

**Proposed Las Cruces to El Paso
Passenger Rail Service Feasibility Study
Executive Summary**

The following summary document is prepared specifically for purposes of a discussion with members of the Board of Directors of the South Central Regional Transit District on April 26, 2017, regarding the feasibility study for the proposed Las Cruces – El Paso passenger rail service. It consists of a one-page abstract that concisely states key findings and recommendations of the study, followed by pages that expand briefly on each of these findings with illustrative maps and tables.

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Abstract

- The primary study area for this project is a seven-mile buffer on either side of the BNSF rail line between terminal stations in Las Cruces and El Paso.
- The Las Cruces – El Paso corridor has a sufficient population and economy to support and benefit from a commuter rail service, and substantial public support exists for the establishment of the proposed rail service in Dona Ana County.
- To date bus-based transit services in the region do not have sufficient patronage to indicate a market for commuter rail. Current transit ridership indicates needs to: differentiate rail from bus service, improve transit connectivity, and undertake extensive transit-oriented development (TOD) around rail stations if commuter rail is to be feasible.
- Analyses based on an applicable sketch model to which local data are applied and 10 comparable commuter rail services project daily ridership for the proposed passenger rail line between 5,500 and 9,200 passengers on an average working day.
- A schedule that would serve and encourage the projected ridership would require 8 to 10 round trip train movements per day, with average headways of 30 to 45 minutes during morning and evening rush hours and headways of 120 minutes during midday.
- The rolling stock required to serve this schedule, for the higher ridership estimate consists of 4 train sets, each of which includes a locomotive and 3 passenger cars. The capital investment to acquire this rolling stock is approximately \$76.8 million for new equipment and \$13.86 for used equipment.
- Analyses based on 12 comparable rail services estimate the costs to operate the proposed service, once established, at \$15.61 to \$18.68 per one-way trip, \$26.87 to 27.46 per service mile.
- Establishment of the passenger rail service will require successful negotiations with BNSF re (a) Costs for rights of use or for acquisition of the rail line and (b) Costs to upgrade the rail infrastructure to passenger standards (c) Terms of joint use.
- Re public support to fund the proposed rail service: (a) The State of NM is currently disinclined to make further investments in railroad ownership or operations. (b) Federal programs to support passenger rail service are in flux.
- Strategic recommendations: (a) Develop a partnership with authorities of metropolitan El Paso for rail service funding, BNSF negotiations, and operations. (b) Recruit a short line railroad as the service operator and a negotiating partner. (c) With El Paso authorities, create an action plan for improved transit connections and TOD around terminal rail stations.

Study Area

The primary study area for this project is a seven-mile buffer on either side of the BNSF rail line between terminal stations in Las Cruces and El Paso. However, for some purposes all of Dona Ana County or the entire metropolitan areas of Las Cruces or El Paso are considered. The track of the proposed passenger rail line is the 42-mile existing BNSF railroad connecting El Paso Union Station to Las Cruces, running parallel to I-25. The rail links major activity centers – El Paso and Las Cruces, providing service to Sunland Park, Montoya, Canutillo, Anthony, Berino and Vado.

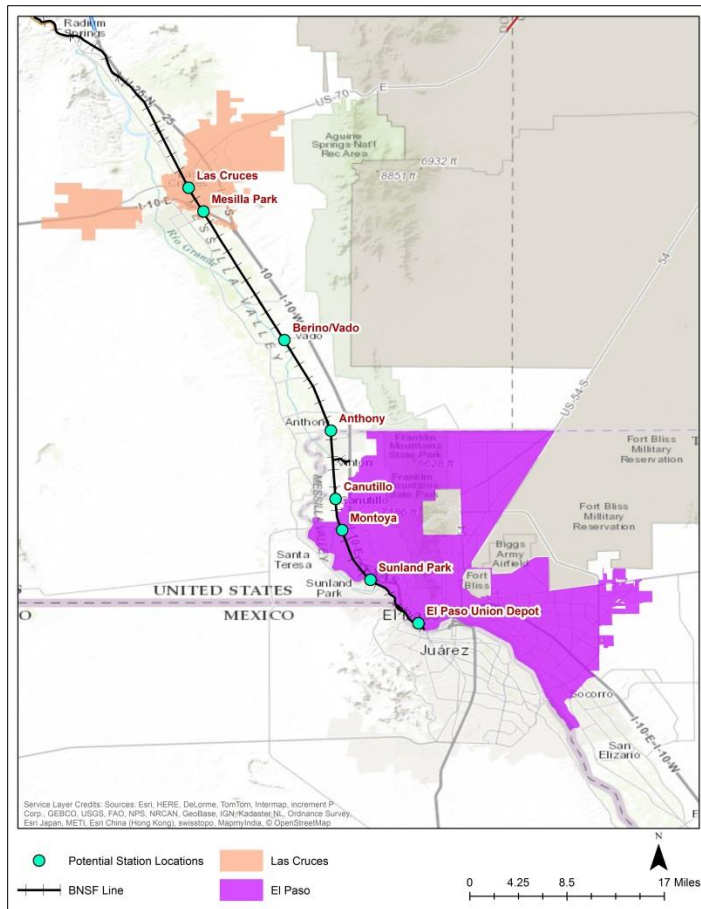


Figure 1: Proposed Line

Population & Economy of the Study Area

The Las Cruces – El Paso corridor has a sufficient population and economy to support and benefit from a commuter rail service. Communities along the corridor are growing – since 2000 population increased by 20 percent and is expected to add another 20 percent by 2030. Population and job density is the highest along I-10 & I-25 and in particular within the city limits of El Paso, Las Cruces and Anthony.

Table 1: Population Growth

	2000 Census	2014 ACS	Population Change
El Paso	563,662	669,771	18.8%
Sunland Park	13,309	14,794	11.2%
Canutillo	5,129	6,091	18.8%
Anthony	7,904	9,462	19.7%
Vado	3,003	2,781	-7.4%
Berino	No data	1,674	-
Mesilla Park	2,180	2,364	8.4%
Las Cruces	74,267	100,360	35.1%
Total	669,454	807,297	20.6%

In Dona Ana County, two large contributors to this increase have been the growing retiree population (expected to rise by 141% between 1995 and 2025) and the presence of Doña Ana Community College and New Mexico State University, which have a combined enrollment of approximately 25,000 students. El Paso also has a rapidly growing senior population and the University of Texas at El Paso with a 2016 enrollment of over 23,000 students. Between 2015 and 2020 jobs in the Las Cruces region are projected to increase from 75,450 to 84,830 (12.4%), making it one of the fastest growing employment centers in New Mexico. By 2030, the El Paso MPO has projected that the region will gain approximately 138,000 new jobs, thereby expanding the job base by 47 percent. In keeping with concentrations of seniors and students in the regional population, “Education and Health” services is the employment category with the largest number of workers in both Dona Ana County and metropolitan El Paso. The universities in Las Cruces and El Paso are each cultivating centers of high-tech manufacturing linked to their engineering and research departments. Seniors, college students, and millennials who are the typical employees of knowledge-based firms all tend to be users of transit services in higher percentages than the general US population.

Approximately 11,800 Dona Anna residents (5.7% of the County population) commute to the El Paso region, while over 6,500 El Paso residents work in Dona Ana County, demonstrating the two regions’

interdependence. It is also notable that 9.7% of Dona Ana workers and 12.0% of El Paso region workers, indicating a readiness to commute through a workable means other than driving alone.

Another factor that drives the need and opportunity for transit in the study area is affordability. Traditionally affordability was measured as the cost of housing not exceeding 30% of income. CNT's Housing and Transportation Index combines housing and transportation costs to provide an expanded view of affordability (not more than 45% of income). Residents of Dona Ana and El Paso counties on average pay more than 60% of their income towards housing and transportation costs. However, communities along the proposed rail corridor are the region's most affordable for their residents, primarily because these relatively urban neighborhoods have the regions' best access to transit and amenities within walking distance; so that some residents can live without owning a car for every working adult. Increased transit service can heighten this advantage.

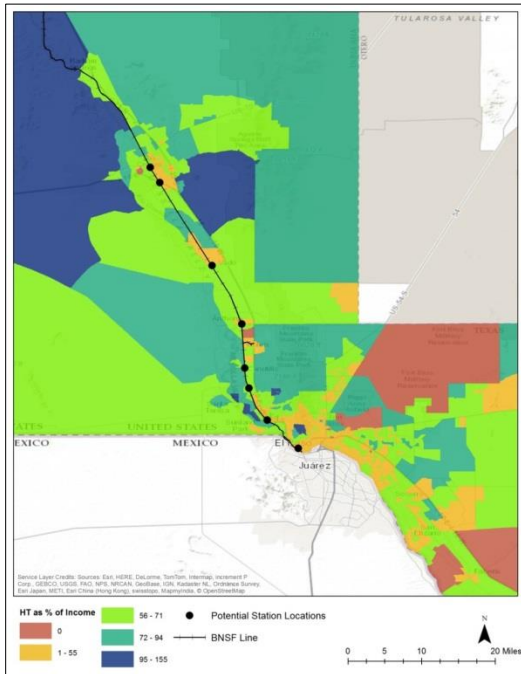
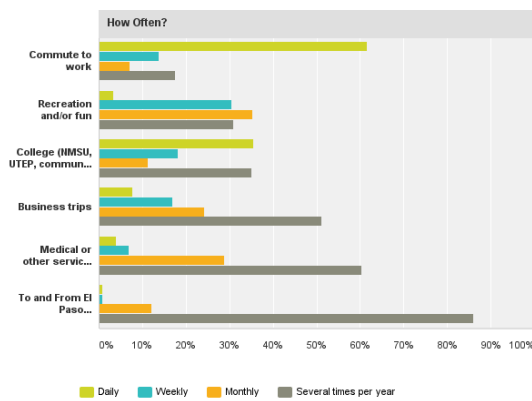


Figure 2: Housing & Transportation Costs as Percent of Income

Substantial public support exists for the establishment of the proposed rail service in Dona Ana County. In conjunction with public meetings held to gather public opinion regarding the proposed passenger rail service, Ngage New Mexico conducted a survey of Dona Ana County residents regarding their thoughts about how they might use the service and how they would like to see it operated. Although this survey was not randomized nor sought to produce a statistically significant finding, more than 1,000 residents completed the survey, demonstrating substantial public interest in the proposed service. Over 87% of survey respondents said that they would use the rail transit service at least occasionally. Of the 305 respondents who said they would use the rail service daily, 61.6% would commute to work, 35.5% would reach a college campus, and 3.9% would go to medical or other professional service appointments.



How Often?	Daily	Weekly	Monthly	Several times per year	Total
Commute to work	61.57% 173	13.88% 39	7.12% 20	17.44% 49	281
Recreation and/or fun	3.41% 28	30.45% 250	35.32% 290	30.82% 253	821
College (NMSU, UTEP, community college)	35.45% 78	18.18% 40	11.36% 25	35.00% 77	220
Business trips	7.79% 25	16.82% 54	24.30% 78	51.09% 164	321
Medical or other service appointments	3.94% 15	6.82% 26	28.87% 110	60.37% 230	381
To and From El Paso International Airport	0.92% 6	0.92% 6	12.08% 79	86.09% 563	654

Use of Existing Transit Services

To date bus-based transit services in the region do not have sufficient patronage to indicate a market for commuter rail.

The BNSF track and proposed passenger rail line parallels a segment of the I-10 Expressway that connects Las Cruces and El Paso. By 2035, traffic volumes on I-10 are projected to double and could result in congestion if proper planning is not done. However, in 2016 the highway capacity (the ratio of traffic volume to the capacity of the roadway) on this segment of I-10 was between 23% and 34% representing reasonably free flow conditions. Speeds on the interstate might help explain the high number of crashes in Dona Ana County, which had the second highest numbers of crashes among New Mexico counties during 2014 (3,779). During public meetings, several Dona Ana County residents pointed to unsafe conditions on I-10 as a reason to support passenger rail. But in general, the proposed passenger rail service will be offering an alternative to an expressway connection that is not currently congested.

The I-10 infrastructure is used by the New Mexico Park & Ride service's Gold Route, which began operations in 2009. The Gold Route provides 6 round trips and 2 one way trips between El Paso and Las Cruces a day. It picks up passengers from the Intermodal Terminal in Las Cruces and makes stops at New Mexico State University and Anthony, Texas before proceeding to the West Side and Downtown Transit Centers in El Paso, Texas. Both termini are served by local transit buses – RoadRunner and Sun Metro. The Gold Route service is only available on weekdays and does not operate on 10 national holidays. Ridership on this service has been flat and has attracted only a small fraction of the passenger counts needed to support passenger rail service.

NMDOT Ridership

	Average Daily Boardings	Days of Operation*	Annual Ridership	Trips
2013	244.6	250	61,150	10 round trips
2014	246.9	250	61,725	6 round trip & 2 one-way
2015	241.4	250	60,350	6 round trip & 2 one-way

*Operates on weekdays only; plus 10 holidays

Intra-city bus transit services in Las Cruces and El Paso provide connectivity from transit centers to major locations within their cities and carry significant numbers of passengers – 13,450,000 for Sun Metro in El Paso and 794,000 for RoadRunner in Las Cruces. However, ridership gains have alternated with declines in recent years.

The South Central Regional Transit District (SCRTD), which connects towns in Dona Ana, Otero, and Sierra counties, is growing aggressively from a small base, through its development of multiple routes and sharp marketing characterized by its new web site. SCRTD can provide an important connecting function for a new passenger rail service, particularly for its intermediate stations, but its ridership -- estimated at 26,000 passengers in 2017 -- is still small compared to the thousands of daily riders needed to support passenger rail.

In light of recent and current levels of transit service in the Las Cruces – El Paso corridor, it should be recognized that the region has lacked intercity public transit in recent decades and that during the last two generations the region has grown around an infrastructure designed for automobile traffic. The region's keen interest and latent market for quality transit service stems from an awareness of the success of transit-oriented development (TOD) in other US metropolitan areas and recognition that rail transit is an amenity desired seniors and millennial knowledge workers – growing elements of the region's population – among others. However, if passenger rail is to succeed in the corridor's current environment, several strategic considerations will need to be built into the region's long-range transportation and economic development plans:

- Passenger rail is and should be differentiated as a transportation amenity that is unlike and in some respects more desirable than bus transportation.
- As a fixed guideway mode of transportation, passenger rail can act as a magnet for employment center, commercial, and residential development around transit stations; and, as amply demonstrated, will do so when long-range development planning is integrated with planning for passenger rail.

Projected Ridership and Station Area Development

Analyses based on an applicable sketch model to which local data are applied and 10 comparable commuter rail services project daily ridership for the proposed passenger rail line between 5,500 and 9,200 passengers on an average working day.

In order to project ridership for the Las Cruces – El Paso service, CNT applied one of the few sketch models available in the professional literature for the specific purpose of estimating ridership for commuter rail service, as opposed to intra-city transit lines. This model incorporates some 10 local factors, among which significant inputs are whether or not the terminal station of the service is a transit center – meaning minimally that it is served by four or more connecting bus routes – as well as the number of residents within a two-mile radius of the station and the number of jobs within a half-mile radius.

Whether or not the terminal stations for the proposed rail service in Las Cruces and El Paso are terminal stations is a matter of judgement. Neither station is the primary interline bus terminal for its region; however, in both cities, the primary bus interline center is less than a mile from the terminal train station, and 4 or more bus routes could readily be connected to the train station. Currently, neither of the terminal station areas is well developed with housing or jobs. However, both stations are within a mile of the central business district of their respective cities, and ambitious plans for transit-oriented development (TOD) in each station area have been developed. So CNT has projected ridership based on the possibility that the terminal stations are or are not transit centers, and considered several other factors in the sketch model to estimate six possible level of ridership, per the following table.

Table 1: Average Daily Ridership

Station	Option 1A - Not a Transit Center, 2014	Option 1B - Transit Center, 2014	Option 2A - Not a Transit Center, 2030	Option 2B - Transit Center, 2030	Option 3A - Not a Transit Center, 2040	Option 3B - Transit Center, 2040
El Paso Union Depot	1871	3115	2313	3851	2628	4376
Sunland Park	600	600	647	647	671	671
Montoya	787	787	843	843	869	869
Canutillo	-	-	-	-	-	-
Anthony	911	911	980	980	1007	1007
Berino/Vado	-	-	-	-	-	-
Mesilla Park	457	457	492	492	505	505
Las Cruces	938	1562	1045	1741	1096	1825
Total	5565	7434	6320	8554	6777	9254
20% Contingency	4452	5947	5056	6843	5422	7403

In its ridership estimates CNT looked to comparable commuter rail systems around the nation and selected ten operating services that are similar to the Las Cruces – El Paso Corridor in several respects: length of the commuter rail line, a pairing of the connected cities that includes a substantial “suburban” terminal city with a major city or moderate size, avoidance of the nation’s largest cities that have massive transit systems and multiple, long-established commuter rail lines. Key figures for these comparable systems are summarized in the following table.

Table 2: Comparable Commuter Rail Lines

Name	Santa Cruz-Watsonville	Boston-Manchester, NH, by Lowell project	Denton County A-Train (Dallas to Trinity Hills by Denton)	FrontRunner (Salt Lake City)	Altamont Corridor Express (ACE) Stockton - San Jose	Denver to Denver Airport A-line commuter rail line	Capital Metro Greater Austin	Coaster NCTD San Diego-Oceanside	Northstar Northwestern suburbs to Minneapolis	Music City Star Nashville
Year	Study of 2015 Scenario G	Project, construction in 2017	Opened 2011	Northern Part: 2008 Southern Part: 2012	Opened in 1998	Opened April 22, 2016	Opened 2010	Opened 1995	Opened 2009	Opened 2006
Distance	22 miles 40min	37 miles	28 miles	Northern Part: 50 miles from Ogden to SLC Southern Part: 80 miles from SLC to Provo	86 miles	22 miles 37min other projects in process Gold-line ;11.2 miles, expected summer 2016 Westminster line: 6.2-miles, expected fall 2016	32miles	41 miles	40 miles	32 miles
Population	SC: 270,000 WL 50,000	B:655,000 M: 110,000	Denton: 123,099 Dallas: 1,258,000	SLC: 200,000 Ogden: 83,000 Provo: 112,000	SJ: 1,000,000 Stockton: 300,000	D: 650,000 Airport: 54 million passengers in 2015 (18th busiest airport in the world)	Austin : 850,000 Northern suburbs: fastest growth in the US	San Diego: 1,350,000 Oceanside: 170,800	Minneapolis : 400,000 Big Lake: 10,000	Nashville: 650,000 Lebanon (Tennessee) 23,000
Ridership	5,500 per weekday	650,000 per year	1,900 per day	16,800 per day (5,000 for the Northern Part in 2012)	3,700 per day	37,900 – estimated average daily ridership	2,900 per day	5,600 per day	3,100 per day	1,225 per day
Frequency	60 weekday trains	16 train per day	26 train per day	30mn (peak) 60mn (off-peak)	Every Hour 4 round trip per	15minues	30min (peak) 60min (off-peak)	Mostly SB am – approx. 40 min	Only: 5-7.30am SB- approx. 30min	60min

					day			NB pm – approx. 40min	4-6.30pm NB- approx. 30min	
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Comparison with these systems shows that the ridership for Las Cruces – El Paso projected by sketch modeling falls well within the range of ridership for comparable commuter rail systems. However, projected ridership for our service is within the upper third for comparable systems. In light of this comparison and our region’s current record of low transit ridership, CNT has thought it prudent to also consider a range of ridership estimates that is 20% lower than the range of ridership projected by the sketch model.

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Proposed Service Plan

A schedule that would serve and encourage the projected ridership would require 8 to 10 round trip train movements per day, with average headways of 30 to 45 minutes during morning and evening rush hours and headways of 120 minutes during midday. These schedules consider several factors, namely ideal service frequency, minimizing the number of train sets, allocation of express and all-station trips, and intermodal riders.

The allocation of express and all-station trips has also been considered. Since the rail should serve those wishing to commute from terminal and non-terminal stations, it is important that morning and evening peak service include both express and all-station options. Accordingly, all proposed schedules include at least one of each service type from both terminal stations.

These schedules also recognize that commuters using a subsequent mode of transit need to arrive well in advance of business hours. Accordingly, the schedules provide that peak morning trains arrive in El Paso and Las Cruces before 8:30 a.m. and in most cases before 8:00 a.m.

EIGHT ROUND TRIPS

Northbound							
El Paso Union Depot	Sunland	Montoya	Canutillo	Anthony	Berino/Vado	Mesilla Park	Las Cruces
7:00:00	7:10:36			7:29:06			7:52:54
8:30:00	8:40:36	8:50:24	8:58:06	9:09:06	9:22:42	9:40:30	9:42:54
10:30:00	10:40:36	10:50:24	10:58:06	11:09:06	11:22:42	11:40:30	11:42:54
12:30:00	12:40:36	12:50:24	12:58:06	13:09:06	13:22:42	13:40:30	13:42:54
14:30:00	14:40:36	14:50:24	14:58:06	15:09:06	15:22:42	15:40:30	15:42:54
16:15:00	16:25:36			16:44:06			17:07:54
17:30:00	17:40:36	17:50:24	17:58:06	18:09:06	18:22:42	18:40:30	18:42:54
18:45:00	18:55:36			19:14:06			19:37:54

Southbound							
Las Cruces	Mesilla Park	Berino/Vado	Anthony	Canutillo	Montoya	Sunland	El Paso Union Depot
7:00:00			7:28:48			7:47:18	7:52:54
8:00:00	8:07:24	8:25:12	8:38:48	8:49:48	8:57:30	9:07:18	9:12:54
10:30:00	10:37:24	10:55:12	11:08:48	11:19:48	11:27:30	11:37:18	11:42:54
12:30:00	12:37:24	12:55:12	13:08:48	13:19:48	13:27:30	13:37:18	13:42:54
14:30:00	14:37:24	14:55:12	15:08:48	15:19:48	15:27:30	15:37:18	15:42:54
16:00:00			16:28:48			16:47:18	16:52:54
17:00:00	17:07:24	17:25:12	17:38:48	17:49:48	17:57:30	18:07:18	18:12:54
17:45:00			18:13:48			18:32:18	18:37:54

NINE ROUND TRIPS

Northbound								
El Paso Union Depot	Sunland	Montoya	Canutillo	Anthony	Berino/Vado	Mesilla Park	Las Cruces	
6:30:00	6:40:36	6:50:24		6:58:06	7:09:06	7:22:42	7:40:30	7:42:54
7:45:00	7:55:36				8:14:06			8:37:54
9:30:00	9:40:36	9:50:24		9:58:06	10:09:06	10:22:42	10:40:30	10:42:54
10:30:00	10:40:36	10:50:24		10:58:06	11:09:06	11:22:42	11:40:30	11:42:54
12:30:00	12:40:36	12:50:24		12:58:06	13:09:06	13:22:42	13:40:30	13:42:54
14:30:00	14:40:36	14:50:24		14:58:06	15:09:06	15:22:42	15:40:30	15:42:54
16:15:00	16:25:36				16:44:06			17:07:54
17:30:00	17:40:36	17:50:24		17:58:06	18:09:06	18:22:42	18:40:30	18:42:54
19:10:00	19:20:36				19:39:06			20:02:54

Southbound								
Las Cruces	Mesilla Park	Berino/Vado	Anthony	Canutillo	Montoya	Sunland	El Paso Union Depot	
6:00:00	6:07:24	6:25:12		6:38:48	6:49:48	6:57:30	7:07:18	7:12:54
7:00:00				7:28:48			7:47:18	7:52:54
8:30:00	8:37:24	8:55:12		9:08:48	9:19:48	9:27:30	9:37:18	9:42:54
10:30:00	10:37:24	10:55:12		11:08:48	11:19:48	11:27:30	11:37:18	11:42:54
12:30:00	12:37:24	12:55:12		13:08:48	13:19:48	13:27:30	13:37:18	13:42:54
14:30:00	14:37:24	14:55:12		15:08:48	15:19:48	15:27:30	15:37:18	15:42:54
16:00:00				16:28:48			16:47:18	16:52:54
17:15:00	17:22:24	17:40:12		17:53:48	18:04:48	18:12:30	18:22:18	18:27:54
17:45:00				18:13:48			18:32:18	18:37:54

TEN ROUND TRIPS

Northbound								
El Paso Union Depot	Sunland	Montoya	Canutillo	Anthony	Berino/Vado	Mesilla Park	Las Cruces	
6:15:00	6:25:36	6:35:24		6:43:06	6:54:06	7:07:42	7:25:30	7:27:54
7:00:00	7:10:36				7:29:06			7:52:54
8:30:00	8:40:36	8:50:24		8:58:06	9:09:06	9:22:42	9:40:30	9:42:54
9:45:00	9:55:36				10:14:06			10:37:54
11:15:00	11:25:36	11:35:24		11:43:06	11:54:06	12:07:42	12:25:30	12:27:54
13:15:00	13:25:36	13:35:24		13:43:06	13:54:06	14:07:42	14:25:30	14:27:54
15:15:00	15:25:36				15:44:06			16:07:54
17:15:00	17:25:36	17:35:24		17:43:06	17:54:06	18:07:42	18:25:30	18:27:54
18:00:00	18:10:36				18:29:06			18:52:54
19:00:00	19:10:36	19:20:24		19:28:06	19:39:06	19:52:42	20:10:30	20:12:54

Southbound								
Las Cruces	Mesilla Park	Berino/Vado	Anthony	Canutillo	Montoya	Sunland	El Paso Union Depot	
6:30:00	6:37:24	6:55:12		7:08:48	7:19:48	7:27:30	7:37:18	7:42:54
7:00:00				7:28:48			7:47:18	7:52:54
8:00:00	8:07:24	8:25:12		8:38:48	8:49:48	8:57:30	9:07:18	9:12:54
9:00:00				9:28:48			9:47:18	9:52:54
10:30:00	10:37:24	10:55:12		11:08:48	11:19:48	11:27:30	11:37:18	11:42:54
12:30:00				12:58:48			13:17:18	13:22:54
14:30:00	14:37:24	14:55:12		15:08:48	15:19:48	15:27:30	15:37:18	15:42:54
16:15:00	16:22:24	16:40:12		16:53:48	17:04:48	17:12:30	17:22:18	17:27:54
17:30:00				17:58:48			18:17:18	18:22:54
19:00:00	19:07:24	19:25:12		19:38:48	19:49:48	19:57:30	20:07:18	20:12:54

Rolling Stock Costs

The rolling stock required to serve the proposed schedule, for the higher ridership estimate consists of 4 train sets, each of which includes a locomotive and 3 passenger cars. The capital investment to acquire this rolling stock is approximately \$76.8 Million for new equipment and \$13.9 Million for used equipment.

The chart below compares data that could impact the type of vehicle [Diesel Multiple Unit (DMU) or locomotive (LMV)] used by 13 operational or proposed commuter lines in the United States. This data includes commuter line distance, population, weekday ridership, average passengers per ride, and an estimated peak capacity per ride. Generally, commuter lines that cover mid to long distances (between 40 and 90 miles) tend to use locomotives and passenger cars, while commuter lines that run across shorter distances (20 to 35 miles) use DMU vehicles.

Based on the Las Cruces-El Paso Corridor's population, the projected ridership, and the proposed distance of the commuter line, the Las Cruces-El Paso commuter line would be most similar to the San Diego-Oceanside Coaster and the Minneapolis Northstar. The Coaster covers 41 miles, makes 30 trips per day, has an average daily ridership of 5,600 per day, and has an average passenger rate per trip of 255. The Northstar covers 40 miles, makes 12 trips per day, has a daily ridership of 3,100 per day, and has an average passenger per trip rate of 258. For comparison, the proposed Las Cruces-El Paso commuter line is projected to cover at least 43 miles, make 16-20 trips per day, have an average daily ridership between 4,452 and 7,404 passengers, and average between 361 and 481 passengers per ride during peak hours and 278 and 370 passengers per ride during non-peak hours. Both the Coaster and the Northstar use diesel electric locomotive engines and Bombardier bi-level coaches. The bi-level coaches have a greater capacity for seated passengers (between 136 and 162) compared to the DMU vehicles (between 91 and 108), which may be advantageous for commuter lines with passengers travelling longer distances.

Given the information provided in the following table, it seems that distance traveled and population size have large impacts on the daily ridership and average ridership per ride for commuter rail lines. Commuter lines that use locomotives generally have higher ridership; they also travel greater distances and access larger populations.

Table 2: Commuter Line Equipment & Ridership Comparison Chart

Name	Santa Cruz-Watsonville	Boston-Manchester, NH, by Lowell project	Denton County A-Train (Dallas, to Trinity Hills by Denton)	Front Runner (Salt Lake City)	Altamont Corridor Express (ACE) Stockton - San Jose	Denver to Denver Airport A-line commuter rail line	Capital Metro Greater Austin	Coaster NCTD San Diego-Oceanside	Northstar Northern suburbs to Minneapolis	Music City Star Nashville	Fort Worth and Dallas TRE (Trinity Railway Express)	New London and New Haven Shoreline East	Las Cruces-El Paso Commuter Rail Estimates
Locomotive (LMV) or Multiple Unit (DMU)?*	DMU (maybe FRA compliant)	LMV	DMU	LMV	LMV	EMU	DMU	LMV	LMV	LMV	LMV	LMV	LMV
Type of Locomotive (LMV) /DMU	Diesel-electric multiple unit <i>studied</i>	Diesel-electric locomotive engine <i>studied</i>	Diesel-electric multiple unit engine	Diesel-electric locomotive engine	Diesel-electric locomotive engine	Electric multiple unit	Diesel-electric multiple unit engine	Diesel-electric LMV engine	Diesel-electric LMV engine	Diesel-electric LMV engine	Diesel- LMV engine and Diesel electric multiple units	Diesel-electric LMV engine	Diesel LMV Engine <i>recommended</i>
Carriage Car Manufacturer/ Fleet Size			(11) Stadler GTW (motor and carriage in same vehicle)	(22) bi-level Bombardier coaches (25) refurbished ex-New Jersey Comet Is (16) locomotives	(30) bi-level Bombardier coaches (5) F40PH-2C engines (1) F40PH-3C engine	(37) Hyundai-Rotem EMU (motor and carriage in same vehicle)	(6) Stadler GTW (motor and carriage in same vehicle)	(28) Bombardier bi-level coaches (7) locomotives	(17) Bombardier bi-level coaches (6) locomotives	(7) former Metra bi-level gallery cars (likely Nippon Sharyo) (4) locomotives	(7) EMD F59PH IV and (2) EMD F59PHI Locomotives. (13) DMU: Budd Rail Diesel (15) Bombardier Transportation bi-level cabs, (10) Hawker-Siddeley bi-level	(6) GH40-2H and (12) GE-P40DC Locomotives (10) Bombardier Transportation bi-level cabs, (33) Mafersa Coaches	Likely 4 locomotives, 8-12 passenger cars <i>recommended</i>
Car-locomotive cost	DMU: \$8-10M Locomotives & trailer cars: \$3M (used); \$12-16M (new)	\$23.3 million est. for purchase of rolling stock	\$7.5 million each vehicle	Bombardier coaches: \$2.2 M each	Bombardier coaches: ~\$2.2 M each		\$36.04 M total (~\$6M each vehicle)						\$3.465M (used); \$14.2-\$19.2M (new)
Car-locomotive (LMV) train configuration	DMU: Married pair LMV: one loc. + two trailers	One LMV + four coaches			One LMV + six-seven passenger cars	DMU Married pair	Likely DMU married pair		One LMV, three or four cars	One LMV, two cars	One LMV, three cars	One LMV, four cabs	One LMV, two-three cars <i>recommended</i>

Carriage Car Capacity			200 passengers each, 108 seated and 92 standing	Bombardier cars: 136-162 seated; up to 360 total with standing Comet 1s: N/A	Bombardier cars: 136-162 seated; up to 360 total with standing	91 seated passengers and 78 standing; will be in "married pair" configuration	200 passengers each, 108 seated and 92 standing	Bombardier cars: 136-162 seated; up to 360 total with standing	Bombardier cars: ~140 seated; up to 355 with standing	Gallery cars: 155-169 passengers	Bombardier cars: 136-162 seated; up to 360 total with standing, Budd RDC's: 96 seated	Bombardier cars: 136-162 seated; up to 360 total with standing, Mafersa cabs: 100 seated	
Rail Distance	32 miles <i>proposed</i>	53-46 miles <i>proposed</i>	21 miles	88 miles	85 miles	23.5 miles	32 miles	41 miles	40 miles	32 miles	34 miles	45 miles (est.)	43-48 miles <i>proposed</i>
Population	SC: 270,000 WL 50,000	B:655,000 M: 110,000	Denton: 123,099 Dallas: 1,258,000	SLC: 200,000 Ogden: 83,000 Provo: 112,000	SJ: 1,000,000 Stockton: 300,000	D: 650,000 Airport: 54 million passengers in 2015 (18th busiest airport in the world)	Austin : 850,000 Northern suburbs: fastest growth in the US	San Diego: 1,350,000 Oceanside: 170,800	Minneapolis: 400,000 Big Lake: 10,000	Nashville: 650,000 Lebanon (Tennessee) 23,000	Dallas: 1,258,000 Fort Worth: 792,727	New London: 27,545 New Haven: 130,660	Las Cruces-El Paso Corridor: 456,885
Number of Daily Trips	Scenario G :60 trips daily - 30 round trip	50 trips daily - 25 roundtrip (Manchester commuter plan); 16 trips daily (Nashua plan)	60 trips daily - 30 roundtrip	56 trips daily - 28 roundtrip	8 trips daily	144 trips daily	38 trips daily	22 trips daily - 11 roundtrip	12 trips daily	12 trips daily - 6 roundtrip	70 trips daily - 35 round trips)	42 trips- 21 round trip	16 to 20 trips daily - 8 to 10 roundtrip <i>proposed</i>
Fares (one way)	N/A	N/A	\$1.50	\$2.50	\$4.50-\$13.75	\$2.60-\$9	\$2.75	\$4-\$5.50	\$3-\$6	\$5.25	\$4.15	\$2.89	TBD
Ridership	5,500 per weekday estimated	3,230 (Manchester); 1,170 (Nashua)	1,900 per day	16,800 per day (5,000 for the Northern Part in 2012)	3,700 per day	37,900 - estimated average daily ridership	2,900 per day	5,600 per day	3,100 per day	1,225 per day	6900 per day	2,200 per day	4,452 (<i>low estimate with 20% contingency</i>) - 7404 (<i>high estimate with 20% contingency</i>) per day*
Average Passengers per Trip (ridership divided by number of daily trips)	92	65 (Manchester) 73 (Nashua)	31	300	463	263	76	255	258	102	95	52	278-370
Estimated Peak Capacity per Trip (130% of Avg. rounded)	120	85 (Manchester) 95 (Nashua)	40	390	602	342	99	332	335	133	128	68	361-481

Relation of Capacity to type of vehicle	Short distance Mid-sized population DMU - fewer seats	Mid distance Mid-sized commuter population Locomotive (other commuter lines out of Boston also use locomotive)	Short distance Small commuter population DMU - seems to run too many trains per day for ridership	Long distance Large commuter population Locomotive - UTA owns most of track but shares right of way with UP for a portion	Long Distance Mid-sized commuter population Locomotive with limited service → more passengers per trip	Short Distance Large commuter population DMU with frequent service and high ridership	Short distance Small-mid-sized population DMU better ridership than Denton, perhaps still too frequent	Mid distance Midsized commuter population Locomotive with decent daily ridership	Mid distance Midsized commuter population Locomotive with good daily ridership	Short distance Small commuter population Locomotive – frequency of trips seem appropriate to ridership	Short distance Large population. High frequency trips with large seating ability	Mid distance Small commuter population Locomotive with low daily ridership	Mid distance Midsized commuter population Most similar to San Diego-Oceanside and Minneapolis
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Rolling Stock Capital Costs

1. Locomotive engines

This report will make its recommendations for vehicle purchases based on the assumption that the Las Cruces-El Paso commuter line will use locomotive vehicles rather than DMU units.

2. Number of locomotives

Based on the proposed schedules in the Estimated Ridership and Proposed Service Plan, the Las Cruces-El Paso line will make between eight and ten round trips per day. The number of locomotives needed to operate during peak hours is three train sets. A fourth train set is required to allow for repairs and emergencies.

3. Number of passenger cars

The locomotive based commuter rail lines analyzed in this study each use one locomotive to pull between two and seven passenger cars, depending on the capacity needed. The majority of the locomotive based lines use bombardier bi-level cars, which can seat up to 162 people per car and accommodate nearly 360 passengers including those standing. As the Estimated Ridership and Proposed Service Plan assumes that most passengers on the Las Cruces-El Paso line will be riding for the majority of the distance, this report will use the seated number to estimate the Las Cruces-El Paso line's passenger carriage needs.

Average ridership on the proposed Las Cruces-El Paso line is currently estimated at 278-370 passengers per trip, which leads to an estimate of 361-481 passengers at peak capacity. As an initial recommendation, this report suggests that the need for passenger cars be based on the projected peak levels for

passengers per ride. Three cars per train will allow each train to seat all passengers even during peak hours.¹ Thus, in order to support eight to ten round trips per day with three passenger cars per train, the Las Cruces-El Paso line will need 9-12 passenger cars, assuming the purchase of a spare trainset.

4. *Cost to purchase locomotives and passenger cars*

Based on the experience comparable railroads, the following chart, shows cost estimates based on the amount of equipment needed to meet the estimated ridership and service schedule needs of the Las Cruces – El Paso service.

Table 3: Las Cruces-El Paso Commuter Line Equipment Summary Chart - Locomotive

Estimated Number Passengers per trip during Peak Hours	# of locomotives	Total # of Passenger Cars (3 per train set)	Estimated Cost, New Equipment per unit (train set)	Estimated Cost, Used Equipment per unit (train set)	Estimated Cost, New Equipment total (unit cost multiplied by # train sets)	Estimated Cost, Used Equipment total (unit cost multiplied by # train sets)
361-481	3-4	9-12	\$14.2-\$19.2M	\$3.465M	\$42.6M (min)-\$76.8M (max)	\$10.39M (min)-\$13.86M (max)

As a cautionary note, while the difference between the costs of new and used rolling stock is very large, reliability is essential to rail operations, and some smaller passenger rail operations have faced repeated difficulties from relying on second hand equipment.

¹ It should be noted that adding a third car to accommodate for peak hours would likely increase fuel costs. If feasible, one advantage of using DMU vehicles would be that cars can be added as needed during service, thereby resolving this problem and reducing energy costs. https://sccrtc.org/wp-content/uploads/2016/02/RailTransitStudy_FullDoc.pdf

Operating Costs

Analyses based on 12 comparable rail services estimate the costs to operate the proposed service, once established, at \$15.61 to \$18.68 per one-way trip, \$26.87 to 27.46 per service mile.

1. Operating and Maintenance Data from Comparable Commuter Services

CNT used data on the same comparable commuter rail services that it compared in regard to capital costs to estimate the El Paso – Las Cruces line’s operating and maintenance expenses, drawing data on these services from the National Transit Database and the American Public Transportation Association (APTA) Data Handbook. The most recent data available from the National Transit Database is from 2015. This data is summarized in the following tables.

Table 4: Operating Costs for Comparable Commuter Rail Lines

Name	Denton County A-Train	FrontRunner Salt Lake City	Altamont Corridor Express	Denver Airport A-line	Capital Metro Greater Austin	Coaster NCTD San Diego-Oceanside	Northstar Minneapolis	Music City Star Nashville	Fort Worth-Dallas Trinity Railway Express	New London and New Haven Shoreline east
Wages & Salaries	\$357K	\$12.65M	\$2.1M	\$33M	\$1.7M	\$1.8M	\$2.9M		\$1.7M	
Fuel	\$2K	\$4.58M	\$1.48M	\$127K	\$0	\$2.1M	\$993K	\$708K		
Service Costs	\$1.3M		\$1.27M	\$34.8M	\$3.4M	\$3.4M	\$2.1M	\$888K	\$2.25M	\$2.11M
Materials & Supplies	\$122K		\$846K	\$10.28M	\$482K	\$150K	\$669K	\$25K	\$94K	\$1.8K
Total Annual Operating Expense	\$13.2M	\$39.3M	\$16.67M	\$111M	\$14.79M	\$19.7M	\$15.7M	\$4.68M	\$24M	\$33.9M

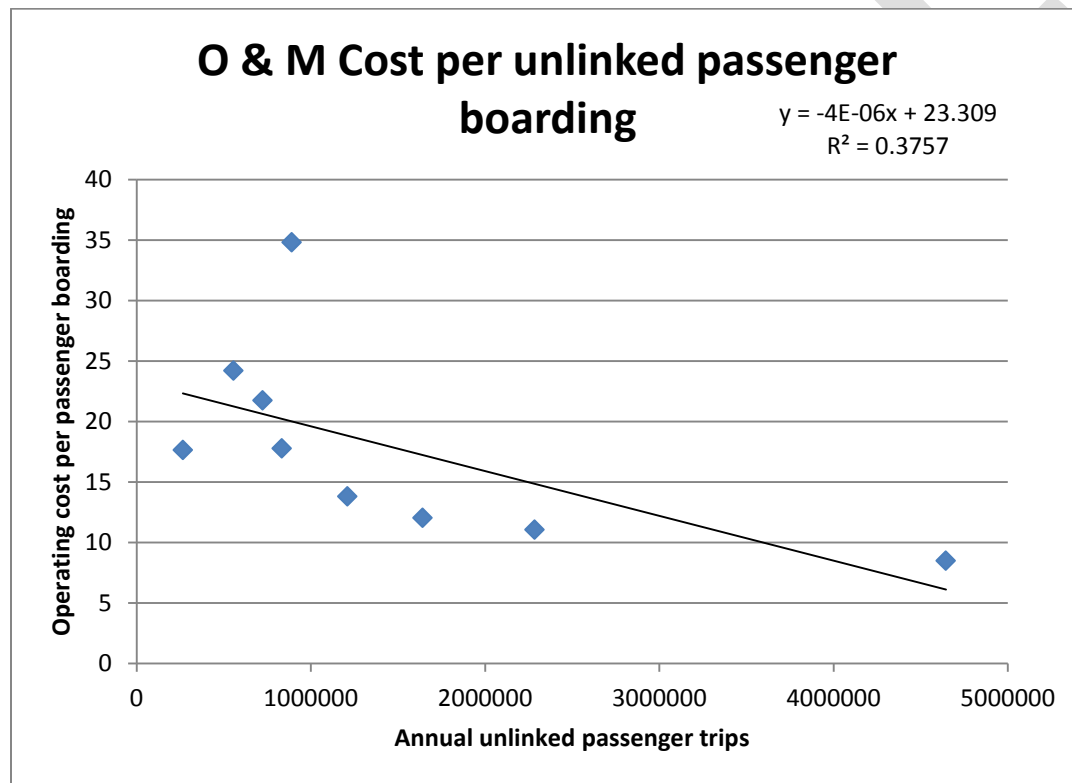
Table 5: Operating Statistics for Comparable Rail Lines

Name	Denton County A-Train	FrontRunner Salt Lake City	Altamont Corridor Express	Capital Metro Greater Austin	Coaster NCTD San Diego-Oceanside	Northstar Minneapolis	Music City Star Nashville	Fort Worth-Dallas Trinity Railway Express	New London and New Haven Shoreline east	Commuter Rail NTD Annual Average
Locomotive or Multiple Unit?	DMU	Locomotive	Locomotive	DMU	Locomotive	Locomotive	Locomotive	Locomotive	Locomotive	
Annual Commuter Rail Capital Costs										
Operating Expenses	\$13.4M	\$39.3M	\$16.7M	\$14.8M	\$19.7M	\$15.7M	\$4.7M	\$24M	\$30.9M	
Annual Ridership	494K	4.6M	1.3M	728K	1.2M	650K	200K	2.1M	520K	
Annual Unlinked Passenger Trips	555,423	4,645,307	1,209,755	833,195	1,641,525	722,637	265,527	2,283,895	889,598	
Operating Cost per Unlinked Passenger Trip	\$24.18	\$8.47	\$13.78	\$17.76	\$12.03	\$21.74	\$17.63	\$11.04	\$34.80	\$11.12
Operating Cost per Vehicle Revenue Mile	\$21.51	\$7.38	\$17.54	\$52.89	\$14.15	\$29.71	\$ 23.42	\$20.84	\$16.56	
Fare Revenue	\$806K	\$7.1M	\$8M	\$2.5M	\$7.4M	\$2.5M	\$786K	\$9.4M	\$2.6M	
Farebox Recovery	6%	18%	47.9%	16.9%	37.6%	15.9%	16.7%	39%	8%	50.8%

2. Operating Cost Estimate from Cost per Unlinked Passenger Trip

This item may be determined by dividing “[Annual] Operating Expenses” by the number of “Unlinked Passenger Trips”, as in the middle rows of the preceding Table. When the “Operating Cost per Unlinked Passenger Trip” items are graphed against trip volume, as in Figure 1 below, they show a pattern: generally the higher the trip volume the lower the operating cost per trip becomes. This is intuitively reasonable, because higher trip volumes will make better use of “sunk” operating and maintenance expenses such as infrastructure maintenance and the labor and fuel required to run trains, not to mention capital investments. This relationship may be graphed, as in Figure 1 below, and the slope of this graph may be calculated, as factor “y”.

Figure 1: Operating & Maintenance Costs Per Ride for Comparable Commuter Railroads



From this study's Estimated Ridership and Proposed Service Plan, CNT has estimated the ridership under several basic assumptions and service plans. These figures of estimated ridership may be combined with the slope of the O & M cost per ride data pattern to yield cost-per-ride estimates. By multiplying these cost-per-ride estimates times the projected number of rides, we can arrive at an estimate of the overall annual cost of operating the rail service. As shown in the following table, these estimated costs fall within a range of \$16.9 M to \$22.2M, depending on the selected basic ridership assumptions and service plan alternative.

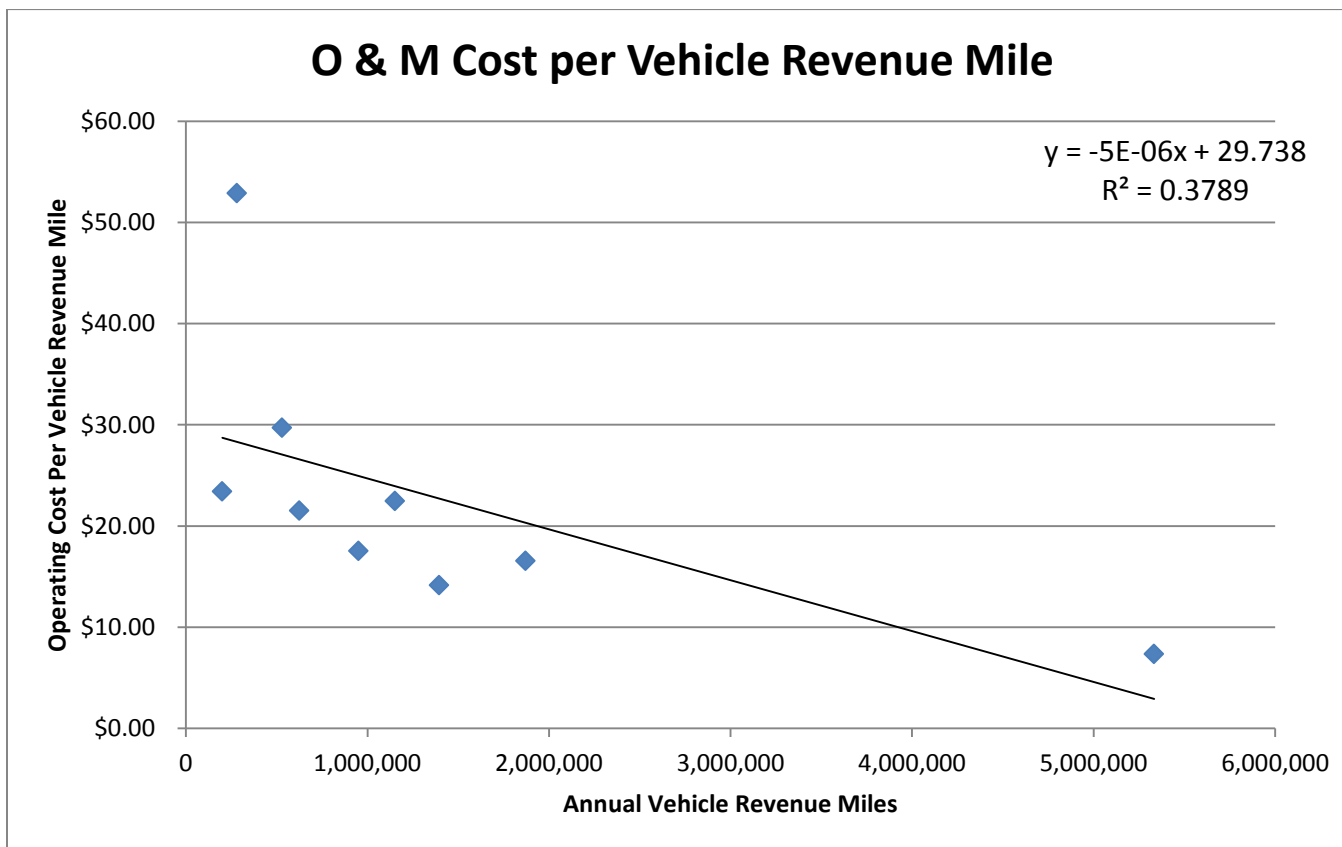
Table 6: Operating Costs Estimated from Ridership and Cost per Ride

	Av Daily Ridership	Annual Ridership	O & M Cost\Ride	Annual O & M Cost
El Paso - Las Cruces Low	4452	1,157,520	\$18.68	\$16,935,610
El Paso - Las Cruces Median	5056	1,314,560	\$18.05	\$18,012,229
El Paso - Las Cruces High	7404	1,925,040	\$15.61	\$22,197,497

3. Operating Cost Estimate from Costs per Vehicle Service Mile

Data from comparable operating railroads provides an alternative method of estimating the El Paso – Las Cruces Line’s operating and maintenance costs. This data, as summarized in Table 6 above, includes a record of the cost per vehicle service mile for each of the comparable commuter rail lines. When the “Operating Cost per Vehicle Revenue Mile” items are graphed against “Annual Vehicle Revenue Miles”, they show a pattern. As in the preceding comparison ridership levels, rail cost per vehicle revenue mile decreases as vehicle revenue miles grow.

Figure 2: Operating & Maintenance Costs per Revenue Mile for Comparable Commuter Railroads



*Using the 2014 data about Vehicle Service miles from the National Transit Database agency snapshots, (<https://www.transit.dot.gov/ntd/transit-agency-profiles>)

Per the selected information from the Estimated Ridership and Proposed Service Plan presented earlier in this document, we can estimate the average daily vehicle service miles that will be performed under each of the basic service alternatives for the El Paso – Las Cruces Line, involving 16 or 18 or 20 trips along the 45 mile rail route. These estimates of vehicle service miles are provided in the following table.

Table 7: Operating Costs Estimated from Annual Revenue Miles and Cost per Revenue Mile

El Paso-Las Cruces	Average Daily Revenue miles	Annual Revenue miles	O & M Cost\Revenue Mile	Annual O & M Cost
Option 1 (16 trips)	1755	456,300	\$27.46	\$12,528,401
Option 2 (18 trips)	1980	514,800	\$27.16	\$13,984,027
Option 3 (20 trips)	2205	573,300	\$26.87	\$15,405,431

Negotiation with BNSF

Establishment of the passenger rail service will require successful negotiations with BNSF re (a) Costs for rights of use or for acquisition of the rail line and (b) Costs to upgrade the rail infrastructure to passenger standards (c) Terms of joint use.

While CNT has informed BNSF that this study is in progress, discussions with the railroad regarding issues that affect their costs of cooperation will require determination of a negotiating position by the SCRTD Board and its potential partners. CNT will be pleased to contribute to the development of this position and offers the following points of information to trigger the discussion:

- The El Paso – Las Cruces segment of the BNSF system (known to BNSF as the El Paso Division) is not heavily served for industrial customers today.
- This rail segment does, however, include the only Mexican border rail crossing owned by BNSF and may have strategic value for this reason.
- A high level viewing of selected points on the line by rail experts working with CNT in June 2016, indicated that the rail line has received recent track maintenance.

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State and Federal Support for the Proposed Rail Investment

Re public support to fund the proposed rail service: (a) The State of NM is currently disinclined to make further investments in railroad ownership or operations. (b) Federal programs to support passenger rail service are in flux.

The State of New Mexico's Rail Plan describes several railroad ownership investments and operating responsibilities that the NMDOT has assumed in recent years and includes a statement that NMDOT is not contemplating further railroad investments.

Under the previous federal administration, applications to several competitive programs would have been appropriate sources of matching funds for establishing the proposed rail service. Currently, it is unlikely that any new announcements of funding opportunities for these programs will be forthcoming. The position of the current administration toward continued transit development funding has not been announced, but is not expected to be favorable.

Strategic Recommendations

In light of anticipated difficulties in BNSF negotiations and in securing state and federal investment support: (a) Develop a partnership with authorities of metropolitan El Paso for rail service funding, BNSF negotiations, and operations. (b) Recruit a short line railroad as the service operator and a negotiating partner. (c) With El Paso authorities, create an action plan for improved transit connections and TOD around terminal rail stations.

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