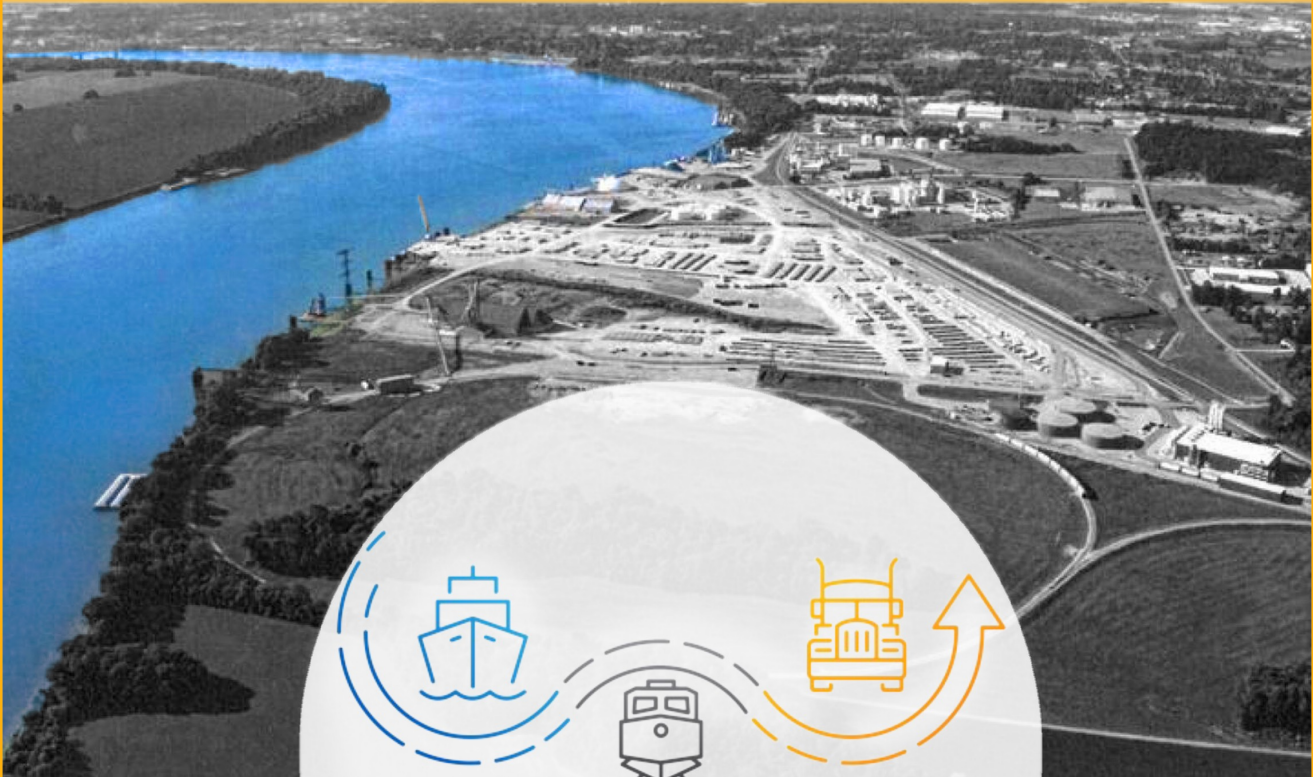


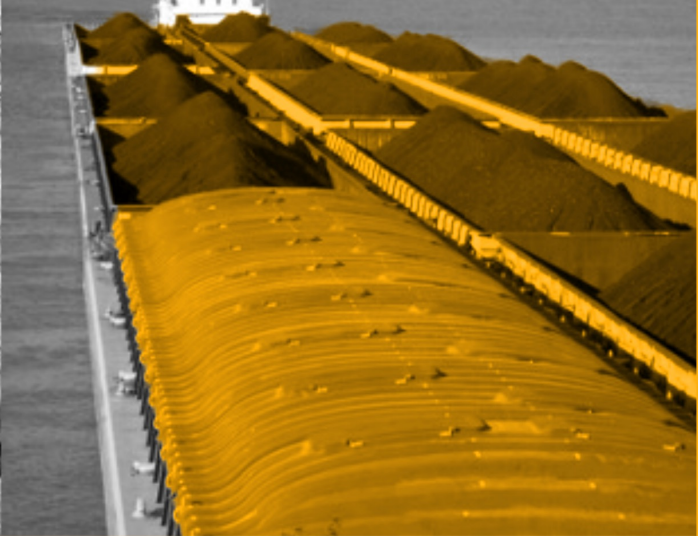
# APPENDIX 4



KENTUCKY RIVERPORTS, HIGHWAY  
& RAIL FREIGHT STUDY



KENTUCKY  
TRANSPORTATION  
CABINET



## APPENDIX 4

### APPENDIX 4.1 Investment Benefits and Impacts

Appendix 4.1a: Expansion Inputs

A-4.1a

Appendix 4.1b: Expansion Impacts

A-4.1b

### APPENDIX 4.2: Preservation Impacts

A-4.2

### APPENDIX 4.3: Modernization Impacts

A-4.3

App 4.1a: Expansion Inputs

Expansion Scenario

Table 1: VMT, VHT and Costs (in millions) by Riverport

	Eddyville					Greenup-Boyd					Henderson				
	Truck savings		Rail savings		Costs	Truck savings		Rail savings		Costs	Truck savings		Rail savings		Costs
	VMT	VHT	VMT	VHT	M\$	VMT	VHT	VMT	VHT	M\$	VMT	VHT	VMT	VHT	M\$
2021	0.44	0.01	-	-	\$ -	0.53	0.01	-	-	\$ -	0.16	0.00	-	-	\$ -
2022	0.44	0.01	-	-	\$ 0.98	0.54	0.01	-	-	\$ 1.00	0.16	0.00	-	-	\$ -
2023	0.45	0.01	-	-	\$ 7.50	0.55	0.01	-	-	\$ -	0.16	0.00	-	-	\$ 1.00
2024	0.46	0.01	-	-	\$ 2.00	0.56	0.01	-	-	\$ 0.01	0.16	0.00	-	-	\$ 3.00
2025	0.47	0.01	-	-	\$ -	0.57	0.01	-	-	\$ -	0.17	0.00	-	-	\$ 12.30
2026	0.48	0.01	-	-	\$ -	0.58	0.01	-	-	\$ -	0.17	0.00	-	-	\$ -
2027	0.48	0.01	-	-	\$ -	0.59	0.01	-	-	\$ -	0.17	0.00	-	-	\$ -
2028	0.49	0.01	-	-	\$ -	0.60	0.01	-	-	\$ -	0.18	0.00	-	-	\$ -
2029	0.50	0.01	-	-	\$ -	0.61	0.01	-	-	\$ -	0.18	0.00	-	-	\$ -
2030	0.51	0.01	-	-	\$ -	0.62	0.01	-	-	\$ -	0.18	0.00	-	-	\$ -
2031	0.52	0.01	-	-	\$ -	0.64	0.01	-	-	\$ -	0.18	0.00	-	-	\$ -
2032	0.53	0.01	-	-	\$ -	0.65	0.01	-	-	\$ -	0.19	0.00	-	-	\$ -
2033	0.54	0.01	-	-	\$ -	0.66	0.01	-	-	\$ -	0.19	0.00	-	-	\$ -
2034	0.55	0.01	-	-	\$ -	0.67	0.01	-	-	\$ -	0.19	0.00	-	-	\$ -
2035	0.56	0.01	-	-	\$ -	0.68	0.01	-	-	\$ -	0.20	0.00	-	-	\$ -
2036	0.56	0.01	-	-	\$ -	0.69	0.01	-	-	\$ -	0.20	0.00	-	-	\$ -
2037	0.57	0.01	-	-	\$ -	0.70	0.01	-	-	\$ -	0.20	0.00	-	-	\$ -
2038	0.58	0.01	-	-	\$ -	0.72	0.01	-	-	\$ -	0.21	0.00	-	-	\$ -
2039	0.59	0.01	-	-	\$ -	0.73	0.01	-	-	\$ -	0.21	0.00	-	-	\$ -
2040	0.61	0.01	-	-	\$ -	0.74	0.01	-	-	\$ -	0.22	0.00	-	-	\$ -
2041	0.62	0.01	-	-	\$ -	0.76	0.01	-	-	\$ -	0.22	0.00	-	-	\$ -
2042	0.63	0.01	-	-	\$ -	0.77	0.01	-	-	\$ -	0.22	0.00	-	-	\$ -
2043	0.64	0.01	-	-	\$ -	0.78	0.01	-	-	\$ -	0.23	0.00	-	-	\$ -
2044	0.65	0.01	-	-	\$ -	0.80	0.01	-	-	\$ -	0.23	0.00	-	-	\$ -
2045	0.66	0.01	-	-	\$ -	0.81	0.01	-	-	\$ -	0.23	0.00	-	-	\$ -
Total	13.51	0.25	-	-	\$ 10.48	16.57	0.30	-	-	\$ 1.01	4.81	0.09	-	-	\$ 16.30

\* VMT and VHT are calculated from Transearch using tonnage diverted from truck and rail to water, and using Kentucky's share

App 4.1a: Expansion Inputs

Hickman					Louisville					Maysville_drybulk				
Truck savings		Rail savings		Costs	Truck savings		Rail savings		Costs	Truck savings		Rail savings		Costs
VMT	VHT	VMT	VHT	M\$	VMT	VHT	VMT	VHT	M\$	VMT	VHT	VMT	VHT	M\$
0.62	0.01	-	-	\$ -	0.44	0.01	0.01	0.00	\$ 0.50	0.00	0.00	-	-	\$ -
0.63	0.01	-	-	\$ 1.50	0.45	0.01	0.01	0.00	\$ 11.50	0.00	0.00	-	-	\$ -
0.64	0.01	-	-	\$ 2.10	0.46	0.01	0.01	0.00	\$ 12.00	0.00	0.00	-	-	\$ -
0.65	0.01	-	-	\$ -	0.46	0.01	0.01	0.00	\$ -	0.00	0.00	-	-	\$ -
0.67	0.01	-	-	\$ 10.00	0.47	0.01	0.01	0.00	\$ -	0.00	0.00	-	-	\$ 4.00
0.68	0.01	-	-	\$ -	0.48	0.01	0.01	0.00	\$ -	0.00	0.00	-	-	\$ -
0.69	0.01	-	-	\$ -	0.49	0.01	0.01	0.00	\$ -	0.00	0.00	-	-	\$ -
0.70	0.01	-	-	\$ -	0.50	0.01	0.01	0.00	\$ -	0.00	0.00	-	-	\$ -
0.71	0.01	-	-	\$ -	0.51	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.73	0.01	-	-	\$ -	0.52	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.74	0.01	-	-	\$ -	0.52	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.75	0.01	-	-	\$ -	0.53	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.76	0.01	-	-	\$ -	0.54	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.78	0.01	-	-	\$ -	0.55	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.79	0.01	-	-	\$ -	0.56	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.81	0.01	-	-	\$ -	0.57	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.82	0.01	-	-	\$ -	0.58	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.83	0.02	-	-	\$ -	0.59	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.85	0.02	-	-	\$ -	0.60	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.86	0.02	-	-	\$ -	0.61	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.88	0.02	-	-	\$ -	0.62	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.89	0.02	-	-	\$ -	0.63	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.91	0.02	-	-	\$ -	0.64	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.92	0.02	-	-	\$ -	0.66	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
0.94	0.02	-	-	\$ -	0.67	0.01	0.01	0.00	\$ -	0.01	0.00	-	-	\$ -
19.27	0.35	-	-	\$ 13.60	13.67	0.25	0.27	0.01	\$ 24.00	0.14	0.00	-	-	\$ 4.00



App 4.1a: Expansion Inputs

Owensboro_cargo					Paducah_drybulk					Paducah_cargo					Western Kentucky RRA				
Truck savings		Rail savings		Costs	Truck savings		Rail savings		Costs	Truck savings		Rail savings		Costs	Truck savings		Rail savings		Costs
VMT	VHT	VMT	VHT	M\$	VMT	VHT	VMT	VHT	M\$	VMT	VHT	VMT	VHT	M\$	VMT	VHT	VMT	VHT	M\$
-	-	0.00	0.00	\$ 0.25	2.62	0.05	-	-	\$ 0.55	-	-	0.00	0.00	\$ 10.40	1.29	0.02	-	-	\$ -
-	-	0.00	0.00	\$ 1.50	2.66	0.05	-	-	\$ -	-	-	0.00	0.00	\$ -	1.31	0.02	-	-	\$ 11.86
-	-	0.00	0.00	\$ -	2.71	0.05	-	-	\$ 50.00	-	-	0.00	0.00	\$ -	1.34	0.02	-	-	\$ 0.25
-	-	0.00	0.00	\$ -	2.76	0.05	-	-	\$ -	-	-	0.00	0.00	\$ -	1.36	0.02	-	-	\$ 0.25
-	-	0.00	0.00	\$ -	2.80	0.05	-	-	\$ -	-	-	0.00	0.00	\$ -	1.38	0.03	-	-	\$ 0.25
-	-	0.00	0.00	\$ -	2.85	0.05	-	-	\$ -	-	-	0.00	0.00	\$ -	1.41	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	2.90	0.05	-	-	\$ -	-	-	0.00	0.00	\$ -	1.43	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	2.95	0.05	-	-	\$ -	-	-	0.00	0.00	\$ -	1.46	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.00	0.05	-	-	\$ -	-	-	0.00	0.00	\$ -	1.48	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.06	0.06	-	-	\$ -	-	-	0.00	0.00	\$ -	1.51	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.11	0.06	-	-	\$ -	-	-	0.00	0.00	\$ -	1.54	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.16	0.06	-	-	\$ -	-	-	0.00	0.00	\$ -	1.56	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.22	0.06	-	-	\$ -	-	-	0.00	0.00	\$ -	1.59	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.27	0.06	-	-	\$ -	-	-	0.00	0.00	\$ -	1.62	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.33	0.06	-	-	\$ -	-	-	0.00	0.00	\$ -	1.65	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.39	0.06	-	-	\$ -	-	-	0.00	0.00	\$ -	1.67	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.45	0.06	-	-	\$ -	-	-	0.00	0.00	\$ -	1.70	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.51	0.06	-	-	\$ -	-	-	0.00	0.00	\$ -	1.73	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.57	0.06	-	-	\$ -	-	-	0.00	0.00	\$ -	1.76	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.63	0.07	-	-	\$ -	-	-	0.00	0.00	\$ -	1.79	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.69	0.07	-	-	\$ -	-	-	0.00	0.00	\$ -	1.82	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.76	0.07	-	-	\$ -	-	-	0.00	0.00	\$ -	1.86	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.82	0.07	-	-	\$ -	-	-	0.00	0.00	\$ -	1.89	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.89	0.07	-	-	\$ -	-	-	0.00	0.00	\$ -	1.92	0.03	-	-	\$ -
-	-	0.00	0.00	\$ -	3.96	0.07	-	-	\$ -	-	-	0.00	0.00	\$ -	1.96	0.04	-	-	\$ -
-	-	0.00	0.00	\$ 1.75	81.07	1.47	-	-	\$ 50.55	-	-	0.00	0.00	\$ 10.40	40.05	0.73	-	-	\$ 12.61

### App 4.1a: Expansion Inputs

Table 2: VMT, VHT and Costs for all riveports

	Truck savings		Rail savings		Costs M \$
	VMT	VHT	VMT	VHT	
2021	6,131,028	111,473	9,130	228	\$ 11.7
2022	6,237,708	113,413	9,289	232	\$ 40.4
2023	6,346,244	115,386	9,450	236	\$ 72.9
2024	6,456,669	117,394	9,615	240	\$ 5.6
2025	6,569,015	119,437	9,782	245	\$ 27.6
2026	6,683,316	121,515	9,952	249	\$ -
2027	6,799,605	123,629	10,126	253	\$ -
2028	6,917,919	125,780	10,302	258	\$ -
2029	7,038,290	127,969	10,481	262	\$ -
2030	7,160,757	130,196	10,664	267	\$ -
2031	7,285,354	132,461	10,850	271	\$ -
2032	7,412,119	134,766	11,038	276	\$ -
2033	7,541,090	137,111	11,231	281	\$ -
2034	7,672,305	139,496	11,426	286	\$ -
2035	7,805,803	141,924	11,625	291	\$ -
2036	7,941,624	144,393	11,828	296	\$ -
2037	8,079,808	146,906	12,034	301	\$ -
2038	8,220,397	149,462	12,243	306	\$ -
2039	8,363,432	152,062	12,457	311	\$ -
2040	8,508,955	154,708	12,674	317	\$ -
2041	8,657,011	157,400	12,894	322	\$ -
2042	8,807,643	160,139	13,119	328	\$ -
2043	8,960,896	162,925	13,348	334	\$ -
2044	9,116,816	165,760	13,580	340	\$ -
2045	9,275,448	168,645	13,817	345	\$ -
<b>Total</b>	<b>189,989,252</b>	<b>3,454,350</b>	<b>282,955</b>	<b>7,074</b>	<b>\$ 158.2</b>

Table 3: Adjusted VMT, VHT and Costs for all riveports (TREDIS inputs)

	Truck savings		Rail savings		Year	Phasing adj factor
	VMT	VHT	VMT	VHT		
2021	278,683	5,067	415	10	1	0.05
2022	567,064	10,310	844	21	2	0.09
2023	865,397	15,734	1,289	32	3	0.14
2024	1,173,940	21,344	1,748	44	4	0.18
2025	1,492,958	27,145	2,223	56	5	0.23
2026	1,822,722	33,140	2,714	68	6	0.27
2027	2,163,511	39,337	3,222	81	7	0.32
2028	2,515,607	45,738	3,746	94	8	0.36
2029	2,879,301	52,351	4,288	107	9	0.41
2030	3,254,889	59,180	4,847	121	10	0.45
2031	3,642,677	66,230	5,425	136	11	0.50
2032	4,042,974	73,509	6,021	151	12	0.55
2033	4,456,099	81,020	6,636	166	13	0.59
2034	4,882,376	88,770	7,271	182	14	0.64
2035	5,322,138	96,766	7,926	198	15	0.68
2036	5,775,726	105,013	8,602	215	16	0.73
2037	6,243,488	113,518	9,299	232	17	0.77
2038	6,725,779	122,287	10,017	250	18	0.82
2039	7,222,964	131,327	10,758	269	19	0.86
2040	7,735,414	140,644	11,522	288	20	0.91
2041	8,263,511	150,246	12,308	308	21	0.95
2042	8,807,643	160,139	13,119	328	22	1.00
2043	8,960,896	162,925	13,348	334	23	1.00
2044	9,116,816	165,760	13,580	340	24	1.00
2045	9,275,448	168,645	13,817	345	25	1.00
<b>Total</b>	<b>117,488,022</b>	<b>2,136,146</b>	<b>174,987</b>	<b>4,375</b>		

## App 4.1b: Expansion Impacts

### Expansion Scenario

#### Benefit-Cost Overview

Category		7% discount rate	3% discount rate																																																																																																																																										
Present Value of Benefit Stream		72.582	137.308																																																																																																																																										
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## App 4.1b: Expansion Impacts

### Expansion Scenario

#### Total By Industry (\$M) (Total Impact)

Region Name		Business Output	Value Added	Jobs	Labor Income
Default Region		473.13	216.2		143.45
Data Year		Business Output	Value Added	Jobs	Labor Income
2021		20.79	10.08	136	7.15
2022		71.17	34.52	466	24.52
2023		128.07	62.14	841	44.14
2024		11.71	5.55	73	3.85
2025		50.45	24.34	328	17.18
2026		3.08	1.28	13	0.75
2027		3.65	1.52	15	0.89
2028		4.25	1.77	18	1.03
2029		4.86	2.03	20	1.18
2030		5.49	2.29	22	1.34
2031		6.15	2.56	25	1.5
2032		6.83	2.84	27	1.66
2033		7.52	3.13	30	1.83
2034		8.24	3.43	32	2.01
2035		8.98	3.74	35	2.19
2036		9.75	4.06	39	2.38
2037		10.54	4.39	42	2.57
2038		11.35	4.73	45	2.77
2039		12.19	5.08	49	2.98
2040		13.06	5.44	53	3.19
2041		13.95	5.81	58	3.41
2042		14.87	6.2	63	3.63
2043		15.13	6.31	65	3.7
2044		15.39	6.42	69	3.76
2045		15.66	6.53	73	3.83

App 4.1b: Expansion Impacts

Value of Benefit Stream by Year - Undiscounted (\$M)

Data Year	(A) Traveler Benefits (\$M)		(B) Traveler Benefits (non-\$M)			(C)	(D)	(E) Social/ Environ. (non-\$)	Total Benefits
	Vehicle Operating Costs	Business Time & Reliability Costs	Value of Personal Time & Reliability	Safety Cost	Additional Consumer Surplus	Shipper/ Logistics Cost (\$)	Business Productivity (\$)		
2021	0.3	0.2	0	0	0	0	0	0.1	0.5
2022	0.6	0.3	0	0.1	0	0	0	0.2	1.1
2023	0.8	0.5	0	0.1	0	0	0	0.2	1.7
2024	1.2	0.7	0	0.1	0	0	0	0.3	2.3
2025	1.5	0.9	0	0.2	0	0	0	0.4	2.9
2026	1.8	1	0	0.2	0	0	0	0.5	3.6
2027	2.1	1.2	0	0.2	0	0	0	0.6	4.2
2028	2.5	1.4	0	0.3	0	0	0	0.8	4.9
2029	2.8	1.6	0	0.3	0	0	0	0.9	5.7
2030	3.2	1.9	0	0.3	0	0	0	1	6.4
2031	3.6	2.1	0	0.4	0	0	0	1.1	7.2
2032	4	2.3	0	0.4	0	0	0	1.3	8
2033	4.4	2.5	0	0.5	0	0	0	1.4	8.8
2034	4.8	2.8	0	0.5	0	0.1	0	1.6	9.7
2035	5.2	3	0	0.6	0	0.1	0	1.7	10.6
2036	5.7	3.3	0	0.6	0	0.1	0	1.9	11.5
2037	6.1	3.6	0	0.6	0	0.1	0	2	12.4
2038	6.6	3.8	0	0.7	0	0.1	0	2.2	13.4
2039	7.1	4.1	0	0.7	0	0.1	0	2.4	14.4
2040	7.6	4.4	0	0.8	0	0.1	0	2.5	15.4
2041	8.1	4.7	0	0.9	0	0.1	0	2.7	16.5
2042	8.6	5	0	0.9	0	0.1	0	2.9	17.6
2043	8.8	5.1	0	0.9	0	0.1	0	3	17.9
2044	8.9	5.2	0	0.9	0	0.1	0	3.1	18.3
2045	9.1	5.3	0	1	0	0.1	0	3.1	18.6
<b>Total</b>	<b>115.3</b>	<b>67</b>	<b>0</b>	<b>12.1</b>	<b>0</b>	<b>1.2</b>	<b>0</b>	<b>37.9</b>	<b>233.6</b>

App 4.2: Preservation Impacts

Preservation Scenario

Eddyville	Greenup-Boyd	Henderson	Hickman	Owensboro	Paducah	West Kentucky	SUM	Terminal Cost
2021	\$ 20,000	\$ 600,000		\$ 3,274,000	\$ 25,000	\$ 234,000	\$ 4,153,000	\$ 4.15
2022	\$ 100,000	\$ 750,000		\$ 632,500		\$ 166,000	\$ 1,648,500	\$ 1.65
2023		\$ 500,000		\$ 2,350,250			\$ 2,850,250	\$ 2.85
2024				\$ 897,000			\$ 897,000	\$ 0.90
2025				\$ 2,775,100			\$ 2,775,100	\$ 2.78
<b>Total</b>	<b>\$ 120,000</b>	<b>\$ 1,850,000</b>		<b>\$ 9,928,850</b>	<b>\$ 25,000</b>	<b>\$ 400,000</b>	<b>\$ 12,323,850</b>	<b>\$ 12.32</b>

Parameter	Value
Terminal Cost	\$ 12.32
Adjustment	50%
Adj. Terminal cost	\$ 6.16
B/C Ratio	1
5-year Benefits	\$ 6.16
Annual Benefits	\$ 1.23
Life after construction	20
Life left in 2045	0.01
Detoriation Rate	0.27
Buid Op. cost	
Starting (2021)	\$ 1.23
6th year	0.01
In 2045	\$ 1.23
OpCost rate (until 2026)	(0.62)
OpCost rate (from 2027)	0.29

App 4.2: Preservation Impacts

Preservation Scenario

Year	Base Detoriation/year	Base Operating Cost	Build Operating Cost	Access-Contingent Development- 416 -Water transportation	3% discount factor	Benefits at 3%
2021		\$ 1.23	\$ 1.23	\$ -	0.94	\$ -
2022		\$ 1.23	\$ 0.47	\$ 0.76	0.92	\$ 0.70
2023		\$ 1.23	\$ 0.18	\$ 1.05	0.89	\$ 0.94
2024		\$ 1.23	\$ 0.07	\$ 1.16	0.86	\$ 1.00
2025		\$ 1.23	\$ 0.03	\$ 1.21	0.84	\$ 1.01
2026	\$ 0.01	\$ 1.25	\$ 0.01	\$ 1.24	0.81	\$ 1.00
2027	\$ 0.02	\$ 1.25	\$ 0.01	\$ 1.24	0.79	\$ 0.98
2028	\$ 0.02	\$ 1.25	\$ 0.02	\$ 1.24	0.77	\$ 0.95
2029	\$ 0.03	\$ 1.26	\$ 0.02	\$ 1.24	0.74	\$ 0.92
2030	\$ 0.03	\$ 1.27	\$ 0.03	\$ 1.24	0.72	\$ 0.89
2031	\$ 0.04	\$ 1.27	\$ 0.04	\$ 1.24	0.70	\$ 0.87
2032	\$ 0.05	\$ 1.29	\$ 0.05	\$ 1.24	0.68	\$ 0.84
2033	\$ 0.07	\$ 1.30	\$ 0.06	\$ 1.24	0.66	\$ 0.82
2034	\$ 0.09	\$ 1.32	\$ 0.08	\$ 1.24	0.64	\$ 0.80
2035	\$ 0.11	\$ 1.34	\$ 0.10	\$ 1.25	0.62	\$ 0.78
2036	\$ 0.14	\$ 1.37	\$ 0.13	\$ 1.25	0.61	\$ 0.75
2037	\$ 0.18	\$ 1.41	\$ 0.16	\$ 1.25	0.59	\$ 0.73
2038	\$ 0.23	\$ 1.46	\$ 0.21	\$ 1.25	0.57	\$ 0.71
2039	\$ 0.29	\$ 1.52	\$ 0.27	\$ 1.25	0.55	\$ 0.69
2040	\$ 0.37	\$ 1.60	\$ 0.35	\$ 1.26	0.54	\$ 0.67
2041	\$ 0.47	\$ 1.70	\$ 0.45	\$ 1.26	0.52	\$ 0.66
2042	\$ 0.60	\$ 1.83	\$ 0.58	\$ 1.25	0.51	\$ 0.64
2043	\$ 0.76	\$ 1.99	\$ 0.74	\$ 1.25	0.49	\$ 0.62
2044	\$ 0.97	\$ 2.20	\$ 0.96	\$ 1.24	0.48	\$ 0.59
2045	\$ 1.23	\$ 2.46	\$ 1.23	\$ 1.23	0.46	\$ 0.57
<b>Total</b>		<b>\$ 36.52</b>	<b>\$ 7.45</b>	<b>\$ 29.07</b>		<b>\$ 19.14</b>

### App 4.3: Modernization Impacts

#### Modernization Scenario

	Eddyville	Greenup-Boyd	Henderson	Hickman	Owensboro	Paducah	West Kentucky	SUM	Terminal Cost
2021	\$ 5,000,000			\$ 2,500,000	\$ 6,965,030	\$ 2,268,000		\$ 16,733,030	\$ 16.73
2022		\$ 400,000		\$ 2,000,000	\$ 2,074,175	\$ 400,000	\$ 3,330,000	\$ 8,204,175	\$ 8.20
2023					\$ 1,270,000	\$ 1,000,000	\$ 1,700,000	\$ 3,970,000	\$ 3.97
2024					\$ 2,500,000		\$ 100,000	\$ 2,600,000	\$ 2.60
2025			\$ 3,000,000			\$ 17,000,000	\$ 100,000	\$ 20,100,000	\$ 20.10
<b>Total</b>		<b>\$ 400,000</b>	<b>\$ 3,000,000</b>		<b>\$ 12,809,205</b>	<b>\$ 20,668,000</b>	<b>\$ 5,230,000</b>	<b>\$ 51,607,205</b>	<b>\$ 51.61</b>

Parameter	Value
Terminal Cost	\$ 51.61
Adjustment	50%
Adj. Terminal cost	\$ 25.80
B/C Ratio	1.25
5-year Benefits	\$ 32.25
Annual Benefits	\$ 6.45
Life after construction	20
Life left in 2045	0.01
Detoriation Rate	0.38
Buid Op. cost	
Starting (2021)	\$ 6.45
6th year	0.01
In 2045	\$ 6.45
OpCost rate (until 2026)	(0.73)
OpCost rate (from 2027)	0.41

App 4.3: Modernization Impacts

Modernization Scenario

Year	Base Detoriation/year	Base Operating Cost	Build Operating Cost	Access-Contingent Development-416 -Water transportaion	3% discount factor	Benefits at 3%
2021		\$ 6.45	\$ 6.45	\$ -	0.94	\$ -
2022		\$ 6.45	\$ 1.77	\$ 4.68	0.92	\$ 4.28
2023		\$ 6.45	\$ 0.49	\$ 5.97	0.89	\$ 5.30
2024		\$ 6.45	\$ 0.13	\$ 6.32	0.86	\$ 5.45
2025		\$ 6.45	\$ 0.04	\$ 6.41	0.84	\$ 5.37
2026	\$ 0.01	\$ 6.46	\$ 0.01	\$ 6.45	0.81	\$ 5.25
2027	\$ 0.02	\$ 6.47	\$ 0.01	\$ 6.46	0.79	\$ 5.10
2028	\$ 0.03	\$ 6.48	\$ 0.02	\$ 6.46	0.77	\$ 4.95
2029	\$ 0.04	\$ 6.49	\$ 0.03	\$ 6.46	0.74	\$ 4.81
2030	\$ 0.05	\$ 6.50	\$ 0.04	\$ 6.46	0.72	\$ 4.67
2031	\$ 0.07	\$ 6.52	\$ 0.05	\$ 6.47	0.70	\$ 4.53
2032	\$ 0.10	\$ 6.55	\$ 0.08	\$ 6.47	0.68	\$ 4.41
2033	\$ 0.13	\$ 6.58	\$ 0.11	\$ 6.48	0.66	\$ 4.28
2034	\$ 0.18	\$ 6.63	\$ 0.15	\$ 6.48	0.64	\$ 4.16
2035	\$ 0.25	\$ 6.70	\$ 0.21	\$ 6.49	0.62	\$ 4.04
2036	\$ 0.35	\$ 6.80	\$ 0.30	\$ 6.50	0.61	\$ 3.93
2037	\$ 0.49	\$ 6.94	\$ 0.42	\$ 6.51	0.59	\$ 3.83
2038	\$ 0.67	\$ 7.12	\$ 0.59	\$ 6.53	0.57	\$ 3.72
2039	\$ 0.93	\$ 7.38	\$ 0.84	\$ 6.54	0.55	\$ 3.62
2040	\$ 1.28	\$ 7.73	\$ 1.18	\$ 6.56	0.54	\$ 3.52
2041	\$ 1.77	\$ 8.22	\$ 1.65	\$ 6.57	0.52	\$ 3.43
2042	\$ 2.44	\$ 8.90	\$ 2.32	\$ 6.57	0.51	\$ 3.33
2043	\$ 3.38	\$ 9.83	\$ 3.26	\$ 6.56	0.49	\$ 3.23
2044	\$ 4.67	\$ 11.12	\$ 4.59	\$ 6.53	0.48	\$ 3.12
2045	\$ 6.45	\$ 12.90	\$ 6.45	\$ 6.45	0.46	\$ 2.99
<b>Total</b>		<b>\$ 184.58</b>	<b>\$ 31.20</b>	<b>\$ 153.37</b>		<b>\$ 101.33</b>