

# Appendix 1 Navigation System Value to the Nation

## System Volume and Commodities

Since the end of the Second World War, fairly continual industrial expansion in the Ohio River Basin has produced significant increases in commodity traffic on the Ohio River. Dramatic increases occurred in the immediate post-war period as the navigation system accommodated the transportation needs of expanding basin industries, especially industries such as primary metals in the Wheeling and Pittsburgh areas. Between 1950 and 1965, traffic on the Ohio River doubled. Over the next 25 years, 1965-1990, traffic on the main stem doubled once again. Most of this traffic growth was driven by massive investments in waterside coal-fired electric generating facilities that were expanding to accommodate the needs of an expanding economic base. Electric utilities were locating new plants all along the waterways of the ORS and expanding their existing waterside facilities to take advantage of this extensive waterway system as a source of water supply and for low-cost waterway transportation of coal. From 1990 to the present few new coal-fired electric utility plants have been built, causing growth in coal traffic to flatten somewhat. Figure 1-1 displays 2006 ORS traffic distribution by commodity. Coal is the leading commodity shipped followed by aggregates, petroleum products, grains, iron and steel, and chemicals. Coal traffic, predominately destined for electric utility plants, represents over half of all ORS traffic.

Figure 1-1

ORS Commodity Traffic Distribution, 2006

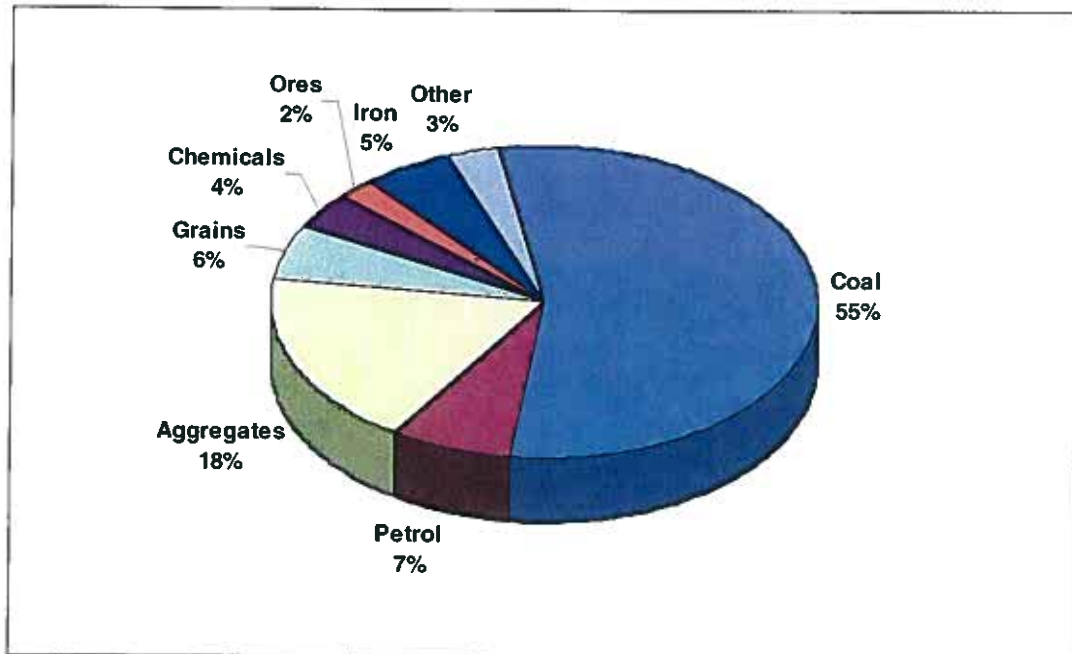


Table 1-1 provides an overview of ORS traffic by tonnage. Traffic growth on the system since 2000, has been driven by coal, aggregates (limestone, sand, and gravel), ores and minerals, and iron and steel traffic. In fact, these commodities experienced growth through this period, growth that was negated by the steep, one-year decline in coal traffic between 2002 and 2003. The system's 271 million tons of commerce in 2006, although down from the 280 million tons of commerce in 2005, makes it the nation's highest tonnage waterway system.

**Table 1-1**  
**Historic ORS Traffic, 1997 – 2006**  
**(millions of tons)**

<b>Commodity</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>Annual Rate 1997-2006</b>
Coal & Coke	159.3	156.9	150.8	146.1	157.1	158.8	140.9	145.3	155.9	148.4	-0.7%
Petroleum	12.9	20.3	20.7	20.4	20.5	20.2	17.2	17.4	19.6	19.4	4.2%
Aggregates	45.3	49.0	49.1	47.0	46.7	45.3	47.4	48.1	48.1	48.7	0.7%
Grains	11.1	14.1	15.4	15.7	18.2	17.1	14.1	16.6	14.6	15.0	3.1%
Chemicals	10.3	10.2	10.2	10.8	10.6	10.5	11.5	11.6	10.8	10.5	0.2%
Ores & Minerals	6.8	6.0	6.7	6.9	6.9	6.4	7.5	7.6	6.8	6.0	-1.2%
Iron & Steel	9.6	10.5	12.5	14.5	11.0	12.5	14.3	15.3	14.2	14.6	4.3%
Other	16.3	7.6	9.6	10.3	8.9	8.4	8.2	9.7	10.0	8.2	-6.6%
<b>Total Traffic <sup>1/</sup></b>	<b>271.5</b>	<b>274.6</b>	<b>274.9</b>	<b>271.7</b>	<b>279.9</b>	<b>279.1</b>	<b>259.8</b>	<b>269.9</b>	<b>280.1</b>	<b>270.8</b>	<b>0.0%</b>

Source: WCSC Data

<sup>1/</sup> Totals may not equal the sum of the commodities due to rounding.

Table 1-2 shows system lock traffic from 1998 to 2007. Growth rates on the Ohio during this period are flat to slightly negative, suggesting a maturing navigation system. The slowest rates are on the upper Ohio with more growth seen downstream. Lock-level commodity traffic growth was hampered in the 1990s by a substantial drop-off in export coal and grain traffic, the loss of some domestic utility steam coal markets outside of the ORS, and a reduction in the usage and waterborne movement of Illinois Basin and Northern Appalachian coals by electric utilities. The projects most severely affected during the 1990s were on the lower Ohio River. Nonetheless, ORS traffic is expected to continue growing at a relatively modest 0.7 percent annually.

Table 1-2

## 1998 – 2007 Ohio River System Total Traffic by Project (kilotons)

River/Project	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Annual Rate 1998-2007
<b>Ohio River</b>											
Emsworth	23,153	23,561	22,334	21,729	23,687	19,211	18,791	21,178	21,425	19,399	-1.8%
Dashields	24,563	24,528	23,230	22,839	24,516	20,012	19,679	22,024	22,032	20,171	-2.0%
Montgomery	26,866	26,560	25,974	25,555	26,709	21,093	20,260	23,142	20,756	19,310	-3.2%
New Cumberland	35,425	33,906	34,062	33,854	35,251	32,189	31,478	34,376	31,594	28,104	-2.3%
Pike Island	43,027	41,276	41,460	41,682	43,634	39,062	38,912	40,314	38,636	33,976	-2.3%
Hannibal	47,627	47,258	48,344	49,476	51,200	48,884	50,101	53,288	49,690	46,297	-0.3%
Willow Island	44,766	44,320	45,635	46,975	48,422	46,592	48,123	50,164	46,529	43,645	-0.3%
Belleville	48,688	47,983	49,201	49,243	51,118	49,482	51,380	52,889	49,109	46,247	-0.5%
Racine	49,517	48,646	50,022	50,239	51,764	50,625	52,297	54,100	50,865	48,541	-0.2%
R.C. Byrd	57,855	55,970	57,879	58,108	54,898	53,164	57,775	62,482	57,568	53,940	-0.7%
Greenup	70,635	70,044	71,713	70,563	65,915	62,135	64,502	70,583	69,391	62,208	-1.3%
Meldahl	63,739	62,784	63,391	63,813	57,771	53,222	55,240	61,778	60,161	53,163	-1.8%
Markland	55,119	54,850	56,062	55,807	49,625	45,248	50,050	53,847	52,697	46,062	-1.8%
McAlpine	52,857	54,835	55,790	56,170	51,893	49,482	52,753	55,695	55,205	49,150	-0.7%
Cannelton	54,386	56,650	55,786	56,653	55,841	54,002	56,888	58,310	58,912	52,641	-0.3%
Newburgh	64,131	64,509	64,433	66,527	64,200	62,475	67,151	67,498	69,188	65,133	0.2%
J.T. Myers <sup>1/</sup>	74,151	71,393	72,447	75,290	68,961	62,655	67,880	71,901	72,169	64,565	-1.4%
Smithland	84,606	82,115	82,610	85,915	79,040	72,305	77,020	80,697	81,025	73,679	-1.4%
L/D 52	97,695	95,125	94,687	96,715	93,382	87,420	94,954	97,336	96,404	88,953	-0.9%
L/D 53 <sup>2/</sup>	---	87,814	89,161	87,085	85,638	81,742	85,459	85,845	85,059	78,274	n/a
<b>Kanawha River</b>											
London	7,278	6,505	6,017	4,662	4,466	2,872	1,374	820	1,900	1,962	-12.3%
Marmet	16,274	14,733	16,481	16,439	13,477	14,107	13,800	14,714	15,521	16,002	-0.2%
Winfield	21,356	19,537	20,693	20,309	17,567	18,076	17,808	18,527	19,911	17,148	-2.2%
<b>Monongahela River</b>											
Opekiska	179	28	66	289	442	57	446	286	241	243	3.1%
Hildebrand	177	26	72	292	442	47	408	282	241	243	3.2%
Morgantown	247	358	601	830	924	491	1,011	885	881	760	11.9%
Point Marion	5,194	5,218	5,608	5,893	5,594	4,508	4,638	4,501	4,981	4,526	-1.4%
Grays Landing	5,658	5,777	5,855	6,073	5,720	4,563	4,691	4,621	5,154	4,947	-1.3%
Maxwell	10,886	13,384	12,338	12,565	12,869	12,427	11,627	13,863	15,654	13,466	2.1%
L/D 4	10,880	13,220	11,960	11,928	12,905	9,849	9,443	12,013	14,303	13,420	2.1%
L/D 3	16,110	18,011	15,613	14,660	15,446	11,699	11,973	14,084	15,638	14,877	-0.8%
Braddock <sup>3/</sup>	20,534	21,137	20,088	19,706	21,734	16,979	17,007	19,871	20,368	18,937	-0.8%
<b>Allegheny River</b>											
L/D 8	463	673	702	229	328	797	767	678	623	602	2.7%
L/D 7	471	134	137	104	56	240	64	85	64	63	-18.2%
L/D 6	179	164	137	119	65	243	74	83	60	63	-9.9%
L/D 5	757	769	691	176	787	910	860	152	130	108	-17.7%
L/D 4	1,789	1,630	1,410	502	1,038	1,170	1,248	1,347	1,408	1,170	-4.2%
L/D 3	2,555	2,581	2,554	2,407	1,671	2,373	2,266	1,861	1,875	1,822	-3.3%
L/D 2	2,480	2,621	2,582	2,459	1,746	2,422	2,284	1,882	1,896	1,854	-2.9%
<b>Green River</b>											
L/D 2	2,122	1,502	1,553	4,320	6,083	3,781	3,157	5,261	5,442	3,512	5.2%
L/D 1	4,783	4,371	3,984	7,200	9,514	6,845	7,324	8,943	8,564	7,946	5.2%
<b>Cumberland River</b>											
Old Hickory	3,511	3,942	3,836	3,850	4,181	4,536	3,911	4,721	5,001	4,841	3.3%
Cheatham	8,710	9,551	8,659	9,124	9,434	9,783	9,765	11,026	11,746	11,203	2.5%
Barkley	9,654	9,081	8,967	8,398	6,901	2,294	2,821	3,906	4,622	9,193	-0.5%
<b>Tennessee River</b>											
Ft. Loudoun	627	639	819	682	570	565	602	467	484	466	-2.9%
Watts Bar	1,701	1,768	1,995	1,586	1,498	1,417	1,139	875	809	655	-9.1%
Chickamauga	2,529	2,306	2,452	1,924	1,902	1,845	1,585	1,398	1,279	1,059	-8.3%
Nickajack	4,959	4,687	4,793	4,093	3,941	3,696	3,384	2,851	2,626	2,333	-7.3%
Guntersville	8,974	9,390	8,942	8,581	9,091	7,612	7,168	5,835	5,600	5,050	-5.6%
Wheeler	14,373	15,350	14,628	12,484	13,120	12,874	12,779	10,800	10,308	10,280	-3.3%
Wilson	14,605	15,518	14,798	12,673	13,272	12,971	12,844	10,872	10,338	10,340	-3.4%
Pickwick	20,388	20,405	19,153	17,628	18,303	16,916	17,181	15,535	15,317	15,223	-2.9%
Kentucky	33,356	31,767	28,836	27,737	29,579	32,403	36,764	36,613	37,873	30,888	-0.8%

Source: COE LPMS

<sup>1/</sup> Uniontown was renamed J.T. Myers in 1997<sup>2/</sup> No data collected at L/D 53 before 1999<sup>3/</sup> Mon 2 was renamed Braddock in 2004

## Economic Value

The ORS facilitates economic development by:

- Lowering transportation costs for bulk commodities
- Improving contact between internal and external markets
- Reducing energy costs for commercial and industrial activities
- Linking producers and markets for raw material inputs
- Supplying municipal, and industrial water
- Creating and providing jobs
- Providing recreational, aesthetic, and environmental opportunities

Companies using the ORS ship over \$30 billion worth of commodities by barge, saving over \$3 billion in transportation costs annually. These savings result in additional national output estimated at over \$11 billion, which made possible approximately 100,000 jobs and \$3 billion in income. *While national impacts are large, regional impacts can be larger still. For example, the Port of Pittsburgh estimates that the Ohio River System directly generates almost 53,000 jobs and just over \$2 billion in income, most of this in the mining and manufacturing companies that rely on the waterway to ship and receive goods.*

From a recent survey of residents in counties along the Ohio River main stem, 65% of respondents stated the Ohio River is either extremely important or very important to them for recreation. Primary recreation activities respondents engaged in were: scenic drives (56%), special events (49%), riverfront dining (45%), riverfront sightseeing (43%), and riverfront parks (40%). Many other parts of the navigation system are even more popular for recreation than the main stem Ohio River.

Major port cities like Pittsburgh, Cincinnati, Louisville, and Huntington have developed distribution centers for goods produced in the basin. Waterside developments include a long list of manufacturing and processing facilities that play a significant role in local economies, as well as the national economy. These include: electric power plants, coal mines, steel mills, coke ovens, aluminum smelters, chemical and cement plants, lime kilns, paper and pulp mills, stone quarries, corn and soybean processors, feed mills, and flour mills. *In addition, it appears likely that container facilities will be developed in some of these cities. Container-on-barge service from New Orleans to Pittsburgh was experimented with and detailed plans for a new double stack container rail line from Norfolk to the Port of Huntington have been announced. These developments suggest an expanded role for waterways in moving cargo in the United States and represent new opportunities for inland ports.*

Shippers are expected to continue to rely heavily on the ORS into the future based on the results of the latest traffic demand forecasts. As a part of the latest forecasting effort, three alternative forecasts were developed that focused primarily on expected future coal traffic to electric utility plants. Utility steam coal traffic was forecast based on the output of a detailed linear program of the electric utility and coal industries. Along with the utility steam coal traffic, the lime and limestone traffic, which is used in coal desulfurization, were forecast as a function of the quantity and type of coal consumption at utility plants.

The utility steam coal forecasts were developed for Base Case, Low Case and High Case Scenarios based on alternative assumptions with respect to economic growth, environmental regulations and such issues as the rate of nuclear plant development.

The Base Case scenario is basically a momentum forecast based largely upon a logical evolution of the now-vacated Clean Air Interstate Rule, a Maximum Achievable Control Technology (MACT) limitation for mercury, moderate economic growth and moderate growth of nuclear generation. The major drivers for the High Case scenario are high economic growth and stricter limitations on nuclear plant development. In the Low Case scenario, the major drivers are national CO2 emissions limitations as outlined in the Waxman-Markey bill and low economic growth.

In addition to the coal forecasts, three alternative forecasts were developed for all other commodity traffic. These forecasts were developed at the system and regional levels using statistical time series techniques involving 26 years of Waterborne Commerce data.

The projected traffic demands for the ORS over the 2006-2070 forecasting horizon are presented in Table 1-3. In year 2070, the forecasts range between 291.6 million tons in the Low Case and 485.1 million tons in the High Case. These correspond to annual growth rates of 0.1 and 0.9 percent, compared to an historic growth rate of 1.4 percent for the 1970-2006 period. All of the forecast scenarios reflect the effects of coal switching by ORS-dependent utilities to meet the requirements of environmental regulations and the effects of constraints in the modeling process.

**Table 1-3**

**Ohio River System Traffic Demand Forecasts, by Scenario, 2006 – 2040**  
(millions of tons)

Scenario	1970	2006	2010	2020	2040	Annual % Growth	
						1970-06	2006-40
Low Case	163.9	270.7	282.2	300.8	291.6	1.4	0.1
Base Case	163.9	270.7	283.6	334.4	429.1	1.4	0.7
High Case	163.9	270.7	286.3	351.5	485.1	1.4	0.9



**System Infrastructure**

Year-round navigation on the ORS is provided by a system of 60 locks and dams. Table 1-4 provides an overview of ORS locks and dams.

**Table 1-4**

<b>ORS Lock and Dam Specifications</b>									
River/ Project	@Mile	Operational			Rehabilitated			Lock Size	
		Main	Aux.	Dam	Main	Aux.	Dam	Main	Aux
<b>Ohio River</b>									
Emsworth	6.2	1921	1921	1922	1984	1984	1984	600x110	360x56
Dashields	13.3	1929	1929	1929	1990	1990	1990	600x110	360x56
Montgomery	31.7	1936	1936	1936	1989	1989	1989	600x110	360x56
N. Cumberland	54.4	1959	1959	1961				1200x110	600x110
Pike Island	84.2	1965	1965	1965				1200x110	600x110
Hannibal	126.4	1972	1972	1975				1200x110	600x110
Willow Island	162.4	1972	1972	1973				1200x110	600x110
Belleville	203.9	1968	1968	1969				1200x110	600x110
Racine	237.5	1967	1967	1970				1200x110	600x110
R.C. Byrd	279.2	1993	1993	1937			2000	1200x110	600x110
Greenup	341.0	1959	1959	1962				1200x110	600x110
Meldahl	436.2	1962	1962	1964				1200x110	600x110
Markland	531.5	1959	1959	1964				1200x110	600x110
McAlpine	606.8	1961	2009	1964		1965		1200x110	1200x110
Cannelton	720.7	1971	1971	1971				1200x110	600x110
Newburgh	776.1	1975	1975	1975				1200x110	600x110
J.T. Myers	846.0	1975	1975	1975				1200x110	600x110
Smithland	918.5	1979	1979	1979				1200x110	1200x110
L&D No. 52	938.9	1969	1928	1929	1983	1983	1984	1200x110	600x110
L&D No. 53	962.6	1980	1929	1929	1983	1982	1984	1200x110	600x110
<b>Kanawha River</b>									
London	82.8	1933	1933	1934				360x56	360x56
Marmet	67.8	2008	1934	1934				800x110	2(360x56)
Winfield	31.1	1998	1935	1937				800x110	2(360x56)
<b>Monongahela River</b>									
Opekiska	115.4	1964		1967				600x84	
Hildebrand	108.0	1959		1960				600x84	
Morgantown	102.0	1950		1950				600x84	
Point Marion	90.8	1993		1994				720x84	
L/D 7 <sup>1/</sup>	85.0	1925		1926				360x56	
Grays Landing	82.0	1993		1995				720x84	
Maxwell	61.2	1964	1964	1965				720x84	720x84
No. 4	41.5	1932	1932	1933	1964	1964	1967	720x84	360x56
No. 3	23.8	1906	1906	1907	1981	1981	1979	720x84	360x56
Braddock <sup>2/</sup>	11.2	1905	1905	1906	1953	1953		720x110	360x56

<sup>1/</sup> L&D 7 ceased operations July 30, 1995

<sup>2/</sup> Mon No.2 was renamed Braddock in 2004

Table 1-4 (cont'd)

## ORS Lock and Dam Specifications

River/ Project	@ Mile	Operational			Rehabilitated			Lock Size	
		Main	Aux.	Dam	Main	Aux.	Dam	Main	Aux
<b>Allegheny River</b>									
No. 9	62.2	1938		1938				360x56	
No. 8	52.6	1931		1931		1937		360x56	
No. 7	54.7	1930		1931				360x56	
No. 6	36.3	1928		1928				360x56	
No. 5	30.4	1927		1927				360x56	
No. 4	24.2	1934		1934				360x56	
No. 3	14.5	1934		1934				360x56	
No. 2	6.7	1934		1934				360x56	
<b>Green River</b>									
No. 2	63.1	1956		1957				600x84	
No. 1	6.7	1956		1957		1970		600x84	
<b>Cumberland River</b>									
Cordell Hull	313.5	1973		1974				400x84	
Old Hickory	216.2	1954		1957				400x84	
Cheatham	148.7	1952		1954				800x110	
Barkley	30.6	1964		1966				800x110	
<b>Tennessee River</b>									
Fort Loudoun	602.3	1943		1943				360x60	
Watts Bar	529.3	1941		1944				360x60	
Chickamauga	471.0	1939		1940				360x60	
Nickajack	424.7	1967		1968				600x110	
Guntersville	349.0	1965	1937	1939				600x110	360x60
Gen. Wheeler	274.9	1963	1934	1937		1962		600x110	400x60
Wilson <sup>1/</sup>	259.4		1927			1961			300x60
Wilson <sup>1/</sup>	259.4	1959	1927	1925		1967		600x110	292x60
Pickwick	206.7	1984	1937	1938				1000x110	600x110
Kentucky	22.4	1942		1944				600x110	
<b>Clinch River</b>									
Melton Hill	23.1	1963		1963				400x75	
<b>Kentucky River</b>									
No. 5-14 <sup>2/</sup>									
No. 4	65.0	1844		1844				145x38	
No. 3	42.0	1844		1844				145x38	
No. 2	31.0	1839		1839				145x38	
No. 1	4.0	1839		1839				145x38	

<sup>1/</sup> Two auxiliary locks in series to form a single, dual lift lock.<sup>2/</sup> Federal Govt. no longer operates.