NORTHWEST TENNESSEE REGIONAL PORT AUTHORITY

Intermodal RAIL CONNECTION PROJECT

A Benefit-Cost Analysis

Dr. Murat Arik | Director | MTSU Business & Economic Research Center

MIDDLE TENNESSEE STATE UNIVERSITY

JONES COLLEGE OF BUSINESS

Business and Economic Research Center

Contents

Executive Summary

The Business and Economic Research Center (BERC) at Middle Tennessee State University has been retained by the Northwest Tennessee Regional Port Authority (NWTRPA) to assess the contributions of the proposed investment in the Port of Cates Landing Rail project to the economy of the core and surrounding region in northwest Tennessee.

The BERC's estimates include the (1) benefit-cost ratio and (2) regional economic impact of the proposed investment. The BERC used several methods to estimate first the cargo volume and then the benefit-cost ratio and regional economic impact. Impact estimates were obtained using the IMPLANpro model.

Study Findings

The Study Region: The essential characteristics of the study region, which includes Dyer (TN), Lake (TN), Obion (TN), Crockett (TN), Gibson (TN), Lauderdale (TN), Weakley (TN):

- Per capita income equivalent to 71.02 percent of U.S. per capita income
- Unemployment rate 0.1 percentage points higher than that of the U.S.
- Declining population (down 3.69 percent from 2010 to 2017)
- Poverty rate 2.82 percentage points higher than that of the U.S.

Benefit-Cost Analysis: The proposed investment will generate the following long-term public benefits over the life cycle of the rail line.

- State of good repair (in present value, in 2017$) of $1.6 million (3% discount rate) or $1.09 million (7% discount rate)
- Economic competitiveness (in present value, 2017$) of nearly $12.8 million (3% discount rate) or $8.87 million (7% discount rate)
- Livability (in present value, in 2017$) of $2.02 million (3% discount rate) or $1.39 million (7% discount rate)
- Sustainability (in present value, in 2017$) of $12.89 million (3% discount rate) or $8.83 million (7% discount rate)
- Safety (in present value, in 2017$) of $16.64 million (3% discount rate) or $11.39 million (7% discount rate)
- Estimated benefit-cost ratio (BCR) of 1.24 (7% discount rate) or 1.83 (3% discount rate)
- Net present value (NPV) of $6.54 million (7% discount rate) or $23.16 million (3% discount rate)

Regional Economic Impact: The proposed investment will create a variety of economic opportunities for the area's population–some short-term, most long-term.

<u>Short-term economic impact</u>

- New jobs: 83
- Business Revenue: $39.1 million
- Personal income: $15.6 million
- Federal taxes: $2.8 million
- State and local taxes: $1.2 million

Implications of Study Findings for the Region: The findings suggest that the proposed investment will increase regional competitiveness by creating a multi-modal port in one of the poorest parts of the country.

Conclusion: The study indicates that benefits to both the general public and the regional economy outweigh the cost of the proposed investment. Given the nature of the investment and the extent of economic distress in the study region, the findings of this study strongly recommend the proposed investment.

The Port of Cates Landing Rail Connection		July 2018-December 2019	
Benefit Period		2019-2038	
Cumulative 20-Year Project Cost (in 2017$)			
Cost		Discount Rate	
	0%	3%	7%
Total Cost	$28,157,403	$28,028,891	$27,474,267
Benefits from Long-Term Outcomes (2019-2038)			
Long-Term Outcomes		Discount Rate	
	0%	3%	7%
State of Good Repair	$2,217,511	$1,599,229	$1,094,936
Economic Competitiveness	$17,580,179	$12,795,067	$8,865,104
Livability	$2,807,617	$2,024,803	$1,386,312
Sustainability	$17,879,635	$12,894,471	$8,828,396
Safety and Security	$23,069,256	$16,637,132	$11,390,866
Railroad Residual Benefits (30-Year Lifecycle)	$9,460,801	$5,238,216	$2,444,851
Cumulative Value	$73,014,999	$51,188,918	$34,010,465
Net Present Value (NPV)		**$23,160,027**	**$6,536,198**
Benefit-Cost Ratio (BCR)		**1.83**	**1.24**

OTHER CUMULATIVE 20-YEAR BENEFITS (UNDISCOUNTED, 2017$)	
Ton-Miles Reduced from Highways	292,903,233
Truck VMT Reduced	27,525,655
Gallons of Fuel Saved	3,924,188
Number of Lives Saved	0.37
Number of Injuries Avoided	17.79
Tons of CO2 Eliminated	97,669
Tons of SO2 Eliminated	7
Tons of VOC Eliminated	181
Tons of PM Eliminated	31
Tons of NOx Eliminated	586

JOB CREATION AND ECONOMIC STIMULUS BENEFITS (ALL MONETARY FIGURES ARE IN 2017$)

Port of Cates Landing Rail Spur: Job Creation and Economic Stimulus			
Short-Term Temporary Jobs: These jobs are associated with the initial construction spending.			
	Q3/2018	Q1/2019	
Direct Jobs	47	70	
Indirect and Induced Jobs	21	30	
Total Jobs*	68	100	
	Q4/2018	Q2/2019	Total
Direct Jobs	70	45	58
Indirect and Induced Jobs	30	19	25
Total Jobs*	100	64	83

I. INTRODUCTION

Located in northwest Tennessee, the proposed infrastructural investment in the Port of Cates Landing Rail line will bring most-needed relief for the area businesses in the seven-county region (Dyer (TN), Lake (TN), Obion (TN), Crockett (TN), Gibson (TN), Lauderdale (TN), Weakley (TN)). The counties above have long been affected by the flight of manufacturing companies from the region. Currently, the seven-county region overall is designated either as an "economically depressed area," "at-risk area," or "transitional area," given the fact that its (1) historical unemployment rate has been higher than the U.S. average, (2) annual average population growth rate is below zero, (3) per capita personal income is significantly lower than the U.S. average, and (4) the manufacturing base has eroded substantially over the past decade.[1]

The proposed infrastructure investment of $28 million in the Port of Cates Landing Intermodal Rail Connection project will upgrade the existing port to allow intermodal transportation, reducing transportation costs for shippers making transportation more efficient.

The Business and Economic Research Center (BERC) at Middle Tennessee State University has been retained by the Northwest Tennessee Regional Port Authority (NWTRPA) to assess the contributions of the proposed investment in the Port of Cates Landing Intermodal Rail Connection project to the regional economy.

I. a. Study Area

The study area in this analysis consists of seven counties in the northwest corner of Tennessee: Dyer (TN), Lake (TN), Obion (TN), Crockett (TN), Gibson (TN), Lauderdale (TN), and Weakley (TN). The counties of Dyer, Lake, and Obion are considered the Core Region. The counties of Crockett, Gibson, Lauderdale, and Weakley are the Surrounding Region. Together, the Core and Surrounding regions compose the study region.

I. b. ***Study Goals and Research Questions:*** This study has four primary goals:

1. To provide a brief assessment of socioeconomic conditions in the seven-county region (Dyer (TN), Lake (TN), Obion (TN), Crockett (TN), Gibson (TN), Lauderdale (TN), and Weakley (TN)), from a comparative perspective
2. To provide an assessment of the public benefits of the proposed investment in the Port of Cates Landing Intermodal Rail project
3. To assess the short-term economic impact of construction spending related to the proposed infrastructure investment in the Port of Cates Landing Intermodal Rail project
4. To evaluate the long-term outcomes of the proposed investment in the rail line

In line with these four goals, this study seeks answers to the following three significant questions:

1. What are the indicators of economic distress in the region, and how is the study region faring compared to the U.S.?
2. Do public benefits from the rail-line justify the $28 million investment?
3. What are the short-term impacts of the $28 million construction spending in the region?

The rest of this study is organized as follows. The second section briefly introduces the indicators of socioeconomic distress in the region, highlighting primarily employment and unemployment, population growth, income, and poverty. The third section deals with the conceptual framework, study assumptions, and data. The fourth section provides the study findings, organized along two major themes: (1) long-term

[1] For more information, see https://www.tn.gov/transparenttn/jobs-economic-development/openecd/tnecd-performance-metrics/openecd-long-term-objectives-quick-stats/distressed-counties.html.

outcomes and benefit-cost analysis, and (2) job creation and economic stimulus. The fifth section summarizes the study.

II. STUDY REGION AT A GLANCE: INDICATORS OF SOCIOECONOMIC DISTRESS

The counties in northwest Tennessee have undergone a significant socio-economic transformation over the past few decades: manufacturing jobs started gradually moving out of the study region, and outmigration followed. A review of commonly used socioeconomic indicators suggests that the study region is in economic distress. To illustrate the extent of the distress, this section deals with the following socioeconomic indicators: unemployment, population growth, per capita income, and poverty.

II.a. Study Region's General Characteristics

The counties in the study region are rural, based on the Census Bureau's criteria, as their populations in 2017 were less than 50,000: Lake (7,832), Dyer (38,330), Obion (31,807), Weakley (35,021), Crockett, TN (14,586), Gibson, TN (49,683), and Lauderdale, TN (27,822). An urbanized area is defined as "a continuously built-up area with a population of 50,000 or more" (www.census.gov). "Territory, population, and housing units that the Census Bureau does not classify as urban are classified as rural" (www.census.gov).

The affected region is designated as an economically distressed area. The region qualifies for economically distressed area designation on the grounds of both unemployment rate (Table 1) (www.bls.gov) and per capita income (www.bea.gov) (Table 3).

II.b. Employment and Unemployment

Table 1 presents the latest available data on labor force, employment, and unemployment. Compared to the U.S., nearly all the counties (except Crockett and Weakley County) have an unemployment rate higher than the U.S. average. The difference in the unemployment rate between the area counties and the U.S. runs as high as 1.2 percentage points in Lauderdale County. At the regional level, the unemployment rate is 0.2 percentage points higher than the U.S. in the core region and 0.1 percentage points higher in the core and surrounding region combined.

Table 1. Unemployment Rate as of April 2018

Region	Labor Force	Employment	Unemployment	Unemployment Rate (%)	Percentage Point Difference from the U.S. Average
U.S.	161,280,000	155,348,000	5,932,000	3.7%	0.0
Core Region	**30,192**	**29,004**	**1,188**	**3.9%**	**+0.2**
Dyer	16,185	15,560	625	**3.9%**	+0.2
Lake	1,837	1,760	77	**4.2%**	+0.5
Obion	12,170	11,684	486	**4.0%**	+0.3
Surrounding Region	**54,238**	**52,213**	**2,025**	**3.7%**	**+0.0**
Crockett	7,027	6,796	231	**3.3%**	-0.4
Gibson	21,689	20,885	804	**3.7%**	+0.0
Lauderdale	9,497	9,031	466	**4.9%**	+1.2
Weakley	16,025	15,501	524	**3.3%**	-0.4
Core and Surrounding Region	**84,430**	**81,217**	**3,213**	**3.8%**	**+0.1**

Source: BERC and BLS (www.bls.gov)

Series reports: Local Area Unemployment Statistics

II.c. Population Growth

Considered in isolation, unemployment rates may not reflect the true state of economic health. Unemployment rates should be used along with labor force or population data to make sense of a region's socioeconomic dynamics. For example, the unemployment rate in Lake County, where Cates Landing is located, is moderately higher than the U.S. average (+0.5 percentage points in Table 1). The primary reason for the relatively smaller unemployment rate for this county may be explained by the massive outflow of the working-age population from the county in search of employment opportunities elsewhere. Table 2 demonstrates the extent of the population flight from the core study region between 2010 and 2017. In this period, Lake County lost more than 4 percent of its population. In contrast, the U.S. population grew by more than 5 percent in the same period (a difference of about nine percentage points).

Table 2. Population Estimates and Growth Rate as of July 2017

Region	2010	2017	Growth (2010-2017)
U.S.	308,745,538	325,719,178	5.50%
Core Region	**77,969**	**75,316**	**-3.40%**
Dyer	38,330	37,463	-2.26%
Lake	7,832	7,468	-4.65%
Obion	31,807	30,385	-4.47%
Surrounding Region	**127,112**	**122,195**	**-3.87%**
Crockett	14,586	14,473	-0.77%
Gibson	49,683	49,111	-1.15%
Lauderdale	27,822	25,274	-9.16%
Weakley	35,021	33,337	-4.81%
Core and Surrounding Region	**205,081**	**197,511**	**-3.69%**

Source: BERC and Census Bureau (www.census.gov)
American FactFinder Annual Esimates of the Population

II.d. Income

Per capita income is another indicator commonly used as a measure of a community's economic distress. Per capita income in the study region is far below the U.S. average as shown in Table 3. For example, per capita income in Lake County is equivalent to 49 percent of U.S. per capita income. In other words, per capita income in Lake County is 51 percent less than U.S. per capita income. Overall, the core study region has an average per capita income equivalent to 73 percent of U.S. per capita income in 2016. The surrounding area does not fare any better than the core region, as per capita income is 69 percent of U.S. per capita income. For the core and surrounding combined areas, per capita income remains at 71 percent of the U.S. average.

Table 3. Personal and Per Capita Income as of 2016

Region	Personal Income (thousands of dollars)	Population	Per Capita Income 2016	Per Capita Income As Percent of U.S.
U.S.	$15,912,777,000	323,405,935	$49,204	100
Core Region	**$2,744,007**	**75,661**	**$36,267**	**73.71**
Dyer	$1,440,262	37,605	$38,300	77.84
Lake	$180,639	7,530	$23,989	48.75
Obion	$1,123,106	30,526	$36,792	74.77
Surrounding Region	**$4,179,893**	**122,488**	**$34,125**	**69.35**
Crockett	$512,207	14,467	$35,405	71.96
Gibson	$1,822,797	49,103	$37,122	75.45
Lauderdale	$722,703	25,350	$28,509	57.94
Weakley	$1,122,186	33,568	$33,430	67.94
Core and Surrounding Region	**$6,923,900**	**198,149**	**$34,943**	**71.02**

Source: BERC, BEA (www.bea.gov), and Census Bureau (www.census.gov)
Bureau of Economic Analysis: Regional Data CA1

II.e. Poverty

The poverty rate is perhaps the most telling indicator of socioeconomic distress. Table 4 shows per capita transfer payments and poverty rates in the core and surrounding counties. Per capita transfer payments reported in Table 4 refer to monetary transfers from the federal government that include food stamps, family assistance, and other income maintenance benefits. Supplemental Social Security benefits are not included.

Overall, Lake County receives nearly one and a half times as many per capita transfer payments as the U.S. average. This is not surprising given the county's poverty rate. Roughly one-third (29.2 percent) of Lake County's population is below the poverty level. The poverty rate in Lake County is 14.1 percentage points higher than the U.S. average in 2016.

Table 4. Transfer Payments and Poverty Population as of 2016

Region	Transfer Payments	Population	Per Capita Transfer Payments 2016	Per Capita Transfer Payments As percent of U.S.	Number of People below Poverty	Percent of Population below Poverty	Percentage Point Difference
U.S.	$2,768,331,000	323,127,513	$8,567	100.00	46,932,225	15.10	0.0
Core Region	**$841,097**	**75,661**	**$11,117**	**129.76**	**14,727**	**17.10**	**+2.00**
Dyer	416,866	37,605	$11,085	129.39	6,915	18.60	+3.50
Lake	$85,420	7,530	$11,344	132.41	1,413	29.20	+14.10
Obion	$338,811	30,526	$11,099	129.55	6,399	21.10	+6.00
Surrounding Region	**$1,336,442**	**122,488**	**$10,911**	**127.35**	**23,617**	**18.44**	**+3.34**
Crockett	$156,927	14,467	$10,847	126.61	2,602	18.30	+3.20
Gibson	$577,440	49,103	$11,760	137.26	9,039	18.70	+3.60
Lauderdale	$256,246	25,350	$10,108	117.99	6,014	24.70	+9.60
Weakley	$345,829	33,568	$10,302	120.25	5,962	19.10	+4.00
Core and Surrounding Region	**$2,177,539**	**198,149**	**$10,989**	**128.27**	**38,344**	**17.92**	**+2.82**

Source: BERC, BEA (www.bea.gov), and Census Bureau (www.census.gov)
American FactFinder: Community Facts S1701

Reversing the current trend requires significant investment in infrastructure improvements that will (a) make the region more competitive and (b) attract new or retain existing businesses, thereby stabilizing socioeconomic dynamics. The major components of such an investment are already in the region, missing only one of the three legs: rail connection.

Although significant investment is necessary to make the study region globally competitive, investiment is not in itself sufficient to generate large-scale intended outcomes. The nature of the investment in the area matters as much as the amount. The next sections analyze an investment of about $28 million to construct a truly intermodal transportation system. Once completed, the Port of Cates Landing is likely to have a profound impact across northwest Tennessee counties along with the Port of Cates Landing and Foreign Trade Zone (FTZ 283).

III. CONCEPTUAL FRAMEWORK, ASSUMPTIONS, AND DATA

Given the extent of socioeconomic distress in the study region, the proposed $28 million investment in the rail connection is likely to transform regional socioeconomic dynamics positively. Measuring these socioeconomic contributions is challenging given the time frame of this study. Ideally, a survey of local businesses regarding the potential use of the rail for cargo transportation is necessary to estimate the average volume of cargo the rail would handle in a given year. Cargo volume data would allow us to derive rail-related employment figures. To overcome this challenge, the Business and Economic Research Center (BERC) has developed several assumptions using existing rail impact studies and regional impact assessment models to calculate average rail-related activities in the study region. Box 1 summarizes the general assumptions and issues affecting the BERC's benefit-cost analysis and economic impact estimates.

Box 1: General Assumptions and Issues

I. The estimates of total cargo volume are survey- and model-driven. The IMPLAN regional model is used to extract commodity flows data for the 7-county region.

II. A survey of potential port users is necessary to calculate the inbound/outbound cargo volume; the brief survey conducted had a limited rate of response.

III. The time frame for grant application does not allow us to conduct a more comprehensive survey.

IV. Anecdotal data from the Foreign Trade Zone (FTZ 283), the Northwest Tennessee Regional Port Authority, and Tennessee Economic and Community Development is used in making assumptions about the potential port use by company and sector.

V. This study has two scenarios: (1) No build scenario (baseline) and (2) Rail connection with the Port Authority.

VI. The first scenario (current) assumes a "single modal" cargo movement (truck), and the second scenario (with the rail) assumes an "intermodal" cargo movement (barge to rail, and vice versa).

III.a.1. Cargo Volume and Railroad Customers Survey

To estimate the potential for users of the Port of Cates Landing's rail spur and total cargo volume for the rail plus barge operations, BERC relied heavily on these four significant sources of information:

1. A brief rail spur user survey administered by the Port of Cates Landing,

2. Anecdotal information supplied to BERC by the FTZ 283 and other local authorities on the potential users and business dynamics,

3. Data from the Freight Analysis Framework (FAF) version 4.4.1 to estimate the compound annual growth rate of rail cargo over the 20 year period in Tennessee,

4. IMPLANpro (www.IMPLAN.com) database for the region to identify export and import trends in the commodity market between 2014 and 2016.

The underlying data regarding the cargo volume estimates over the 20-year of the benefit period is presented in the attached spreadsheet in the following tabs:

- Spreadsheet name: CL Rail BCA 1.xlsx
  - Rail user survey results Excel tabs: TSurvey Summary 1, TSurvey Mode 2, and TSurvey CargoP 3,
  - FAF compound annual growth projections and other ratios: TFAF Growth 1, TFAF Growth 2, and TFAF Value per Ton 3,
  - Foreign Trade Dynamics in the Region: TIMPLAN FExport 1,
  - Regional Competitive Dynamics and Job Losses from Trade Adjustment Data and Local Sources for Spillover Business Closures: TEmploymentLoss Causes 1, TEmploymentLoss by County 2, TEmploymentLoss Decade 3, and TEmployment BusinessesClosed 4.

Rail User Survey. Although the rail user survey did not yield many responses, BERC nevertheless gathered enough information from it to determine a baseline and alternative scenario assessment of the business interest in the port when the rail spur is built. Although some of the businesses and associated cargo volumes are labeled as "new business cargo," BERC treats those companies and their cargos as "locally present," looking for expansion and/or transportation mode changes if the price is right. The user interest survey reveals a significant number of regional (current or expected) employment and cargo volume activities (TSurvey Summary 1).

Local Survey and Other Potential Users for the Port of Cates Landing with the Rail Spur: Cargo Volume Estimates

Survey Response, Other Potential, or FTZ Client	Company or Project Name	Location	Industry Descriptions	With the Rail Connection, How Likely to Use the Port?	If Decided to Use the Port with Rail, What is the Total Cargo Volume (Inbound-Outbound)?	Number of Employees	Modeled in Cargo Estimates As
Response 1	Project Soybean	Obion, TN	Existing ethanol plant/ New facility being planned	Highly Likely	287,500 tons		New Business Cargo
Response 2	Kohler	Union City, TN	Manufacturer of shower doors	Likely for products we currently receive by truck	Not sure	300	
Response 3	MVP	Union City, TN	Private label manufacturer	It is possible with ocean and rail carriers agree on shipment methods. Otherwise, unlikely	Unknown until carriers accept this as alternative and container yard implemented	500+	
Response 4	Storey Sawmill	Troy, TN	Manufacturer of Hardwood Lumber	Very likely	5,600 tons	40	Baseline Cargo
Potential 5	Gerdau	Jackson, TN	Steel Mills	Potential Interest for new facility expansion			
Potential 6	Nucor and Big River	Moving from Memphis to Cates Landing	Coil and Structural Steel	Moving from Congested Memphis to Cates Landing	66,000 tons		Baseline Cargo
Response 7	Project NOLA	Potential Site Lake County	International Steel Manufacturer	Very likely	6,000 tons (initial)	90	New Business Cargo
Potential 8	MTD	FTZ 283 Client	Machinery	Maybe	2 barges per year = 3,600 tons		Baseline Cargo
Potential 9	MAT Industries	FTZ 283 Client	Consumer Goods	Maybe	2 barges per year = 3,600 tons		Baseline Cargo
Potential 10	TBC Corporation	FTZ 283 Client	Plastics and Rubber	Maybe	5 barges per year = 9,000 tons		Baseline Cargo
Potential 11	Excel Boat Co.	Lake County, TN	Boat manufacturing	Maybe	2 barges of aluminum per year = 3,600 tons		Baseline Cargo

Source: The Port of Cates Landing, Foreign Trade Zone 283, Local Chambers, Tennessee Department of Economic and Community Development

A noteworthy aspect of the rail user survey is that many regional businesses express interest in the change in transportation mode only if the alternatives are reliable and affordable. Based on the heavy emphasis of the rail users on these two aspects of their current transportation experience, BERC expects that once the intermodal transportation system is created along with the Foreign Trade Zone designation of the region, there will be increasing trade activities both in agricultural commodities and advanced manufacturing products (see TSurvey Mode 2).

What does it take for a transportation mode change?

If your company is willing to use the new rail line, would you say it is because of (select all that apply) (5 responses):

	Yes	No/	No Answer
Reliability	4		1
Security	3		2
Sustainability	4		1
Affordability	4		1
Other (please define)			

Source: BERC, the Port of Cates Landing, and Foreign Trade Zone 283

From 1 to 10 (1 = being the least, and 10 = being the most), how do the following characteristics of a transportation system affect your decision to switch from one mode of transportation to another? (Please rate each option separately) (5 responses).

Characteristics	Average Rating
Reliability	**9.0**
Security	6.2
Sustainability	7.8
Affordability	**9.8**
Other (please define)	

Source: BERC, the Port of Cates Landing, and Foreign Trade Zone 283

How do you rate your company's experience with the current transportation mode that your company uses in the last five years (5 responses)?

Characteristics	Average Rating
Reliability	**6.4**
Security	8.0
Sustainability	6.8
Affordability	**5.6**
Other (please define)	

Source: BERC, the Port of Cates Landing, and Foreign Trade Zone 283

III.a.2. Cargo Volume Assumptions and Data

Baseline vs. Alternative Scenarios (see TSurvey CargoP 3): Using the results of the rail user survey and other available information, BERC was able to make assumptions regarding the cargo volumes to be expected upon completion of the rail line project. ***Baseline scenario*** includes assumptions regarding the existing companies' assessment of the cost and reliability issues regarding their current transportation choices and includes cargo volume from (a) companies that clearly mention the possibility of using truck plus barge option, and (b) BERC's estimates of a conservative volume of cargo diversion to the port because of the changing international dynamics and presence of FTZ 283 in the region. ***Alternative Scenario*** includes two components: (1) cargo volume that is associated with the current FTZ 283 partner companies is expected to gradually shift with the availability of the rail connection, and (2) so-called "new business," which includes companies currently operating in the region or surrounding area that may either expand their operations with the rail connections or relocate to the Lake County industrial park. In modeling this component, BERC treated the cargo volume associated with these businesses as regionally present.

In estimating the growth rate of rail cargo volume in the next 20-year period, BERC used growth projections by FAF version 4.4.1 for Tennessee by the mode of transportation. BERC then calculated compound annual growth rates for the rail cargo volume in Tennessee to estimate the yearly cargo volume between 2019 and 2038. Detailed information about how these calculations are made is available in CL Rail BCA 1.xlsx (TSurvey CargoP 3, TFAF Growth 1, and TFAF Growth 2). The following tables present BERC's initial assumptions, baseline and alternative estimates, and growth projections over the 20-years of the benefit period.

Cargo Volume (Tons)-2020	Tons	Mode	Type of Businesses
Baseline Scenario with Truck*	91,400	Truck + Barge	Existing Businesses
Diversion with Rail**	91,400	Rail + Barge	Existing Businesses
New Business with Rail***	293,500	Rail + Barge	New Businesses
Diversion with Rail over Time****	84,800	Rail + Barge	Foreign Exports Only

Cargo Volume Estimates through the Port (Tons)

Project Year	Year	Baseline Scenario with Truck*	Diversion with Rail (Multi-Modal)	Diversion with Rail (Truck Component of Foreign Exports)	New Business with Rail (Multi-Modal)	Total Cargo Volume (Multi-Modal)
2019	0	91,400				
2020	1	95,640	91,400	4,240	293,500	389,140
2021	2	99,880	93,831	8,480	301,307	403,618
2022	3	104,120	96,327	12,720	309,322	418,369
2023	4	108,360	98,889	16,960	317,550	433,399
2024	5	112,600	101,520	21,200	325,997	448,717
2025	6	116,840	104,220	25,440	334,668	464,329
2026	7	121,080	106,951	29,680	343,436	480,067
2027	8	125,320	109,753	33,920	352,435	496,108
2028	9	129,560	112,629	38,160	361,668	512,457
2029	10	133,800	115,579	42,400	371,144	529,123
2030	11	138,040	118,608	46,640	380,868	546,116
2031	12	142,280	121,822	50,880	391,189	563,891
2032	13	146,520	125,123	55,120	401,791	582,034
2033	14	150,760	128,514	59,360	412,679	600,553
2034	15	155,000	131,997	63,600	423,863	619,460
2035	16	159,240	135,574	67,840	435,350	638,763
2036	17	163,480	138,611	72,080	445,101	655,792
2037	18	167,720	141,716	76,320	455,072	673,107
2038	19	171,960	144,890	80,560	465,265	690,715
2039	20	176,200	148,136	84,800	475,687	708,623
Average		135,920	118,304	44,520	379,895	542,719

Baseline Scenario with Trucks: This scenario includes total cargo volume that is expected to go through the Port of Cates Landing over time without the Rail Spur. It includes companies shifting their transportation pattern from the highly congested Memphis region plus the companies that are part of the newly created Foreign Trade Zone (FTZ 283).

Diversion with the Rail Spur: Based on the limited survey and anecdotal evidence from the region, BERC assumes that all cargo volume using the Truck and Barge transportation options will gradually shift their options to the Rail and Barge.

Diversion with Rail (Truck Component of Foreign Exports): As the export sector in the region continues to lose its competitive edge, the remaining businesses will gradually shift their modes of transportation to rail and barge with the construction of the rail spur. BERC assumes that this will happen gradually.

New Business with Rail: BERC survey identified several companies that indicated that the Rail Spur is a precondition for them to either build a local facility in the industrial park at the Port of Cates Landing or relocate their operations completely to the region. BERC modeled these companies as new businesses.

Total Cargo Volume: This column includes all cargo volume associated with the Rail Spur (diversion from the truck, foreign exporters, and new businesses).

****In 2016, the 7-county region exported 160,000 tons of goods to other countries. Compared with 2014, there was a decline of 35,402 tons of goods due to declining competitiveness of the region When the rail becomes operational, existing exporters will have access to affordable, reliable and safe multi-modal transportation system. This availability will shift some of these export products to the rail + barge. This study assumes an annual five (5) percent shift to the rail + barge from the current exporters to foreign countries. Given that trucks account for about 53 percent of all ton-miles in Tennessee, this study models only 84,800 tons of foreign exports under the Diversion with Rail over the years.

Cargo Volume in Tennessee (Outbound and Inbound) Annual Compound Growth Rate by Mode	2016-2020	2020-2025	2025-2030	2030-2035
Truck	3.19%	1.51%	1.43%	1.39%
Rail	1.40%	1.61%	1.60%	1.51%
Water	3.88%	1.96%	1.77%	1.52%
Air (Includes Truck-Air)	7.13%	4.76%	4.40%	4.64%
Multiple Modes & Mail	-3.16%	2.66%	2.62%	2.71%
Pipeline	15.48%	2.05%	1.32%	1.10%
Other and unknown	25.28%	4.46%	4.35%	4.53%

Source: BERC and Data from the Freight Analysis Framework Version 4.4.1
https://ops.fhwa.dot.gov/freight/freight_analysis/faf/

Annual Compound Growth Rate (Export + Import) 2035-2039	
Air (Includes Truck-Air)	5.36%
Multiple Modes & Mail	2.24%
Rail	1.81%
Truck	3.82%
Water	1.82%

https://ops.fhwa.dot.gov/freight/freight_analysis/faf/

Share of Ton-Miles by Mode in 2016 in Tennessee	
Truck	52.63%
Rail	18.20%
Water	3.65%
Air (Includes Truck-Air)	0.29%
Multiple Modes & Mail	12.07%
Pipeline	13.14%
Other and unknown	0.02%

https://ops.fhwa.dot.gov/freight/freight_analysis/faf/

Total Investment and Construction Data: Table 5 presents a breakdown of the proposed rail-related construction spending in the core region. These figures are used as inputs in the IMPLAN regional model to generate short-term employment and other regional aggregate figures. A total of $28 million will be invested in the region to complete the rail's construction.

Table 5. Northwest Tennessee Regional Port Authority: Intermodal Rail Connection

Total Construction Cost of Intermodal Railway Connection		
I.	Acquistion of ROW (approximately 85 acres)	$920,000
II.	Earthwork/EC/Storm Drainage	$3,916,408
III.	Levee/ Dam Extension	$0
IV.	Sub Ballast	$2,382,918
V.	Bridge at Port Terminal	$9,900,000
VI.	Track/ Ballast/ Turnouts/ Crossing etc.	$7,883,077
VII.	Design and Engineering	$1,210,000
VIII.	Legal	$100,000
IX.	Engineering Inspection & Support	$195,000
X.	Construction Coordination	$900,000
XI.	Contingency	$750,000
XII.	**Grand Total**	**$28,157,403**

Note: Contingency amount of $1,750,000 is allocated across construction-related spending items based on their share in total proposed construction-related spending.
Source: The Port of Cates Landing

Estimating the Major Parameters that will Drive the Analysis: Before proceeding further, BERC introduces the second spreadsheet as an attachment that contains significant parameters of the long-term benefit assessment of the proposed investment in the rail spur: CL Rail BCA 2.xlsx. All the tables associated with the attachment CL Rail BCA 2.xlsx are numbered throughout the spreadsheet and in this report.

Considering a careful assessment of the limited number of survey and other available information, BERC projects that in the year 2038, the annual cargo volume through the rail spur will reach up to 708,623 tons (Table 6). In this twenty-year life cycle of the railroad, cumulative cargo volume is expected to be more than 10 million tons.

Table 6. Northwest Tennessee Regional Port Authority: Intermodal Rail Connection- Cargo Volume by Year (20-Year)

Year	Project Year	"Without the Rail Spur" Scenario Cargo Volume (Tons)[1]	"With the Rail Spur Scenario" Cargo Volume (Tons)[2]	Reduced Ton-Miles from Highways	Increased Ton-Miles for Rail	Reduced Vehicle Miles Travelled (VMT)	Gallons of Fuel Saved
2018	0	91,400					
2019	1	95,640	389,140	24,824,230	14,137,895	992,969	141,562
2020	2	99,880	403,618	25,690,189	14,631,076	1,027,608	146,501
2021	3	104,120	418,369	26,579,182	15,137,375	1,063,167	151,570
2022	4	108,360	433,399	27,491,823	15,657,142	1,099,673	156,775
2023	5	112,600	448,717	28,428,739	16,190,735	1,137,150	162,117
2024	6	116,840	464,329	29,390,578	16,738,522	1,175,623	167,602
2025	7	121,080	480,067	30,363,153	17,292,422	1,214,526	173,149
2026	8	125,320	496,108	31,361,210	17,860,836	1,254,448	178,840
2027	9	129,560	512,457	32,385,416	18,444,141	1,295,417	184,681
2028	10	133,800	529,123	33,436,456	19,042,730	1,337,458	190,674
2029	11	138,040	546,116	34,515,033	19,657,001	1,380,601	196,825
2030	12	142,280	563,891	35,659,890	20,309,020	1,426,396	203,354
2031	13	146,520	582,034	36,835,772	20,978,708	1,473,431	210,059
2032	14	150,760	600,553	38,043,521	21,666,546	1,521,741	216,947
2033	15	155,000	619,460	39,284,000	22,373,023	1,571,360	224,021
2034	16	159,240	638,763	40,558,096	23,098,646	1,622,324	231,286
2035	17	163,480	655,792	41,639,763	23,714,677	1,665,591	237,454
2036	18	167,720	673,107	42,745,660	24,344,507	1,709,826	243,761
2037	19	171,960	690,715	43,876,328	24,988,446	1,755,053	250,209
2038	20	176,200	708,623	45,032,324	25,646,808	1,801,293	256,801
Total		2,809,800	10,854,382	680,410,752	387,507,519	27,216,430	3,880,103

[1]"Without the Rail Spur" scenario assumes that the truck plus barge will pick up and continue operating.

[2]BERC assumes that railroad connection will give a significant push to the region through increased economic activities. In developing this assumption, BERC also consulted the following sources: (a) Maritime Administration, U.S. Department of Transportation (2008), *Impact of High Oil Prices on Freight Transportation: Modal Shift Potential in Five Corridors,* Technical Report, (b) Regional Economic Development Center, University of Memphis (2005), *Market Opportunity Analysis for a Short Line Railroad Connecting Brownsville and Dyersburg Tennessee,* (c) IHS Global Insight (2009), *Memphis Regional Infrastructure Plan.*

III.b. *Assumptions Regarding Long-Term Outcomes*

Critical to the benefit-cost analysis of the proposed investment are the long-term outcomes associated with railroad operation: (a) state of good repair, (b) economic competitiveness, (c) livability, (d) sustainability, and (e) safety. The assumptions and estimates regarding the long-term outcomes will be used to calculate the benefit-cost ratio. Table 7 below summarizes basic calculations for the region. The calculations in the table are based on two scenarios: 1) No Railroad spur ("Baseline") and 2) With rail line ("Alternative Scenario") (see Table 7 in the attachment "CL Port BCA 2.xlsx").

Some general assumptions are as follows:

- We assume that all trucks return 100 percent empty (load ratio of 0.5).
- Ton-miles per gallon figures used is from a national study done by Center for Ports and Waterways, Texas Transportation Institute, College Station, Texas.

- Box A includes the following calculations:
  - Tons = actual tons
  - Ton-miles = tons X distance (distance of the railroad)
  - Units = tons / tons per unit by mode
  - Vehicle Miles Traveled (VMT) = 2 X (distance to/from / tons per unit)
  - Fuel (Gallons) = ton-miles/ton-miles per gallon

Table 7. Northwest Tennessee Regional Port Authority: Intermodal Rail Connection- Cost Saving Assumptions and Societal Benefits (Average Annual Snapshot)

Project Location: Dyer, Lake, and Obion counties/ Other immediate beneficiary counties: Crockett, Gibson, Lauderdale, and Weakley
Length of Rail Spur: 6.75 miles
Average Length of the Port to North and South Railroad Access Points with the Rail Spur, as well as the Neighboring Counties: 48.17 miles
Average Distance to the Port of Cates Landing from the Center of Seven Counties for Truck Transportation: 42.29 miles

Scope of the Project: Project involves (1) constructing a rail spur and (2) a rail loop at the Port of Cates Landing to turn the port into a real multi-modal transportation infrastructure.

Significance of the Project: The project is the critical third leg of the transportation infrastructure and economic competitiveness in the region. Once completed, the region will be a major multi-modal transportation hub with (1) a port at Cates Landing, (2) Foreign Trade Zone designation, and (3) railroad connection.

Baseline Scenario: No Rail Spur			**A** (20-Year Annual Average Cargo Volume)		
Seven-County Regio	Tons	Ton-miles	Units	VMT	Fuel (Gallon)
Short Truck	135,920	11,496,114	10,874	459,845	79,284
Rail	0	0	0		0

Alternative Scenario: Rail Spur and Loop			**A**		
Seven-County Regio	Tons	Ton-miles	Units	VMT	Fuel (Gallon)
Short Truck	0	0	0	0	0
Rail	542,719	26,142,774	4,934		54,807

Annual Average Fuel Cost Savings with Rail Spur			
Seven-County Region	Gallons Saved	Price per Gallon	Total saved (cents)
Annual Average Fuel Savings	24,477	317.1	7,761,621

VMT= Vehicle Miles Travele	**B**	
Truck= Load Ratio of 0.5		
Ton-Miles per Gallon	Tons per Unit	Ton-Miles/Gallon
Truck	25	145
Rail	110	477

Energy information administration (Midwest Region) (www.eia.gov)	
Diesel (cents per gallon) (July 2nd, 2018)	317.1

Annual Average Transportation Cost Savings to Producers	
Seven-County Region	Total Fuel Saved($)
Producers' Annual Saving	$77,616

Notes: The BERC's calculations are based on the national figures estimated by the Center for Ports and Waterways in a study entitled "A Modal Comparison of Domestic Freight Transportation Effects on the General Public" (Updated in 2017).

IV. FINDINGS

This section presents two types of findings: 1) benefits to the general public and benefit-cost ratio; and 2) job creation and economic stimulus.

IV.a. Long-Term Outcomes

Investment in the rail line is estimated to generate significant benefits. The BERC estimates long-term public benefits for (a) state of good repair, (b) economic competitiveness, (c) livability, (d) sustainability, and (e) safety.

IV.a.1. State of Good Repair

The BERC monetized public benefits for undiscounted pavement and maintenance savings. Once constructed, the new rail spur will improve the transportation system of the region. BERC estimates a public benefit of between $1 million (7% discount rate) and $1.5 million (3% discount rate) throughout the life cycle of the rail line (see Table 8 in CL Port BCA 2.xlsx).

Table 8. Northwest Tennessee Regional Port Authority: Intermodal Rail Connection- State of Good Repair

Parameters and Undiscounted Estimates (in 2017 Dollars)				Discounted Pavement and Maintenance Savings	
Year	Project Year	Truck VMT Reduced	Undiscounted Pavement and Maintenance Savings ($0.0805616/VMT)	3%	7%
2018	0				
2019	1	992,969	$79,995	$77,665	$74,762
2020	2	1,027,608	$82,786	$78,033	$72,308
2021	3	1,063,167	$85,650	$78,382	$69,916
2022	4	1,099,673	$88,591	$78,712	$67,586
2023	5	1,137,150	$91,611	$79,024	$65,317
2024	6	1,175,623	$94,710	$79,318	$63,109
2025	7	1,214,526	$97,844	$79,556	$60,932
2026	8	1,254,448	$101,060	$79,778	$58,818
2027	9	1,295,417	$104,361	$79,984	$56,765
2028	10	1,337,458	$107,748	$80,174	$54,774
2029	11	1,380,601	$111,223	$80,350	$52,841
2030	12	1,426,396	$114,913	$80,597	$51,023
2031	13	1,473,431	$118,702	$80,830	$49,257
2032	14	1,521,741	$122,594	$81,049	$47,544
2033	15	1,571,360	$126,591	$81,254	$45,883
2034	16	1,622,324	$130,697	$81,446	$44,272
2035	17	1,665,591	$134,183	$81,183	$42,479
2036	18	1,709,826	$137,746	$80,911	$40,754
2037	19	1,755,053	$141,390	$80,633	$39,095
2038	20	1,801,293	$145,115	$80,347	$37,500
Average		1,376,283	$110,876	$79,961	$54,747
Total		27,525,655	$2,217,511	$1,599,229	$1,094,936

Note: Marginal pavement cost per mile of 5.6 cents in 2000 is from 1997 Federal Highway Cost Allocation Study at http://www.fhwa.dot.gov/policy/hcas/summary/97fhcas.html.
Note 1: Cost per mile figures are adjusted to the 2017 value using Consumer Price Index (www.bls.gov): Growth between 2000 and 2017: 43.86 percent.

IV.a.2. Economic Competitiveness

Before presenting the long-term outcome of the proposed rail spur investment, it is important to highlight several critical trends in the region. These trends include (a) gradual loss of manufacturing jobs because of increasing international competitiveness, (b) decreasing volume of foreign export cargo volumes from the region, and (c) the ripple effect of these factors affecting a large number of business closures throughout the counties. One of the critical remedies to the loss of economic competitiveness is to build the last leg of the stool to ensure the rural communities gain a competitive edge. That last leg is the rail spur along with the Port of Cates Landing and FTZ 283.

According to the Trade Adjustment Data (see TEmploymentLoss Causes 1, TEmploymentLoss by County 2, and TEmploymentLoss Decade 3 in CL Rail BCA 1.xlsx), the study region has been losing its competitive edge over the past decades. The tables below show the extent of confirmed job losses from 1994 to 2017. From 1994 to 2017, nearly 13,000 manufacturing jobs were lost in the 7-county region. As the tables below reveal, about half of these jobs was lost because of increased imports.

Trade Adjustment Data

Estimated Job Losses Associated with the Manufacturing Sector within the 7-County Region between 1994 and 2017

Product-Industry	Crockett County	Dyer County	Gibson County	Lake County	Lauderdale County	Obion County	Weakley County	Grand Total
Advanced Materials Manufacturing			17		288			305
Automotive		179	632			203		1,014
Chemical Manufacturing			27	61				88
Clothing-Textile	333	1,056	728	160	476	819	1,010	4,582
Electronics Manufacturing	10						25	35
Furniture			282		301			583
Lighting Fixtures		49	160				157	366
Logistics and Warehousing		74	236					310
Machinery Manufacturing		73	426		155			654
Miscellaneous Manufacturing		93	70			653		816
Paint-Dye Manufacturing							7	7
Processed Clay							6	6
Professional Services			44				8	52
Publication Printing Ink & Pigments		292					125	417
Tire Manufacturing						3,651		3,651
Grand Total	343	1,816	2,622	221	1,220	5,326	1,338	12,886

Source: BERC and https://www.doleta.gov/tradeact/taa-data/petitions-determinations-data/

Trade Adjustment Data

Estimated Job Losses Associated with the Manufacturing Sector within the 7-County Region between 1994 and 2017

Causes	Crockett County	Dyer County	Gibson County	Lake County	Lauderdale County	Obion County	Weakley County	Grand Total
Certified-Upstreams or Undefined	286	49	800	160	203	160	238	1,896
High and Rising U.S. Imports from Canada/Mexico		722	30		95	525	522	1,894
Imports	14	216	292		169	3,686		4,377
Petition Denied		366	514	61	598	752	328	2,619
Shift in Production	43	463	986		155	203	250	2,100
Grand Total	343	1,816	2,622	221	1,220	5,326	1,338	12,886

Source: BERC and https://www.doleta.gov/tradeact/taa-data/petitions-determinations-data/

If we focus on recent history (2008-2017), these seven counties have lost more than 6,000 manufacturing jobs that are officially recorded as job losses due to global competitive pressure.

Estimated Number of Trade Adjustment Recorded Job Losses in the Last Decade (2008-2017)

Counties	2008	2009	2010	2011	2013	2014	2016	2017	Grand Total
Crockett	14								14
Dyer		49	867					150	1,066
Gibson	338	492		27	68			184	1,109
Obion		663	23	2,524	2	244	165		3,621
Weakley	170	254	140				3		567
Grand Total	522	1,458	1,030	2,551	70	244	168	334	6,377

Source: BERC and https://www.doleta.gov/tradeact/taa-data/petitions-determinations-data/

When a region experiences competitive pressure and starts losing the critically important and high-value-added manufacturing jobs, the whole economy will suffer. If we look at the area in the last five years, more than 500 local businesses shut their doors in the core region and another nearly 1,500 businesses in the neighboring counties. Many of these businesses are victims of the large-scale manufacturing job losses over the years.

Number of Businesses Closed by Year, by County

	Core Region			Surrounding Area				
Year	Dyer	Lake	Obion	Lauderdale	Tipton	Gibson	Madison	Haywood
2013	73	32	130	105	203	73	252	0
2014	83	24	83	58	121	51	39	4
2015	60	19	75	44	109	60	6	8
2016	57	11	64	40	91	60	4	25
2017	37	9	52	26	48	25	1	19
2018	1	N/A	2	N/A	3	N/A	N/A	N/A
Total	311	95	406	273	575	269	302	56

Source: Local Chambers of Commerce and Northwest Tennessee Port Authority

To consider the region's eroding global competitiveness from a different perspective, BERC extracted foreign exports data for the 7-county region between 2014 and 2016: the results are not encouraging. Between 2014 and 2016, international exports from the region shrunk nearly 20 percent, generating a job loss of almost 2,200 in the foreign export sector (see TIMPLAN FExport 1 in CL Rail BCA 1.xlsx). Other notable findings from the data are that (1) foreign export segment of the regional economy accounts for nearly 8,000 jobs in the 7-county region, and (2) there is still a sizeable amount of foreign export volume (160,000 tons).

Commodity Trade between 2014 and 2016 in the Seven-County Region (Lake, Obion, Dyer, Lauderdale, Weakley, Gibson, and Crockett): *Only Foreign Exports*

Top 30 Commodities	Foreign Exports (2014)	Foreign Exports (2016)	Percent Change (2014-16)	Estimated Tonnage [$8,177 in 2014]	Estimated Tonnage [$8,001 per ton in 2016]	Output per Worker (2014)	Foreign Export Employment 2014	Output per Worker (2016)	Foreign Export Employment 2016	Change in Foreign Export Employment (2014-2016)
Total	$1,602,630,491	$1,284,644,600	-19.84%	195,992	160,561	$159,067	10,078	$161,871	7,936	-2,139
All other commodities	$375,333,623	$375,567,243	0.01%	45,926	46,940	$55,627	6,751	$73,936	5,080	-1,671
Motor vehicle steering, suspension components (except	$163,262,878	$139,788,666	-14.38%	19,966	17,471	$460,097	355	$460,639	303	-51
Meat (except poultry) produced in slaughtering plant	$157,164,886	$131,394,943	-16.40%	19,220	16,422	$604,736	260	$701,804	187	-73
Oilseeds	$133,510,666	$115,059,128	-13.82%	16,328	14,381	$270,022	494	$234,464	491	-4
Switchgear and switchboard apparatus	$79,339,241	$85,641,312	7.94%	9,705	10,704	$439,205	181	$449,599	190	10
Other motor vehicle parts	$80,369,530	$67,698,776	-15.77%	9,829	8,461	$491,157	164	$522,470	130	-34
Lawn and garden equipment	$80,690,079	$51,213,417	-36.53%	9,868	6,401	$551,332	146	$560,530	91	-55
Cotton	$54,250,587	$49,304,031	-9.12%	6,635	6,162	$115,997	468	$89,663	550	82
Grains	$58,844,856	$41,446,205	-29.57%	7,196	5,180	$122,697	480	$105,928	391	-88
Frozen fruits, juices and vegetables	$37,363,400	$32,437,656	-13.18%	4,569	4,054	$490,461	76	$457,551	71	-5
Synthetic rubbers	$153,614,609	$24,613,117	-83.98%	18,786	3,076	$1,059,199	145	$946,776	26	-119
Construction machinery	$40,655,685	$24,393,221	-40.00%	4,972	3,049	$691,744	59	$674,924	36	-23
Other basic organic chemicals	$9,661,255	$12,211,441	26.40%	1,182	1,526	$2,095,574	5	$1,509,424	8	3
Air conditioning, refrigeration, and warm air heating eq	$19,343,039	$11,944,377	-38.25%	2,366	1,493	$390,709	50	$399,250	30	-20
Iron and steel and ferroalloy products	$3,766,398	$11,772,484	212.57%	461	1,471	$1,705,048	2	$825,931	14	12
Power, distribution, and specialty transformers	$20,623,960	$10,571,777	-48.74%	2,522	1,321	$361,725	57	$353,267	30	-27
Soaps and other detergents	$18,704,241	$10,351,845	-44.66%	2,287	1,294	$1,050,679	18	$1,286,440	8	-10
Rubber and plastics hoses and belts	$14,517,905	$7,824,105	-46.11%	1,775	978	$317,150	46	$289,315	27	-19
Other plastics products	$8,640,244	$7,543,716	-12.69%	1,057	943	$248,602	35	$265,644	28	-6
Mayonnaise, dressings, and sauces	$52,513	$7,391,568	13975.80%	6	924	$159,000	0	$604,412	12	12
Surgical appliance and supplies	$9,726,346	$7,356,237	-24.37%	1,189	919	$421,007	23	$477,023	15	-8
Processed animal rendered byproducts	$9,659,340	$7,199,733	-25.46%	1,181	900	$585,753	16	$500,489	14	-2
Couriers and messengers services	$5,770,936	$7,051,429	22.19%	706	881	$82,012	70	$104,908	67	-3
Scientific research and development services	$8,020,723	$6,735,252	-16.03%	981	842	$200,057	40	$197,698	34	-6
Compounded resins	$5,932,905	$6,164,047	3.90%	726	770	$533,577	11	$527,303	12	1
Cutlery, utensils, pots, and pans	$1,594,436	$5,456,900	242.25%	195	682	$505,692	3	$499,687	11	8
Industrial trucks, trailers, and stackers	$17,893,085	$5,370,333	-69.99%	2,188	671	$459,975	39	$415,207	13	-26
Other miscellaneous chemical products	$19,713,558	$5,357,965	-72.82%	2,411	670	$582,296	34	$587,931	9	-25
Speed changers, industrial high-speed drives, and gears	$756,074	$5,345,487	607.01%	92	668	$263,004	3	$263,057	20	17
Power boilers and heat exchangers	$7,610,886	$5,275,675	-30.68%	931	659	$289,718	26	$272,262	19	-7
Other rubber products	$6,042,626	$5,162,514	-14.57%	739	645	$318,129	19	$318,295	16	-3

Source: BERC and IMPLAN

Given the fact that the region is bleeding jobs, how can the study region regain its competitive position? One way is to decrease transportation costs for producers. The study region is rich in natural resources. The increasing cost of transportation is likely to put pressure on the profit margins of many manufacturing and agricultural shippers.

Once the rail line to Cates Landing becomes operational, the shippers in the study region are likely to benefit from transportation cost savings. Competitiveness benefits also include indirect and induced effect of producers' surplus. To calculate these components, BERC inputted an average investment amount of cost savings into the IMPLAN model to determine the annual stream of benefits. Table 9 (CL Rail BCA 2.xlsx) below shows the estimates of transportation savings over the life cycle of the rail line.

Table 9. Northwest Tennessee Regional Port Authority: Intermodal Rail Connection-Economic Competitiveness (20-year Monetized Public Benefits)

Annual Benefits (Undiscounted)					Build Rates	
Year	Project Year	Fuel Savings (G) ($2017)	Producers' Surplus: Average Value-Added: Indirect & Induced Only (H) ($2017)*	Undiscounted Total Benefits (G+H) ($2017)	3%	7%
2018	0					
2019	1	$448,894	$256,829	$705,723	$685,168	$659,555
2020	2	$464,553	$256,829	$721,382	$679,972	$630,083
2021	3	$480,629	$256,829	$737,458	$674,879	$601,985
2022	4	$497,132	$256,829	$753,961	$669,885	$575,193
2023	5	$514,074	$256,829	$770,903	$664,988	$549,643
2024	6	$531,467	$256,829	$788,296	$660,186	$525,275
2025	7	$549,054	$256,829	$805,883	$655,257	$501,864
2026	8	$567,102	$256,829	$823,931	$650,419	$479,535
2027	9	$585,623	$256,829	$842,452	$645,669	$458,238
2028	10	$604,628	$256,829	$861,457	$641,005	$437,921
2029	11	$624,132	$256,829	$880,961	$636,425	$418,538
2030	12	$644,835	$256,829	$901,664	$632,409	$400,349
2031	13	$666,098	$256,829	$922,927	$628,468	$382,982
2032	14	$687,938	$256,829	$944,767	$624,602	$366,397
2033	15	$710,369	$256,829	$967,198	$620,808	$350,557
2034	16	$733,408	$256,829	$990,237	$617,083	$335,428
2035	17	$752,968	$256,829	$1,009,797	$610,944	$319,676
2036	18	$772,966	$256,829	$1,029,795	$604,896	$304,679
2037	19	$793,412	$256,829	$1,050,241	$598,938	$290,400
2038	20	$814,316	$256,829	$1,071,145	$593,067	$276,804
Average		$622,180	$256,829	$879,009	$639,753	$443,255
Total		$12,443,599	$5,136,580	$17,580,179	$12,795,067	$8,865,104

*Based on IMPLAN model for the region.

An average value of $622,180 is used to measure the indirect and induced revenues in agricultural sectors.

IV.a.3. Livability

With the rail line, society would benefit from reductions in congestion, accidents, and noise. The BERC monetized only those societal benefits from reductions in congestion, accidents, and noise. Details and assumptions can be found in CL Rail 1.xlsx.

Table 10. Northwest Tennessee Regional Port Authority: Intermodal Rail Connection-Livability Benefits

		Social Benefits of Reduced VMT (Undiscounted) (2017)					Discounted Livability	
Year	Project Year	Congestion ($0.0576 /VMT)	Accidents ($0.0312 /VMT)	Noise ($0.0132 /VMT)	Reduced VMT	Undiscounted Total Benefits ($2017)	3%	7%
2018	0							
2019	1	$57,195	$30,981	$13,107	992,969	$101,283	$98,333	$94,657
2020	2	$59,190	$32,061	$13,564	1,027,608	$104,816	$98,799	$91,550
2021	3	$61,238	$33,171	$14,034	1,063,167	$108,443	$99,241	$88,522
2022	4	$63,341	$34,310	$14,516	1,099,673	$112,167	$99,659	$85,571
2023	5	$65,500	$35,479	$15,010	1,137,150	$115,989	$100,053	$82,699
2024	6	$67,716	$36,679	$15,518	1,175,623	$119,914	$100,426	$79,903
2025	7	$69,957	$37,893	$16,032	1,214,526	$123,882	$100,727	$77,147
2026	8	$72,256	$39,139	$16,559	1,254,448	$127,954	$101,008	$74,470
2027	9	$74,616	$40,417	$17,099	1,295,417	$132,132	$101,269	$71,871
2028	10	$77,038	$41,729	$17,654	1,337,458	$136,421	$101,510	$69,349
2029	11	$79,523	$43,075	$18,224	1,380,601	$140,821	$101,732	$66,903
2030	12	$82,160	$44,504	$18,828	1,426,396	$145,492	$102,045	$64,600
2031	13	$84,870	$45,971	$19,449	1,473,431	$150,290	$102,340	$62,365
2032	14	$87,652	$47,478	$20,087	1,521,741	$155,218	$102,617	$60,196
2033	15	$90,510	$49,026	$20,742	1,571,360	$160,279	$102,877	$58,092
2034	16	$93,446	$50,617	$21,415	1,622,324	$165,477	$103,120	$56,053
2035	17	$95,938	$51,966	$21,986	1,665,591	$169,890	$102,786	$53,783
2036	18	$98,486	$53,347	$22,570	1,709,826	$174,402	$102,443	$51,599
2037	19	$101,091	$54,758	$23,167	1,755,053	$179,015	$102,090	$49,499
2038	20	$103,754	$56,200	$23,777	1,801,293	$183,732	$101,728	$47,480
Average		$79,274	$42,940	$18,167	1,376,283	$140,381	$101,240	$69,316
Total		$1,585,478	$858,800	$363,339	27,525,655	$2,807,617	$2,024,803	$1,386,312

*Values per VMT are adjusted to 2017 from 2007 using the Consumer Price Index (CPI).

https://www.fhwa.dot.gov/policy/hcas/final/toc.cfm		
Year	2011	CPI (Bls.gov)
	Trucks	2017 Values
Pavements	5.6 cents per mile	8.05616
Noise cost	1.1971 cents per mi	1.32
Congestion	5.2236 cents per mi	5.76
Accident	2.8294 cents per mi	3.12

According to BERC's finding, the discounted present value of Livability indicators is somewhere around $2.02 million and $1.4 million. In calculating the values per VMT, BERC used the guideline in this table.

IV.a.4. Sustainability

With the rail line, there would be a reduction in greenhouse emissions. BERC monetized the impacts of reductions in the following environmentally hazardous gases: VOC (Volatile Organic Components), CO2 (Carbon Dioxide), SO2 (Sulfur Dioxide), PM (Particulate Matter), and NOx (Nitrogen Oxide).

Table 11 provides reductions in environmentally hazardous gases, while Table 12 provides detailed discounted benefits (see CL Rail BCA 2.xlsx).

Table 11. Northwest Tennessee Regional Port Authority: Intermodal Rail Connection-Sustainability

		Emission (Tons)					Annual Benefits (Undiscounted)								
Year	Project Year	VOC (Tons)	CO2 (Tons)	SO2 (Tons)	PM (Tons)	NOx (Tons)	VOC ($2017)	CO2 ($2017)	SO2 ($2017)	PM ($2017)	NOx ($2017)	Reduced Ton-Miles from Highways	Increased Ton-Miles for Rail	Reduced Vehicle Miles Travelled (VMT)	Gallons of Fuel Saved
2018	0														
2019	1	6.52	3,523	0.27	1.14	19.33	$12,208	$95,483	$11,604	$383,076	$142,625	24,824,230	14,137,895	992,969	141,562
2020	2	6.75	3,646	0.28	1.17	20.01	$12,634	$98,814	$12,008	$396,439	$147,600	25,690,189	14,631,076	1,027,608	146,501
2021	3	6.98	3,772	0.28	1.22	20.70	$13,071	$102,233	$12,424	$410,157	$152,708	26,579,182	15,137,375	1,063,167	151,570
2022	4	7.22	3,902	0.29	1.26	21.41	$13,520	$105,743	$12,850	$424,241	$157,951	27,491,823	15,657,142	1,099,673	156,775
2023	5	7.47	4,035	0.30	1.30	22.14	$13,981	$109,347	$13,288	$438,699	$163,334	28,428,739	16,190,735	1,137,150	162,117
2024	6	7.72	4,171	0.32	1.34	22.89	$14,454	$113,047	$13,738	$453,542	$168,861	29,390,578	16,738,522	1,175,623	167,602
2025	7	7.98	4,309	0.33	1.39	23.65	$14,932	$116,787	$14,193	$468,550	$174,448	30,363,153	17,292,422	1,214,526	173,149
2026	8	8.24	4,451	0.34	1.43	24.42	$15,423	$120,626	$14,659	$483,951	$180,183	31,361,210	17,860,836	1,254,448	178,840
2027	9	8.51	4,597	0.35	1.48	25.22	$15,927	$124,566	$15,138	$499,756	$186,067	32,385,416	18,444,141	1,295,417	184,681
2028	10	8.78	4,746	0.36	1.53	26.04	$16,444	$128,608	$15,629	$515,976	$192,106	33,436,456	19,042,730	1,337,458	190,674
2029	11	9.07	4,899	0.37	1.58	26.88	$16,974	$132,757	$16,133	$532,620	$198,303	34,515,033	19,657,001	1,380,601	196,825
2030	12	9.37	5,061	0.38	1.63	27.77	$17,537	$137,161	$16,668	$550,287	$204,880	35,659,890	20,309,020	1,426,396	203,354
2031	13	9.68	5,228	0.39	1.68	28.69	$18,116	$141,683	$17,218	$568,432	$211,636	36,835,772	20,978,708	1,473,431	210,059
2032	14	9.99	5,400	0.41	1.74	29.63	$18,710	$146,329	$17,783	$587,070	$218,575	38,043,521	21,666,546	1,521,741	216,947
2033	15	10.32	5,576	0.42	1.80	30.60	$19,320	$151,100	$18,363	$606,212	$225,702	39,284,000	22,373,023	1,571,360	224,021
2034	16	10.66	5,756	0.43	1.85	31.59	$19,946	$156,001	$18,958	$625,873	$233,022	40,558,096	23,098,646	1,622,324	231,286
2035	17	10.94	5,910	0.45	1.90	32.43	$20,478	$160,161	$19,464	$642,565	$239,237	41,639,763	23,714,677	1,665,591	237,454
2036	18	11.23	6,067	0.46	1.95	33.29	$21,022	$164,415	$19,981	$659,631	$245,591	42,745,660	24,344,507	1,709,826	243,761
2037	19	11.53	6,227	0.47	2.01	34.17	$21,578	$168,764	$20,509	$677,079	$252,087	43,876,328	24,988,446	1,755,053	250,209
2038	20	11.83	6,392	0.48	2.06	35.07	$22,147	$173,210	$21,049	$694,918	$258,729	45,032,324	25,646,808	1,801,293	256,801
Total		181	97,669	7	31	536	$338,423	$2,646,835	$321,658	$10,619,073	$3,953,646	688,141,364	391,910,257	27,525,655	3,924,188

Sustainability Indicators		Tons Reduced
CO2	Carbon Dioxide	97,669
SO2	Sulfur Dioxide	7
VOC	Volatile Organic Compounds	181
PM	Particulate Matter	31
NOx	Nitrogen Oxide	536

Grams per Ton-Mile

Sustainability Units		Trucks	Train
CO2	Carbon Dioxide	154	21.19
SO2	Sulfur Dioxide	1.88	Gallon
VOC	Volatile Organic Compounds	0.27	0.0128
PM	Particulate Matter	0.05	0.0075
NOx	Nitrogen Oxide	0.94	0.283

Sustainability Indicators		Cost per Ton
CO2	Carbon Dioxide	$27.10
SO2	Sulfur Dioxide	$43,600
VOC	Volatile Organic Compounds	$1,872
PM	Particulate Matter	$337,459
NOx	Nitrogen Oxide	$7,377

https://www.transportation.gov/sites/dot.dev/files/docs/Costs%20of%20Surface%20Transportation%20Congestion.pdf

Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (February 2010), on page 39 in Table A-1 "Annual SCC Values 2010-2050 (in 2007 dollars)" (http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/CAFE_2012-2016_FRIA_04012010.pdf)

Table 12. Northwest Tennessee Regional Port Authority: Intermodal Rail Connection-Sustainability

		Annual Benefits (Undiscounted)							Discounted Benefits	
Year	Project Year	VOC ($2017)	CO2 ($2017)	SO2 ($2017)	PM ($2017)	NOx ($2017)	Undiscounted Total Benefits ($2017)	Gallons of Fuel Saved	3%	7%
2018	0									
2019	1	$12,208	$95,483	$11,604	$383,076	$142,625	$644,996	141,562	$626,209	$602,800
2020	2	$12,634	$98,814	$12,008	$396,439	$147,600	$667,495	146,501	$629,178	$583,016
2021	3	$13,071	$102,233	$12,424	$410,157	$152,708	$690,594	151,570	$631,991	$563,730
2022	4	$13,520	$105,743	$12,850	$424,241	$157,951	$714,306	156,775	$634,652	$544,941
2023	5	$13,981	$109,347	$13,288	$438,699	$163,334	$738,650	162,117	$637,166	$526,647
2024	6	$14,454	$113,047	$13,738	$453,542	$168,861	$763,641	167,602	$639,537	$508,846
2025	7	$14,932	$116,787	$14,193	$468,550	$174,448	$788,911	173,149	$641,457	$491,294
2026	8	$15,423	$120,626	$14,659	$483,951	$180,183	$814,843	178,840	$643,244	$474,246
2027	9	$15,927	$124,566	$15,138	$499,756	$186,067	$841,454	184,681	$644,905	$457,695
2028	10	$16,444	$128,608	$15,629	$515,976	$192,106	$868,763	190,674	$646,441	$441,635
2029	11	$16,974	$132,757	$16,133	$532,620	$198,303	$896,787	196,825	$647,858	$426,057
2030	12	$17,537	$137,161	$16,668	$550,287	$204,880	$926,533	203,354	$649,852	$411,392
2031	13	$18,116	$141,683	$17,218	$568,432	$211,636	$957,086	210,059	$651,729	$397,156
2032	14	$18,710	$146,329	$17,783	$587,070	$218,575	$988,466	216,947	$653,492	$383,344
2033	15	$19,320	$151,100	$18,363	$606,212	$225,702	$1,020,697	224,021	$655,146	$369,947
2034	16	$19,946	$156,001	$18,958	$625,873	$233,022	$1,053,801	231,286	$656,694	$356,959
2035	17	$20,478	$160,161	$19,464	$642,565	$239,237	$1,081,905	237,454	$654,570	$342,504
2036	18	$21,022	$164,415	$19,981	$659,631	$245,591	$1,110,639	243,761	$652,383	$328,598
2037	19	$21,578	$168,764	$20,509	$677,079	$252,087	$1,140,017	250,209	$650,136	$315,224
2038	20	$22,147	$173,210	$21,049	$694,918	$258,729	$1,170,052	256,801	$647,830	$302,364
Average		$16,921	$132,342	$16,083	$530,954	$197,682	$893,982	196,209	$644,724	$441,420
Total		$338,423	$2,646,835	$321,658	$10,619,073	$3,953,646	$17,879,635	3,924,188	$12,894,471	$8,828,396

According to BERC's calculations, the total benefits associated with sustainability are between $12.9 million and $8.8 million.

IV.a.5. Safety

The BERC addressed safety benefits under three categories: (1) lives saved, (2) injuries prevented, and (3) property damage. Detailed calculations can be found in CL Rail BCA 2.xlsx. Table 13 shows that diversion of long trucks from highways will prevent 18 injuries and 55 instances of damage to property. Monetized values are estimated using guideline standards.

Table 13. Northwest Tennessee Regional Port Authority: Intermodal Rail Connection-Safety Benefits

		Annual Benefits (Undiscounted)							Present Value (Discounted)		
Year	Project Year	Fatality Reduction (lives saved)	Injury Reduction (injuries prevented)	Accidents Involving Property Damage (Number)	SVL Saved ($2017)	Value of Injuries Prevented ($2017)	Property Damage ($2017)	Total Annual Benefits (Undiscounted)	3% Discount ($2017)	7% Discount ($2017)	Reduced Vehicle Miles Travelled (VMT)
2018	0										
2019	1	0.01	0.64	2.01	$127,682	$646,717	$57,809	$832,208	807,969	777,764	992,969
2020	2	0.01	0.66	2.08	$132,136	$669,277	$59,825	$861,238	811,799	752,239	1,027,608
2021	3	0.01	0.69	2.15	$136,708	$692,437	$61,895	$891,041	815,428	727,355	1,063,167
2022	4	0.01	0.71	2.22	$141,402	$716,213	$64,021	$921,636	818,862	703,112	1,099,673
2023	5	0.02	0.74	2.30	$146,221	$740,622	$66,203	$953,045	822,105	679,508	1,137,150
2024	6	0.02	0.76	2.38	$151,168	$765,679	$68,442	$985,290	825,165	656,540	1,175,623
2025	7	0.02	0.79	2.46	$156,171	$791,017	$70,707	$1,017,895	827,641	633,894	1,214,526
2026	8	0.02	0.81	2.54	$161,304	$817,018	$73,031	$1,051,353	829,948	611,897	1,254,448
2027	9	0.02	0.84	2.62	$166,572	$843,700	$75,417	$1,085,689	832,090	590,543	1,295,417
2028	10	0.02	0.86	2.70	$171,978	$871,082	$77,864	$1,120,924	834,073	569,821	1,337,458
2029	11	0.02	0.89	2.79	$177,526	$899,181	$80,376	$1,157,082	835,901	549,721	1,380,601
2030	12	0.02	0.92	2.88	$183,414	$929,006	$83,042	$1,195,462	838,473	530,800	1,426,396
2031	13	0.02	0.95	2.98	$189,462	$959,640	$85,780	$1,234,883	840,895	512,432	1,473,431
2032	14	0.02	0.98	3.08	$195,674	$991,104	$88,593	$1,275,371	843,171	494,611	1,521,741
2033	15	0.02	1.02	3.18	$202,054	$1,023,421	$91,481	$1,316,957	845,305	477,326	1,571,360
2034	16	0.02	1.05	3.28	$208,608	$1,056,614	$94,448	$1,359,670	847,301	460,567	1,622,324
2035	17	0.02	1.08	3.37	$214,171	$1,084,793	$96,967	$1,395,932	844,562	441,916	1,665,591
2036	18	0.02	1.11	3.46	$219,859	$1,113,604	$99,543	$1,433,006	841,740	423,975	1,709,826
2037	19	0.02	1.13	3.55	$225,675	$1,143,060	$102,176	$1,470,910	838,840	406,719	1,755,053
2038	20	0.02	1.16	3.64	$231,621	$1,173,176	$104,868	$1,509,664	835,864	390,126	1,801,293
Average		0.02	0.89	2.78	$176,970	$896,368	$80,124	$1,153,463	$831,857	$569,543	1,376,283
Total		0.37	17.79	55.67	$3,539,406	$17,927,362	$1,602,488	$23,069,256	$16,637,132	$11,390,866	27,525,655

In calculating the safety benefits, BERC used the following values:

TN Ratios	2016	2017
Fatality Rates per 100 million VMT	1.34	N/A
Injuries per 100 million VMT		64.64
PDOs per 100 million VMT		202.23

IV.a.6. Total Project Cost

As previously discussed, the total project cost is around $28 million. In addition to this cost, BERC anticipates an annual average cost of about $5,000 to maintain the rail.

Table 14. Northwest Tennessee Regional Port Authority: Intermodal Rail Connection-Construction, Operating and Maintenance Cost

					Discounted Total Cost ($2017)	
Year	Project Year	Operations & Maintenance Costs ($2017)*	Initial Costs ($2017)	Total Cost (Undiscounted)	3%	7%
2018	0	$0	$13,691,203	$13,691,203	-$13,691,203	-$13,691,203
2019	1	$5,000	$14,691,200	$14,696,200	-$14,268,155	-$13,734,766
2020	2	$5,000		$5,000	-$4,713	-$4,367
2021	3	$5,000		$5,000	-$4,576	-$4,081
2022	4	$5,000		$5,000	-$4,442	-$3,814
2023	5	$5,000		$5,000	-$4,313	-$3,565
2024	6	$5,000		$5,000	-$4,187	-$3,332
2025	7	$5,000		$5,000	-$4,065	-$3,114
2026	8	$5,000		$5,000	-$3,947	-$2,910
2027	9	$5,000		$5,000	-$3,832	-$2,720
2028	10	$5,000		$5,000	-$3,720	-$2,542
2029	11	$5,000		$5,000	-$3,612	-$2,375
2030	12	$5,000		$5,000	-$3,507	-$2,220
2031	13	$5,000		$5,000	-$3,405	-$2,075
2032	14	$5,000		$5,000	-$3,306	-$1,939
2033	15	$5,000		$5,000	-$3,209	-$1,812
2034	16	$5,000		$5,000	-$3,116	-$1,694
2035	17	$5,000		$5,000	-$3,025	-$1,583
2036	18	$5,000		$5,000	-$2,937	-$1,479
2037	19	$5,000		$5,000	-$2,851	-$1,383
2038	20	$5,000		$5,000	-$2,768	-$1,292
Average		$5,000		$1,356,305	-$1,334,709	-$1,308,298
20-Year Total		$100,000	$28,382,403	$28,482,403	-$28,028,891	-$27,474,267

*Construction and Maintenance Costs are calculated as follows:

(1) New railroad does not require maintenance expenses until at least its 10th year of service.

(2) BERC assumes that an average $5,000 annual expenditure covers any contingency associated with the rail.

IV.a.7. Residual Value

A final benefit-cost category is the residual value of the rail beyond the stream of benefit estimated in this study. According to the estimates by the local contractors, the life cycle of the rail spur is more than 40 years. To remain conservative, BERC assumed a rail life cycle of 30 years. During this period, the rail is note expected to go through major rehabilitation. Since this study used a benefit-cost stream of 20 years, the value of the remaining 10 years is estimated using the guidelines provided by the Build Grant guidelines. According to BERC's estimates, the rail spur will have a residual value of between $5.24 million and $2.44 million at the end of year 20.

Table 15. Northwest Tennessee Regional Port Authority: Intermodal Rail Residual Value

				Discounted Total Cost ($2017)	
Year	Project Year	Residual Value ($2017)*	Total Cost (Undiscounted)	3%	7%
2018	0	$0	$0	$0	$0
2019	1		$0	$0	$0
2020	2		$0	$0	$0
2021	3		$0	$0	$0
2022	4		$0	$0	$0
2023	5		$0	$0	$0
2024	6		$0	$0	$0
2025	7		$0	$0	$0
2026	8		$0	$0	$0
2027	9		$0	$0	$0
2028	10		$0	$0	$0
2029	11		$0	$0	$0
2030	12		$0	$0	$0
2031	13		$0	$0	$0
2032	14		$0	$0	$0
2033	15		$0	$0	$0
2034	16		$0	$0	$0
2035	17		$0	$0	$0
2036	18		$0	$0	$0
2037	19		$0	$0	$0
2038	20	$9,460,801	$9,460,801	$5,238,216	$2,444,851
Average		$4,730,401	$450,514	$249,439	$116,421
20-Year Total		$9,460,801	$9,460,801	$5,238,216	$2,444,851

*Rail Spur's life cycle is 30 years

IV.a.7. Evaluation of Benefit-Cost Indicators

Tables 16 summarizes monetized and non-monetized benefits of the proposed investment in the Port railroad project.

According to BERC estimates,

- Cumulative undiscounted benefits (20-year) of the railroad project are estimated at $73 million.
- Cumulative discounted (3%) benefits are $51.2 million.
- Cumulative discounted (7%) benefits are $34.0 million.
- Net present value (NPV) of the rail project is $23.2 million at a 3% discount rate and $6.5 million at a 7% discount rate.

Table 16. Northwest Tennessee Regional Port Authority: Cumulative 20-Year Public Benefits (All Monetary Figures are in 2017 $)

The Port of Cates Landing Rail Connection		July 2018-December 2019	
Benefit Period		2019-2038	
Cumulative 20-Year Project Cost (in 2017$)			
Cost		Discount Rate	
	0%	3%	7%
Total Cost	$28,157,403	$28,028,891	$27,474,267
Benefits from Long-Term Outcomes (2019-2038)			
Long-Term Outcomes		Discount Rate	
	0%	3%	7%
State of Good Repair	$2,217,511	$1,599,229	$1,094,936
Economic Competitiveness	$17,580,179	$12,795,067	$8,865,104
Livability	$2,807,617	$2,024,803	$1,386,312
Sustainability	$17,879,635	$12,894,471	$8,828,396
Safety and Security	$23,069,256	$16,637,132	$11,390,866
Railroad Residual Benefits (30-Year Lifecycle)	$9,460,801	$5,238,216	$2,444,851
Cumulative Value	$73,014,999	$51,188,918	$34,010,465
Net Present Value (NPV)		**$23,160,027**	**$6,536,198**
Benefit-Cost Ratio (BCR)		**1.83**	**1.24**

OTHER CUMULATIVE 20-YEAR BENEFITS (UNDISCOUNTED, 2017$)	
Ton-Miles Reduced from Highways	292,903,233
Truck VMT Reduced	27,525,655
Gallons of Fuel Saved	3,924,188
Number of Lives Saved	0.37
Number of Injuries Avoided	17.79
Tons of CO2 Eliminated	97,669
Tons of SO2 Eliminated	7
Tons of VOC Eliminated	181
Tons of PM Eliminated	31
Tons of NOx Eliminated	586

JOB CREATION AND ECONOMIC STIMULUS BENEFITS (ALL MONETARY FIGURES ARE IN 2017$)

Port of Cates Landing Rail Spur: Job Creation and Economic Stimulus			
Short-Term Temporary Jobs: These jobs are associated with the initial construction spending.			
	Q3/2018	Q1/2019	
Direct Jobs	47	70	
Indirect and Induced Jobs	21	30	
Total Jobs*	68	100	
	Q4/2018	Q2/2019	Total
Direct Jobs	70	45	58
Indirect and Induced Jobs	30	19	25
Total Jobs*	100	64	83

Benefit-Cost Ratio (BCR). Based on the discounted benefits and costs presented in Table 16, benefit-cost ratios (BCR) are:

- 1.88 at a 3% discount rate, suggesting every dollar of investment will generate 1.88 dollars worth of societal benefits; and
- 1.28 at a 7% discount rate, suggesting every dollar of investment will create 1.28 dollars worth of societal benefits.

IV.b. Job Creation and Economic Stimulus

Job creation and retention are critical in the study region, where poverty and the unemployment rate are significantly higher than for the U.S. This section presents short-term economic impact results. To estimate the short-term economic impact of the railroad project, BERC constructed a regional economic impact model for the seven-county region with the widely used economic impact software IMPLANpro. Economic impact figures generated by the IMPLAN model are divided into three sub-groups: direct, indirect, and induced (see CL Rail BCA 2.xlsx):

- Direct impact—involves construction expenditures of businesses directly related to the construction spending.
- Indirect Impact—involves business-to-business transactions in the regional economy triggered by the initial spending of businesses directly related to the construction project.
- Induced impact—involves the effect of employee spending on the regional economy.

According to BERC's estimates, construction activities create about 83 jobs throughout the construction period, generating a total personal income of $15.6 million and business revenue of $39.1 million.

Economic Impact Analysis Results*

		Employment	Personal Income	Business Revenue
Quarter 1				
	Direct	47	$2,368,320	$5,521,408
	Indirect	9	$313,556	$997,297
	Induced	12	$419,379	$1,433,143
	Total	68	$3,101,255	$7,951,848
Quarter 2				
	Direct	70	$3,588,600	$8,187,918
	Indirect	12	$448,091	$1,428,348
	Induced	18	$631,394	$2,157,760
	Total	100	$4,668,085	$11,774,026
Quarter 3				
	Direct	70	$3,715,538	$8,260,541
	Indirect	11	$420,707	$1,356,900
	Induced	19	$647,229	$2,212,036
	Total	99.1	$4,783,474	$11,829,477
Quarter 4				
	Direct	45	$2,338,918	$5,267,536
	Indirect	7	$278,292	$892,134
	Induced	12	$409,451	$1,399,333
	Total	64	$3,026,661	$7,559,003
Total		83**	$15,579,475	$39,114,354

*Figures Calculated in IMPLAN using 2017 dollars

**Employment estimated at average per a quarter

Fiscal Impact. In addition to the benefits to residents of construction activities, local, state and federal governments benefit from the associated tax revenues. As a result of the proposed investment, local and state governments are expected to collect local and state taxes and fees in the neighborhood of $1.15 million.

Fiscal Impact: Local and State Taxes*				
	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Corporate				
Corporate Profits Taxes	$8,374	$12,363	$12,766	$8,047
Dividends	$276	$408	$421	$265
Indirect Business Taxes				
Sales Tax	$139,541	$197,308	$196,730	$126,193
Property Taxes	$51,814	$73,264	$73,049	$46,858
Motor Vehicle Licensing Fees	$3,087	$4,365	$4,352	$2,792
Severance Taxes	$34	$49	$49	$31
Other Taxes	$19,817	$28,021	$27,939	$17,922
Personal Taxes				
Income Taxes	$2,944	$4,435	$4,550	$2,877
NonTaxes (Fines & Fees)	$9,926	$14,951	$15,339	$9,700
Motor Vehicle Licensing Fees	$3,873	$5,834	$5,985	$3,785
Property Taxes	$667	$1,005	$1,031	$652
Other Taxes	$1,812	$2,729	$2,800	$1,771
Total	$242,165	$344,732	$345,011	$220,893

*Figures Calculated in IMPLAN using 2017 dollars

Federal government similarly receives a significant amount of revenues generated through the construction activities. According to BERC's estimates, a total of $2.8 million will return to the federal government in the forms of taxes and fees.

Fiscal Impact: Federal Taxes				
	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Employee Compensation				
Social Insurance Tax- Employee Contributions	$113,983	$169,187	$169,344	$108,416
Social Insurance Tax- Employer Contributions	$109,595	$162,674	$169,344	$104,242
Propieter Income				
Social Insurance Tax- Employee Contributions	$59,379	$90,949	$95,849	$59,813
Indirect Business Taxes				
Excise Taxes	$19,971	$28,239	$28,156	$18,061
Custom Duty	$7,535	$10,654	$10,623	$6,814
Fed NonTaxes	$950	$1,344	$1,340	$859
Personal Taxes				
Income Taxes	$207,575	$312,675	$320,790	$202,853
Corporate	$32,618	$48,157	$49,726	$31,344
Total	$551,606	$823,879	$845,172	$532,402

V. CONCLUSION

The Port of Cates Landing serves the a impoverished area of the country. The study region has lost its competitive edge in the manufacturing sector due to relocation of companies overseas to reduce their cost of operation. Creating a vital transportation infrastructure would change the business dynamics in the study region. It would serve not only to retain existing manufacturing companies but also to attract new

companies to the area. This expected virtuous cycle would, in turn, dramatically affect the quality of life in the region.

According to our estimates, **every dollar of the proposed investment would generate public benefits ranging from $1.88 (at a 3% discount rate) to $1.28 (at a 7% discount rate).**

The local economy would benefit handsomely from this investment. In the short run, the region would gain 83 jobs.

Given the extent of economic distress in the region, the proposed $28 million investment is well worth it. The findings of this study strongly recommend this level of investment in the railroad construction.

VI. WORKS CONSULTED AND DATA

In preparation of this study, we consulted numerous sources in a short period. What follows is a selection of those that benefited us substantially.

Bureau of Economic Analysis (www.bea.gov)

Bureau of Labor Statistics (www.bls.gov)

Census Bureau (www.census.gov)

Congressional Budget Office, The Economic Costs of Disruptions in Container Shipments, March 29, 2006

Tennessee Department of Labor and Workforce Development (www.tennessee.gov/labor-wfd)

IMPLANpro, Economic Impact Model (www.implan.com)

Northwest Tennessee Regional Port Authority (www.cateslanding.com)

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U.S. Department of Transportation. (2009, February). "Assessing the Full Costs of Congestion on Surface Transportation Systems and Reducing Them through Pricing."

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U.S. Department of Transportation, National Infrastructure Investments Grant Program. "TIGER Discretionary: South Orient Rehabilitation- Sulphur Junction to Fort Stockton." Texas Department of Transportation. Austin, TX.

U.S. Department of Transportation. "Nationally Significant Freight and Highway Projects: Benefit-Cost Analysis Report." Port of Anacortes Pier 2 Export Initiative Project.

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APPENDICES

Appendix A Investment to Date: Public and Private Partnership

Grant Funds and Sources	
Federal Funding	
HUD Grant	$514,500
TVA Grant	$304,000
USDA Grant	$150,000
Delta Regional Authority Grant	$337,796
Corps of Engineers (Harbor Land)	$290,707
Corps of Engineers (Section 107)	$4,000,000
Department of Transportation TIGER II Grant	$13,000,000
TVA Industrial Readiness Grant	$19,950
USDA – Select Tennessee	$12,076
Subtotal	$18,630,029
State of Tennessee Funding	
TN Department of Transportation	$1,150
TN Department of Economic and Community Development (TNECD)	$2,716,099
TN Department of Transportation (TDOT) Fast Track Grant	$383,900
State of Tennessee	$7,000,000
TN Department of Transportation (TDOT) Hwy 22	$18,000,000
TN Economic and Community Development (TNECD) Select Tennessee	$7,500
TN Fast Track Grant	$500,000
TN Department of Agriculture Marketing Study	$1,500
Local Government	
Port Authority Revenue Bonds	$2,162,310
Lake County Reimbursement	$146,856
Dyer County Debt Service	$33,794
Obion County Debt Service	$33,794
Lake County Debt Service	$67,587
Gibson Electric Membership Corporation	$429,426
Dyersburg Electric System	$1,164
Morgan Keegan Fund Dividend (Bond Interest)	$8,828
Lake County Industrial Site – General Obligation Bonds	$2,807,362
Northwest Tennessee Development District – Select TN and Marketing Study	$2,050
Gibson Electric Membership Cooperation – Select Tennessee	$676
West Tennessee Industrial Association – Marketing Study	$1,500
Subtotal	$5,695,347
Private	
Deposits General Fund	$3,270
Ten-Ken Railroad	$3,000
First Citizens National Bank	$565,019
John M. Lannom	$1,393
Prime Financial	$5,000
First State Bank - Marketing Study	$2,000
White & Associates Insurance Agency – Marketing Study	$1,000
B&B Farms – Marketing Study	$1,000
Forcum Lannom Contractors – Marketing Study	$1,000
Ford Construction – Marketing Study	$2,000
Tennessee Department of Economic and Community Development	$100,000
Subtotal	$585,682
TOTAL	$53,621,207
Source: Forcum Lannom Contractors, LLC.	

Appendix B Project Budgets

Segment 1, Segment 2, and Loop Track

Port of Cates Landing, Tiptonville, Tennessee
Cost Estimate for Port Access Rail, Segments 1 and 2

Segment 1 – Ten-Ken Short Line to Southeast corner of the Lake County Industrial Park	
(cost is included for property purchase or acquisition of ROW*)	
Acquisition of ROW (approximately 85 acres)	$850,000
Earthwork/EC/Storm Drainage	$954,020
Levee/Dam Extension	Not Required
Sub Ballast	$1,061,368
Track/Ballast/Turnouts/Crossing etc.	$3,470,880
Design and Engineering	$210,000
Subtotal	$6,546,268
Segment 2 – Southeast corner of the Lake County Industrial Park to Port of Cates Landing including two ladder tracks.	
Acquisition of ROW	Not Required
Earthwork/EC/Storm Drainage	$448,221
Levee/Dam Extension	Not Required
Sub Ballast	$786,720
Track/Ballast/Turnouts/Crossing etc.	$2,650,202
Design and Engineering	$150,000
Subtotal	$4,035,143
Subtotal – Segments 1 and 2	$10,581,411
Legal	$50,000
Engineering Inspection & Support	$75,000
Construction Coordination	$400,000
Contingency	$250,000
Total	$11,356,411

Estimated Cost for Rail Segments 1 and 2 is $11,356,411
Source: Forcum Lannom Contractors, LLC.

Cost Estimate for Port Access Rail Loop Track	
Acquisition of Property (approximately 7 acres)	$70,000
Earthwork/ EC/ Storm Drainage	$2,514,167
Levee/Dam Extension	Included in Earthwork
Sub Ballast	$534,830
Bridge at Port Terminal	$9,900,000
Track/Ballast/Turnouts/Crossings, ETC	$1,761,995
Design and Engineering	$850,000
Loop Track Subtotal	**$15,630,992**
Legal	$50,000
Engineering Inspection & Support	$120,000
Construction Coordination	$500,000
Contingency	$500,000
	$16,800,992

Loop Track – Proposed Loop Track on Port of Cates Landing (cost is included for a property purchase or acquisition of ROW**)

Estimated Cost for Loop Track is $16,800,992

Source: Forcum Lannom Contractors, LLC.