

# 5.0 ECONOMIC ANALYSIS

## 5.1 INTRODUCTION

The economic analysis provided for the Heartland Expressway Corridor Development and Management Plan (CDMP) analyzed transportation and economic benefits in relation to project costs. A formal Benefit Cost Analysis (BCA) was performed along with a detailed economic impact analysis. The findings of the BCA are presented first. A detailed evaluation of the economic impacts follows.

The economic analysis relied on a variety of technical data sources and input obtained from the public, agency staff members, elected officials and business community representatives<sup>1</sup>. The first public information meeting was held on October 11, 2012, and included a workshop with business and City and County leaders from the region. This workshop focused on obtaining input from the business community. Economic issues and preliminary findings were discussed at the NDOR Highway Commission meeting on May 18, 2012 and at a June 7, 2012 public open house meeting on the CDMP. Input obtained from NDOR Highway Commissioners and from the public workshop attendees<sup>2</sup> was incorporated into the analysis methodology and assumptions.

## 5.2 TRANSPORTATION BENEFIT COST ANALYSIS

### 5.2.1 SCOPE OF ANALYSIS

The benefit cost analysis considers the potential net benefits attributable to the Heartland Expressway project in Nebraska, i.e. those differences between an Improvement Case (with project) and Base Case (no build, or without project). Four improvement scenarios were evaluated:

1. Heartland Expressway Corridor improvements
2. Heartland Expressway Corridor improvement with Intensified Energy Resource Development
3. Entire Ports to Plains (PTP) Corridor improvements
4. Entire PTP Corridor improvements with Intensified Energy Resource Development

The improvements evaluated in the benefit cost analysis were the projects identified as part of the overall Heartland Expressway Corridor Vision detailed in Section 2.3.3. The benefits associated with these improvement scenarios include transportation and operational savings, travel time and accident reductions, pavement cost savings, as well broader economic benefits, such as inventory gains. It is important to note that the economic benefit analysis only considers direct impacts (those first-level impacts that result from the construction and operation of the project); and therefore, does not include any multiplier effects (i.e. indirect and induced impacts).

<sup>1</sup>Technical data sources and input from these entities are available in the Public Involvement Appendix.

<sup>2</sup>A summary of the workshop is included in the Public Involvement Appendix.

The benefit stream estimated as part of the benefit cost analysis is converted to present values using real discount rates of 7% and 3% and is then compared to the discounted project capital and operating costs. Discounting is important because a dollar 10 years from now is not worth the same as a dollar today. The dollar today could be invested and return more than a dollar 10 years from now (excluding inflationary impacts). As a result, benefits and costs that are experienced today are more valuable than the benefits and costs expected in 10 years. Projects expecting to use federal funding are required to use a 7% discount rate (analysis in 2012 dollars)<sup>3</sup>, however, given the interest rates of the last few years, the results are also shown with a 3% discount rate. Presenting the results with both a 3% and 7% discount rate, as recommended in the US DOT TIGER BCA guidance, allows for a relative comparison and demonstrates the sensitivity of the results to the discount rate applied.

An analysis period of 2016 through 2054 was used. The implementation plan identified in Section 2.3.3 is an estimated plan for the improvement projects from 2015 to 2035. The analysis period extends to 2054 to account for 20 years of benefits after the estimated completion of the last segment of the Heartland Expressway Corridor improvements. The results of this analysis generate a benefit cost ratio, indicating whether or not the Heartland Expressway Corridor benefits in Nebraska exceed Nebraska's costs.

### 5.2.2 TRANSPORTATION BENEFITS

This section describes the transportation benefits that may occur as a result of the transportation infrastructure improvements along Nebraska's portion of the Heartland Expressway Corridor. Typically, these benefits are comprised of travel time savings, which may occur as motorists experience reduced travel times; increased safety, which may occur as the number of accidents that take place on the corridor are reduced; and operating cost savings that may occur as the distances driven by motorists on parallel facilities are reduced.

The travel time savings benefits are estimated for both commercial (truck) and non-commercial (non-truck) traffic. These benefits are calculated using estimated increases in travel speeds resulting from improved transportation infrastructure and the value of the time saved. The improved safety benefits are calculated by first estimating the accident avoidance that may occur as a result of improved transportation infrastructure, and then by estimating the cost of those avoided accidents. Because improvements along the corridor, in accordance with the Heartland Expressway Vision, typically involve expansion from two-lane facilities to four-lane facilities, it is assumed that there are no operating cost benefits for travelers. However, there would be operating cost savings associated with reduced maintenance costs for parallel roadways as travelers divert to the Heartland Expressway Corridor, thereby reducing the pavement wear and tear on parallel roadways. As a result, the transportation benefits associated with Heartland Expressway Corridor improvements in Nebraska are comprised of travel time, accident reduction, and pavement cost savings only.

#### Travel Time Savings

The reduction in travel times for autos and trucks that could be expected in 2035 due to the improved transportation infrastructure along Nebraska's portion of the Heartland Expressway Corridor was calculated and provided by AECOM (see the travel demand analysis in Chapter 2 and Appendix B). This section uses the forecasted 2035 travel time savings to calculate the annual time saved for:

1. **Existing users** – those vehicles and passengers currently using the Heartland Corridor roadways without the improvements
2. **Diverted users** – those vehicles and passengers currently using parallel routes who divert to the improved Heartland Corridor roadways

<sup>3</sup>The analysis discounts future benefits using a real discount rate of 7% following guidance from the Office of Management and Budget (OMB) in circulars A-4 and A-94 (<http://www.whitehouse.gov/omb/circulars/>).

These travel time savings are valued according to whether the time is saved by auto travelers or truck drivers; therefore, results are presented for both auto and truck traffic. The analysis begins with the calculation of travel time savings for existing users and is followed by the diverted user travel time savings.

**Existing Traffic**

Existing users of the Nebraska portion of the Heartland Expressway Corridor would experience a travel time savings associated with the improvement in speed and efficiency achieved with the transportation investments. The daily vehicle hours saved for each improvement scenario in comparison to the no build scenario in 2035 was estimated by AECOM and is summarized below in Table 5.1 (see the travel demand analysis in Chapter 2 and Appendix B).

Table 5.1– Daily Vehicle and Truck Travel Time Savings for Existing Users in 2035 (Hours)

Users	Heartland		Heartland & Intensified Energy Resource Development		Entire PTP		Entire PTP & Intensified Energy Resource Development	
	Total Hours	Truck Hours	Total Hours	Truck Hours	Total Hours	Truck Hours	Total Hours	Truck Hours
NE Background Traffic (Regardless of Improvements)	2,451	761	2,422	752	2,431	755	2,375	737

Source: AECOM Travel Model

Table 5.2 summarizes the total discounted existing traveler time savings for the Nebraska component of the Heartland Expressway Corridor scenarios over the analysis period.

Table 5.2 – Value of Travel Time Savings for Existing Users between 2016 and 2054 (2012 Dollars in Millions)

Scenarios	Auto	Truck	Total
<b>Heartland</b>			
Discounted @7%	\$100.3	\$40.5	\$140.8
Discounted @ 3%	\$247.7	\$100.0	\$347.7
<b>Heartland &amp; Intensified Energy Resource Development</b>			
Discounted @7%	\$99.1	\$40.0	\$139.1
Discounted @ 3%	\$244.8	\$98.8	\$343.6
<b>Entire PTP</b>			
Discounted @7%	\$99.5	\$40.2	\$139.6
Discounted @ 3%	\$245.7	\$99.2	\$344.9
<b>Entire PTP &amp; Intensified Energy Resource Development</b>			
Discounted @7%	\$97.2	\$39.2	\$136.4
Discounted @ 3%	\$240.1	\$96.8	\$336.9

Source: AECOM

**Diverted Traffic**

In addition to the time savings for existing users, a reduction in travel times also would occur for those users who divert to the Heartland Expressway Corridor from other parallel roads. These users divert to the improved Heartland Corridor due to the faster average speeds achievable on the improved roadway in comparison to their existing route. The diverted daily vehicle hours saved for each improvement scenario in comparison to the no build scenario in 2035 was estimated by AECOM and is summarized below in Table 5.3 (see the travel demand analysis in Chapter 2 and Appendix B).

Table 5.3 – Daily Vehicle and Truck Travel Time Savings for Diverted Users in 2035 (Hours)

Users	Heartland		Heartland & Intensified Energy Resource Development		Entire PTP		Entire PTP & Intensified Energy Resource Development	
	Total Hours	Truck Hours	Total Hours	Truck Hours	Total Hours	Truck Hours	Total Hours	Truck Hours
Current CO Users Diverted to Improved Heartland Expressway Corridor in NE	2	2	2	2	2	2	2	2
Current WY Users Diverted to Improved Heartland Expressway Corridor in NE	11	2	10	2	11	2	10	2
Current NE Users Diverted to Improved Heartland Expressway Corridor in NE	6	4	6	4	6	4	6	3
Current Outside the Model Users Diverted to Improved Heartland Expressway Corridor in NE	-	-	-	-	419	82	381	74
<b>Total Daily Hours Saved</b>	<b>19</b>	<b>8</b>	<b>18</b>	<b>8</b>	<b>438</b>	<b>90</b>	<b>399</b>	<b>81</b>

Source: AECOM Travel Model

The vehicle time savings shown in Table 5.3 assumes that all Heartland Expressway Corridor improvements in Nebraska are complete, therefore, the time saved between 2017 (year the first project is completed) and 2035 was interpolated assuming that the time saved increases equally in each year until 2035. Table 5.4 summarizes the total discounted diverted traveler time savings for the Nebraska component of the Heartland Expressway Corridor scenarios over the analysis period.

Table 5.4 – Value of Travel Time Savings for Diverted Users between 2016 and 2054 (2012 Dollars in Millions)

Scenarios	Auto	Truck	Total
<b>Heartland</b>			
Discounted @ 7%	\$0.6	\$0.4	\$1.0
Discounted @ 3%	\$1.5	\$1.0	\$2.5
<b>Heartland &amp; Intensified Energy Resource Development</b>			
Discounted @ 7%	\$0.6	\$0.4	\$1.0
Discounted @ 3%	\$1.4	\$1.0	\$2.4
<b>Entire PTP</b>			
Discounted @ 7%	\$20.6	\$4.8	\$25.4
Discounted @ 3%	\$50.9	\$11.8	\$62.7
<b>Entire PTP &amp; Intensified Energy Resource Development</b>			
Discounted @ 7%	\$18.8	\$4.3	\$23.1
Discounted @ 3%	\$46.4	\$10.7	\$57.1

Source: AECOM

### Accident Reduction Savings

Another transportation benefit of the Heartland Expressway Corridor improvements is the potential to reduce the number of accidents that could occur along the corridor due to roadway widening and the introduction of Intelligent Transportation Systems (ITS) variable message boards for incident management. The reduction in accidents in the project corridor that could be expected due to these investments was determined by reviewing crash rates and crash reduction factors from the Highway Safety Manual for rural, two-lane, Super 2, and four-lane divided highways. These accident rates were then assigned to the Heartland Expressway Corridor roadways in Nebraska based on their average annual daily traffic (AADT). In addition, the introduction of dynamic variable accident and speed warning signs along roadways has been shown to reduce the likelihood of injury and property damage accidents. The Heartland Expressway Corridor improvements in Nebraska include the introduction of these signs throughout the corridor, further reducing the potential for crashes. The 2007 FHWA Desktop Reference for Crash Reduction Factors cites a 44% reduction in injury and property damage accidents due to the operation of dynamic variable warning signs<sup>4</sup>.

In order to estimate the reduction in accidents along the Nebraska portion of the Heartland Expressway Corridor, the total number of accidents that would occur on the corridor without any improvement was first estimated. That estimate was calculated by multiplying segment specific accident rates for each portion of the Heartland Expressway Corridor by the estimated annual Vehicle Miles Traveled (VMT) on each segment between 2016 and 2054. The AECOM travel model estimated the VMT for the Heartland Corridor roadways without the improvements in 2035, (see the travel demand analysis in Chapter 2 and Appendix B), which is shown below in Table 5.5.

Table 5.5 – Nebraska Heartland Expressway Corridor Daily VMT without Improvements in 2035

Heartland Corridor Roadways	All Scenarios	
	Total VMT	Truck VMT
US 385	375,668	41,326
US 26	266,561	13,116
NE 71	170,213	16,237
NE 71 Bypass	2,366	310
L62A	106,327	8,871
<b>Total Daily VMT</b>	<b>921,135</b>	<b>79,860</b>

Source: AECOM Travel Model

Next, the lower accident rates associated with the completion of the Super 2 and/or four-lane divided roadways and the ITS improvements were applied to the same VMT forecasts (without improvements) to determine the number of accidents that would occur on the project corridor given transportation improvements<sup>5</sup>. A comparison of the number of accidents with and without transportation improvement allowed the reduction in accidents due to Nebraska’s Heartland Expressway Corridor investment to be calculated.

Before estimating the economic benefits associated with a reduction in accidents, the accidents that were avoided must be distributed into types of accidents. The accident rates applied were for fatal, injury, and property damage accidents only. These crash estimates were then converted to the Maximum Abbreviated Injury Scale (MAIS) accident types in order to apply US DOT Guidance on the value of avoiding an accident. The conversion is based on the National Highway Traffic Safety Administration (NHTSA) KABCO-AIS Conversion Table (July 2011) Injury (severity unknown) and No Injury accidents.

<sup>4</sup>FHWA, Desktop reference for Crash Reduction Factors, 2007, p.80.

<sup>5</sup>The number of accidents was calculated using the 2035 VMT forecast without improvements as opposed to increased VMT with transportation improvement based on FHWA guidance. In FHWA’s *The Safety Effects of the Conversion of Rural Two-Lane Roadways to Four-Lane Roadways*, it was noted that the more appropriate comparison is between baseline existing and projected traffic volumes without improvement where data for all affected streets in the system were not available (FHWA 1999). This analysis was only conducted on portions of the Heartland Expressway Corridor that were to be improved.

Based on the comparison of the number of fatalities, injuries, and property damage incidents with the improvements and without the improvements, the accident reductions for each Heartland Expressway Corridor improvement scenario were estimated. The total value of the accidents avoided is based on US DOT Guidance<sup>6</sup> and the NHTSA<sup>7</sup> estimates for the value of avoiding an accident. The values applied in this analysis are summarized below in Table 5.6.

Table 5.6 – Value of One Person Avoiding a Crash in 2012 Dollars

AIS Level	Fraction of VSL	Unit Value (2011 Dollars)	Unit Value (2012 Dollars)
0			\$3,375
1	0.003	\$18,600	\$18,859
2	0.047	\$291,400	\$295,458
3	0.105	\$651,000	\$660,065
4	0.266	\$1,649,200	\$1,672,164
5	0.593	3,676,600	3,727,795
FATAL	1.000	\$6,200,000	\$6,286,333

Source: US DOT and NHTSA

Applying the value of the fatalities, injuries, and property damages to the annual avoided crashes by type, yields the accident reduction savings associated with Nebraska’s Heartland Expressway Corridor improvements. Table 5.7 summarizes the total discounted accident reduction savings for the Nebraska component of the Heartland Expressway Corridor scenarios over the analysis period. The benefits are the same for all scenarios because the analysis is based on the 2035 VMT without improvements and the impacts associated with the investments made; the transportation investments made are the same for each improvement scenario.

Table 5.7 – Value of Accident Reduction Savings between 2016 and 2054 (2012 Dollars in Millions)

Scenarios	Total
All Scenarios	
Discounted @ 7%	\$94.8
Discounted @ 3%	\$226.7

Source: AECOM

<sup>6</sup> US DOT, *Treatment of the Economic Value of a Statistical Life in Departmental Analyses*, 2008 revised guidance and 2011 update.

<sup>7</sup> NHTSA, *The Economic Impact of Motor Vehicle Crashes*, Table A-1, 2000.

**Pavement Cost Savings in Neighboring States**

Another transportation benefit of the Heartland Expressway Corridor improvements is the potential reduction in VMT along parallel routes, as travelers divert to Nebraska’s Heartland Corridor roadways. This reduction in traffic on alternate highway routes would reduce the pavement maintenance needs on those routes. Both auto and truck traffic would be diverted to the improved Heartland Corridor; however, the pavement benefits are realized only by truck diversions because the damaged caused by autos on a rural interstate is negligible. The daily truck VMT projected to be removed from neighboring states for each scenario in comparison to the 2035 no build (see the travel demand analysis in Chapter 2 and Appendix B) are shown in Table 5.8.

Table 5.8 – Daily Truck VMT Removed from Neighboring States in 2035 (Net of No- Build)

Users	Heartland	Heartland & Intensified Energy Resource Development	Entire PTP	Entire PTP & Intensified Energy Resource Development
Current CO Users Diverted to Improved Heartland Corridor in NE	1,766	1,724	1,737	1,656
Current WY Users Diverted to Improved Heartland Corridor in NE	1,695	1,654	1,668	1,590
<b>Total Daily Truck VMT Removed</b>	<b>3,461</b>	<b>3,378</b>	<b>3,405</b>	<b>3,246</b>

Source: AECOM travel model

Table 5.9 summarizes the total discounted pavement cost savings in neighboring states associated with the Nebraska component of the Heartland Expressway Corridor scenarios over the analysis period.

Table 5.9 – Value of Pavement Cost Savings between 2016 and 2054  
(2012 Dollars in Millions)

Scenarios	Total
<b>Heartland</b>	
Discounted @ 7%	\$0.44
Discounted @ 3%	\$1.10
<b>Heartland &amp; Intensified Energy Resource Development</b>	
Discounted @ 7%	\$0.43
Discounted @ 3%	\$1.07
<b>Entire PTP</b>	
Discounted @ 7%	\$0.43
Discounted @ 3%	\$1.08
<b>Entire PTP &amp; Intensified Energy Resource Development</b>	
Discounted @ 7%	\$0.41
Discounted @ 3%	\$1.03

Source: AECOM

### 5.2.3 ECONOMIC BENEFITS FROM TRANSPORTATION EFFICIENCY

The following discussion summarizes economic benefits derived from transportation efficiency improvements. These benefits are used in a Benefit Cost Analysis. Additional economic benefits are described in Section 5.3. These benefits involve job creation and expanded payrolls from construction, operation and maintenance of the proposed improvements as well as benefits from purchases of goods and services necessary to operate and maintain the project.

Agriculture and food processing activities anchor western Nebraska's economy. Soybeans, corn, dry beans, sugar beets and animals are mainstays of the region's farm economy and exports. Mexico is the third largest importer of agricultural goods from the US. Although rail is the dominant mode for such shipments, Nebraska shipped over \$317 million in goods (of all types) to Mexico by truck through the Port of Laredo in 2011, the main route between western Nebraska and Mexico's markets, according to the Bureau of Transportation Statistics' TransBorder Freight Data<sup>8</sup>. Another \$7 million in Nebraska goods (of all types) traveled north to Canada through the Port of Raymond.

While not all of those shipments originated in western Nebraska (it is not possible to divide the state's exports by truck into sub-state regions), knowing that the western part of the state is a rich agricultural center, that Mexico is a leading consumer of agricultural imports, and that the commodities entered via the Port of Laredo suggests that a significant portion of this trade originated in the Heartland Expressway Corridor region. This indicates that a significant flow of goods currently travel between western Nebraska and Mexico with much upside potential for additional exports as Mexican household incomes rise gradually over time.

Overland transportation offers several advantages over marine transport, beyond the direct routing between western Nebraska to Mexico that is facilitated by an improved Heartland Expressway Corridor. Using grain as the example, these include<sup>9</sup>:

- The avoidance of transfer upon entry into the country, resulting in less damage than to grain shipped by vessel, which has to be off-loaded;
- Smaller lot sizes that permit more specialized purchasing, with less variation in shipment quality; and
- Lower inventory costs because smaller lots are purchased more frequently.

Road improvements that reduce travel times and improve reliability for truck freight improve the productivity of the logistics chain through the ability to use truck fleets more efficiently resulting in a reduction of inventory cost and organize production more efficiently. If shipments are more reliable, then distribution facilities can be more centralized and enjoy greater scale economies in many cases. Collectively, this allows the economy to be more economically competitive. The annual hours of delay avoided due to the Heartland Expressway improvements were estimated and described as part of the truck travel time savings (see travel demand analysis in Chapter 2 and Appendix B). A total inventory savings of \$215.4 million across all alternatives results from applying a discount rate of 7%. The inventory savings with a 3% discount rate would be of \$532.1 million.

### 5.2.4 PROJECT COSTS

Project capital and operating costs for the Nebraska portion of the Heartland Expressway Corridor were developed by NDOR and Alfred Benesch & Company and are in 2012 dollars. The project and capital costs were not inflated to match year of expenditure because the actual year of expenditure is unknown. Table 5.10 summarizes the total capital costs for each project component and specifies an estimated completion date in accordance to the implementation plan of the Vision of the Heartland Expressway Corridor detailed in Section 2.3.3. The total costs include costs for project development, engineering, and construction

<sup>8</sup>[http://transborder.bts.gov/programs/international/transborder/TBDR\\_QuickSearchPC.html](http://transborder.bts.gov/programs/international/transborder/TBDR_QuickSearchPC.html)

<sup>9</sup>Summarized from Delmy L. Salin. *U.S. Grain and Soybean Exports to Mexico A Modal Share Transportation Analysis, 2007-2010*, USDA Agricultural Marketing Service, April 2011.

engineering; utilities; right-of-way; and construction. Table 5.11 summarizes the total new maintenance and operating costs (M&O) costs for each project, which include annual M&O expenses as well as the joint sealing and new pavement cost required every eight years.

Table 5.10 – Total Capital Costs for Nebraska Components of Heartland Expressway Corridor (2012 Dollars in Millions)

Highway	Segment	Type	Completion Year	Total Cost
<b>Group 1 (2015-2020)</b>				
US 385	Intersection with NE 20 (East)	Safety	2017	\$0.80
US 385	L62A to Alliance	Roadway	2019	\$66.00
US 385	Alliance to Chadron	Roadway	2020	\$2.25
US 26	In Scottsbluff @ 5th Avenue	Safety	2020	\$1.00
US 385	Chadron to South Dakota	Roadway	2022	\$48.00
US 26	L79E Intersection (Minatare)	Safety	2017	\$0.15
NE 71	I-80		2022	\$18.00
NE 71	Colorado Border to I-80	Roadway	2021	\$15.00
NE 71	Clean Harbors (South of Kimball)	Safety	2020	\$0.25
NE 71	I-80 (MP 22) Interchange	Truck Parking	2022	\$5.00
	ITS Improvements			\$2.82
<b>Total Cost of Group 1</b>				<b>\$159.27</b>
<b>Group 2 (2020-2025)</b>				
L62A	US 26 to US 385	Roadway	2022	\$40.00
US 385	Alliance to L7E (Hemingford)	Roadway	2027	\$48.00
US 385	Alliance to L7E (Hemingford)	Roadway	2027	\$3.00
US 26	Wyoming State Line to Morrill	Roadway	2024	\$21.00
US 26	Mitchell		2026	\$1.00
US 26	Morrill Relief Route		2027	\$20.00
	ITS Improvements			\$0.85
<b>Total Cost of Group 2</b>				<b>\$133.85</b>
<b>Group 3 (2025-2030)</b>				
US 385	L7E (Hemingford) to Chadron State Park	Roadway	2032	\$66.00
US 26	Minatare to L62A Intersection	Roadway	2027	\$45.00
US 26	Minatare		2028	\$1.00
<b>Total Cost of Group 3</b>				<b>\$112.00</b>
<b>Group 4 (2030-2035)</b>				
US 385	Chadron		2033	\$20.00
US 385	Chadron to S Edge of Chadron State Park	Roadway	2032	\$42.00
US 26	Intersection with NE 71		2035	\$5.00
US 385	Chadron	Truck Parking	2034	\$5.00
US 26	Mitchell Relief Route		2037	\$20.00
NE 71	Colorado Border to I-80	Roadway	2037	\$45.00
<b>Total Costs for Group 4</b>				<b>\$137.00</b>
<b>Total Costs for Group 1-4</b>				<b>\$542.12</b>

Source: NDOR and Benesch

Table 5.11 – Total New M&O Costs for Heartland Expressway Corridor Components located within the State of Nebraska (2012 Dollars in Millions)

Highway	Segment	M&O Start Year	Annual M&O Costs	Every 8 Year Costs	Total M&O Cost (2016-2054)
<b>Group 1 (2015-2020)</b>					
US 385	Intersection with NE 20 (East)	2018	\$ -	\$ -	\$ -
US 385	L62A to Alliance	2020	\$0.21	\$0.55	\$9.41
US 385	Alliance to Chadron	2021	\$0.06	\$ -	\$1.91
US 26	In Scottsbluff @ 5th Avenue	2021	\$ -	\$ -	\$ -
US 385	Chadron to South Dakota	2023	\$0.15	\$0.40	\$6.40
US 26	L79E Intersection (Minatare)	2018	\$ -	\$ -	\$ -
NE 71	I-80	2023	\$0.06	\$0.15	\$2.40
NE 71	Colorado Border to I-80	2022	\$0.14	\$0.38	\$6.14
NE 71	Clean Harbors (South of Kimball)	2021	\$ -	\$ -	\$ -
NE 71	I-80 (MP 22) Interchange	2023	\$0.11	\$ -	\$3.52
	ITS Improvements		\$0.42	\$ -	\$15.23
<b>Total M&amp;O Costs for Group 1</b>					<b>\$45.00</b>
<b>Group 2 (2020-2025)</b>					
L62A	US 26 to US 385	2023	\$0.15	\$0.40	\$6.40
US 385	Alliance to L7E (Hemingford)	2028	\$0.15	\$0.40	\$5.25
US 385	Alliance to L7E (Hemingford)	2028	\$0.07	\$0.18	\$2.30
US 26	Wyoming State Line to Morrill	2025	\$ -	\$ -	\$ -
US 26	Mitchell	2027	\$0.07	\$0.20	\$2.70
US 26	Morrill Relief Route	2028	\$ -	\$ -	\$ -
	ITS Improvements		\$0.13	\$ -	\$3.95
<b>Total M&amp;O Cost of Group 2</b>					<b>\$20.59</b>
<b>Group 3 (2025-2030)</b>					
US 385	L7E (Hemingford) to Chadron State Park	2033	\$0.21	\$0.55	\$5.63
US 26	Minatare to L62A Intersection	2028	\$0.17	\$0.45	\$5.90
US 26	Minatare	2029	\$ -	\$ -	\$ -
<b>Total M&amp;O Cost of Group 3</b>					<b>\$11.54</b>
<b>Group 4 (2030-2035)</b>					
US 385	Chadron	2034	\$0.07	\$0.20	\$1.97
US 385	Chadron to S Edge of Chadron State Park	2033	\$0.13	\$0.35	\$3.59
US 26	Intersection with NE 71	2036	\$ -	\$ -	\$ -
US 385	Chadron	2035	\$0.11	\$ -	\$2.20
US 26	Mitchell Relief Route	2037	\$ -	\$ -	\$ -
NE 71	Colorado Border to I-80	2037	\$0.14	\$0.38	\$3.28
<b>Total M&amp;O Costs for Group 4</b>					<b>\$11.04</b>
<b>Total Costs for Group 1-4</b>					<b>\$88.17</b>

Source: NDOR and Benesch

In order to calculate the BCA, the capital and M&O costs must be discounted before they can be compared to the project benefits. Similarly, the total expenditures for M&O were allocated over the analysis period so that the annual M&O expenses for each project component started in the year following project completion, as provided by NDOR.

### 5.2.5 BENEFIT COST SUMMARY

The preceding discussion has illustrated the varied ways that the Nebraska components of the Heartland Expressway Corridor generate benefits. Table 5.12 below summarizes the discounted value of the transportation and economic benefits that have been discussed. Taken in total and using a 7% discount rate, the travel time savings, accident reduction savings, pavement cost savings, and economic benefits provide over \$452 million dollars of benefits over the 2016 to 2054 analysis period. Compared to a similarly discounted cost estimate, the Benefit Cost Ratio for the project is 1.88. In summary, this means that while using conservative/restrictive estimates, the corridor passes the BCA test.

Table 5.12 – Summary of Discounted Benefits and Costs (2012 Dollars in Millions)

	7% Discount Rate				3% Discount Rate			
	Heartland Improvements	Heartland Improvements & Intensified Energy Resource Development	Entire PTP Improvements	Entire PTP Improvements & Intensified Energy Resource Development	Heartland Improvements	Heartland Improvements & Intensified Energy Resource Development	Entire PTP Improvements	Entire PTP Improvements & Intensified Energy Resource Development
<b>Benefits</b>								
Travel Time								
Existing Traffic	\$140.8	\$139.1	\$139.6	\$136.4	\$347.7	\$343.6	\$344.9	\$336.9
Diverted Traffic	\$1.0	\$1.0	\$25.4	\$23.1	\$2.5	\$2.4	\$62.7	\$57.1
Pavement Savings	\$0.4	\$0.4	\$0.4	\$0.4	\$1.1	\$1.1	\$1.1	\$1.0
Accident	\$94.8	\$94.8	\$94.8	\$94.8	\$226.7	\$226.7	\$226.7	\$226.7
Economic - Inventory Savings	\$215.4	\$215.4	\$215.4	\$215.4	\$532.1	\$532.1	\$532.1	\$532.1
<b>Total</b>	<b>\$452.4</b>	<b>\$450.7</b>	<b>\$475.7</b>	<b>\$470.2</b>	<b>\$1,110.0</b>	<b>\$1,105.8</b>	<b>\$1,167.4</b>	<b>\$1,153.8</b>
<b>Costs</b>								
Capital	\$224.1	\$224.1	\$224.1	\$224.1	\$361.8	\$361.8	\$361.8	\$361.8
M&O	\$16.3	\$16.3	\$16.3	\$16.3	\$40.2	\$40.2	\$40.2	\$40.2
<b>Total</b>	<b>\$240.4</b>	<b>\$240.4</b>	<b>\$240.4</b>	<b>\$240.4</b>	<b>\$402.0</b>	<b>\$402.0</b>	<b>\$402.0</b>	<b>\$402.0</b>
<b>Benefit Cost Ratio</b>	<b>\$1.88</b>	<b>\$1.87</b>	<b>\$1.98</b>	<b>\$1.96</b>	<b>\$2.76</b>	<b>\$2.75</b>	<b>\$2.90</b>	<b>\$2.87</b>

Source: AECOM

## 5.3 ECONOMIC IMPACTS

### 5.3.1 SCOPE OF ANALYSIS

The following discussions address the potential economic impacts of the Heartland Expressway Corridor in Nebraska through an examination of what changes would occur because of the project's construction and implementation and who is affected by these changes, regardless of whether they are a transfer or net incremental change. The Heartland Expressway Corridor would generate economic impacts through its construction and daily operation for the Nebraska Heartland Expressway Corridor counties as well as the four-state Heartland Expressway Corridor.

These economic impacts include:

- **Construction impacts.** Construction of the project would create jobs and expand payrolls for the duration of the project's construction cycle.
- **Operation and maintenance impacts.** Since the project adds new lane miles, there would be hiring associated with the operation and maintenance of these new lane miles as well as the local purchases of goods and services necessary to operate and maintain the project. Unlike the one-time construction impacts, these new operations jobs and local purchases required to operate the project would be recurring impacts.
- **Economic development impacts.** Economic development would increase with the market's response to the operation of the improved facility. As described in Section 5.2 the improved road will improve travel times and reliability, which improves the productivity of the logistics chain through the ability to use fleets more efficiently. If shipments are more reliable, then businesses can reduce their inventories and organize their production processes to be leaner. Collectively, this allows the Heartland Corridor economy to be more economically competitive. In addition, traffic in the corridor would increase, increasing demand for roadside services in the corridor.
  - **Roadside services impacts.** Since the project attracts new long distance users to the corridor, demand for roadside services, including lodging, food, fuel, and other retail purchases would increase. The increase in demand would result in additional hiring and wages earned along the corridor. These would be recurring impacts.
  - **Competitive response.** It is not possible to predict the exact type of business relocation that might occur in response to the productivity improvement; likely expansions would include food processing manufacturing to take advantage of the corridor's significant agricultural assets and distribution facilities that take advantage of the corridor's low costs and proximity to the larger urban areas.

The construction, operating, and economic development impacts associated with the project represent the direct effects of the Nebraska components of the Heartland Expressway Corridor investment on the Nebraska Heartland Expressway Corridor counties as well as the four-state corridor counties. The construction, operation, and economic development purchases associated with the project would stimulate demand for support industries. As a result, a further increase of new employment across a variety of industrial sectors and occupational categories is expected as employers hire to meet this increase in local consumer demand. Additionally, the earnings of these newly-hired construction, maintenance and operations, manufacturing/distribution, and roadside services workers would translate into a proportional increase in consumer demand as these workers purchase goods and services throughout the region. This latter hiring represents the project's indirect and induced impacts.

The direct, indirect, and induced economic impacts associated with the construction, operation, and economic development of the Nebraska portion of the Heartland Expressway Corridor are measured using regional multipliers from the Bureau of Economic Analysis (BEA) within the US Department of Commerce. Derived from the Regional Input-Output Modeling System (RIMSII), the RIMS II multipliers measure the total change (direct + indirect + induced effects) in employment and earnings that result from an incremental change to a particular industry. The multipliers are based on the 2008 Annual Series accounts data; they represent the most up to date version available at the time this analysis was prepared.

While the improvement being studied all occur within Nebraska, the economic impact analysis includes two study areas: 1) Nebraska counties along the Heartland Expressway Corridor, illustrated in Figure 5.1, and 2) four-state counties along the Heartland Expressway Corridor. The Nebraska counties only area represents Nebraska's impacts associated with the construction and operation of the state's Heartland investments. However, many of the inputs, services, and employment used to construct and operate the Nebraska Heartland Expressway Corridor improvements will come from the larger region, including neighboring Heartland Expressway counties in Colorado, South Dakota, and Wyoming. As a result, the economic impacts shown in this section include both areas as detailed below.

5.3.2 CONSTRUCTION IMPACTS

Construction of the Heartland Expressway Corridor improvements in Nebraska may have a substantial impact on the regional and local economy due to new direct and indirect employment that would result from the capital expenditures associated with the investments. Direct employment consists of the construction-related employment in industries whose jobs and services are directly purchased to build the alternative. Indirect economic impacts are created by the secondary demand for goods and services across a broader spectrum of industrial sectors to support the industries providing the construction services. These indirect impacts are reflected in the economic multipliers for construction. The analysis estimates the number of construction jobs and earnings generated by the Heartland Expressway Corridor improvements in Nebraska based on construction cost estimates.

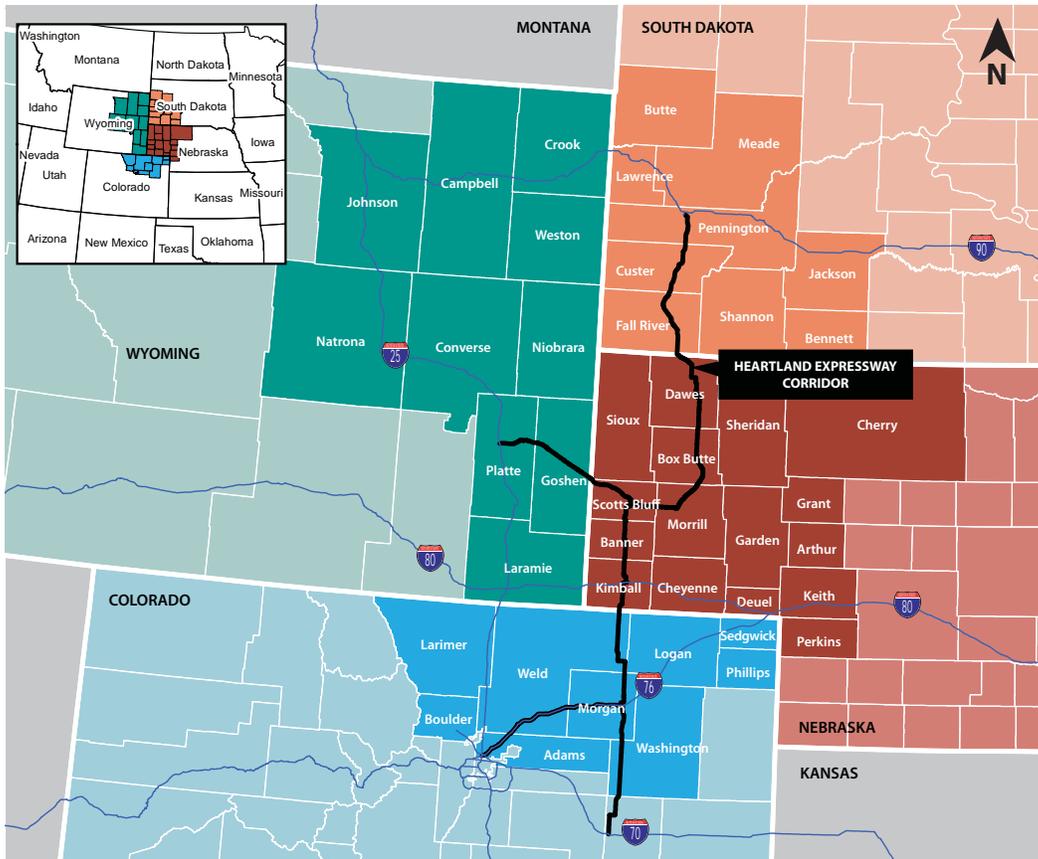


Figure 5.1 - Counties included in the Heartland Expressway Study

The analysis applies a consistent set of multipliers tailored to the structure of the four-state Heartland counties economy as well as the Nebraska Heartland counties only. The economic impacts associated with construction expenditures are measured using regional multipliers from the BEA within the US Department of Commerce. Derived from RIMS II, the multipliers measure the total change (direct + indirect + induced impacts) in employment and earnings that result from an incremental change to a particular industry.

### Construction Expenditures

The capital expenditures for the Nebraska components of the Heartland Expressway Corridor improvements were provided by NDOR in 2012 dollars. Table 5.13 summarizes the total capital costs for each project component and specifies a completion date. The total capital expenditures are divided into four major categories.

These include:

- **General Construction:** guideway elements, stations, yards and shops, site work, systems, and contingencies;
- **Utilities:** utility relocation and accommodation
- **Right-of-Way (ROW):** all rights-of-way, land and existing improvements; and
- **Soft Costs:** project development, professional engineering, and construction engineering.

The economic impact of these expenditures would vary significantly by activity and depend on the amount of locally produced goods and services embodied in the purchases. Construction (including utilities) goods and services and professional services (soft costs) would be purchased in the local economy. Although every building material required for the improvements would not be produced locally, the RIMS II multipliers reflect the supplier linkages for the industry, and thus account for this leakage from the local economy.

Conversely, right-of-way expenditures are for real property only; the transaction costs associated with these expenditures are included in the soft cost category. As there is no labor associated with the ROW expenditures, there is no economic impact to the pure land costs.

As a result, only the construction (including utilities) and soft costs are expected to impact the local and regional economies. The total expenditures for these costs are allocated over several years so that each project was complete in the year provided by NDOR. Table 5.14 summarizes capital costs applied in the analysis. This allocation is just an estimate in order to provide an annual cost and impact estimate; it is not intended to serve as a construction schedule or represent a cash flow for the project.

Table 5.13 – Total Capital Costs of the Vision of the Heartland Expressway Corridor Components located within Nebraska (2012 Dollars in Millions) (Estimated Completion Year)

Highway	Segment	Completion Year	Soft Costs	Utility	ROW	Const.	Total Cost
<b>Group 1 (2015-2020)</b>							
US 385	Intersection with NE 20 (East)	2017	\$ 0.13	\$ 0.02	\$ 0.02	\$ 0.62	\$ 0.80
US 385	L62A to Alliance	2019	\$ 10.56	\$ 1.98	\$ 1.98	\$ 51.48	\$ 66.00
US 385	Alliance to Chadron	2020	\$ 0.36	\$ 0.07	\$ 0.07	\$ 1.76	\$ 2.25
US 26	In Scottsbluff @ 5th Avenue	2020	\$ 0.16	\$ 0.03	\$ 0.03	\$ 0.78	\$ 1.00
US 385	Chadron to South Dakota	2022	\$ 7.68	\$ 1.44	\$ 1.44	\$ 37.44	\$ 48.00
US 26	L79E Intersection (Minatare)	2017	\$ 0.02	\$ 0.00	\$ 0.00	\$ 0.12	\$ 0.15
NE 71	I-80	2022	\$ 2.88	\$ 0.54	\$ 0.54	\$ 14.04	\$ 18.00
NE 71	Colorado Border to I-80	2021	\$ 2.40	\$ 0.45	\$ 0.45	\$ 11.70	\$ 15.00
NE 71	Clean Harbors (South of Kimball)	2020	\$ 0.04	\$ 0.01	\$ 0.01	\$ 0.20	\$ 0.25
NE 71	I-80 (MP 22) Interchange	2022	\$ 0.80	\$ 0.15	\$ 0.15	\$ 3.90	\$ 5.00
	ITS Improvements		\$ 0.20	\$ -	\$ -	\$ 2.62	\$ 2.82
<b>Total Costs for Group 1</b>			<b>\$25.23</b>	<b>\$4.69</b>	<b>\$4.69</b>	<b>\$124.65</b>	<b>\$159.27</b>
<b>Group 2 (2020-2025)</b>							
L62A	US 26 to US 385	2022	\$6.40	\$1.20	\$1.20	\$31.20	\$40.00
US 385	Alliance to L7E (Hemingford)	2027	\$7.68	\$1.44	\$1.44	\$37.44	\$48.00
US 385	Alliance to L7E (Hemingford)	2027	\$0.48	\$0.09	\$0.09	\$2.34	\$3.00
US 26	Wyoming State Line to Morrill	2024	\$3.36	\$0.63	\$0.63	\$16.38	\$21.00
US 26	Mitchell	2026	\$0.16	\$0.03	\$0.03	\$0.78	\$1.00
US 26	Morrill Relief Route	2027	\$3.20	\$0.60	\$0.60	\$15.60	\$20.00
	ITS Improvements		\$0.06	\$ -	\$ -	\$0.79	\$0.85
<b>Total Cost of Group 2</b>			<b>\$21.34</b>	<b>\$3.99</b>	<b>\$3.99</b>	<b>\$104.53</b>	<b>\$133.85</b>
<b>Group 3 (2025-2030)</b>							
US 385	L7E (Hemingford) to Chadron State Park	2032	\$10.56	\$1.98	\$1.98	\$51.48	\$66.00
US 26	Minatare to L62A Intersection	2027	\$7.20	\$1.35	\$1.35	\$35.10	\$45.00
US 26	Minatare	2028	\$0.16	\$0.03	\$0.03	\$0.78	\$1.00
<b>Total Cost of Group 3</b>			<b>\$17.92</b>	<b>\$3.36</b>	<b>\$3.36</b>	<b>\$87.36</b>	<b>\$112.00</b>
<b>Group 4 (2030-2035)</b>							
US 385	Chadron	2033	\$3.20	\$0.60	\$0.60	\$15.60	\$20.00
US 385	Chadron to S Edge of Chadron State Park	2032	\$6.72	\$1.26	\$1.26	\$32.76	\$42.00
US 26	Intersection with NE 71	2035	\$0.80	\$0.15	\$0.15	\$3.90	\$5.00
US 385	Chadron	2034	\$0.80	\$0.15	\$0.15	\$3.90	\$5.00
US 26	Mitchell Relief Route	2037	\$3.20	\$0.60	\$0.60	\$15.60	\$20.00
NE 71	Colorado Border to I-80	2037	\$7.20	\$1.35	\$1.35	\$35.10	\$45.00
<b>Total Costs for Group 4</b>			<b>\$21.92</b>	<b>\$4.11</b>	<b>\$4.11</b>	<b>\$106.86</b>	<b>\$137.00</b>
<b>Total Costs for Group 1-4</b>			<b>\$86.41</b>	<b>\$16.15</b>	<b>\$16.15</b>	<b>\$423.40</b>	<b>\$542.12</b>

Source: NDOR and Benesch

Table 5.14 – Annual Construction and Soft Costs of the Heartland Expressway Corridor Components located in Nebraska (2012 Dollars in Millions)

Year	Total Construction Costs	Total Professional Services Costs
2016	\$0.85	\$0.10
2017	\$18.79	\$3.65
2018	\$18.34	\$3.56
2019	\$23.31	\$4.54
2020	\$35.12	\$6.87
2021	\$32.83	\$6.47
2022	\$38.50	\$7.59
2023	\$5.83	\$1.13
2024	\$5.83	\$1.13
2025	\$30.67	\$6.04
2026	\$31.32	\$6.19
2027	\$32.94	\$6.51
2028	\$0.81	\$0.16
2029	\$-	\$-
2030	\$29.16	\$5.76
2031	\$34.56	\$6.83
2032	\$34.56	\$6.83
2033	\$9.45	\$1.87
2034	\$4.05	\$0.80
2035	\$17.55	\$3.47
2036	\$17.55	\$3.47
2037	\$17.55	\$3.47
<b>Total</b>	<b>\$439.56</b>	<b>\$86.41</b>

Source: AECOM calculation using NDOR capital costs

### Construction Jobs and Earnings Effects

RIMS II multipliers are used to translate capital expenditures for the Nebraska component of the Heartland Expressway Corridor improvements into the associated job and income effects. The impacts are shown for the four-state Heartland Expressway counties and the Nebraska Heartland Expressway counties only. The impacts vary by the geographic area considered; impacts are greater for the four-state area relative to the Nebraska counties as there is less “leakage” associated with construction spending. Put another way, a larger economy captures a greater share of project spending as its greater size allows it to provide a greater share of the diverse range of services required for construction.

The Final Demand Earnings Multiplier represents the total dollar change in earnings of households employed by all industries for each additional dollar of output delivered to final demand by the construction and professional, scientific, and technical services industries.

The Final Demand Employment Multiplier represents the total change in the number of jobs that occur in all industries for each \$1 million of output delivered to final demand by the construction and professional, scientific, and technical services industries.

Applying the final demand multipliers for the construction and professional services industries to the amount of capital expenditures in each industry provides estimates of the earnings and employment impacts generated by the construction of the Heartland Expressway Corridor improvements in Nebraska. The results are summarized in Tables 5.15 and 5.16, showing the four-state corridor county impacts and Nebraska county impacts, respectively. Note that the impacts shown in Tables 5.15 and 5.16 are not additive. The Nebraska Heartland Expressway Corridor county impacts are included in the four-state Heartland Expressway county impacts. In addition, these are one-time impacts that last for the duration of the construction period only. One job is defined as a job for one person during a one year’s duration. As an example, a job for one person for three years would be defined as three person-year jobs.

Table 5.15 – Annual Construction Impacts for the Four-State Heartland Expressway County Region  
(2012 Dollars in Millions)

Year	4 State Heartland Counties			
	Total Job Years	Total Earnings	Total Earnings Discounted @ 7%	Total Earnings Discounted @ 3%
2016	12	\$0.51	\$0.39	\$0.46
2017	288	\$12.17	\$8.68	\$10.50
2018	281	\$11.88	\$7.92	\$9.95
2019	358	\$15.10	\$9.41	\$12.28
2020	539	\$22.78	\$13.26	\$17.98
2021	505	\$21.32	\$11.59	\$16.34
2022	592	\$25.00	\$12.71	\$18.60
2023	89	\$3.77	\$1.79	\$2.73
2024	89	\$3.77	\$1.68	\$2.65
2025	471	\$19.91	\$8.26	\$13.56
2026	482	\$20.35	\$7.89	\$13.45
2027	507	\$21.40	\$7.76	\$13.74
2028	12	\$0.53	\$0.18	\$0.33
2029	-	\$-	\$-	\$-
2030	488	\$18.94	\$5.61	\$11.13
2031	531	\$22.45	\$6.21	\$12.80
2032	531	\$22.45	\$5.80	\$12.43
2033	145	\$6.14	\$1.48	\$3.30
2034	62	\$2.63	\$0.59	\$1.37
2035	270	\$11.40	\$2.41	\$5.78
2036	270	\$11.40	\$2.25	\$5.61
2037	270	\$11.40	\$2.10	\$5.45
<b>Total</b>	<b>6,754</b>	<b>\$285.32</b>	<b>\$117.95</b>	<b>\$190.42</b>

Note: To use the final demand multiplier for employment, the construction expenditures were deflated to 2008 dollars using the GDP Price Index Deflator because the RIMS II multipliers are based on 2008 data.

Source: AECOM

Table 5.16 – Annual Construction Impacts for the Nebraska Heartland County Region  
(2012 Dollars in Millions)

Year	Northeast Heartland Counties			
	Total Job Years	Total Earnings	Total Earnings Discounted @ 7%	Total Earnings Discounted @ 3%
2016	12	\$0.44	\$0.34	\$0.39
2017	280	\$10.57	\$7.54	\$9.12
2018	273	\$10.32	\$6.88	\$8.64
2019	347	\$13.12	\$8.17	\$10.67
2020	524	\$19.79	\$11.52	\$15.62
2021	490	\$18.52	\$10.08	\$14.20
2022	575	\$21.73	\$11.04	\$16.17
2023	87	\$3.28	\$1.56	\$2.37
2024	87	\$3.28	\$1.46	\$2.30
2025	458	\$17.31	\$7.18	\$11.78
2026	468	\$17.68	\$6.86	\$11.69
2027	492	\$18.60	\$6.74	\$11.94
2028	12	\$0.46	\$0.15	\$0.28
2029	-	\$-	\$-	\$-
2030	435	\$16.46	\$4.87	\$9.67
2031	516	\$19.51	\$5.40	\$11.13
2032	516	\$19.51	\$5.04	\$10.80
2033	141	\$5.34	\$1.29	\$2.87
2034	60	\$2.29	\$0.52	\$1.19
2035	262	\$9.91	\$2.09	\$5.02
2036	262	\$9.91	\$1.95	\$4.87
2037	262	\$9.91	\$1.83	\$4.73
<b>Total</b>	<b>6,558</b>	<b>\$247.95</b>	<b>\$102.50</b>	<b>\$165.48</b>

Note: To use the final demand multiplier for employment, the construction expenditures were deflated to 2008 dollars using the GDP Price Index Deflator because the RIMS II multipliers are based on 2008 data.

Source: AECOM

In the case of economic impacts generated by capital expenditures for the project, there are no long-term effects. Construction-related impacts last for the duration of the project’s construction cycle. For the four-state region the effects of the Nebraska component of the Heartland Expressway Corridor construction would result in \$285.3 million in earnings (\$2012) and 6,754 person-year jobs for the 2016-2037 construction period. Similarly, for the Nebraska Heartland Expressway Corridor counties, the effects would result in \$248.0 million in earnings (\$2012) and 6,558 person-year jobs for the 2016-2037 construction period.

### 5.3.3 MAINTENANCE AND OPERATIONS IMPACTS

The maintenance and operations (M&O) of the Nebraska components of the Heartland Expressway Corridor improvements would have an impact on the regional and local economy due to new direct and indirect employment that would result from the M&O expenditures associated with the improvements. The new M&O expenditures are those expenditures associated with the yearly maintenance and less frequent repaving costs for the additional lanes created by the Heartland Expressway Corridor investment. Direct employment consists of operations-related employment in industries whose jobs and services are purchased directly to operate and maintain the new lanes. Indirect economic impacts are those that would be created by the secondary demand for goods and services across a broader spectrum of industrial sectors to support the industries providing the M&O services. These indirect impacts are reflected in the economic multipliers for construction, as most roadway maintenance is construction related. The analysis estimates the number of M&O jobs and earnings generated by the Heartland Expressway Corridor improvements in Nebraska based on new (or additional) M&O cost estimates provided by NDOR.

The analysis applies a consistent set of multipliers tailored to the structure of the four-state Heartland counties economy as well as the Nebraska Heartland counties only. The economic impacts associated with M&O expenditures were measured using regional multipliers from the BEA within the US Department of Commerce. Derived from RIMS II, the multipliers measure the total change (direct + indirect + induced impacts) in employment and earnings that result from an incremental change to a particular industry.

#### M&O Expenditures

The annual M&O expenditures as well as the less frequent joint sealing and new pavement costs (every eight years) for the new lane miles added in Nebraska as part of the Heartland Expressway Corridor improvements were provided by NDOR in 2012 dollars (see Chapter 4 for more information on M&O costs). The capital costs of the ITS improvements are phased in over five years, therefore, the M&O costs are also phased in over five years.

The total M&O expenditures are divided into two major categories. These include:

- **Annual Expenditures:** yearly maintenance including snow removal, striping, etc.
- **Expenditures Incurred Every Eight Years:** joint sealing and new pavement

The economic impact of these expenditures would vary by activity and depends on the amount of locally produced goods and services embodied in the purchases. Construction (the industry most associated with highway M&O) goods and services would be purchased in the local economy. Although every material required for M&O would not be produced locally, the RIMS II multipliers reflect the supplier linkages for the industry, and thus account for this leakage from the local economy.

The total expenditures for these costs are allocated over the analysis period so that the annual M&O expenses for each project component started in the year following project completed, as provided by NDOR. In addition, the joint sealing and new pavement expenses are incurred in the eighth year after operation begins and every eight years thereafter through 2054. Table 5.17 summarizes total M&O costs for the Heartland Expressway Corridor applied for each year in the analysis. This allocation is just an estimate in order to provide an annual cost and impact estimate; it is not intended to represent a cash flow for the project.

Table 5.17 – Annual New M&O Costs for Nebraska Components of Heartland Expressway Corridor (2012 dollars in millions)

Year	Total M&O Costs
2016	\$-
2017	\$0.08
2018	\$0.17
2019	\$0.25
2020	\$0.54
2021	\$0.69
2022	\$0.85
2023	\$1.34
2024	\$1.37
2025	\$1.39
2026	\$1.42
2027	\$2.04
2028	\$1.88
2029	\$2.25
2030	\$2.83
2031	\$1.88
2032	\$1.88
2033	\$2.22
2034	\$2.49
2035	\$3.98
2036	\$2.40
2037	\$2.92
2038	\$3.49
2039	\$2.54
2040	\$3.44
2041	\$2.74
2042	\$2.74
2043	\$4.12
2044	\$2.92
2045	\$2.92
2046	\$3.49
2047	\$2.54
2048	\$3.44
2049	\$2.74
2050	\$2.74
2051	\$4.12
2052	\$2.92
2053	\$2.92
2054	\$3.49
<b>Total</b>	<b>\$88.17</b>

Source: NDOR

**M&O Jobs and Earnings Effects**

RIMS II multipliers are used to translate the M&O expenditures for the Nebraska component of the Heartland Expressway Corridor improvements into the associated job and income effects. The impacts are shown for the four-state Heartland Expressway counties and the Nebraska Heartland Expressway counties only. The impacts vary by the geographic area considered; impacts are greater for the four-state area relative to the Nebraska counties as there is less “leakage” associated with construction spending. Put another way, a larger economy captures a greater share of project spending as its greater size allows it to provide a greater share of the diverse range of services required for highway M&O activities.

The **Final Demand Earnings Multiplier** represents the total dollar change in earnings of households employed by all industries for each additional dollar of output delivered to final demand by the construction industry.

The **Final Demand Employment Multiplier** represents the total change in the number of jobs that occur in all industries for each \$1 million of output delivered to final demand by the construction industry.

Applying the final demand multipliers for the construction industry to the annual M&O expenditures shown in Table 5.17 provides an estimate of the earnings and employment impacts generated by the new Nebraska components of the Heartland Expressway Corridor improvements. The Nebraska total annual M&O expenditures for Groups 1-4 for the 2016 to 2054 period is \$88.17M in 2012 dollars.

In the case of economic impacts generated by M&O expenditures for the project, the annual impacts are recurring effects that last as long as the project is operating. In the results summarized below, one job year is defined as a job for one person for one year’s duration. As an example, a job for one person for three years would be defined as three person-year jobs. For the four-state region the effects of the Nebraska component of the Heartland Expressway Corridor maintenance and operations would result in \$46.9 million in earnings (\$2012) and 1,146 person-year jobs for the 2016-2054 analysis period. These jobs and earnings consist of operations-related employment in industries whose jobs and services are purchased directly to operate and maintain the new lanes as well as the secondary demand for goods and services across a broader spectrum of industrial sectors that support the industries providing the M&O services. Similarly, for the Nebraska Heartland Corridor counties,

the effects would result in \$40.2 million in earnings (\$2012) and 1,108 person-year jobs for the 2016-2054 analysis period.

### 5.3.4 ECONOMIC DEVELOPMENT IMPACTS

As the market recognizes and responds to the travel time and reliability improvements associated with the Heartland Expressway Corridor investments, long-term economic development would occur. For example, if shipments are more reliable and travel times are reduced, then businesses can reduce their inventories and organize their production processes to be leaner and can reach a larger market area than without the improvements. Collectively, this allows the Heartland Expressway Corridor economy to be more economically competitive. Food processing and other light manufacturing, as well as distribution are important opportunities for the corridor that would capitalize on the region's existing industrial base and the productivity improvements offered by the improved road network. The corridor's rail links, including rail connections to the West Coast ports, offer upside potential to this development strategy. In addition, auto traffic in the corridor would increase, increasing demand for roadside services in the corridor. This section describes the estimation of likely development impacts.

#### Roadside Services Impacts

Traffic along the Nebraska portion of the Heartland Expressway Corridor is expected to increase by at least 3.6% (see the travel demand analysis in Chapter 2 and Appendix B) with the completion of the transportation improvements due to the attraction of new users and diversions from parallel routes with slower travel times. This increase in traffic translates into increases in spending on lodging, food, gasoline, diesel, and other retail items by travelers along Nebraska's portion of the Heartland Corridor.

These new roadside service expenditures are important because they generate additional revenues for small businesses and result in additional direct and indirect employment and earnings for the corridor counties. Direct employment consists of accommodation, food services, and retail trade employment in industries whose jobs and services are purchased by roadside travelers. Indirect economic impacts are those that would be created by the secondary demand for goods and services across a broader spectrum of industrial sectors to support the industries providing roadside services. These indirect impacts are reflected in the economic multipliers for accommodation, food services, and retail trade industries. The analysis estimates the number of roadside service jobs and earnings generated by the Heartland Expressway Corridor improvements based on new roadside services expenditure estimates.

Unlike the construction and M&O impacts, the economic impacts associated with the new roadside services expenditures in the Heartland Expressway Corridor are only estimated for the local Nebraska counties. Since the traffic generating most of the new roadside service expenditures along the corridor is diverted traffic from slower routes, largely in neighboring states, the roadside service expenditures in the corridor would have been spent in these neighboring states, if the Nebraska portion of the Heartland Expressway Corridor project were not constructed. In other words, the impacts of roadside services are largely a transfer from parallel routes to Nebraska's portion of the Heartland Expressway Corridor. As a result, the analysis applies a consistent set of multipliers tailored to the structure of the Nebraska Heartland Expressway counties only. The economic impacts associated with roadside services expenditures were measured using regional multipliers from the BEA within the US Department of Commerce. Derived from RIMS II, the multipliers measure the total change (direct + indirect + induced impacts) in employment and earnings that result from an incremental change to a particular industry.

### Roadside Services Expenditures

To estimate the increase in roadside services expenditures on lodging, food, gasoline, diesel, and other retail along Nebraska's Heartland Expressway Corridor, an estimate of expenditures per vehicle mile traveled (VMT) was developed based on an analysis from the Appalachian Regional Commission's (ARC) Appalachian Development Highways Economic Impact Studies (1998)<sup>10</sup>. The logic used to estimate lodging, food, gasoline, diesel, and other retail expenditures per VMT is the same as the ARC report; however, the dollar values assumed have been updated to reflect prices in 2012.

The roadside services expenditures per VMT are multiplied by the annual new or diverted VMT projected to occur along Nebraska's portion of the Heartland Expressway Corridor. The daily VMT projections for each Heartland Expressway scenario were provided by the AECOM travel model for 2035.

### Roadside Services Jobs and Earnings Effects

RIMS II multipliers are used to translate the annual roadside services expenditures for the Nebraska component of the Heartland Expressway Corridor improvements into the associated job and income effects. The impacts are shown for the Nebraska Heartland Corridor counties only as these expenditures are largely diverted from neighboring areas.

Applying the final demand multipliers for the appropriate industry to the annual roadside expenditures provides an estimate of the earnings and employment impacts generated by the new components of Nebraska's Heartland Expressway Corridor improvements. Accommodation multipliers are used for lodging expenditures; food services multipliers are used for food expenditures; and retail trade multipliers are used for gasoline, diesel, and other retail expenditures.

In the case of economic impacts generated by roadside services expenditures for the Heartland Expressway travel scenario, the annual impacts are recurring effects that last as long as the project is operating. For the Nebraska Heartland Expressway Corridor region the effects of the roadside services expenditures associated with the Heartland Expressway Corridor travel scenario would result in \$73.5 million in earnings (\$2012) and 3,175 person-year jobs for the 2016-2054 analysis period.

In the case of economic impacts generated by roadside services expenditures for the Heartland & Intensified Energy Resource Development travel scenario, the annual impacts are recurring effects that last as long as the project is operating. For the Nebraska Heartland Expressway Corridor region the effects of the roadside services expenditures associated with the Heartland Expressway Corridor Heartland & Intensified Energy Resource Development travel scenario would result in \$330.9 million in earnings (\$2012) and 14,374 person-year jobs for the 2016-2054 analysis period.

In the case of economic impacts generated by roadside services expenditures for the Entire PTP Corridor travel scenario, the annual impacts are recurring effects that last as long as the project is operating. For the Nebraska Heartland Expressway Corridor region the effects of the roadside services expenditures associated with the Heartland Expressway Corridor Entire PTP Corridor travel scenario would result in \$370.8 million in earnings (\$2012) and 16,079 person-year jobs for the 2016-2054 analysis period.

In the case of economic impacts generated by roadside services expenditures for the Entire PTP Corridor & Intensified Energy Resource Development travel scenario, the annual impacts are recurring effects that last as long as the project is operating. For the Nebraska Heartland Expressway Corridor region the effects of the roadside services expenditures associated with the Heartland Expressway Corridor and the Entire PTP Corridor & Intensified Energy Resource Development travel scenario would result in \$655.0 million in earnings (\$2012) and 28,468 person-year jobs for the 2016-2054 analysis period.

<sup>10</sup> [http://www.arc.gov/assets/research\\_reports/AppalachianDevelopmentHighwaysEconomicImpactStudies3chap2.pdf](http://www.arc.gov/assets/research_reports/AppalachianDevelopmentHighwaysEconomicImpactStudies3chap2.pdf)

**Competitive Impacts**

Unlike the estimate of roadside services, which relies on projections of VMT, the assessment of relocations and expansions cannot be tied directly to travel time and VMT savings. It is possible, however, to estimate the typical impact of food processing and distribution expansions in the Heartland Expressway Corridor. Based on recent food processing relocations to the region such as KYS Foods and industry trends, the typical food processing plant employs between 20 and 50 employees directly. There are several established food processors in the corridor that are much larger, but these are at the upper end of the industry’s size and not representative of a typical firm. Distribution facilities are also in that similar range based on data from the Bureau of Economic Analysis’s County Business Patterns and information on specific distribution facilities currently operating in the corridor. The estimation assumes an average industry wage of \$29,000 for food processing, an average wage of \$35,000 for distribution activities, and an average wage of \$40,000 for other services.

Table 5.18 - Economic Impact of Typical Firm Relocation in Industries Likely to Capitalize on Heartland Expressway Improvements

	Direct Employment	Direct Earnings (000)	Final Demand Multipliers		Impact of a Typical Relocation	
			Earnings (dollars)	Employment (jobs)	Earnings (dollars)	Employment (jobs)
<b>Industry Opportunity</b>						
Food Processing	50	1,450	\$2.3664	2.2868	\$3,431	114
Distribution	35	1,225	\$1.1631	1.1564	\$1,425	40
Other Services	35	1,400	\$1.1912	1.1962	\$1,668	42

Note: RIMS II multipliers line 19. Food, beverage, and tobacco product manufacturing, line 36. Warehousing and storage, and line 61 (Other services)

These are recurring jobs; the impacts in Table 5.18 are annual impacts that last for the duration of the firm’s operation. Both industry opportunities are likely; the corridor has some established firms in each industry but has also been considered and ultimately not selected by other firms in the industry (based on stakeholder interviews) for expansions. Thus, the road improvements and associated accessibility gains created by the greater travel reliability and travel time savings is expected to improve the region’s capture rate for these industries.

Table 5.18 contains an estimate for an additional industry opportunity beyond the corridor’s traditional advantages. This opportunity involves “other services.” Over time, as the nearby Denver region continues to develop into the dominant urban economy in this region of the country, industries will increasingly seek lower cost locations with good access to this dense urban market. There is upside potential that some businesses will select locations in the Heartland Expressway Corridor. Nebraska’s cost of doing business is estimated to be 85% below the US national average cost by Moody’s Analytics<sup>11</sup>. By contrast, the estimated cost in Denver is 94% of the national average, yielding a significant savings to those firms that can locate in the corridor and still access the Denver market as needed. The expanding manufacturing base, combined with low cost proximity to Denver, offers opportunities to expand the range of services (and employment opportunities) in the corridor over time. Accessibility of mining jobs associated with Intensified Energy Resource Development similarly offers support for an expanding service industry. Though the corridor is not expected to experience the direct employment impacts, workers in the corridor will more readily access the Intensified Energy Resource Development sites (see Chapter 2) and the well-paying jobs associated with these opportunities. Thus, incomes in the Heartland Expressway Corridor are supported, which in turn translates into support for a greater range of services in the local economy.

<sup>11</sup> Value is for 2009, the most recent available. No specific cost for Scottsbluff is available, but it is un-likely that costs in the panhandle region of the state exceed the national average which includes the state’s main metropolitan centers. North American Business Cost Review, 2011 Edition.

**5.3.5 ECONOMIC IMPACT SUMMARY AND FACTORS SUPPORTING SUCCESS**

The preceding discussion has illustrated the varied ways that the Nebraska components of the Heartland Expressway Corridor generate economic impacts in the form of jobs and earnings. Table 5.19 below summarizes the jobs and earnings created or supported by the Heartland Expressway Corridor investments that have been discussed. Taken in total the construction, maintenance and operations, and roadside services offered by the investment support between 10,840 and 36,133 job years and \$362 to \$943 million in earnings for the Nebraska Heartland Counties during the 2016 to 2054 analysis period. The range of results provided is based on the different roadside service scenarios analyzed.

Table 5.19 – Summary of Economic Impacts for the Nebraska Heartland Expressway Counties 2016-2054 (2012 Dollars in Millions)

	Total Job-Years (2016-2054)	Total Earnings (2016-2054)
Construction	6,558	\$ 248
O&M	1,108	\$ 40
<b>Roadside Services</b>		
Heartland	3,175	\$ 73
Heartland & Intensified Energy Resource Development	14,374	\$ 331
Entire PTP	16,079	\$ 371
Entire PTP & Intensified Energy Resource Development	28,468	\$ 655
<b>Total (Range provided based on the Roadside Services Scenarios)</b>	<b>10,840 to 36,133</b>	<b>\$362 to \$943</b>

Over time, as the nearby Denver region continues to develop into the dominant urban economy in this region of the country, industries will increasingly seek lower cost locations with good access to this dense urban market. As a result, there is upside potential that some businesses will select locations in the Heartland Expressway Corridor. The expanding manufacturing base, combined with low cost proximity to Denver, offers opportunities to expand the range of services (and employment opportunities) in the corridor over time. Food processing and distribution industry opportunities are likely in the Heartland Expressway Corridor; the corridor has some established firms in each industry but has also been considered and ultimately not selected by other firms in the industry (based on stakeholder interviews) for expansions. Thus, the road improvements and associated accessibility gains created by the greater travel reliability and travel time savings is expected to improve the region’s capture rate for these industries. The attraction of one of these industry opportunities is likely to create between 40 and 114 annual jobs and \$1.4 and \$3.4 million in annual earnings. These jobs and earnings impacts include both the direct employment at the facility as well as in industries supporting the operation of the facility and its employees.

Researchers have found that any subset of the following factors supports highway investments’ ability to generate meaningful economic growth. These include: high volumes of travel, travel time savings, improved connections among trade centers, better labor access, improved access to manufacturing centers, better connections between agricultural centers and markets, better access between raw materials and processors, and better access for tourists. Of note, all relate to mobility or accessibility, the traditional role of transportation. In each case, transportation enables the firms and workers to capitalize on an existing strength or competitive advantage present in the community’s economic structure. The transportation improvement connects a regional asset (broadly understood to be a resource, labor force or amenity) to a

market for the asset. More directly, transportation investment is successful when addressing a transportation problem in the economy.

By contrast, transportation investment cannot overcome the economic disadvantages of a small labor pool, an unskilled or uneducated workforce, unreliable power or water supplies, nor can it attract industry where the requisite resources are not present. This perspective leads one to consider a collaborative approach to economic development, where investments of different types are bundled together to mitigate a region's economic disadvantages. For example, road improvements to support a desirable employer in a targeted industry might be combined with workforce training tailored to the needs of the employer, and tax incentives to permit a new industry to take hold in the region and demonstrate its success in a new location and can be marketed to other employers in the industry or to related industries. In this instance, road investment is part of a package of policies and investments that address the region's economic disadvantages; transportation investment is not the sole investment.

The Heartland Expressway Corridor has a number of ancillary qualities that allow it to leverage highway improvements. These include the following:

**Advantageous costs.** Nebraska's cost of doing business is estimated to be 85 percent below the US national average cost by Moody's Analytics<sup>12</sup>. By contrast, the estimated cost in Denver is 94 percent of the national average, yielding a significant savings to those firms that can be located in the corridor and still access the Denver market as needed.

**Educational programs aligned with the economy.** Western Nebraska Community College offers course concentrations in Transportation, Distribution, and Logistics and Manufacturing Processes. These two areas accounted for 10 percent of attendees. Combined with the more general business curriculum, this accounted for over a quarter of attendees.

**Complementary infrastructure.** Stakeholder participants reported on the region's fiber optic network and excess supply of telecommunications capacity to support industry.

**Strategic location.** The corridor is strategically on major rail lines that feed to the west coast ports. These lines are gradually being upgraded to remove bottlenecks and to better connect the inland US to these Pacific gateways. The corridor benefits from these improvements along with the balance of the Midwest. In addition, the corridor is located in close proximity to Intensified Energy Resource Development areas and along an emerging North-South trade link.

Collectively, these ancillary qualities provide support for a strategy of highway-led economic development in the Heartland Expressway Corridor.

<sup>12</sup> Value is for 2009, the most recent available. No specific cost for Scottsbluff is available but it is unlikely that costs in the panhandle region of the state exceed the national average which includes the state's main metropolitan centers. 2011 Edition, North American Business Cost Review, 2011 Edition.