

Section II - Resources and Economy

An assessment of the study area's natural and human resources, development, and economy provides a profile of existing and future conditions. This is a portion of the baseline used for formulating and comparing alternative plans to improve or continue navigation on the Upper Tennessee River system.

1. Climate

The Upper Tennessee Valley is in the Southern Appalachian region. The general climate of the watershed is humid. The mountain ridge and valley terrain influences the climate of the Upper Tennessee Valley. The winter season is influenced by eastward moving high and low pressure systems resulting in alternating cold and warm air masses. The summer months are warm and moist due to the air influx from the Atlantic Ocean and the Gulf of Mexico. The high Cumberland Plateau terrain, 1500 to 1800 feet above the valley elevation, tends to moderate many of the migratory storms that move from the west across the area.

The average annual temperature for the study area is approximately 60.7 degrees Fahrenheit with the range of monthly averages from 41.1 degrees Fahrenheit in January to 78.1 degrees Fahrenheit in July. The extreme monthly maximum and minimum temperatures are 106 degrees Fahrenheit in July to -10 degrees Fahrenheit in January.

Above Chickamauga Dam, annual rainfall averages 51 inches and varies from a low of 40 inches at sheltered locations within the mountains to high spots of 85 inches on the southern and eastern basin divide. Rainfall occurs relatively even throughout the year.

Snowfall averages about 14 inches annually. Snowfall above the 3,000-foot elevation averages only 22 inches annually. Individual snowfalls are normally light, with an average of 13 snowfalls per year.

2. Physiography

The project lies within the Valley and Ridge physiography province. This landform is characterized by long narrow valleys, which are bounded by ridges whose

longitudinal axes trend northeast-southwest. The land forms of this province developed because of the underlying structural geology, which consists of a series of overlapping thrust sheets faulted and driven to the northwest by the Appalachian mountain building process. The faulting yielded geology essentially repeats itself from ridge to ridge-measured normal to the trend. The topography is, however, not only a product of the geology but also of erosion. Rock units less resistant to erosion have been worn away more rapidly forming the valleys between the more resistant strata. The Valley and Ridge province is comprised of sedimentary sequences that were deposited and faulted wholly within the Paleozoic Era.

3. Geology

The foundation geology for the Chickamauga Lock and Dam is complex. The foundation of the dam embraces a number of geologic groups and sedimentary rock types variably affected by faulting, folding, solutioning, and weathering. Excluding the terrace and alluvial deposits, four geologic groups, which include the Stones River, Lowville, Trenton, and Richmond underlie the structure. The Stones River group is comprised of formations containing fine-grained, argillaceous limestone, calcareous shale, and thin to thick-bedded limestone. The Lowville or Black River group is represented by two distinct rock types. One is a fine-grained, massive-bedded limestone, while the other is a shaley limestone containing beds of bentonite and shale. The Trent group also has two units. The lower Trenton or Hermitage Formation, which comprises most of the foundation for the existing structures, is thick-bedded, fine-grained, argillaceous limestone containing four bentonite beds. A thin-bedded pure limestone makes up the remainder of the group. Thin-bedded to shaley, siliceous, argillaceous limestone and shales along with one bentonite bed make up the Richmond group. Tertiary terrace deposits occur at elevations above the dam's foundation. However, similar deposits of recent alluvial material are located on the floodplains on either side of the river and range in thickness from 45 to 50 feet.

Major thrust faulting occurred 3,250 feet upstream of the dam and represents a 5,000-foot stratigraphic displacement. Thrust and reverse faulting of a lesser magnitude, graben development, folding, and tilted strata

summarize the complicated structural geology of the project site. All areas comprising the foundation have been affected by the compression and contortion generated by the mountain building process. Jointing is extensive and contributed to the dissolution of areas of the extensive limestone foundation. The solution cavities constituted the most serious foundation difficulties during construction of the original structure. Much of the intensive solutioning is associated with fault planes and exhibits a northeast-southwest trend.

A new lock would probably cross a fault plane and lie adjacent to a graben (depression bounded on at least two sides by faults). The original lock structure encountered considerable amounts of badly weathered and decomposed limestone. The same geologic conditions are anticipated for a new lock as is reflected in original investigation for the dam foundation and more recent borings.

4. Land Use

The City of Chattanooga exerts a strong influence on the land use in the vicinity of Chickamauga Lock and Dam. This influence has resulted in extensive development for residential, commercial, and recreational uses to a distance of about 30 river miles upstream of the dam. The upper portion of the reservoir shoreline (upstream of the influence of Chattanooga) is less developed and more rural in nature, dominated by open space, agriculture, and forest. Because of the ridges that parallel the reservoir, access to the shorelines is difficult throughout most of the reservoir area.

5. Terrestrial Environment

The terrestrial environment of the eastern valley of the Tennessee River has been significantly changed by man's activities. The large metropolitan area of Chattanooga and its numerous suburbs occupies much of the land in the study area. Suitable agricultural lands in the valley between the ridges and rolling foothills have long supported subsistence farms and dairy operations. These lands provide the area's small game habitat and where there is sufficient cover, the primary deer habitat. The region was settled early in the history of the State of Tennessee and its early settlers as well as its present day residents exploited its wildlife. Today populations of the popular

game and furbearing species, white-tailed deer and raccoon, are low but recovering somewhat through state restoration efforts. The Appalachian Mountains, which border the area, provide the last remaining black bear habitat in the State of Tennessee as well as range for another unique animal, the European wild hog. The wild hog population spread throughout the southern Appalachians from early release site in the Snow Bird Mountains in Graham County, North Carolina in the late 1700s.

Subdivisions, commercial boat docks, marinas, state and county parks, industrial sites, and private and public recreation areas occupy the shoreline in the lower reaches of Chickamauga Lake. There is an extensive waterfowl refuge in the upper lake at the mouth of Hiwassee River from Hiwassee Island to Highway 58. The upper part of Chickamauga Lake from Hiwassee Island to Watts Bar Dam is more riverine in character and less developed by commercial and residential enterprises.

6. Aquatic Environment

The area's rich aquatic resources include numerous cool water streams flowing with steep gradients southeastward from Walden Ridge and cold water streams and rivers draining northwestward from the interior of the southeastern Appalachian Highlands. The major tributary of the Tennessee River (Chickamauga Lake) is the Hiwassee River.

Chickamauga Lake has a good sport fishery and bass fishing tournaments are often held. The lake supports commercial as well as sport fisheries and at the Watts Bar tailwater in particular has popular sauger and lake rockfish fisheries.

7. Federal and State Endangered or Threatened Species

No populations of federal or state listed plant species or plant species candidates under review for federal or state listing are known to exist on the sites proposed for disturbance. Mountain skullcap (*Scutellaria Montana*), a federally endangered member of the mint family, occupies areas of suitable habitat on the Big Ridge Habitat Protection Area located immediately adjacent to the designated disposal site. This herb requires shade

provided by an intact forest canopy and is especially sensitive to encroachment from weed species when the forest canopy is removed. Individuals of this species are known to occur within 150 feet of the proposed disposal area.

Terrestrial animals listed as federally endangered or threatened, or considered as candidate species for such listing, that have been reported from Hamilton County and the surrounding area include the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*) and Tennessee cave salamander (*Gyrinophilus palleucus*).

State-listed terrestrial species in the area include the red-shouldered hawk (*Buteo lineatus*), common barn-owl (*Tyto alba*), and green salamander (*Aneides aeneus*), all listed as in need of management in Tennessee.

A number of aquatic species, which once occurred in the Chickamauga Dam tailwater, are now on the U. S. Fish and Wildlife Service lists of endangered or threatened wildlife, or are candidates for these lists. These species are listed in Table II-1. This table also includes an indication of whether each of these species still occurs in the tailwater downstream of Chickamauga Dam, in Chickamauga Lake, or the lower Hiwassee River. The recent occurrence determinations are based on the results of surveys made by federal and state agencies and incidental collections made by sport and commercial fishermen.

Table II-1. Federal endangered and threatened species known from the Tennessee River downstream from Chickamauga Dam (TRM 458-471) and within Chickamauga Reservoir (TRM 471-515).

Common Name	Scientific Name	Protect ion Status	Still Present ?	
			Chickama ga Tailwater	Chickama ga Reservoir
Snail Anthony's riversnail	<i>Athearnia anthonyi</i>	LE	N?	N
Mussels fanshell	<i>Cyprogenia stegaria</i>	LE	N?	N
dromedary pearlymussel	<i>Dromus dromas</i>	LE	N?	N
tuberculed blossom	<i>Epioblasma t. torulosa</i>	LE	N	N
cracking pearlymussel	<i>Hemistena lata</i>	LE	N	N
pink mucket	<i>Lampsilis abrupta (= L. orbiculata)</i>	LE	Y	N
ring pink	<i>Obovaria retusa</i>	LE	N	N
white	<i>Plethobasus</i>	LE	N	N
wartyback	<i>cicatricosus</i>			
orange-footed	<i>Plethobasus</i>	LE	N?	N
pimpleback	<i>cooperianus</i>			
rough pigtoe	<i>Pleurobema plenum</i>	LE	N?	N
Fish snail darter	<i>Percina tanasi</i>	LT	Y	N?

Abbreviations:

LE - listed as an endangered species by USFWS.

LT - listed as a threatened species by USFWS.

N - once found in this area but no longer occurs there.

Y - still occurs in this area.

? - this is the likely status; however, insufficient information exists to confirm or refute this opinion.

8. Archaeological, Historical, and Cultural Resources

Within the Chickamauga Dam region, archaeological sites have been documented from the Paleo (ca. 10,000 - 7,500 BC), Archaic (ca. 7,500 - 1,000 BC), Woodland (ca. AD 900 - 1000), and Mississippian (ca. AD 900 - 1450) periods.

During the Proto-historic time, the Cherokee Indians occupied this region; white settlement began in the first quarter of the nineteenth century. An archaeological survey in 1992 determined that project impact areas likely to be impacted by new lock construction were void of intact archaeological deposits. An additional archaeological survey in 1994 of an area proposed for right bank removal between Tennessee River miles 470.1 and 470.8 resulted in the delineation of two archaeological sites, 40HA397 within the first terrace and 40HA398 within the second terrace. Neither site was determined eligible for the National Register of Historic Places.

The Chickamauga Lock and Dam is eligible for listing on the National Register of Historic places. In accordance with the regulations at 36 CFR 800, construction of a new lock adjacent to the existing lock will result in an adverse effect. An adverse effect occurs when an undertaking, in this case the construction of a new lock, alters the characteristics of a historic property that qualify the property for inclusion in the National Register.

Resolution of adverse effects will require consultation with the Tennessee State Historic Preservation Officer (SHPO) to seek ways to avoid, minimize, or mitigate adverse effects. Resolution of adverse effects will likely require researched historical documentation. If agreement between the Federal Government and the Tennessee SHPO on how the adverse effect can be resolved, the resolution will be defined within the stipulations of a Memorandum of Agreement. This work will be initiated after the Chief of Engineers issues his report recommending authorization and construction of a new replacement lock. A copy of the executed Memorandum of Agreement and documentation specified at 36 CFR 800.11(f) will be provided to the Advisory Council on Historic Preservation prior to the final approval of the undertaking. Execution and implementation of the Memorandum of Agreement will complete

the Governments' obligations under section 106 of the National Historic Preservation Act.

9. Natural Resources

The Upper Tennessee River flows along the southeastern edge of the Tennessee coalfields. Barge transfer terminals on this segment of the Tennessee River are within a truck or short rail haul of not only Tennessee's coalfields but also portions of Eastern Kentucky's and Virginia's coalfields, which contain billions of tons of coal reserves. These vast reserves and large production volumes provide the opportunity for coal to be a major commodity shipped on an improved, more cost-effective waterway.

The study area contains 15.1 billion tons of the Appalachian demonstrated coal reserve base, including 12.1 billion tons in Eastern Kentucky, 2.2 billion tons in Virginia, and about 0.8 billion tons in Tennessee. (Coal reserve data obtained from Energy Information Administration, Demonstrated Reserve Base of U.S. Coal (1997 update); U.S. Bureau of Mines, The Reserve Base of U.S. Coals by Sulfur Content (1975)). The demonstrated reserve base, or DRB, refers to coal deposits where accurate estimates of the deposit's thickness, rank, quality, and quantity were made to estimate mineable in-place coal. Estimates of demonstrated reserves are based on sample analyses and measurements (measured reserves) as well as geological projections (indicated reserves). Over 75 percent of these reserves would currently require underground methods for extraction. The characteristics of the study area coals reflect some of the best quality Appalachian coals - high BTU, low sulfur, and low ash. High quality coals for both steam and metallurgical purposes are available from all three-study area sub areas - Eastern Kentucky, Virginia, and Tennessee. Study area counties with the largest demonstrated reserves, however, are located over 50 miles from the Tennessee River, requiring a long rail or truck haul to barge transportation facilities.

Only about 15 percent of the study area land is devoted to farmland because the topography, climate, and soils. Farming activities are concentrated in animal husbandry and associated fodder crops. The study area produces less than 3 percent of the nation's total corn

production and less than 1 percent of the nation's total soybean production. The study area's grain production helps support area livestock and poultry activities but is in no way large enough to meet feed requirements. Poultry and livestock consume 6.4 million more bushels of corn and 11.5 million more bushels of soybeans than are produced by area farmers. Thus, grains are brought into the region mainly from the Midwest. Three of the five major grain processors in the study area built facilities on the Tennessee River to enable barge transport of grain into the area and export of animal feeds to New Orleans. The annual total grain demand of the region is about 2.5 million tons.

Forests cover seventy percent of the study area's land. Timber production, such as lumber and pulpwood, is the major contribution from the forests. The area's predominate trees are hardwood of the oak and hickory families. Hardwoods outnumber softwoods, such as pines, by a margin of three to one. Hardwoods are generally used for furniture, shipping pallets, flooring, and railroad ties, while the softwoods are used for commercial purposes such as lumber for construction and pulpwood for paper and fibers.

Regionally produced hardwood lumber is used as construction material and is much sought after in furniture grades. Grade 1 furniture lumber is increasingly shipped in containers to ensure freedom from pests and to offer greater protection from damage. Experience to date suggests that container shipments appear best suited for truck and rail line-haul handling. At any rate, the quantities involved are relatively small with domestic destinations being widely dispersed and shipments being small and infrequent.

The term pulpwood is descriptive of this wood product's primary market and denotes a low grade, low value wood relative to that used for lumber. Both hardwoods and softwoods are used as pulpwood, though softwoods are the dominant variety used. In addition, to its use as a raw material in papermaking, pulpwood is also used in the manufacture of textile fibers and as poles and pilings.

Another natural resource in the upper Tennessee River area is zinc. Two firms operate 6 zinc mines and 5 processing mills in east Tennessee. Zinc, which has been mined in the area since the 1850's, is taken from

underground deposits laced throughout thick deposits of limestone. Zinc mining in the area is the longest continuous zinc mining operation in North America. The relatively low-grade ores (3 percent zinc) are crushed at the mine site and then transported to neighboring mills for further processing to a 75 percent concentrate. It is this concentrate, which is moved to zinc smelters for manufacture of zinc or to processing plants for the manufacture of zinc oxides. While the exact quantity of zinc ore reserves in the study area is unknown, knowledgeable people in the area feel that existing reserves will support present mining levels for many years.

10. Recreational Resources

Chickamauga and Nickajack Lakes are important recreational resources to the nearby metropolitan area's more than 400,000 residents. Projections for Hamilton and Marion Counties indicate the population base will increase 24.7 percent by 2035. The economic value of recreation development on Chickamauga is estimated to be the second highest in the Tennessee River system, and Chickamauga ranks third in system-wide reservoir visitation.

The two lakes and adjoining land provide over 100 public, commercial, and quasipublic recreation areas with over 30,000 acres of land committed to recreation use. Chickamauga has the greater number of recreation areas, while Nickajack has the larger amount of acreage. The urban population significantly influences water-related recreation activities.

The two lakes' 18 marinas typically experience occupancy rates in excess of 95 percent during the recreation season, and several maintain waiting lists for wet and dry slips. Boating access is distributed through 64 developed public and commercial boat access areas. Local governments have completed the first phase of 22 miles of planned riverfront development in Hamilton County. The Tennessee Aquarium, which opened in 1992, surpassed its projected annual visitation of 650,000 in the first four months.

Several heavily used recreation areas are located in the immediate vicinity of Chickamauga Dam. The North Chickamauga Creek Greenway, Tennessee Riverpark, and TVA Chickamauga Dam Lake recreation and natural areas offer a

variety of day use and water-related opportunities. The recreation areas on the Chickamauga Dam Reservation receive the highest use of any in the TVA system.

The City of Chattanooga, Hamilton County, and local organizations are capitalizing on the Chattanooga riverfront developments on Nickajack Lake by conducting successful special events that are drawing large numbers of people. The two most successful events, the Riverbend Festival (June) and Annual Fall Color Cruise and Folk Festival (October), attract large numbers of participants and contribute significantly to the high recreation use of Chickamauga Lock during the events. Riverbend Festival had 89,000 paid admissions in 1992, and event sponsors estimate admission sales produced 500,000 visits. The Annual Fall Color Cruise has grown from 10,000 visitors in 1973 to 150,000 visitors during its two-weekend period in 1991. In addition, Christmas on the River (December) is experiencing increased local interest.

11. Regional Transportation System

a. Waterways. The Tennessee River provides the study area shippers with direct access to the Tennessee-Tombigbee Waterway, the Cumberland River, and Ohio River. These waterways link the study area with the Upper Ohio River Basin, the entire mid-west, the Gulf Coast, and the Lower Mississippi River Valley. Gulf Coast ports at Mobile and New Orleans offers the study area access to vessels bound for Florida and export markets. Actual access to waterway transportation is limited to a great extent by the design and nature of waterway terminals in the study area. River terminals and docks in this area are essentially private, single-purpose, and single-user facilities that provide a narrow range of services directly relating to the needs of individual firms. They are not designed or equipped for extensive use by the public.

A total of 29 river docks and terminals are located along the Upper Tennessee and the navigable reaches of the Hiwassee River, Soddy Creek, Piney River, King Creek, Clinch River, Emory River, Little Tennessee River, Little River, and the French Broad River. These terminals are listed in Table II-2. The most active terminals are directly related to river sited manufacturing operations, the most important being Olin Chemical, Bowaters Southern

Paper, Diamond Crystal Salt, and A. E. Staley. Only three Upper Tennessee Terminals are not served by either CSX or Norfolk Southern railways. A number of towing companies used to operate on the navigable reaches of the Upper Tennessee River, however, this number has been reduced to only a few.

b. Railroads. Eastern Tennessee has historically enjoyed good rail service. Chattanooga developed as an early junction for northern and southern rail systems in the 19th Century. It continues as an important hub, which spins rail traffic southeast through Atlanta, southwest to Mobile, west through Nashville, and east to Norfolk. The major northeastern lines out of Chattanooga split at Knoxville, one fork heading due north to Cincinnati and the Ohio Valley, and the other fork continuing in a northeasterly direction toward Norfolk, Virginia.

Rail service in the study area is provided by two major railroads - CSX and Norfolk Southern. CSX trains move along the old Chessie, Seaboard, Louisville and Nashville, and Clinchfield railroad lines. Norfolk Southern traffic moves on the Southern Railway System lines in Tennessee and North Carolina and Norfolk Western Railway lines in Kentucky and Virginia.

Both companies rely heavily on coal traffic for freight revenues. In 1985, coal traffic amounted to 30 and 21 percent of total freight traffic origination on the CSX and Norfolk Southern railroads, respectively. Rail coverage in the study area reflects the revenue base of these railroads with rail concentration being heaviest in the study area's coalfields in Tennessee, Kentucky, and Virginia. Eastern and southeastern power plants sourcing coal in the study area are serviced by Norfolk Southern and Midwestern plants by CSX. Both railways link the study area's coalfields Charleston, South Carolina; Morehead City, North Carolina; Savannah, Georgia; and Mobile, Alabama.

Access to these ocean ports also allows study area companies to import foreign goods. Fertilizers, petroleum products, and manufactured products gain entry to the U.S. at these ports and are moved by rail to inland locations including the study area. These ports are also used for exporting study area lumber and a variety of manufactured

Table II-2 - Upper Tennessee River Waterway Terminals

TENNESSEE RIVER TERMINALS				
Terminal Name	Mile, City, State	Use	Commodities	Rail
US Coast Guard	472.0L Chattanooga, TN	Private	Services	None
Volunteer Army	472.9L Chattanooga, TN	Private	(Inactive)	None
Sequoyah Nuclear Plant	484.5R Soddy Daisy, TN	Private	Equipment	TVA
Watts Bar Steam Plant	529.1R Watts Bar, TN	Private	Coal	TVA
A.E. Staley Mfg.	592.6R Loudon, TN	Public	Grain	NS
Ft. Loudon Terminal	600.2R Lenoir City, TN	Public	Miscellaneous	NS
Signal Mountain	646.0R Knoxville, TN	Private	(Inactive)	NS & CSX
American Limestone	646.1R Knoxville, TN	Private	Sand & Stone	NS & CSX
American Limestone	647.0L Knoxville, TN	Private	Sand & Stone	NS
Southern States Asphalt	648.0L Knoxville, TN	Private	Asphalt	NS
Star Enterprise	648.1L Knoxville, TN	Private	Petroleum	NS
R.L. Conley & Co.	648.3L Knoxville, TN	Private	(Inactive)	NS
White Lily Foods	648.5R Knoxville, TN	Private	Grain	NS
UNOCAL Corps.	649.0L Knoxville, TN	Private	Petroleum	NS
Volunteer Asphalt	651.5L Knoxville, TN	Private	Asphalt	NS
SODDY CREEK TERMINALS				
Terminal Name	Mile, City, State	Use	Commodities	Rail
Bowater, Inc. Southern Div.	1.0L Soddy, TN	Public	Pulpwood	None
HIWASSEE RIVER TERMINALS				
Terminal Name	Mile, City, State	Use	Commodities	Rail
Olin Corporation	16.9L Charleston, TN	Private	Chemical	NS
AKZO Salt, Inc.	17.2L Charleston, TN	Private	Salt	NS
Bowater	18.0R Charleston, TN	Private	Pulpwood/Paper	CSX
PINEY RIVER TERMINALS				
Terminal Name	Mile, City, State	Use	Commodities	Rail
Bowater	5.0L Calhoun, TN	Private	Pulpwood	None
FRENCH BROAD RIVER TERMINALS				
Terminal Name	Mile, City, State	Use	Commodities	Rail
Burkhart Enterprises	0.5R Knoxville, TN	Public	Limestone	NS
Burkhart Enterprises	0.8R Knoxville, TN	Public	Miscellaneous	NS
EMORY RIVER TERMINALS				
Terminal Name	Mile, City, State	Use	Commodities	Rail
Bowater	10.6L Calhoun, TN	Private	Pulpwood	NS & CSX
Harbert	11.1L Harriman, TN	Private	Coal	NS & CSX
Clinch River Corp.	11.4L Harriman, TN	Private	(Inactive)	NS & CSX
LITTLE TENNESSEE RIVER				
Terminal Name	Mile, City, State	Use	Commodities	Rail
Tellico Public Use Terminal	18.8L Knoxville, TN	Public	(Inactive)	None
CLINCH RIVER TERMINALS				
Terminal Name	Mile, City, State	Use	Commodities	Rail
US Department of Energy	14.1R Kingston, TN	Private	(Inactive)	None
Bull Run Steam Plant	47.6L Knoxville, TN	Private	Coal	CSX
Eagle Bend Mfg.	61.5R Clinton, TN	Private	(Inactive)	NS
Source: Tennessee River Navigation Charts, January 2000				

products in containers; the port of Savannah is the most important container port for study area manufactures.

c. Highways. The study area is served by an excellent system of State and Federal arterial highways. The Federal highways include both interstate and U.S. highways. With regard to coal transportation, the study area's highways are used primarily for short-haul movements from mines to local power plants or, more importantly, to points of modal transfer. Timber also moves short distances along the study area highways, generally to sawmills. Much of manufactured product of the study area moves over the highway system as well.

All but the north central portion of the study area is well served by the interstate highway system. Knoxville and Chattanooga are points of convergence for three interstate highways and Asheville, North Carolina for two. Completion of the Interstate system and upgrading of the U.S. highways in this area have enhanced the competitive position of the trucking industry, thus increasing competition between the railroads and trucking companies.

The study area is served by one major north-south highway (I-75) that links area counties to the Ohio Valley on the north and to Atlanta and the Atlantic ports at Savannah, Georgia and Jacksonville, Florida on the south. In addition, I-81 out of Knoxville provides a route to the northeast and I-59 out of Chattanooga provides a route to New Orleans. Nashville is linked with Chattanooga by I-24 and with Knoxville by I-40. Interstate 40 also provides Knoxville and Asheville with access to the Carolinas and the ocean port at Charleston, South Carolina.

Secondary highways provide access to area coalfields, especially in Tennessee and Kentucky. Coal is transported by truck directly to power plants, industrial users, rail tipples, and to a lesser extent barge terminals. The typical net capacity of coal trailers is 22 tons. The use of trucks is generally advantageous for mines with relatively small production or for mines or plants lacking railway siding access.

Trucks are also ideally suited for the primary timber industry of the study area. The network of secondary highways serves sawmills as a way of bringing timber in from the forest for cutting into rough lumber or for

chipping into woodchips. Trucks are also used from moving lumber and various rough products to finishing mills, furniture manufacturers, pulp mills, and other industrial users.

d. Pipelines - There are no petroleum refineries in the study area. Requirements are supplied by truck and rail shipment from coastal terminals, from Mississippi and Ohio Valley refineries, and by product pipeline. Product pipeline shipments dominate the movement of light petroleum products. Plantation and Colonial pipelines serve terminals in both Chattanooga and Knoxville. These pipelines and their products originate along the lower Mississippi Valley and Gulf Coast.