

Technical Memorandum

Date: October 1, 2009
Subject: NC DOT FRA Track 2 Applications - Economic Benefits Analysis

This technical memorandum describes the economic impacts associated with the (1) construction, (2) professional services, (3) rail vehicle purchases and rehabilitation, and (4) operations and maintenance, associated with the NC DOT FRA Track 2 Applications. This technical memorandum also summarized the areas of economic distress located within the project areas.

1) Construction Benefits

Construction of the improvements identified in North Carolina's Track 2 applications represents significant capital investment in the local and regional economies of the State of North Carolina and the local and regional economies of the Commonwealth of Virginia for Application NC 2.4.¹ This spending would rapidly increase employment for the duration of the construction process. Capital cost estimates and construction values for this analysis are presented in 2010 dollars, providing a common value for expenditures that are distributed over a number of years. The following section describes the expenditures and anticipated economic impacts.

Exhibit 1 below summarizes the spending anticipated for the NC DOT FRA Track 2 Application projects. These costs are net of Professional Services (engineering and construction management), ROW, and Equipment. In the case of ROW, there is no labor content and thus no impact. In the case of equipment, this would likely be purchased outside the North Carolina economy and thus not impact North Carolina directly. Professional services will generate impacts in the state as these activities will be purchased in the Raleigh-Cary, NC MSA; however, they are omitted in this section because these purchases are not distributed across the entire NC Corridor County area. The professional services impacts are shown in the section 2.

The distinction between expenditures is made as the economic impacts would vary significantly by type of expenditure. Further, it depends on the amount of locally produced goods and services embodied in the purchase. Construction goods and services would be purchased in the local economy. Although not every building material required for the Track 2 applications would be produced locally, the RIMS II multipliers reflect the supplier linkages for the industry, and thus account for this leakage from the local economy.

¹ NC 2.4 includes construction in Virginia as the alignment continues to Richmond, VA. As a result, NC DOT separated the construction expenditures into costs that occur in North Carolina and costs that occur in Virginia. The regional costs in North Carolina occur in the NC Corridor Counties (Alamance, Cabarrus, Davidson, Guilford, Mecklenburg, Orange, Randolph, Rowan, and Wake Counties) and the regional costs in Virginia occur in the Richmond, VA MSA.

Exhibit 1: Construction Expenditures in 2010 dollars (Excludes Professional Services, ROW, and Equipment)

	NC 2.1	NC 2.2	NC 2.3	NC 2.4 (NC)	NC 2.4 (VA)
2010	\$ 5,633,014	\$ 16,730,958	\$ -	\$ -	\$ -
2011	\$ 11,914,863	\$ 103,411,341	\$ 526,095	\$ -	\$ -
2012	\$ -	\$ 162,400,583	\$ 17,725,394	\$ 37,380,905	\$ 51,764,048
2013	\$ -	\$ 113,688,150	\$ 104,583,999	\$ 184,150,216	\$ 255,006,150
2014	\$ -	\$ -	\$ 168,280,482	\$ 193,219,506	\$ 258,564,031
2015	\$ -	\$ -	\$ 76,664,698	\$ 289,624,758	\$ 258,564,031
2016	\$ -	\$ -	\$ -	\$ 380,324,505	\$ 257,378,071
2017	\$ -	\$ -	\$ -	\$ 331,579,938	\$ 257,378,073
Total	\$ 17,547,877	\$ 396,231,033	\$ 367,780,668	\$ 1,416,279,826	\$ 1,338,654,403

Source: NC DOT, September 2009

In order to determine the economic impacts generated from the construction spending, RIMS II Final Demand Employment Multipliers are applied to the net capital costs shown in the Exhibit above.² The multipliers used in this analysis are for the State of North Carolina and the Commonwealth of Virginia (for NC 2.4) and for the NC Corridor Counties³ (for expenditure occurring in North Carolina) and the Richmond, VA MSA (for expenditures occurring in Virginia). Multipliers are based on the 1997 Benchmark Input-Output table and 2006 regional data. These are the most recent multipliers available at the time of this analysis.

Exhibit 2: RIMS II Construction Multipliers

Region	Final Demand Employment Multiplier	Direct Effect Employment Multiplier
Corridor (NC)	17.6393	1.9235
Richmond, VA MSA	19.4732	2.1341
North Carolina	22.3831	1.9931
Virginia	17.9686	2.1686

Source: BEA

The Final Demand Employment Multiplier represents the total change in the number of jobs that occurs in all industries for each \$1 million of output delivered to final demand by the construction industry. The Direct Effects multipliers, by contrast, describe the total change in employment and earnings associated with a one construction job change or \$1 change in construction earnings respectively. The Direct Effect multipliers are used to identify the direct impacts relative to the total impacts across all sectors of the economy.⁴

Exhibit 3 summarizes those jobs directly attributable to the construction phase of the project; the values below do not take into account any additional employment created as professional services workers spend their wages in the local and regional North Carolina (and Virginia for Application NC 2.4) economy, creating a proportionate demand for a broad range of goods and services. Note that these are one-time impacts that occur during the construction period only. One job is defined as full-time employment for one person of one year's duration (2,080 hours).

² Since the Final Demand Multipliers are based on 2006 regional data, the construction costs shown in Exhibit 1 were deflated to 2006 dollars using the Noncapital Defense GDP Deflator.

<http://www.gpoaccess.gov/usbudget/fy10/sheets/hist10z1.xls>

³ Corridor counties include: Alamance, Cabarrus, Davidson, Durham, Guilford, Mecklenburg, Orange, Randolph, Rowan, and Wake Counties in North Carolina.

⁴ Direct employment impacts are estimated by multiplying the construction expenditures (in millions of 2006\$) by the result of the division of the Final demand Employment Multiplier by the Direct Effect Employment Multiplier.

As an example, a job for one person that had duration of three years would be defined as three person-year jobs.

Exhibit 3: Direct Employment from Construction Expenditures

	Track 2 Applications			
	NC 2.1	NC 2.2	NC 2.3	NC 2.4
Jobs in the State of NC				
2010	60	178	-	-
2011	127	1,099	6	-
2012	-	1,726	188	397
2013	-	1,208	1,112	1,957
2014	-	-	1,789	2,054
2015	-	-	815	3,079
2016	-	-	-	4,043
2017	-	-	-	3,525
Total	187	4,212	3,909	15,055
Jobs in the Commonwealth of VA				
2010	-	-	-	-
2011	-	-	-	-
2012	-	-	-	406
2013	-	-	-	2,000
2014	-	-	-	2,028
2015	-	-	-	2,028
2016	-	-	-	2,019
2017	-	-	-	2,019
Total	-	-	-	10,499
Jobs in the Corridor (NC)				
2010	49	145	-	-
2011	103	898	5	-
2012	-	1,410	154	324
2013	-	987	908	1,598
2014	-	-	1,461	1,677
2015	-	-	665	2,514
2016	-	-	-	3,301
2017	-	-	-	2,878
Total	152	3,439	3,192	12,293
Jobs in the Richmond MSA (VA)				
2010	-	-	-	-
2011	-	-	-	-
2012	-	-	-	447
2013	-	-	-	2,202
2014	-	-	-	2,233
2015	-	-	-	2,233
2016	-	-	-	2,223
2017	-	-	-	2,223
Total	-	-	-	11,562

Note: The state and regional benefits are not additive as the regional benefits for the NC Corridor are included in the State of North Carolina benefits, and the regional benefits for the Richmond, VA MSA are already included in the Commonwealth of Virginia benefits.

Sources: BEA RIMS II Multipliers, NC DOT Cost Estimates, Noncapital Defense GDP Deflator, and AECOM Calculations

The total impacts of construction activity for the Track 2 Applications, inclusive of direct, indirect, and induced employment are provided in the Exhibit 4 below.

Exhibit 4: Total Employment Impacts from Construction Expenditures

	Track 2 Applications			
	NC 2.1	NC 2.2	NC 2.3	NC 2.4
Jobs in the State of NC				
2010	119	354	-	-
2011	252	2,191	11	-
2012	-	3,441	376	792
2013	-	2,409	2,216	3,901
2014	-	-	3,565	4,094
2015	-	-	1,624	6,136
2016	-	-	-	8,058
2017	-	-	-	7,025
Total	372	8,395	7,792	30,005
Jobs in the Commonwealth of VA				
2010	-	-	-	-
2011	-	-	-	-
2012	-	-	-	880
2013	-	-	-	4,337
2014	-	-	-	4,398
2015	-	-	-	4,398
2016	-	-	-	4,377
2017	-	-	-	4,377
Total	-	-	-	22,767
Jobs in the Corridor (NC)				
2010	94	279	-	-
2011	199	1,727	9	-
2012	-	2,711	296	624
2013	-	1,898	1,746	3,075
2014	-	-	2,810	3,226
2015	-	-	1,280	4,836
2016	-	-	-	6,350
2017	-	-	-	5,536
Total	293	6,615	6,140	23,646
Jobs in the Richmond MSA (VA)				
2010	-	-	-	-
2011	-	-	-	-
2012	-	-	-	954
2013	-	-	-	4,700
2014	-	-	-	4,766
2015	-	-	-	4,766
2016	-	-	-	4,744
2017	-	-	-	4,744
Total	-	-	-	24,674

Note: The state and regional benefits are not additive as the regional benefits for the NC Corridor are included in the State of North Carolina benefits, and the regional benefits for the Richmond, VA MSA are already included in the Commonwealth of Virginia benefits.

Sources: BEA RIMS II Multipliers, NC DOT Cost Estimates, Noncapital Defense GDP Deflator, and AECOM Calculations

2) Construction Professional Service Benefits

In addition to the capital improvements made throughout the corridor, the Track 2 applications also include investments in engineering and construction management services. These professional services are included in all four Track 2 applications and are summarized below in Exhibit 5. In all applications, these investments are expected to be made in the Raleigh-Cary, NC MSA.

Exhibit 5: Construction Professional Services Expenditures in 2010 dollars

	NC 2.1	NC 2.2	NC 2.3	NC 2.4 (NC)
2010	\$ 703,595	\$ 26,070,860	\$ 5,880,350	\$ 106,700,000
2011	\$ 579,486	\$ 11,937,065	\$ 10,519,291	\$ 107,115,000
2012	\$ -	\$ 8,964,294	\$ 12,320,253	\$ 108,680,000
2013	\$ -	\$ 8,227,292	\$ 11,751,226	\$ 110,239,585
2014	\$ -	\$ -	\$ 11,840,535	\$ 43,772,069
2015	\$ -	\$ -	\$ 8,184,397	\$ 42,353,765
2016	\$ -	\$ -	\$ -	\$ 40,221,403
2017	\$ -	\$ -	\$ -	\$ 39,861,403
Total	\$ 1,283,082	\$ 55,199,512	\$ 60,496,052	\$ 598,943,224

Source: NC DOT, September 2009

Using the same methodology as for the construction estimation, adjusting the multiplier to reflect Professional, Scientific, and Technical Services in North Carolina and The Raleigh-Cary, NC MSA, the Exhibits below summarizes the anticipated benefits in North Carolina and the Raleigh-Cary, NC MSA for North Carolina's program of Track 2 investments. The final demand professional, scientific, and technical services multipliers for the State of North Carolina and the Raleigh-Cary, NC MSA are 19.4739 and 17.1728, respectively. The direct effect professional, scientific, and technical services multipliers for the State of North Carolina and the Raleigh-Cary, NC MSA are 2.2254 and 2.0291, respectively.

Exhibit 6 summarizes those jobs directly attributable to the professional services expenditures for the Track 2 applications; the values below do not take into account any additional employment created as professional services workers spend their wages in the local and regional North Carolina economy, creating a proportionate demand for a broad range of goods and services. Note that these are one-time impacts that occur during the construction period only. One job is defined as full-time employment for one person of one year's duration (2,080 hours). As an example, a job for one person that had duration of three years would be defined as three person-year jobs.

Exhibit 6: Direct Employment from Construction Professional Services Expenditures

	Track 2 Applications			
	NC 2.1	NC 2.2	NC 2.3	NC 2.4
Jobs in the State of NC				
2010	6	216	49	884
2011	5	99	87	887
2012	-	74	102	900
2013	-	68	97	913
2014	-	-	98	363
2015	-	-	68	351
2016	-	-	-	333
2017	-	-	-	330
Total	11	457	501	4,961
Jobs in the Raleigh, NC MSA				
2010	6	209	47	855
2011	5	96	84	858
2012	-	72	99	871
2013	-	66	94	883
2014	-	-	95	351
2015	-	-	66	339
2016	-	-	-	322
2017	-	-	-	319
Total	10	442	485	4,798

Note: The state and regional benefits are not additive as the regional benefits for the NC Corridor are included in the State of North Carolina benefits.

Sources: BEA RIMS II Multipliers, NC DOT Cost Estimates, Noncapital Defense GDP Deflator, and AECOM Calculations

The total impacts of construction professional services activity for the Track 2 Applications, inclusive of direct, indirect, and induced employment are provided in the Exhibit 7 below.

Exhibit 7: Total Employment from Construction Professional Services Expenditures

	Track 2 Applications			
	NC 2.1	NC 2.2	NC 2.3	NC 2.4
Jobs in the State of NC				
2010	13	481	108	1,967
2011	11	220	194	1,974
2012	-	165	227	2,003
2013	-	152	217	2,032
2014	-	-	218	807
2015	-	-	151	781
2016	-	-	-	741
2017	-	-	-	735
Total	24	1,017	1,115	11,040
Jobs in the Raleigh, NC MSA				
2010	11	424	96	1,734
2011	9	194	171	1,741
2012	-	146	200	1,767
2013	-	134	191	1,792
2014	-	-	192	711
2015	-	-	133	688
2016	-	-	-	654
2017	-	-	-	648
Total	21	897	983	9,735

Note: The state and regional benefits are not additive as the regional benefits for the NC Corridor are included in the State of North Carolina benefits.

Sources: BEA RIMS II Multipliers, NC DOT Cost Estimates, Noncapital Defense GDP Deflator, and AECOM Calculations

3) Vehicle Manufacture and Rehabilitation

In addition to the capital improvements made throughout the corridor, the Track 2 applications also include investments to manufacture or rehabilitate rolling stock. These investments are included in all four Track 2 applications and are shown below in Exhibit 8. In all cases, these investments will be made out of state, but within the 48 contiguous states (including the District of Columbia) in the United States. As the purchases are all out of state, there is no job creation in North Carolina. There is, however, job creation and/or preservation in U.S (48 contiguous states including the District of Columbia).

Exhibit 8: Vehicle Purchases and Rehabilitation Expenditures in 2010 dollars

	NC 2.1	NC 2.2	NC 2.3	NC 2.4
2010	\$ 7,464,031	\$ 5,385,750	\$ -	\$ -
2011	\$ -	\$ 6,195,000	\$ -	\$ -
2012	\$ -	\$ -	\$ -	\$ -
2013	\$ -	\$ -	\$ 9,870,000	\$ -
2014	\$ -	\$ -	\$ 36,566,250	\$ -
2015	\$ -	\$ -	\$ 29,426,250	\$ -
2016	\$ -	\$ -	\$ -	\$ 57,750,000
2017	\$ -	\$ -	\$ -	\$ 57,750,000
Total	\$ 7,464,031	\$ 11,580,750	\$ 75,862,500	\$ 115,500,000

Source: NC DOT, September 2009

Using the same methodology as for the construction estimation, adjusting the multiplier to reflect Railroad Rolling Stock Manufacturing (there is no separate multiplier for rehabilitation) in the 48 contiguous states (including the District of Columbia), the Exhibits below summarize the anticipated benefits in the U.S. (48 contiguous states and the District of Columbia) from North Carolina's program of Track 2 investments. The final demand and direct effect railroad rolling stock manufacturing employment multipliers for the 48 contiguous states and the District of Columbia are 18.1521 and 6.4774, respectively.

Exhibit 9 summarizes those jobs directly attributable to the vehicle expenditures for the Track 2 applications; the values below do not take into account any additional employment created as railroad rolling stock manufacturing workers spend their wages in the local and regional North Carolina economy, creating a proportionate demand for a broad range of goods and services. Note that these are one-time impacts that occur during the construction period only. One job is defined as full-time employment for one person of one year's duration (2,080 hours). As an example, a job for one person that had duration of three years would be defined as three person-year jobs.

Exhibit 9: Direct Employment from Vehicle Manufacture and Rehabilitation Expenditures

	Track 2 Applications			
	NC 2.1	NC 2.2	NC 2.3	NC 2.4
Jobs in the U.S. (Lower 48 States and DC)				
2010	20	14	-	-
2011	-	16	-	-
2012	-	-	-	-
2013	-	-	26	-
2014	-	-	97	-
2015	-	-	78	-
2016	-	-	-	153
2017	-	-	-	153
Total	20	31	201	306

Sources: BEA RIMS II Multipliers, NC DOT Cost Estimates, Noncapital Defense GDP Deflator, and AECOM Calculations

The total impacts of construction professional services activity for the Track 2 Applications, inclusive of direct, indirect, and induced employment are provided in the Exhibit 10 below.

Exhibit 10: Total Employment from Vehicle Manufacture and Rehabilitation Expenditures

	Track 2 Applications			
	NC 2.1	NC 2.2	NC 2.3	NC 2.4
Jobs in the U.S. (Lower 48 States and DC)				
2010	128	93	-	-
2011	-	106	-	-
2012	-	-	-	-
2013	-	-	170	-
2014	-	-	628	-
2015	-	-	506	-
2016	-	-	-	992
2017	-	-	-	992
Total	128	199	1,303	1,984

Sources: BEA RIMS II Multipliers, NC DOT Cost Estimates, Noncapital Defense GDP Deflator, and AECOM Calculations

4) Operating Impact Benefits

The Track 2 Applications will require hiring to operate and maintain the additional equipment. Direct hiring associated with the four applications is shown in Exhibit 11 below. These are recurring jobs over the long-term operating period. The analysis anticipates that these new jobs will be created in North Carolina.

Exhibit 11: Direct Employment from Operating the Track 2 Applications

	NC 2.1	NC 2.2	NC 2.3	NC 2.4
Stations:				
Amtrak Union Employees	2	-	3	10
NCDOT Station Attendants	3	4	11	6
Mechanical:				
Amtrak Union Employees	-	-	5	5
Contractor Non-Union	9	3	4	9
Contractor Mech. Managers	-	1	-	2
NCDOT Mech. Managers	1	-	1	2
Amtrak Train Crews:				
Conductors, Asst. Conductors	2	11	18	64
Engineers	3	6	9	32
On-Board Services	-	-	9	36
Administration:				
Amtrak	-	-	3	7
NCDOT	-	2	2	4
Total	20	27	65	177

Source: NC DOT, September 2009

The engineers, conductors and other staff are hired to support the service expansion will in turn spend their wages and create a proportional increase in demand for a range of goods and services, supporting the creation or preservation of additional hiring.

In order to estimate the number of indirect jobs created or preserved, the analysis utilizes a Direct Effect Employment Multiplier. Using railroad transportation as the example industry, the Direct Effect Multiplier represents the total change in jobs in ALL industries for each additional job in the railroad transportation industry. Unlike the construction estimation presented above that relied on costs, this analysis is driven by the estimate of rail personnel needed to support the operation of the third frequency. The Direct Effects Employment Multipliers for North Carolina and the Corridor communities are shown below. They are very similar in magnitude.

Exhibit 12: RIMS II Railroad Transportation Multipliers

Region	Direct Effect Multiplier
Corridor (NC)	3.1929
North Carolina	3.2433

Source: BEA

Annual operating impacts for the Project vary by alternative as shown in the Exhibit below. Unlike the construction impacts described above, these are recurring impacts that extend for the entire

25-year period of analysis. Exhibit 13 summarizes the operating cost assumptions that underpin this analysis. Exhibit 14 summarizes the total employment impacts for the 1st Full Year of Operation, 5th Full Year of Operation, and 10th Full Year of Operation.

Exhibit 13: Total Employment Impacts from Operations for 25-year Analysis Period

	25-year Total			
	NC 2.1	NC 2.2	NC 2.3	NC 2.4
Jobs in the State of NC	1,622	2,189	5,270	14,352
Jobs in the Corridor (NC)	1,596	2,155	5,188	14,129

Sources: BEA RIMS II Multipliers, NC DOT, and AECOM calculations

Exhibit 14: Total Annual Employment Impacts for 1st, 5th, and 10th Year of Operations

	NC 2.1	NC 2.2	NC 2.3	NC 2.4
Jobs in the State of NC				
First Full Year of Operation	65	88	211	574
Fifth Full Year of Operation	65	88	211	574
Tenth Full Year of Operation	65	88	211	574
Jobs in the Corridor (NC)				
First Full Year of Operation	64	86	208	565
Fifth Full Year of Operation	64	86	208	565
Tenth Full Year of Operation	64	86	208	565

Notes:

First Full Year of Operation: NC 2.1 (2011), NC 2.2 (2014), NC 2.3 (2016), and NC 2.4 (2018)

Fifth Full Year of Operation: NC 2.1 (2015), NC 2.2 (2018), NC 2.3 (2020), and NC 2.4 (2022)

Tenth Full Year of Operation: NC 2.1 (2020), NC 2.2 (2023), NC 2.3 (2025), and NC 2.4 (2027)

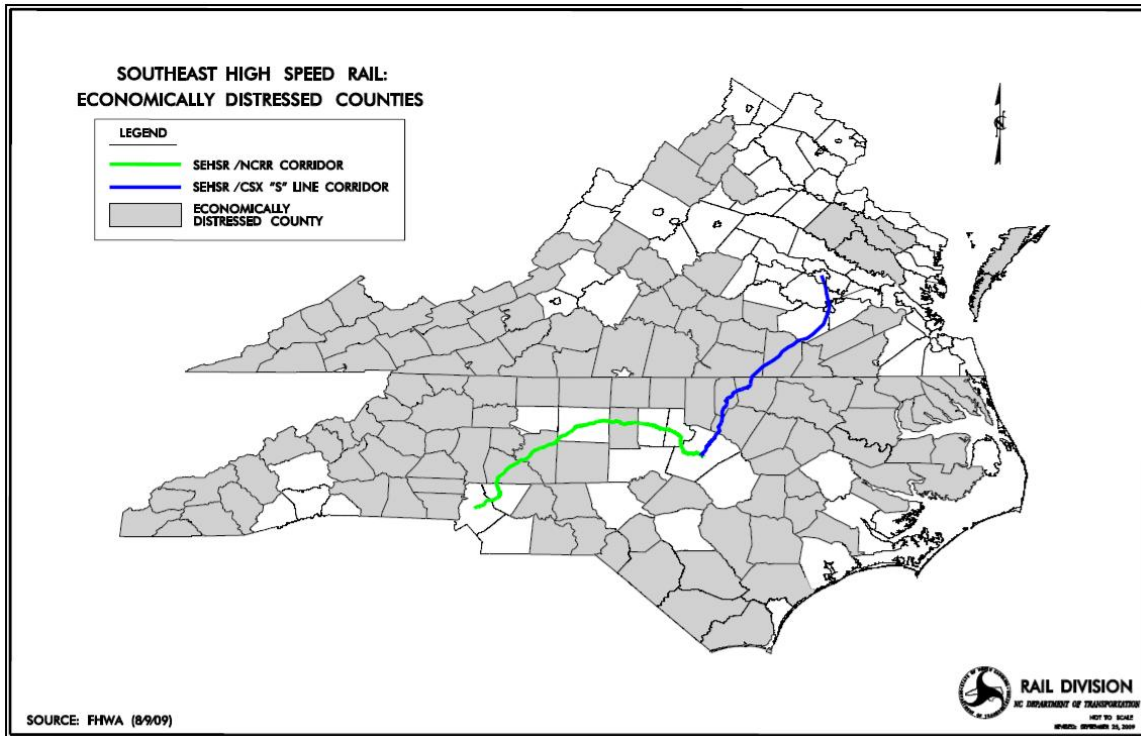
Sources: BEA RIMS II Multipliers, NC DOT, and AECOM calculations

5) Economic Distress

The definition of an Economically Distressed Area is provided in the Public Works and Economic Development Act. According to the act, to qualify for this designation, an area generally must (1) have a per capita income of 80 percent or less of the national average or (2) have an unemployment rate that is, for the most recent 24-month period for which data are available, at least 1 percent greater than the national average unemployment rate. For areas that do not meet one of these two criteria, the Secretary of Commerce has the authority to determine that an area has experienced or is about to experience a special need arising from actual or threatened severe unemployment or economic adjustment problems resulting from severe short term or long-term changes in economic conditions⁵.

The map below shows the counties along the corridor route that meet the definition of Economic Distress. Distressed counties are shaded grey. The map is consistent with the map provided by FHWA based on the same definition. The FHWA map and supporting information is available at http://hepgis.fhwa.dot.gov/hepgis_v2/GeneralInfo/Map.aspx.

⁵ U.S.C. § 3161(a). Eligibility must be supported using the most recent federal data available or, in the absence of recent federal data, by the most recent data available through the government of the state in which the area is located. Federal data that may be used include data reported by the Bureau of Economic Analysis, the Bureau of Labor Statistics, the Census Bureau, the Bureau of Indian Affairs, or any other federal source determined by the Secretary of Commerce to be appropriate (42 U.S.C. § 3161(c)).



As shown in the map above, nine (9) counties directly traversed by the SEHSR/ NCRRCORRIDOR or CSX "S" Line corridor qualify as economically distressed. Moreover, a number of the counties that are directly adjacent are also distressed. This is significant as a project of this magnitude would be expected to draw supplies and labor from a larger region than just the counties directly touched by the corridor. On a statewide level, over 75 percent of North Carolina's 100 counties are Economically Distressed.