$7,104,757	\$10,398,784
2035	\$2,805,920	\$1,942,328	\$639,071	\$1,510,909	\$1,314,763	\$2,264,240	\$1,493,469	\$2,908,240	\$1,029,153	\$2,033,035	\$7,282,376	\$10,658,753
2026-2035	\$25,171,531	\$17,424,363	\$5,733,018	\$13,554,162	\$11,794,563	\$20,312,194	\$13,397,707	\$26,089,434	\$9,232,397	\$18,238,087	\$65,329,215	\$95,618,241



Conclusions

The estimated annual operational and capital maintenance costs for the BNSF to maintain the Kansas and Colorado rail to Class 2 operating standards is approximately \$15 million per year for the period 2016-2025, increasing to \$19 million per year from 2026-2035.

The estimated annual incremental operational and capital maintenance costs associated with maintaining the line to Class 4 standards for the Southwest Chief is approximately \$13.7 million per year for the period 2016-2025, increasing to \$17.4 million per year from 2026-2035. This annual \$13.7 million represents operational and capital maintenance in Kansas, Colorado and New Mexico as follows:

State	Operational	Capital	Total
Kansas	\$ 534	\$ 585	\$1,119
Colorado	\$ 973	\$2,243	\$3,216
New Mexico	\$3,046	\$6,330	\$9,376
TOTAL	\$4,553	\$9,158	\$13,711

Note – costs are in thousand dollars of year of expenditure dollars.

The above estimates did take into account the TIGER grant received by Garden City, KS to relay approximately 55 miles of track on the La Junta Subdivision. The assumption was that these improvements would be completed in 2015 prior to the renewal of the Amtrak – BNSF joint use agreement evaluated in this study.

The cost estimates are lower than Amtrak’s projected \$20 million per year maintenance funding requirements to maintain Class 4 operations on this line from 2016 to 2025.

Amtrak has not yet presented a funding request to the states for continued operations from 2026 to 2035.

This study did not foresee any large capital cost items that would create a “surprise” within the 20-year period evaluated. It is anticipated that the 2026 to 2035 year period’s annual maintenance costs will remain similar to the 2016 to 2025 costs with a 2.5% inflation factor included.

It is noted that the estimated annual maintenance costs presented in this study were based on limited data provided by BNSF and no physical inspections were completed on the track segments reviewed. The Study Team did draw on in-house and other available data to develop a reasonableness evaluation of the maintenance costs developed. Therefore, the Study Team feels the data provided will provide useful information to NMDOT.



References

- 1) Benefit-Cost Analysis of Heavy Haul Railway Track Upgrade for Safety and Efficiency, X.Liu, M.R. Saat, C.P.L. Barkan, Rail Transportation & Engineering Center, University of Illinois at Urbana-Champaign, Urbana, IL, USA, 2009
- 2) Estimating Maintenance Costs for Mixed High-Speed Passenger and Freight Rail Corridors, Allen M. Zarembski and John F. Cikota, Jr., 2008