ECONOMIC ANALYSIS

INTRODUCTION

The purpose of this part of the special investigation of the proposal for Northwest Tennessee Harbor is to provide the decision-makers with economic insight into the economic feasibility of constructing the project. There are three major parts to this economic analysis section. Part 1 is designed to discuss the project setting, project conditions, and project benefits. The project benefits developed in this section are used to establish federal interest in the project investment and are developed with respect to National Economic Development (NED). Part 2 focuses on regional economic impact analysis. The purpose of this section is to provide the local decision-makers with some insight when examining the impacts of the public investment with respects to the local economy and local fiscal impacts. Part 3 The Economic Base Study. The three parts are:

Part 1.
- Introduction;
- Project (NED) Costs and Benefits Analysis;

Part 2.
- Regional Economic Impact Analysis (of the Capital Investment Spending);
- Local Public Finance Impact Analysis (of the Capital Investment Spending);

Part 3.
- Economic Base Study.

The Project Conditions section establishes the benchmark condition from which the project benefits are measured. The four project conditions with respect to the project benefit categories are:

- Present without Project conditions:
- Present with Project conditions;
- Future without Project conditions;
- Future with Project conditions;

The first two project conditions define the with and without project conditions with respect to the present period when the project is implemented. The latter two project conditions describe the future conditions for the with and without project conditions. The without project conditions: both present (existing) and future are expected to remain, at best, the same and, at worst, somewhat diminished due to declining population and industry base. The Cates Landing area will be used for agricultural production and have a potential harbor location site that remains without development and the current modes of transportation (truck & rail) will also be the future mode. Lake County, which has the highest poverty rate, and lowest per capita income in the state of Tennessee remains one of the economically depressed counties in state. The 1990 through 2000 trend has seen a declining population and industry base. The with project conditions: both present (existing) and future are expected to reflect some moderate growth in economic activity

with commensurate growth in commodity movement activity. The benefits referred to in this analysis are based on present with project conditions.

The National Economic Development (NED) section provides information on the benefits and costs for the selected plan evaluated in the study. The project benefits are based upon transportation saving benefits derived from lowering of transportation cost associated with an alternative mode of transportation (Waterborne – barge) vis-a- vis truck or rail modes of transportation.

The Regional Impact Analysis provides information on the sales, employment and income impacts on the study region of the total project as it relates to investment spending including the local share of the expenditure. These impacts on sales, employment, and income result from investment spending on the project. It is also important to note that the local investment expenditures required for this project would have alternative investment opportunities which would also have multiplier impacts upon sales, employment and income.

Economic Base Study is included to give a broad overview of industry employment in the region within which the proposed Northwest Tennessee Harbor would be located. The industry structure patterns provide a broader perspective to gauge the trends in local industry export capacity and growth in the area.

Project Setting and Existing Problems

The Lake County Area remains the poorest county in Tennessee. The counties main employment activity is agricultural. The non-agricultural commercial and industrial activities in Lake County as of 1991 are listed as follows: Keneric Corporation (apparel manufacturing), Rolane Industries Division of Apparel Tech Incorporated (apparel manufacturing), Banner Printing Company (Printing activity), Georgia Gulf Corporation (PVC Pellets Manufacturing), and Henry I. Siegel Company incorporated (apparel manufacturing). Since 1991, all of the apparel manufacturing industries have discontinued operations. The Lake County area is in dire need of a harbor to make their proposed industrial site inter-modal thus increasing the site's potential for local employment. In the past, several industrials have indicated a desire to locate to the area if the harbor was constructed.

The Mississippi River is a tremendous natural resource. Therefore, local interests want to use it to provide even greater industrial and economic growth. They believe that construction of a harbor would allow for and encourage the expansion of industries. Slack water type harbors reduce the hazards resulting from high stream velocities in fast water harbors. Industries prefer to invest in warehouses, docks and appurtenances on these types of harbors because the probability of incurring damage due to runaway barges and debris is significantly less. Slack water harbors also provide more safeguards in the containment of chemical and other hazardous material spills than do fast water harbors.

Location Description

The project area is located on the Westside of Lake County, Tennessee adjacent to Cates Landing at Mississippi River Mile 900. (See Plate 1) This landing is elevated and is not subject to flooding. An old chute of the Mississippi River connects Cates Landing to the Mississippi River. In the past, the U.S. Army Corps of Engineers used this site to cast and store concrete mat used in stabilizing the Mississippi River. On December 15, 1992, the U.S. Army Corps of Engineers gave this site to Lake County, for their use because of the reduced need for concrete mat on this region of the Mississippi River.

Cates Landing and the adjacent land is an area that Lake, Dyer and Obion Counties want to develop into an industrial park. These counties formed a Port Authority that has taken over sponsorship of the development of a harbor project from the Lake County Government.

Cates Landing is adjacent to Tiptonville, Tennessee and is near state Highway 78 and 22. State Highway 78 runs to Dyersburg, Tennessee connecting with U.S. Highway 51, while Highway 22 runs into Union City, Tennessee, connecting U.S. Highway 51. Additionally, the area has a regional airport at Reelfoot Lake with a 3,500-foot concrete airstrip that is all-weather and lighted. The TennKen Railroad that operates from Dyersburg, Tennessee to Hickman, Kentucky serves the area. Finally, truck transportation service is provided by many carries throughout the area.

Appendix II ALTERNATIVE SOLUTIONS

During the feasibility process different alternatives were analyzed to achieve the optimum plan that has both a Federal interest and is acceptable by the local sponsor. Factors considered during the study were as stated below:

1. compatibility with existing or planned use of the surrounding area;
2. impacts to economic development in the community;
3. ease of acquiring land and disposal of dredged material;
4. access to the harbor; and
5. environmental impacts.

Alternatives Considered

Six alternatives were considered to provide river access to the proposed industrial park to be located at Cates Landing, Lake County, Tennessee, River Mile 900. All alternatives were located in an old chute of the Mississippi River and would be within the navigational servitude and fast lands would not be created. (Ordinary High Water Mark elevation at River Mile 900 is 285.0 National Geodetic Vertical Datum. These alternatives are described in Table 1. Alternative 6 is the future without Federal action.

Table A
Alternative Plans Considered

Items	Alternative Plans Considered 1	2	3	4	5	6
Canal Length, ft	14,000	13,800	8,500	5,000	9,000	NA
Canal Bottom-Width, ft	225	130	225	130	130	NA
Canal Depth, ft	9	9	9	9	9	NA
Diameter Turning Basin, ft	None	300	None	300	300	NA
Canal Side Slopes	1V:5H	1V:5H	1V:5H	1V:5H	1V:5H	NA
Canal Excavation, cy	3.1M	2.48M	4.1M	117,000	1.02M	NA
Canal Riprap	Yes	Yes	Yes	Yes	Yes	NA
Dredge Material Disposal Area	On Land	On Land	On Land	On Land	On Land	NA

Selection of Alternatives for Detail Analysis

From these six alternatives, alternatives 1, 2 and 3 were removed from detailed analysis because the quantity of canal excavation was much more then alternatives 4 and 5. The project team viewed canal excavation as an indicator for cost and environmental impact. Thus, the smaller the quantity for canal excavation the smaller the construction cost and environmental impact. Alternative 6 being the future without Federal action was removed from detailed analysis because acceptance of this alternative would forego the economic benefits of a navigation channel and would hinder the development of the proposed industrial park. Therefore, alternatives 4 and 5 were evaluated in detail before a selected plan was chosen.

Table 2 presents the information developed for alternatives 4 and 5 by the project team that consisted of the U.S. Army Corps of Engineers, Northwest Tennessee Regional Port Authority with assistance from their engineers Forcum Lannom Contractor and Garver Engineers and appropriate resource agencies. Additionally, the Port Authority received assistance from the following organizes: Tennessee Valley Authority Economic Development Agency, State of Tennessee Department of Economic Development, U.S. Department of Commerce Economic Development Agency and varieous other State of Tennessee and Federal agencies.

Table B
Detailed Analysis for Alternatives 4 and 5

Items	4 with Berthing Area	5 with Berthing Area
Top Elevation, ft NGVD	285.0	285.0
Bottom Elevation, ft NGVD	250.0	250.0
Harbor Area, acres	33	64
Canal Length, ft	5,000	9,000
Canal Bottom-Width, ft	130-225	130-225
Canal Depth, ft	9	9
Diameter Turning Basin, ft	300	300
Canal Side Slopes	1V:5H	1V:5H
Canal Excavation, cy	195,000	1,020,000
Riprap, tons	5,600	30,600
Filter Gravel, tons	2,800	15,300
Dredge Material Disposal Area, acres	16	86
Environmental Protection, ft	1,950	11,800
Estimated Clearing, acres	14	51
Areas where mitigation may be impacted, acres	NA	28
Estimated Average Maintenance Dredging, cy	111,000	122,000
Impact, acres	20 wet, 2 FW	60 wet, 14 FW
Impact Habitat, AHUV	9	27
Mitigation (acres)	47	134
GNF Parametric Costs	$1,360,751	$4,265,496
Total Present Value O&M	$2,663,828	$2,941,636
Associated Site Development Costs	$19,331,800	$14,056,000
Total Costs	$23,356,379	$21,263,132
Annual Average Equivalent Costs	$1,404,849	$1,278,944
Benefits	$2,506,950	$2,506,950
Benefit/Cost Ratio	1.78	1.96
Excess Benefits	$1,102,101	$1,228,006

Notes:

FW – Farmed Wetland

AHUV – Annualized Habitat Unit Value

Mitigation would include purchasing prior converted farmland within the batture land of the Mississippi Main Line Levee.

Appendix III Alternative Chosen as Selected Plan

Appendix IIII Based on the alternative with the greatest excess benefits, Alternative 5 was chosen as the selected plan. At this point, the team prepared a MCACES cost estimate that is $4,378,480 (see Table 4 and Appendix 2). Table 3 presents a benefit-to-cost ratio of 1.89 when the calculation of the ratio uses the MCACES plus estimated associated site development costs.

Appendix IVI
Appendix VI In Table 2, the cost of the berthing area is included in the GNF Parametric Costs. To calculate the final Local Facilities Cost for Alternative 5, $421,100 for berthing area GNF and land costs must be added to the $14,056,000 shown in Table 2. This yields a Site Development Cost for Alternative 5 to be $14,477,100. (Appendix 2 contains the details for the Site Development Costs for Alternative 4 and 5.)

Table C
Selected Plan Benefits and Costs

GNF MCACES Costs	$4,378,480
Total Present Value O&M	$3,642,867
Associated Site Development Costs	$14,056,000
Total Costs	$22,077,347
Average Annual Equivalent Costs [1]	$1,327,917
Benefits	$2,506,950
Benefit/Cost Ratio	1.89
Excess Benefits	$1,179,033

[1] Annual Average Equivalent Costs include: average annual values for first costs, O&M costs, and associated site development costs.

Appendix VII Table D
Appendix VIII NORTHWEST TENNESSEE REGIONAL HARBOR
Appendix VIIII MCACES ESTIMATED PROJECT FIRST COSTS
($000)

Item	Quantity	Unit	Contract	Contingency	Total
LERR*	**239.05**	**AC**	**$435.0**	**$89.0**	**$524.0**
Land, Project Disposal	85.5	AC	158.0	40.0	198.0
Land, Mitigation	118.0	AC	142.0	35.0	177.0
Land Acquisition Cost			64.0		64.0
Project Subtotal			364.0	75.0	439.0
Land, Berth. Area Disp.	19.5	AC	36.0	9.0	45.0
Land, Mitigation	16.0	AC	19.0	5.0	24.0
Land, Acquisition Cost			16.0		16.0
Berthing Area Subtotal			71.0	14.0	85.0
Relocations			**0.0**		**0.0**
Harbor Construction			**2,738.7**	**392.7**	**3131.4**
Project (Non-Dredge)					
Mob/Demob	1	JB	29.1	5.9	35.0
Clearing	51.0	AC	137.9	27.5	165.4
Excavation	187,100	CY	232.6	46.4	279.1
Filter Mat./Crushed Stone	15,300	TN	196.5	39.2	235.7
Riprap	30,600	TN	424.4	84.9	509.3
Environmental Protection	11,800	LF	24.7	4.9	29.6
Environmental Restoration	134.0	AC	67.3	13.5	80.8
Turfing	10.0	AC	7.5	1.6	9.1
Subtotal			1,120.0	223.9	1,343.9
Berthing Area					
Excavation	47,600	CY	68.9	13.8	82.7
Non-Dredge Subtotal			1,188.9	237.7	1426.6
Project (Dredge)					
Mob/Demob	1	JB	350.9	35.0	385.9
Dredging	872,900	CY	1,027.0	101.6	1,128.6
Subtotal			1,377.9	136.6	1,514.5
Berthing Area					
Dredging	147,100	CY	171.9	18.4	190.3
Dredge Subtotal			1,549.8	155.0	1,704.8
E & D	**1**	**JB**	**328.7**	**65.7**	**394.4**
Project			299.7	59.9	359.6
Berthing Area			29.0	5.8	34.8
S & A	**1**	**JB**	**273.8**	**54.8**	**328.6**
Project			249.7	49.9	299.6
Berthing Area			24.1	4.9	29.0
Total			**$3,776.2**	**$602.3**	**$4,378.5**
Project			3,411.3	545.4	3,956.7
Berthing Area			364.9	56.9	421.8

*LERR-Lands, easements, rights-of-way, and relocations.

NED Economic Analysis

The National Economic Development (NED) section provides information on the benefits and costs for the selected plan evaluated in the study. The project benefits are based upon transportation saving benefits derived from lowering of transportation cost associated with an alternative mode of transportation (Waterborne – barge) vis-a- vis truck or rail modes of transportation.

This appendix presents an analysis of the economic viability of the plan of improvement that is recommended to construct a slack water harbor at Northwest Tennessee Harbor and stabilize its bank. The current (existing) conditions associated with this project are there are neither existing harbor facilities nor commodity traffic through this section of Lake County Tennessee. Future without project conditions is assumed to be similar to the existing without project conditions. Lake County, Tennessee is one of the poorest counties in Tennessee.

Economic viability of the plan is demonstrated through a comparison of its estimated average annual equivalent costs and estimated average annual equivalent benefits occurring during a common period of analysis at a given interest rate and price level. Construction is assumed to begin during 2005 and to be completed by the beginning of 2006.

The reference point in time for obtaining present values is the beginning of 2007, which is the first year in which navigation benefits for the proposed harbor expansion project will be realized by the beginning of 2007. All costs prior to this point in time are compounded forward at a 5.625 percent interest rate. The discounted benefits are equal to the annual benefits given the assumption that they remain constant over project life. Total present values are then amortized at the 5 5/8 percent interest rate over a 50-year period to obtain average annual equivalent streams of costs. Benefits and costs are expressed in constant price levels (2004). The period of analysis is 50 years.

The following assumptions were made:

(1) Costs take place at the end of the year during which they are expended.

(2) Benefits related to the physical construction from such costs occur one year after the occurrence of the costs upon which they derive.

(3) A conservative assumption that commodity shipments have no growth over the project life.

WATERBORNE COMMODITIES THROUGH THE HARBOR

Calcium carbonate, petroleum, paper, natural rubber, steel coils, and soybean meal will be the incoming cargo for Northwest Tennessee Harbor. Barge shipment of these commodities is expected to continue to be an important component of future traffic at the port. Among transportation modes, barge rates are the lowest and rail rates are the next most economical.

Location Quotient Analysis was used to determine the key export industries in Lake County, and the Dyer, Lake, and Obion Counties Region. Then using this data to survey, local interests identified firms that would use barge transportation if new harbor facilities existed. Such a shift in transportation mode could result in new cost savings generated by the additional traffic. The following assumptions were made:

(1) Location quotients can be used to determine which industries in Lake, Dyer, and Obion Counties, Tennessee are export oriented; and,

(2) Industries that have presumably found a location advantage in Lake, Dyer, and Obion Counties, Tennessee are potential future users of the proposed expanded harbor.

BENEFITS

According to Section 7a of the 1966 Transportation Act, Public Law 89-670, the primary direct navigation benefit of a water resource project is defined as the product of the transportation savings to shippers using the waterway and the estimated traffic that would use the waterway. The calculated navigation benefits by commodity group are described below. Due to confidentiality, we did not present a detailed computation of benefits here but aggregated estimates of cost savings that would accrue to future port users.

Benefits are based on inter-modal transportation shifts from rail or truck to barge as revealed from surveys with potential shippers and estimates provided by traffic management specialists. The computed the difference between barge and rail rates to estimate transportation cost savings for each commodity. Where applicable, handling charges are neither separately identified per mode nor part in this study due to the following reasons.

1. There are no separate handling charges for overland movements by rail or truck. Shippers are furnished empty equipment at origin that is loaded by consignors and unloaded at destination by consignees. Carriers do not perform loading/unloading services and neither publishes nor charge separate handling rates.

2. Barges loaded or unloaded at private terminals, such as Bunge or Conagra, within a port do not incur any separate handling charges.

The private terminal operators are responsible for trans-loading their product and typically do so with their own equipment and employees. This essentially applies to all the movements in this study.

3. Ocean port handling charges are assessed for all traffic trans-loaded at a public pier. These charges vary by commodity but typically not by mode. For example, there may be different charges within the same port for grain or fertilizer but not according to shipment by rail, truck, or barge.

4. There are handling charges for trans-loading commodities at public piers within river ports. These charges are primarily based on the prevailing wage rates in a region, which may fluctuate seasonally or with short-term workload variations within a port. These variations, however, should "average out" through time and have practically no influence on long-term modal choice by shippers. Any influence that handling charges might have is likely to be more significant in short-term port choices.

In this study, therefore, loading and unloading is the shipper's responsibility in nearly all cases. In those very few cases where charges might occur in a public port, there is no influence on modal choice and, therefore, no meaningful impact on the findings.

The projected commodity movements of inbound traffic are based on survey data from professional contacts made during previous benefit-cost studies. Table 1 shows the commodity type, quantity, transportation rates and savings for commodities such as Calcium carbonate, petroleum products (gasoline & diesel), steel coils, natural rubber, paper, and soybean meal. The point of origin for the shipments of these N commodities are: (a) Calcium carbonate from Ste Genevieve, Missouri, (b) Petroleum products from Memphis, Tennessee (c) Steel coil from East Chicago, Illinois, Granite City, Illinois, Ghent, Kentucky, Birmingham, Alabama, and New Orleans, Louisiana (c) Petroleum from Memphis, Tennessee and West Memphis Arkansas, respectively. In Table 1, annual transportation cost and benefit totals are shown by commodity type. Table 2, displays the extended (Commodity tonnage x Freight Rate) costs and savings for each of the respective commodities.

TRANSPORTATION COST SAVINGS COMPUTATIONS

Transportation savings are defined as the net difference between the full transportation costs, with and without the project. The computed these savings were computed by comparing the full cost of moving each of the respective commodities from origin to destination by each alternative mode of transportation with the full cost of barge transportation. Based these calculations on savings that would accrue to firms that would likely relocate to the proposed Northwest Tennessee facility. The formula used to estimate the present value (PV) of transportation cost savings is given by:

$$[1] \qquad PV = \Sigma \frac{S_i}{(1+r)^n}$$

where S_i represents transportation cost savings in year i, r is the discount rate, and n is the number of years in which benefits will be realized. Transportation cost savings result from differences between freight line-haul rates among alternative modes, net of additional handling charges. Thus,

$$[2] \qquad S_i = F_i - H_i$$

where F_i is freight line-haul savings in year i and H_i is defined as the additional handling charges associated with selecting barge transportation over the next best alternative in year i. Let R_i denote the difference (measured in dollars per ton mile) in freight rates between barge transportation and the next most economical alternative in year i. T_i is defined as total traffic to and from the various points in year i (measured in ton miles). Thus, freight savings can be computed as:

$$[3] \qquad F_i = R_i \times T_i$$

Let X_i denote additional handling charges (measured in dollars per ton) incurred by using barge transportation rather than the next most economical alternative in year i. C_i is defined as total cargo handled at the harbor in year i (measured in tons). Thus,

$$[4] \qquad H_i = X_i \times C_i$$

By substitution have:

$$[5] \qquad PV = \Sigma \frac{[(F_i \times T_i)] - [(X_i \times C_i)]}{(1+r)^n}$$

Barge rates were obtained for each port. Barge rates are stated in dollars and cents per net ton based on a minimum charge of 1,400 net tons per rake barge and 1,600 net tons per box barge. Source data for rail rates are published tariffs and circulars. Rail

rates include origin and destination reciprocal switching charges and may vary depending on origin-destination, minimum tonnage and type of rail car used. To properly reflect these variations, rail rates from Tennessee Valley Authority were used to calculate transportation savings. Truck rates are based trucking company and potential port facility user and vendor data. Tonnage costs are based on a truckload of 22 net tons.

BENEFIT AND COST CALCULATIONS

These benefits were calculated using 2004 price levels and at 5 5/8 percent interest rate discounted over a fifty-year project life period.

Benefits & Costs were converted to an average annual equivalent (AAE) basis using an appropriate discounting technique. Average annual interest and sinking fund charges were based on an interest rate of 5 5/8 percent and a 50-year economic life. Both Tables 1 and 3, display the average annual equivalent benefits/costs for each project feature.

Average Annual Equivalent Values. Benefits are calculated in average annual equivalent values. These were obtained by amortizing the computed present values as of the common period of analysis at a particular discount rate in order to take into account the time value of money as well as the respective difference in time that benefits and costs realize over the project life (during construction and operation of the project). The average annual equivalent (AAE) values, both benefits and costs, presented in this report are based upon a common set of reference characteristics as follows:

- Average annual equivalent (AAE) values were obtained by amortizing the computed present values as of the common reference date over the 50-year period of the analysis at 5 5/8 percent discount rate.

- Economic prices are based on current price levels (October 2004), the economic life of the project, which is assumed to be a 50-year period.

- Construction is assumed to begin during 2005 and to be completed in 2006. The common reference date for purposes of discounting is the beginning of 2007. Costs and Benefits prior to this point in time are compounded forward and those after this point in time are discounted backward.

COSTS

Financial First Costs. Financial first cost estimates are summarized in the Economic Analysis Section of the Main Report and provide for harbor construction and bank stabilization. The General Navigation Feature (GNF) of construction is cost-shared by the Federal Government and the Non-Federal sponsor. The associated site development

cost is a Non-Federal responsibility. Estimates of financial first costs are based on October 2004 prices. Total construction costs are divided into Federal and Non-federal costs. This is cost-shared by the Federal Government and the Non-Federal sponsor.

Economic Cost. The economic cost of a water resource project is the value foregone in alternative uses of the goods and services (and ultimately the factors of production) required for construction operation and maintenance of the project. From the national perspective, the economic costs of a water resource project are the values foregone in alternative uses of resources. In addition, this cost is the value of resources destroyed or otherwise adversely affected by the project. Specific economic costs detailed in this analysis include the initial investment, operation and maintenance and site development. These costs are also the National Economic Development (NED) cost, which include all costs directly related to the Federal project that are necessary to achieve the claimed benefits. Specific economic costs detailed in this analysis include the initial investment cost and operation and maintenance (O&M) costs to continue use of the channel.

Table 1
ANNUAL BENEFIT – COST SUMMARY
(2004 $, 5.625 interest rate)

I. BENEFITS		Transportation Rates ($)[1]			Transportation
Commodity	Tonnage	Rail / Truck	Barge	Differential[2]	Savings ($)
Inbound:					
Calcium Carbonate (Bulk)	150,000	$15.50	$ 9.76	$ 5.74	$ 861,000
Natural Rubber	23,750	$48.00	$31.44	$16.56	$ 393,300
Paper (Container)	50,000	$165.45	$153.63	$11.82	$ 591,000
Petroleum (Gasoline)	150,000	$11.97	$10.56	$ 1.41	$ 105,750
Petroleum (Diesel)	150,000	$15.15	$ 9.18	$ 5.97	$ 447,750
Soybean Meal	25,000	$24.40	$22.53	$ 1.87	$ 46,750
Steel Coils	20,000	$23.68	$20.61	$ 3.07	$ 61,400
Total Benefits:	418,750				$2,506,950
II. AAE COSTS:					
Initial Investment					$ 263,359
Operation & Maintenance					$ 219,113
Site Development Cost:					$845,446
Total Cost:					$ 1,327,917
III. AAE ANNUAL TOTALS[3]					
Benefits					$2,506,950
Costs					$ 1,327,917
Excess Benefits					$1,179,033
Benefit/Cost Ratio:					1.89

[1] Transportation Freight Rates include associated shipping and handling charges.

[2] Differential value reflects difference between current mode and barge transportation rates.

[3] AAE Total for Phase I and Phases I & II are displayed respectively for the following categories: Costs, Excess Benefits, and B/C Ratio.

TABLE 2

Northwest Tennessee Harbor

Annual Benefits Using Rail vs. Barge Transportation Costs

	Transportation Cost ($)[4]		Transportation
	By Rail	By Barge	Savings ($)
Inbound Shipments:			
Commodity			
Calcium Carbonate	$2,325,000	$1,464,000	$ 861,000
Natural Rubber	$1,140,000	$ 746,700	$ 393,300
Paper	$8,272,727	$7,681,818	$ 590,909
Petroleum (Gasoline)	$ 897,750	$ 792,000	$ 105,750
Petroleum (Diesel)	$1,136,250	$ 688,500	$ 447,750
Soybean Meal	$ 610,000	$ 563,250	$ 46,750
Steel Coils	$ 473,600	$ 412,200	$ 61,400
Transportation Savings:			$2,506,950

Initial Investment Cost. The initial investment cost at the time the project becomes operational or begins to produce benefits is the sum of construction cost and other initial costs plus interest during construction. Interest during construction (sinking fund) accounts for the cost of capital incurred during the construction period.

Operation & Maintenance (O&M) Cost. Future use of the harbor requires operations and maintenance, including dredging to be done on an annual basis. Continued use of the channel will require operations and maintenance (O&M) costs, which will not begin until the project is completed.

Associated Development Cost. Associated costs are for measures, over and above the Federal project measures, which are required for the benefits to be realized. Like the other NED costs discussed above, these are included in benefit-cost ratios. To achieve full use of the harbor, there is $14,056,000 in Associated Site Development Cost (non-GNF) features needed. Associated Site Development costs are all non-Federal and are requirements to make the harbor operational. Some of these site development requires are as follow: $1,549,000 in roadway improvements, $4,215,692 in railroad construction, $56,750 in utilities and wastewater construction, $5,373,334 in port facility with dolphins and winch system construction, $5,000 in Administration Building cost, $50,000 in parking areas construction, $55,000 in Warehouse, Storage Tanks, Storage Areas construction and $460,000 in land acquisition. Appendix II contains the complete list of Alternative 5 Associated Site Development costs.

[4] Include associated shipping and handling charges

Summary Of Benefits And Costs

Due to time and money constraints in this study, we made no growth projections in movement during the period of analysis. Neither did we investigate to any detail the potential benefits to be realized by shippers who did not respond to the questionnaire or responded with insufficient data. Consequently, uncertainties associated with the benefits quantified herein may be, in part, offset by the above constraints limiting benefits.

Benefit and Cost Summary

Table 3 below shows the projected total annual benefits and costs for the total project. The annual transportation savings benefits associated with Northwest Tennessee harbor project are $2,506,950. The MCASES first costs associated with the Northwest Tennessee project amounted to $1,327,917 with an average annual equivalent (AAE) cost of $263,359 and an operation and maintenance average annual equivalent cost of $219,113 associated site development costs of $14,056,000 average annual equivalent cost of $845,446, resulting in a total AAE cost of $1,327,917. The excess benefits associated with this project are $1,179,033. These average annual cost values were discounted at 5 5/8 percent using 2004 price level values. The total average annual equivalent costs including charges for (1) project first costs, (2) operation and maintenance and associated site development costs are $1,327,917 shown below. The costs associated with the construction and operation of each feature is based on the cost estimates described heretofore in this report.

Table 3

Northwest Tennessee Harbor
Annual Benefit and Cost Summary
(2004 Price Level, 5.625% interest rate)

BENEFIT:	
Transportation Savings	$2,506,950
COSTS:	
Investment	$ 263,359
Operation and Maintenance	$ 219,113
Site Development	$ 845,446
Total	$ 1,327,917
EXCESS BENEFITS	$1,179,033
BENEFIT/COST RATIO:	1.89

SENSITIVITY ANALYSIS

IMPACT OF FUEL TAX PHASE-IN

Phasing in the future increase in user charges (fuel tax) and the corresponding impact on the cost of doing business for barge operators could have a negative impact on benefits. Prescribed by Public Law 99-662, the Inland Waterways Tax authorized a tax on fuel used in commercial transportation for inland waterways. The fuel tax became effective on 1 October 1980, with an initial tax rate of 4 cents per gallon. It was allowed to increase to barge operators from 10 cents per gallon in 1990 to a maximum of 20 cents per gallon in 1994. Consequently, average fuel prices rose from 70 to 80 cents per gallon (other things being equal).

The consequences of increased fuel taxes are outlined in a study conducted by the Bureau of Economic and Business Research at the former Memphis State University entitled, Impacts of a Waterway Users Charge on the Economy of Tennessee[5], dated May 1978. This study indicated that demand for barge transportation is highly price elastic (price sensitive). Therefore, an increase of over 12 percent in shipping rates would precipitate a movement of about 15 percent of barge shippers to other modes of transportation. A consequence of this highly elastic demand is that the barge operators will incur the better part of the new tax burden from the increase in their cost of doing business and lower profit margins. Additional increases in fuel taxes could lead to a reduced supply of barges, causing higher barge transportation charges and lower benefits. Barge operators have already factored the current user charge into their freight rates, with no appreciable bearing upon project feasibility.

BREAK-EVEN YEAR

In a break-even year, the annual benefits exceed the costs assuming no further growth in benefits. Using 5.625 percent interest rate, the break-even analysis indicates that annual benefits after the first year exceed costs in the second year to cover the GNF first cost, and the eighth year to cover both first cost and associated site development costs.

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[5] Impacts of a Waterways User Charge on The Economy of Tennessee. Prepared for the Bureau of Waterways and Rail, Tennessee Department of Transportation, by the Bureau of Economic Research at Memphis State University, May 1978, pages 74-88.

INTERNAL RATE OF RETURN & NET PRESENT VALUE

The internal rate of return is the rate of interest at which annual benefits equal costs during the period of analysis (i.e., benefit-cost ratio equals 1.0). For this project, the internal rate of return is 57.3 percent, and 13.6 percent when site development costs are considered (included). The net present value of the project over project life is $29.8 million dollars, and $16.6 million dollars when associated site development costs are taken into account.

Alternative Port Analysis

In addition, to obtaining the freight rate analysis from TVA we obtained an alternative port analysis looking at the respective transportation cost of bringing the commodities through Caruthersville, MO, Eddyville, MO, Heloise, TN, New Johnsonville, TN, Paducah, KY, and Murray, KY, harbors. To this extent we were able to determine that would be more cost effective to move 347,500 tons (100,000 and 50,000) of the 647,500 tons of the respective commodities coming from New Orleans Louisiana, and Birmingham Alabama through the alternative ports.

Consequently, only 300,000 of the 647,500 tons of steel were used to derive project benefits. However, it might be argued that these 150,000 tons could be shipped from Illinois and Kentucky locations and including them in the analysis adding an additional $855,000 to the project benefits.

The commodity, which is a substantial proportion of the project benefits and which are pivotal to the project's success, is calcium carbonate. The residual benefit cost ratio would be greater than unity: ($2,506,950 - $861,000) = $1,645,950 ($1,645,950 / $1,327,917) = 1.24 given the incidence if calcium carbonate were not part of the project benefits. Prevailing National and Regional Business Cycle conditions along with other regional and industrial economic conditions, may and could alter commodity movement activity over the life of the project.

Risk Analysis

In order to employ risk analysis with respect to project outcomes it is important to identify key risk factors. One of these risk factors associated with the project's outcome is potential volatility in commodity tonnages due to economic conditions (business cycle), navigation problems such as those associated with drought conditions, and delays associated lock and dam operations.

Risk Analysis. This section provides an estimate of the risk inherent with the economic and data used to evaluate the transportation savings benefits. It addresses the areas where risk and uncertainty are known to exist so that the economic performance of the project can be expressed in terms of probability distributions.

The analysis was performed using a spreadsheet in conjunction with a simulation model entitled @Risk. It incorporates the range (maximum and minimum) of possible values

for an input variable and specifies the statistical distribution of likely outcomes over the chosen range. In the case where a normal distribution is assumed, 68 percent of the occurrences of a particular outcome would fall within (plus or minus) one standard deviation, on either side of the mean, and 95 percent within two standard deviations on either side of the mean. The variables chosen and the amounts they were allowed to vary are: commodity tonnages and project benefits. The assumed boundaries for variation were commodity tonnage 15 percent, Land (freight rates) 10 percent, water freight rates 10 percent. All distribution functions are assumed to be normal.

The @Risk simulation was performed utilizing 10,000 iterations, or different combinations, of the chosen variables. The 68 and 95 percent confidence bands around the mean results are plus/minus one and two standard deviations, respectively. A sensitivity analysis was employed to identify which variable(s) contributed the most to uncertainty. The simulation was run again, varying each variable individually while holding the remaining variables constant. The most important variable was the calcium carbonate tonnage, variation in stage frequency followed by the 10 percent variation in freight rates. The results of the individual simulations and their ranking are presented in Table 4.

Table 4
Risk Analysis Sensitivity Analysis Tonnage & Benefits
(October 2004 Price Levels, 5.625%)

Item	Mean Value	Standard Deviation
Tonnage	418,750	28,882
Benefits	$2,505,662	$888,760

Sensitivity Analysis: **Commodities**	Tonnage Regression Coefficient	Tonnage Rank Correlation Coefficient	Rank
Calcium Carbonate	0.779	0.757	1
Petroleum Products	0.390	0.365	2
Petroleum Products	0.390	0.357	3
Paper	0.260	0.230	4
Soybean Meal	0.130	0.112	5
Natural Rubber	0.123	0.114	6
Steel Coils	0.104	0.112	7

REGIONAL ECONOMIC DEVELOPMENT

This part focuses on regional economic impact analysis. The purpose of this information is to provide the local decision-makers with some insight in examining the impacts of the public investment with respect to the local economy and local fiscal impacts. The regional economic impacts reflected in this study are the result of a one-time infusion of investment capital into the local economy rather than the result of a sustained annual change associated with the relocation of employment into the economy (e.g., the location of a Military Base).

Regional Economic Impacts and Local Public Fiscal Impacts

The Regional Impact Analysis provides information on the sales, employment and income impacts upon the study region of the total project related investment spending including the local share of that expenditure. The impacts on sales, employment and income are directly related to the investment spending on the project. These regional impact estimates are considered to be of some value and interest to the local interests.

The Economic Impact Forecasting System Impact Models

The basis of EIFS analytical capabilities is the calculation of multipliers that estimate impacts resulting from a change in local expenditures and/or employment. In calculating the multipliers, EIFS uses the economic base model and its ratios of basic activity and non-basic or service activity. Basic, in this context, is defined as production consumed outside the region of influence or by Federal activities locally. According to economic base theory, the ratio of total income to basic income is measurable (as the multiplier) and sufficiently stable so that future changes in economic activity can be forecast.

The multiplier is interpreted as the total impact on the economy of the region resulting from a unit change in its basic sector, i.e., a dollar increase in local expenditures due to an expansion of a facility. EIFS estimates its multipliers using a "location quotient" approach based on the concentration of industries within the region relative to the industrial concentrations for the nation. EIFS has models for basic activity scenarios: i.e., a standard model. Once these are entered into the system, a projection of changes in the local economy is provided. These are projected changes in sales volume, employment, income and population. These four "Indicator" variables are used to measure and evaluate socioeconomic impacts.

Results

The economic impact associated with an $18,434,480 (first cost + associated site development cost) investment for Northwest Tennessee Harbor in Lake County, Tennessee are shown in Table 4 and are separated out into three major economic categories:

- Sales Volume: both direct and induced impacts;
- Employment: both direct and induced impacts;
- Income: both direct and induced impacts.

Tables 5, 6, 7, and 8 display the impacts associated with Northwest Tennessee Harbor region: Dyer, Lake, and Obion Counties in Tennessee. Tables 7 and 8 display the impact of both construction and site development expenditures. These impacts are for the same three major economic categories as above. These impacts are considered separately and not part of the feasibility study. Table 9 displays an example of the EIFS Local Public Fiscal Impact Model, Standard Model section output for Northwest Tennessee showing the regional economic impacts upon sales volume, income, and employment within the Dyer, Lake, and Obion Counties Tennessee region of influence.

Local Public Finance Impact Model: [6]

The Local Public Finance Impact Model output displayed in Table 9 reflects the impacts of public investments in a region predicated upon the region's capacity to raise the level of public services as new workers move into an area. Public investments in infrastructure projects generate many effects throughout their construction and operation. Initially, the project requires the employment of workers. In the case of larger investments the capacity to create employment opportunities may precipitate new workers who might migrate into the region bringing their families. Along with these effects, these projects are also expected to alter the need for public services. These broad revenue and expenditure effects are an important in the initial stages of planning, when program managers are making their initial budget allocations. The LPFI model estimates the local government revenue and expenditure consequences of a change in the economic and demographic character of a local economy.

[6] Local Public Finance Impact Model: User's Guide and Technical Documentation. Federal Infrastructure Strategy Program IWR, Dennis P. Robinson, and Harry H. Kelejian , Report 94-FIS-10 Institute for Water Resources, WRSC, USACE. June 1994.

Table 5[7]						
Northwest Tennessee Harbor Regional Economic Impacts						
Region:	**Lake, Dyer, Obion, Counties in Tennessee**					
Export Income Multipliers:	**Export Income Multiplier: 2.15**			**Initial Investment: $18,434,480**		
	Total Expenditures:					
Measures	**Sales Volume**	**Income**	**Employment**	**Sales Volume**	**Population**	
Economic Impacts	$21,199,650	$3,425,132	105			
Percentage Change	1.11 %	0.22 %	0.24 %			
RTV (+)	10.21 %	10.79 %	4.67 %	10.21 %	1.89 %	
RTV (-)	-7.08 %	-6.02 %	-5.34 %	-7.08 %	-0.85 %	
FSI						

Table 6				
Northwest Tennessee Harbor Fiscal Regional Impacts[8]				
Region:	Lake, Dyer, Obion, Counties in Tennessee			
Export Income Multipliers:	Impacts			
Measures	Revenues & Expenditures	Sales Volume	Income	Employment
Induced Changes:		$11,339,350	$1,832,048	56

[7] For Further details on the Model's Output see Economic Impact Forecast System (EIFS) II: User Manual Updated Edition, Technical Report N-69 (Revised) May 1984. US Army Corps of Engineers, Construction Engineering Laboratory, Champaign Ill.

[8] LOCAL PUBLIC FINANCE IMPACT MODEL: User's Guide and Technical Documentation. IWR Report 94-FIS-10 1994.

EIFS REPORT
Appendix III Table 7

PROJECT NAME

Northwest Tennessee Harbor: Dyer, Lake, & Obion Counties

STUDY AREA

47045 Dyer, TN
47095 Lake, TN
47131 Obion, TN

FORECAST INPUT

Change In Local Expenditures	$18,434,480
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-post	0

FORECAST OUTPUT

Employment Multiplier	2.15	
Income Multiplier	2.15	
Sales Volume - Direct	$9,860,304	
Sales Volume - Induced	$11,339,350	
Sales Volume - Total	$21,199,650	1.11%
Income - Direct	$1,593,085	
Income - Induced)	$1,832,048	
Income - Total(place of work)	$3,425,132	0.22%
Employment - Direct	49	
Employment - Induced	56	
Employment - Total	105	0.24%
Local Population	0	
Local Off-base Population	0	0%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	10.21 %	10.79 %	4.67 %	1.89 %
Negative RTV	-7.08 %	-6.02 %	-5.34 %	-0.85 %

EIFS REPORT

Appendix III Table 8

PROJECT NAME

Northwest Tennessee Harbor: Dyer Lake Obion

STUDY AREA

47045 Dyer, TN
47095 Lake, TN
47131 Obion, TN

FORECAST INPUT

Change In Local Expenditures	$18,434,480
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-post	0

FORECAST OUTPUT

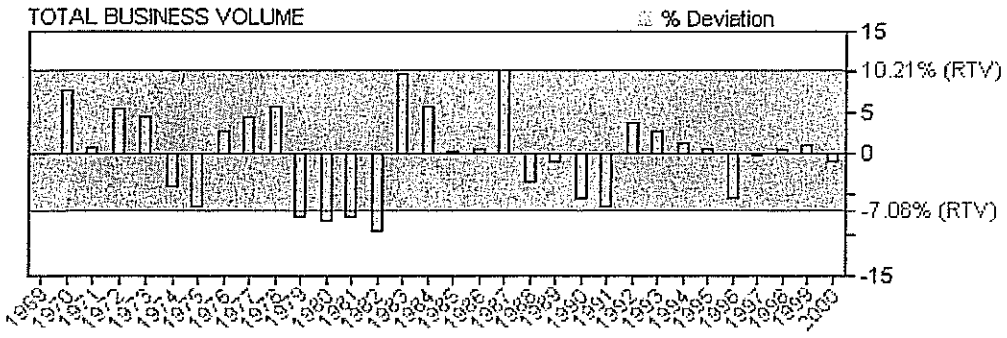
Employment Multiplier	2.15	
Income Multiplier	2.15	
Sales Volume - Direct	$9,860,304	
Sales Volume - Induced	$11,339,350	
Sales Volume - Total	$21,199,650	1.11%
Income - Direct	$1,593,085	
Income - Induced)	$1,832,048	
Income - Total(place of work)	$3,425,132	0.22%
Employment - Direct	49	
Employment - Induced	56	
Employment - Total	105	0.24%
Local Population	0	
Local Off-base Population	0	0%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	10.21 %	10.79 %	4.67 %	1.89 %
Negative RTV	-7.08 %	-6.02 %	-5.34 %	-0.85 %

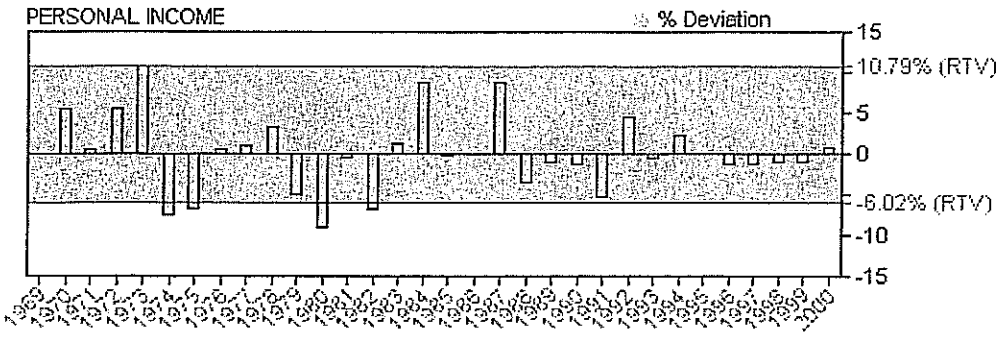
RTV DETAILED

SALES VOLUME



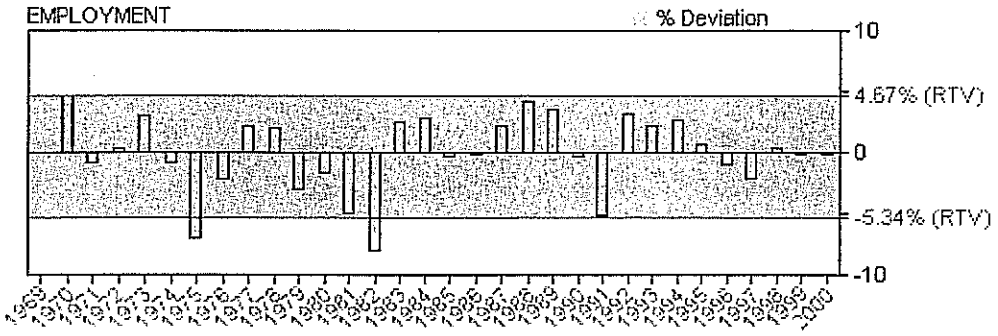
Year	Value	Adj_Value	Change	Deviation	%Deviation
1969	135146	590588	0	0	0
1970	159921	660474	69886	51436	7.79
1971	172763	684141	23668	5218	0.76
1972	194248	743970	59828	41378	5.56
1973	221032	797925	53956	35506	4.45
1974	241624	785278	-12647	-31097	-3.96
1975	253359	755010	-30268	-48718	-6.45
1976	281727	794470	39460	21010	2.64
1977	322617	851709	57239	38789	4.55
1978	374818	922052	70343	51893	5.63
1979	394694	872274	-49779	-68229	-7.82
1980	424290	823123	-49151	-67601	-8.21
1981	444109	781632	-41491	-59941	-7.67
1982	440388	731044	-50588	-69038	-9.44
1983	516246	831156	100112	81662	9.83
1984	585543	901736	70580	52130	5.78
1985	619758	923439	21703	3253	0.35
1986	647668	945595	22156	3706	0.39
1987	692711	1073702	128107	109657	10.21
1988	776002	1055363	-18339	-36789	-3.49
1989	824879	1064094	8731	-9719	-0.91
1990	833590	1025316	-38778	-57228	-5.58
1991	830062	979473	-45843	-64293	-6.56
1992	909744	1037108	57635	39185	3.78
1993	978676	1086330	49222	30772	2.83
1994	1037066	1120031	33701	15251	1.36
1995	1090120	1144626	24595	6145	0.54
1996	1080891	1102509	-42117	-60567	-5.49
1997	1117840	1117840	15331	-3119	-0.28
1998	1166112	1142790	24950	6500	0.57
1999	1223144	1174218	31428	12978	1.11
2000	1269872	1180981	6763	-11687	-0.99

INCOME



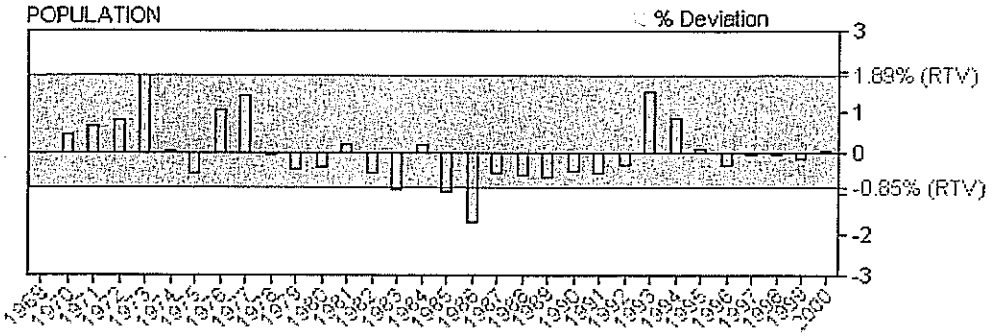
Year	Value	Adj_Value	Change	Deviation	%Deviation
1969	173859	759764	0	0	0
1970	201779	833347	73583	46814	5.62
1971	218359	864702	31354	4585	0.53
1972	246194	942923	78221	51452	5.46
1973	301100	1086971	144048	117279	10.79
1974	318585	1035401	-51570	-78339	-7.57
1975	333555	993994	-41407	-68176	-6.86
1976	364168	1026954	32960	6191	0.6
1977	403641	1065612	38659	11890	1.12
1978	459017	1129182	63570	36801	3.26
1979	497923	1100410	-28772	-55541	-5.05
1980	533074	1034164	-66246	-93015	-8.99
1981	600479	1056843	22679	-4090	-0.39
1982	611452	1015010	-41833	-68602	-6.76
1983	654686	1054044	39034	12265	1.16
1984	769820	1185523	131478	104709	8.83
1985	812542	1210688	25165	-1604	-0.13
1986	846696	1236176	25489	-1280	-0.1
1987	893746	1385306	149130	122361	8.83
1988	1003491	1364748	-20558	-47327	-3.47
1989	1067682	1377310	12562	-14207	-1.03
1990	1127018	1386232	8922	-17847	-1.29
1991	1138765	1343743	-42490	-69259	-5.15
1992	1258211	1434361	90618	63849	4.45
1993	1311375	1455626	21266	-5503	-0.38
1994	1402468	1514666	59039	32270	2.13
1995	1467040	1540392	25726	-1043	-0.07
1996	1518222	1548586	8194	-18575	-1.2
1997	1555778	1555778	7192	-19577	-1.26
1998	1599084	1567102	11324	-15445	-0.99
1999	1643529	1577788	10685	-16084	-1.02
2000	1738048	1616385	38597	11828	0.73

EMPLOYMENT



Year	Value	Change	Deviation	%Deviation
1969	34867	0	0	0
1970	36935	2068	1724	4.67
1971	36985	50	-294	-0.79
1972	37438	453	109	0.29
1973	38919	1481	1137	2.92
1974	38927	8	-336	-0.86
1975	36706	-2221	-2565	-6.99
1976	36266	-440	-784	-2.16
1977	37452	1186	842	2.25
1978	38582	1130	786	2.04
1979	37797	-785	-1129	-2.99
1980	37496	-301	-645	-1.72
1981	36063	-1433	-1777	-4.93
1982	33720	-2343	-2687	-7.97
1983	34925	1205	861	2.47
1984	36284	1359	1015	2.8
1985	36514	230	-114	-0.31
1986	36786	272	-72	-0.2
1987	37982	1196	852	2.24
1988	40014	2032	1688	4.22
1989	41857	1843	1499	3.58
1990	42081	224	-120	-0.29
1991	40334	-1747	-2091	-5.18
1992	42011	1677	1333	3.17
1993	43327	1316	972	2.24
1994	44851	1524	1180	2.63
1995	45479	628	284	0.62
1996	45371	-108	-452	-1
1997	44780	-591	-935	-2.09
1998	45312	532	188	0.41
1999	45580	268	-76	-0.17
2000	45870	290	-54	-0.12

POPULATION



Year	Value	Change	Deviation	%Deviation
1969	68216	0	0	0
1970	68832	616	318	0.46
1971	69585	753	455	0.65
1972	70442	857	559	0.79
1973	72100	1658	1360	1.89
1974	72443	343	45	0.06
1975	72375	-68	-366	-0.51
1976	73435	1060	762	1.04
1977	74765	1330	1032	1.38
1978	75023	258	-40	-0.05
1979	75011	-12	-310	-0.41
1980	75050	39	-259	-0.35
1981	75503	453	155	0.21
1982	75440	-63	-361	-0.48
1983	75048	-392	-690	-0.92
1984	75497	449	151	0.2
1985	75100	-397	-695	-0.93
1986	74137	-963	-1261	-1.7
1987	74067	-70	-368	-0.5
1988	73973	-94	-392	-0.53
1989	73835	-138	-436	-0.59
1990	73817	-18	-316	-0.43
1991	73752	-65	-363	-0.49
1992	73836	84	-214	-0.29
1993	75244	1408	1110	1.48
1994	76208	964	666	0.87
1995	76601	393	95	0.12
1996	76666	65	-233	-0.3
1997	76935	269	-29	-0.04
1998	77206	271	-27	-0.03
1999	77407	201	-97	-0.13
2000	77753	346	48	0.06

Appendix III Table 9

LOCAL PUBLIC FINANCE IMPACT MODEL

Project name: Northwest Tennessee Harbor (Dyer, Lake & Obion Counties TN) Total

Dollar volume of construction project: $18,434,480

LOCAL PUBLIC FINANCE IMPACT MODEL
STANDARD IMPACT FORECAST FOR NORTHWEST TENNESSEE HARBOR (TN)

Change in local		impact	% change
Export income multiplier.....:		2.15	
Employment multiplier		2.15	
Sales volume	.....direct:	$ 9,860,304	
	.....indirect:	$ 11,339,350	
	.....total:	$ 21,199,650	1.11%
Employment.....direct:		49	
	.....total:	105	0.22%
Income.....direct:		$ 1,593,085	
.....total by place of work:		$ 3,425,132	0.24%
..total by place of residence			
Population.....:		0	0.000

developed by Dennis P. Robinson and Harry H. Kelejian in
LOCAL PUBLIC FINANCE IMPACT MODEL: USER'S GUIDE AND TECHNICAL DOCUMENTATION. Alexandria, VA: U.S. Army Institute for Water

ECONOMIC BASE STUDY

The purpose of this section is to provide background information about the region where the project benefits are to take place to give the decision-maker some insight and provide a broader perspective of the regional setting where the public investment is to take place.

Introduction

An economic base study can provide an initial step that can aid in the understanding of the identification of a public problem and the prescribed remedy in terms of public investment in identifying the economic context in which the problem exists to gain some perspective on the relative size of the problem and shed light on the problem from public or private investment. Understanding the economics environment allows us to glean some insight into the consequences and possible impacts of public investment in terms of economic growth and in the quality of living standards of the affected communities.

Regional Economic Growth

Economic Base Analysis

Among the factors that need consideration when assessing a region current economic state and its potential for future growth are:

1. The Sources of Current Income and Employment
2. The Prospects for Economic Growth or Decline
3. Relationship of Land Use and Community Services to Economic Growth or Decline.

An economic base study identifies the key economic activities of a community.[9] Economic Base Theory provides an analytical framework and a primary means of identifying a region's key industries with respect to potential growth. The first step is to identify the industrial structure of the region by examining the number of people (in both absolute and relative terms) employed by each industry (standard industrial code, SIC) in the region, then looking at the comparable statistics for the national economy with the idea being to develop a measure of resource allocation with respect to the national pattern.

This measure is called a Location Quotient (LQ) which compares local employment in an industry to national employment in the same industry, the underlying idea being that if the region employs more resources in a particular industry relative to the national employment in that industry the region is producing for both domestic and export purposes. The Location Quotient looks at the relative employment of local labor to the national employment using the national employment base as a national average

[9] The Community Economic Base Study Charles M. Tiebout, Committee for Economic Development Supplemental Paper No. 16 December 1962.

Location Quotient (LQ):

$$LQ = \frac{\frac{Employment_{industry_{a\ local}}}{Employment_{total_{local}}}}{\frac{Employment_{industry_{a\ national}}}{Employment_{total_{national}}}}$$

The measure is designed to identify key export industries placing emphasis on industries with a LQ coefficient with a value greater than one (identified as basic or export industries) vis-a-vis those industries with a LQ value of one or less (identified as non-basic non exporting industries). Export industries are presumed to be prime movers of the local economy. If employment serving the export market rises or falls, employment serving the non-basic local market is presumed to move in the same direction. In the economic base analysis is the tacit recognition that firms within industries sell their products to both basic and non-basic markets. A simplifying assumption is that over the long run the proportion of basic to non-basic jobs will remain the same.

Export Industries and Regional Competitive Advantage

The identification of the key export industries (LQ>1) indicates the region's source of comparative or competitive advantage in that employment growth in the export (basic) industries will precipitate increased employment in the non-basic industries. For example, if a community's total employment were 100,000, and 40,000 were in basic and 60,000 in non-basic employment then given a new plant opens in the community and increases employment by 400 jobs, the long run consequences would be an increase of 600 jobs in the non-basic sector (6 non-basic jobs for each 4 basic jobs) new jobs created in the basic industry, then 1000 new jobs would be added to the economy. Table 14 displays the location quotients for the three Northwest Tennessee counties for two periods: 1998 and 2001.

Industry by Employment and Structure

The industrial structure of an area characterizes the relative employment shares (importance) of an industry in that area to total employment for the same area. There has been a significant shift in employment away from farming to the manufacturing sector. This shift in part has been caused by technical changes in farming since 1950. Other reasons include unpredictability in the weather, higher costs with no offsetting increase in prices received by farmers resulting in lower profits, and the emergence of corporate farming (economies of scale).

Table 10 displays LQ data. It should be noted that some of the individual industries have missing data c the figure was omitted entirely due to the sensitive nature of the industry, but the totals are correct. For manufacturing, the largest sector, some components for durable and non-durable employment are missing. Therefore, total employment in manufacturing is understated and care must be exercised when interpreting the data.

Table 10

Employment Location Quotient: Dyer, Lake, & Obion County Area

Industry	SIC	Employment (2001)	1998	2001	Trend
Agriculture		19	0.8012	0.3867	↓
Utilities		25	0.1687	0.1427	↓
Contract Construction		1471	1.0674	0.8462	↓
Manufacturing		13293	2.7462	3.1124	↑
Wholesale Trade		1265	0.8988	0.7692	↓
Retail Trade		4149	1.0229	1.0406	↓
Transportation		501	0.5911	0.4989	↓
Information		311	0.2819	0.3093	↑
Finance & Insurance		1010	0.4925	0.6037	↑
Real Estate		195	0.4078	0.3617	↓
Professional		329	0.1838	0.1717	↓
Management		0	0.0941	0	↓
Admin. Support		1805	0.8629	0.7439	↓
Educational Services		0	0.0465	0	↓
Health Care		2667	0.7110	0.6853	↓
Arts, entertainment		135	0.2356	0.2832	↑
Accommodation		2318	0.6939	0.8681	↑
Other Service		971	0.6969	0.6752	↓
Auxiliaries		0	0	0	
Unclassified	90	19	0	0.6743	↑

Comparative Advantage and Growth

Two analytical measures of a region's employment / economic base and its relative well being are: the **Location Quotient Analysis** and the **Shift-Share Analysis.** The Location Quotient is a measure of an area's comparative advantage (competitive advantage gained from region's industrial specialization).[10] Those industries which are more productive in the region than the surrounding regions will be the export industries. Table 12 and Figure 1 displays the Location Quotients or actual comparative advantages of and the Dyer, Lake and Obion Counties for selected years. If the Location Quotient for a particular industry is greater than one, the industry is considered an export based industry, and as such, parts of the region's comparative advantage. If the number is less than one, the region is weak in the industry. If the LQ is equal to one, the region is at unity with the national average. This measure is a benchmark for regional planning decision-making.

Table 12 and Figure 1. display there is a comparative advantage in agriculture, construction, manufacturing and retail trade. While its comparative advantage in wholesale has been declining it still holds its some comparative advantage in wholesale. Data were not available for mining and finance for the selected years. The Dyer, Lake and Obion counties has comparative advantages in construction, manufacturing, retail, wholesale, health care, and accommodation and food service.

The second measure, Shift-Share Analysis, is used primarily to identify the growth components of employment in a region between three dynamic effects: industry mix effect (structure), regional competitive effect (regional competition) and national growth. Table 13 and Figure 2 displays 1998 to 2001 data shift-share analysis for the three-county Northwest Tennessee area: Dyer, Lake and Obion Counties. It should be noted that the sign in front of the numerical values for each of the three is important to the interpretation of the effects. Also, the magnitude of the measure is important to the interpretation of the relative contribution of each measure to the change in the region's employment.

Table 13 and Figure 2. displays the negative influence of the industry mix effect on manufacturing industry. While there is a negative effect of the regional competitive effect upon construction, wholesale, administration, and healthcare industries. While all components had a positive effect upon: finance, and accommodation and food service industries, who also displayed positive absolute growth. The Dyer, Lake and Obion counties area has comparative advantages in construction, transportation, wholesale, retail and service.

[10] Richardson H. W. Elements of Regional Economics. Penguin Books Baltimore Maryland (1969) pages 27-44. Also see Webber, Michael, J. Impact of Uncertainty on Location. The M.LT Press, Cambridge, Massachusetts and London, England. (1972): pages 73-80.

Table 11[11]
Employment & Location Quotients - Comparative Advantages

Industry\Year	1998	2001	1998	2001
Agriculture:				
United States			1.00	1.00
Dyer, Lake and Obion counties	43	19	0.8012	0.3867
Utilities				
United States			1.00	1.00
Dyer, Lake and Obion counties	33	25	0.1687	0.1427
Construction:				
United States			1.00	1.00
Dyer, Lake and Obion counties	1,775	1,471	1.0674	0.8462
Manufacturing:				
United States			1.00	1.00
Dyer, Lake and Obion counties	13,347	13,293	2.7462	3.1124
Wholesale:				
United States			1.00	1.00
Dyer, Lake and Obion counties	1,517	1,265	0.8988	0.7692
Retail:				
United States			1.00	1.00
Dyer, Lake and Obion counties	4,178	4,149	1.0229	1.0406
Transportation:				
United States			1.00	1.00
Dyer, Lake and Obion counties	587	501	0.5911	0.4989
Information:				
United States			1.00	1.00
Dyer, Lake and Obion counties	254	311	0.2819	0.3093
Finance, etc.:				
United States			1.00	1.00
Dyer, Lake and Obion counties	815	1010	0.4925	0.6037
Real Estate etc.:				
United States			1.00	1.00
Dyer, Lake and Obion counties	212	195	0.4078	0.3617
Professional etc.:				
United States			1.00	1.00
Dyer, Lake and Obion counties	319	329	0.1838	0.1717
Management etc.:				
United States			1.00	1.00
Dyer, Lake and Obion counties	73	0	0.0941	0
Administrative, etc.:				
United States			1.00	1.00
Dyer, Lake and Obion counties	1924	1805	0.8629	0.7439
Health Care, etc.:				
United States			1.00	1.00
Dyer, Lake and Obion counties	2,766	2,667	0.7010	0.6853
Arts, entertainment, etc.:				
United States			1.00	1.00
Dyer, Lake and Obion counties	107	135	0.2356	0.2832
Accommodation & Food Service:				
United States			1.00	1.00
Dyer, Lake and Obion counties	1,884	2,318	0.6939	0.8681
Other Services:				
United States			1.00	1.00
Dyer, Lake and Obion counties	1,007	971	0.6969	0.6752
Unclassified.:				
United States			1.00	1.00
Dyer, Lake and Obion counties	0	19	0	0.6743

[11] United States Army Corps of Engineers, Construction Engineering Research Laboratory (CERL) **Computer Data Base,** Environmental Technical Information System (ETIS).

Table 12
LOCATION QUOTIENT ANALYSIS

Industry Employment	Regions Lake, Dyer, Obion Co	Lake, Dyer, Obion Co	United States	United States	Regional Employ Factor	National Employ Factor	Location Quotient 1998	Regional Employ Factor	Location Quotient National Employ Factor	Location Quotient 2001
	1998	2001	1998	2001						
Total	31009	30809	108117731	115061184						
Forestry, Agriculture etc	43	19	187133	183476	0.14	0.2	0.8012	0.06	0.16	0.3867
Utilities	33	25	682217	654484	0.11	0.6	0.1687	0.08	0.57	0.1427
Construction	1775	1471	5798261	6491994	5.72	5.4	**1.0674**	4.77	5.64	0.8462
Manufacturing	13347	13293	16945834	15950424	43.04	15.7	**2.7462**	43.15	13.86	**3.1124**
Wholesale trade	1517	1265	5884946	6142089	4.89	5.4	0.8988	4.11	5.34	0.7692
Retail trade	4178	4149	14240726	14890289	13.47	13.2	**1.0229**	13.47	12.94	**1.0406**
Transportation & warehousing	587	501	3462472	3750663	1.89	3.2	0.5911	1.63	3.26	0.4989
Information	254	311	3141957	3754698	0.82	2.9	0.2819	1.01	3.26	0.3093
Finance & insurance	815	1010	5770209	6248400	2.63	5.3	0.4925	3.28	5.43	0.6037
Real estate & rental & leasing	212	195	1812621	2013673	0.68	1.7	0.4078	0.63	1.75	0.3617
Professional, scientific	319	329	6051636	7156579	1.03	5.6	0.1838	1.07	6.22	0.1717
Management of companies	73	0	2703798	2879223	0.24	2.5	0.0941	0.00	2.50	0.0000
Administrative, support,	1924	1805	7774610	9061987	6.20	7.2	0.8629	5.86	7.88	0.7439
Educational services	31	0	2323744	2612430	0.10	2.1	0.0465	0.00	2.27	0.0000
Health care and social assistance	2766	2667	13757996	14534726	8.92	12.7	0.7010	8.66	12.63	0.6853
Arts, entertainment & recreation	107	135	1583783	1780362	0.35	1.5	0.2356	0.44	1.55	0.2832
Accommodation & food services	1884	2318	9466088	9972301	6.08	8.8	0.6939	7.52	8.67	0.8681
Other services (except public admin.)	1007	971	5037866	5370479	3.25	4.7	0.6969	3.15	4.67	0.6752
Auxiliaries (exc corporate)	0	0	916349	1022114	0.00	0.8	0.0000	0.00	0.89	0.0000
Unclassified establishments	0	19	77642	105228	0.00	0.1	0.0000	0.06	0.09	0.6743

Table 13

SHIFT-SHARE ANALYSIS [12]

INDUSTRY	Lake, Dyer, & Obion Counties	Lake, Dyer, & Obion Counties	Employment United States		Growth Components Growth Decline U.S. Growth Employment.	Regional Growth Employment.	Growth Components National Growth Element	Industry Mix Effect	Regional Competitive Effect	Absolute Growth Regional
	1998	2001	1998	2001						
Total	31009	30809	108117731	115061184	0.06	-0.01	1991.4	0.0	-2191.4	-200.0
Forestry, Agriculture	43	19	187133	183476	-0.02	-0.56	2.8	-3.6	-23.2	-24.0
Mining	0	0	497843	485565	-0.02	0.00	0.0	0.0	0.0	0.0
Utilities	33	25	682217	654484	-0.04	-0.24	2.1	-3.5	-6.7	-8.0
Construction	1775	1471	5798261	6491994	0.12	-0.17	114.0	98.4	-516.4	-304.0
Manufacturing	13347	13293	16945834	15950424	-0.06	0.00	857.2	-1641.2	730.0	-54.0
Wholesale trade	1517	1265	5884946	6142089	0.04	-0.17	97.4	-31.1	-318.3	-252.0
Retail trade	4178	4149	14240726	14890289	0.05	-0.01	268.3	-77.7	-219.6	-29.0
Transportation	587	501	3462472	3750663	0.08	-0.15	37.7	11.2	-134.9	-86.0
Information	254	311	3141957	3754698	0.20	0.22	16.3	33.2	7.5	57.0
Finance & insurance	815	1010	5770209	6248400	0.08	0.24	52.3	15.2	127.5	195.0
Real estate	212	195	1812621	2013673	0.11	-0.08	13.6	9.9	-40.5	-17.0
Professional, scientific	319	329	6051636	7156579	0.18	0.03	20.5	37.8	-48.2	10.0
Management of companies	73	0	2703798	2879223	0.06	-1.00	4.7	0.0	-77.7	-73.0
Administration	1924	1805	7774610	9061987	0.17	-0.06	123.6	195.0	-437.6	-119.0
Educational services	31	0	2323744	2612430	0.12	-1.00	2.0	1.9	-34.9	-31.0
Health care	2766	2667	13757996	14534726	0.06	-0.04	177.6	-21.5	-255.2	-99.0
Arts, entertainment	107	135	1583783	1780362	0.12	0.26	6.9	6.4	14.7	28.0
Accommodation	1884	2318	9466088	9972301	0.05	0.23	121.0	-20.2	333.3	434.0
Other services	1007	971	5037866	5370479	0.07	-0.04	64.7	1.8	-102.5	-36.0
Auxiliaries (exc)	0	0	916349	1022114	0.12	0.00	0.0	0.0	0.0	0.0
Unclassified estab.	0	19	77642	105228	0.36	0.00	0.0	0.0	0.0	19.0

[12] http://www.fedstats.gov/

Figure 1
Location Quotients: Dyer, Lake & Obion Counties 1998 & 2001

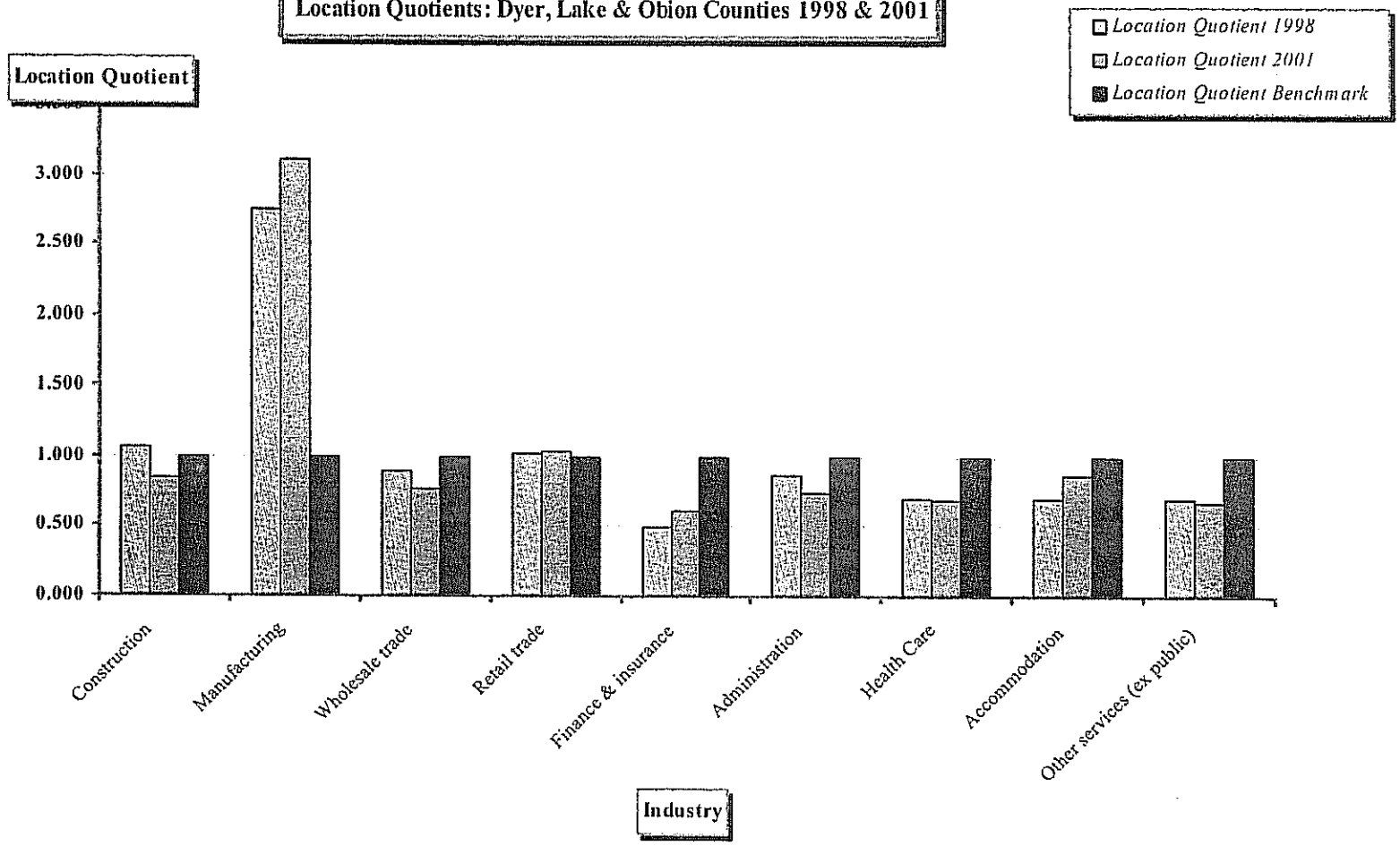


Figure 2
Shift-Share Analysis: Mississippi County 1998 - 2001