# PRIOR STUDIES, REPORTS, AND EXISTING WATER PROJECTS

## FEDERAL

The following is a description of those studies, reports, and existing water resources projects that are pertinent to this study.

• **Mississippi River, Baton Rouge to the Gulf of Mexico, Louisiana.** Numerous studies have been made by the Corps of Engineers concerning deep-draft navigation on the lower Mississippi River below Baton Rouge, Louisiana. These studies have been going on intermittently for well over 100 years. The early studies were concerned with providing deep-draft access at the mouth of the river. In 1875, a depth of 26 feet was considered adequate, and dredging to attain this depth was needed only in rapidly shoaling South Pass. As depths required for navigation increased over the years, studies were authorized by Congress to determine the feasibility of providing an access channel with these greater depths. Soon after the turn of the century, an adequate depth for navigation to the Port of New Orleans was considered to be 35 feet via Southwest Pass. Dredging to maintain this depth was required between Cubits Gap and Head of Passes as well. A few decades later, Corps of Engineers studies established the need for a 35-foot deep channel of various widths from Baton Rouge down through Southwest Pass. Ship sizes continued to increase due to the economics of scale, and the need for a corresponding increase in channel size became evident. Just prior to 1940, navigation studies and the subsequent report resulted in the authorization by the River and Harbor Act of 1945 of a single project which combined several existing deep-draft projects on the river and modified them to provide the following channel dimensions:

| Reach | Dimensions |
|---|---|
| Baton Rouge to New Orleans | 35' x 500' |
| Port of New Orleans | 35' x 1500’ |
| Port of New Orleans to Head of Passes | 40' x 1000’ |
| Southwest Pass | 40' x 800' |
| Southwest Pass Bar Channel | 40' x 600' |
| South Pass | 30' x 450' |
| South Pass Bar Channel | 30' x 600' |

The River and Harbor Act of 1962 provided for deepening the river from New Orleans to Baton Rouge to 40 feet and further provided for the 40' x 500' channel within the 35' x 1500' channel in the Port of New Orleans.

A feasibility report, "Deep-Draft Access to the Ports of New Orleans and Baton Rouge, Louisiana" containing a recommendation

to deepen the Mississippi River's navigation channel to a 55-foot depth from Baton Rouge to the Gulf of Mexico, was prepared in 1984. The project was authorized for construction by the 1985 Supplemental Appropriations Act. The Water Resources Development Act of 1986 (PL 99-662) provided additional authorization by formalizing the cost-sharing provisions of the project. This act permits the local sponsor to enact user fees to defray their portion of the project costs and implements harbor maintenance fees to help pay the Federal cost of the project. The State of Louisiana, the local sponsor, requested implementation of this project in phases to spread out their financial burden. A 45-foot channel from the Gulf of Mexico to river mile 181 near Donaldsonville, Louisiana, was completed in December 1988, and from mile 181 to Baton Rouge in December 1994. Construction of the remainder of the project is pending further detailed studies of various depths and reaches.

• **Mississippi River-Gulf Outlet.** House Document No. 245, 82nd Congress, 1st Session, dated 25 September 1951, resulted in authorization of the Mississippi River Gulf Outlet (MR-GO) project by the River and Harbor Act of 1956 (PL 84-455). The MR-GO is a tidewater ship channel 36 feet deep and 500 feet wide, extending from the Gulf of Mexico through Breton Sound to a junction with the Gulf Intracoastal Waterway (GIWW) immediately west of Lake Borgne. The MR-GO was constructed to provide deep draft navigation access to the tidewater port area located adjacent to the Inner Harbor Navigation Canal (IHNC) close to its junction with the Mississippi River. Access from this tidewater port area to the Mississippi River is through the IHNC Lock. Port officials desired the development of this deep water entrance channel for the purpose of providing additional area based on the premise that land located along the Mississippi River would not be sufficient to satisfy demand. National defense was also an issue during the development of this project. This project was placed into service in the mid-1960's. The project authorization also provides for a new lock and connecting channel between the Mississippi River and the new ship channel when economically justified by obsolescence of the existing lock.

• **Gulf Intracoastal Waterway Between Apalachee Bay, Florida, and the Mexican Border.** House Document No. 96, 79th Congress, 1st Session, submitted 29 February 1942, provides the basis for the existing project on the GIWW east of New Orleans. The IHNC and lock initially served as a toll link in the GIWW from Mobile, Alabama to New Orleans, Louisiana (via the Rigolets and Lake Pontchartrain) until enlargement of the waterway was authorized by the River and Harbor Act of 23 July 1942. Under this authorization, the GIWW was rerouted and enlarged to provide a 12- by 125-foot land-locked channel east of Lake Pontchartrain from the IHNC to the mouth of the Rigolets. The Act of 23 July

1942 also authorized acquisition of control, from the Board of Commissioners for the Port of New Orleans by the Corps of Engineers, of that part of the IHNC between the Mississippi River and the point where the GIWW turns eastward towards Mobile, a distance of about 225 miles; control of the lock, the lock forebay, and the St. Claude Avenue and Florida Avenue bridges was also transferred to the Corps. After acquisition of control by the Corps and completion of the enlargement and rerouting of the GIWW, tolls were no longer required of vessels traveling to and from points east of the Mississippi River on the GIWW. The IHNC lock now serves as the only connection for traffic using the MR-GO, the GIWW from Mobile, Alabama, to New Orleans, Louisiana, docks along the IHNC, and traffic to and from Lake Pontchartrain.

There are five locks on the GIWW mainstem going west from the Mississippi River. They are Algiers, Harvey, Bayou Boeuf, Leland Bowman and Calcasieu, with Bayou Sorrel and Port Allen on the GIWW Morgan City-Port Allen Alternate Route. The River and Harbor Act of 1962, and numerous prior river and harbor acts, provides for the following improvements in the area: a 16- by 150- foot channel between the Mississippi River and Atchafalaya River via a lock through the west Mississippi River levee at mile 98 Above Head of Passes (AHP) at Harvey, Louisiana; an alternate 16- by 150-foot channel connecting the above channel and the Mississippi River in Algiers, Louisiana; a 12- by 125-foot channel connecting the Gulf Intracoastal Waterway at Morgan City, Louisiana, and the Mississippi River at Port Allen, Louisiana, via a lock through the levee at Mississippi River mile 228 AHP; a 12- by 150-foot channel between the Rigolets (between Lakes Borgne and Pontchartrain) and the Mississippi River via a portion of the Inner Harbor Navigation Canal and lock at mile 93 AHP; and annual payments to the Board of Commissioners of the Port of New Orleans for use of a portion of the Inner Harbor Navigation Canal and for use of the lock. In 1986, the Federal government acquired the lock from the Port of New Orleans. The Industrial Canal (IHNC), from the Mississippi River to the MR-GO is also an integral part of the Gulf Intracoastal Waterway.

• **Mississippi River and Tributaries.** House Document No. 90, 70th Congress, 1st Session, submitted 8 December 1927, is the basis for the Flood Control, Mississippi River and Tributaries project adopted by the Flood Control Act of 15 May 1928 (PL 70-391), as amended. This project provides a comprehensive plan for flood control on the lower Mississippi River below Cape Girardeau, Missouri. It includes levees as the backbone of the system and covers over 2,000 miles along the Mississippi River and principal tributaries. The purpose is to confine floodwaters to the main channel and designated floodways. The Mississippi River Levees (MRL) feature provides the first line of defense against riverine flooding in South Louisiana. These levees have protected populated areas such as New Orleans, industrial plants,

and people living in the area from annual high water in the river. Any new or replacement lock project will require modification of the existing levees to tie into the new lock structure to maintain the integrity of the protection and prevent riverine flooding.

• **Mississippi River Outlets, Venice, Louisiana**. The report "Mississippi River for Additional Navigation Outlets in the Vicinity of Venice, Louisiana," published as House Document 361, 90th Congress, resulted in the authorization by the River and Harbor and Flood Control Act of 1968 (PL 90-483) of additional navigational outlets from the Mississippi River in the vicinity of Venice, Louisiana, by enlargement of the existing channels of Baptiste Collette Bayou and Grand-Tigre Passes to provide channels 14 feet deep over a bottom width of 150 feet, with entrance channels in open water 16 feet deep over a bottom width of 250 feet. Jetties were authorized to the -6 foot contour to reduce the cost of maintenance dredging. Channel construction was completed in 1978 and jetty construction completed in 1979.

• **Lake Pontchartrain and Vicinity, Louisiana, Hurricane Protection Project.** This project was authorized by Section 204 of the Flood Control Act of 1965 (Public Law 89-298 as amended) and currently provides for enlargement of hurricane protection levees along Lake Pontchartrain in Orleans, Jefferson, and St. Charles Parishes and the Chalmette area which includes portions of Orleans and St. Bernard Parishes between the Mississippi River and the Mississippi River-Gulf Outlet. The lock project will involve reconstruction of a portion of the protection and/or tying the hurricane protection back to the new lock in order to maintain the integrity of the hurricane protection system.

• **Inner Harbor Navigation Canal (IHNC).** The IHNC and lock were built by the Board of Commissioners for the Port of New Orleans during the late 1910's and early 1920's and placed into service in May 1923. Located at Mile 92.6 AHP, it originally connected only Lake Pontchartrain with the Mississippi River. The development of the canal, subsequent to the lock, provides approximately eleven miles of additional waterfront to the Port of New Orleans. The canal originally operated as a toll facility and was designed to permit navigation between the Mississippi River and Lake Pontchartrain. The dimensions of the canal were 200 feet wide and 20 feet deep with approximately 1,000 feet of land on each side of the canal to be used for port and industrial development. The lock, a reinforced concrete "U" shaped chamber having gate bays at the river and canal ends, was built to dimensions of 640 by 75 by 31.5 feet (Mean Low Gulf). The gate bays on the river end have two sets of miter gates, one set for normal water levels and flow, and another set for water flow from the opposite direction (reverse head) when the canal water level

is higher than the river water level. The gate bay on the canal end has three sets of gates, two sets for normal flow and one set for reverse head flow conditions. The second set of normal flow gates permit operation of the lock if the other set is accidentally damaged. Currently, the land on both sides of the canal is fully developed and devoted to industrial/port use. During World War II, the Federal government rerouted the GIWW so that the IHNC lock connected the eastern and western sections of the GIWW, creating a more direct route to locations on the eastern gulf coast. Concurrent with the relocation of the GIWW-east, the Federal government leased the IHNC lock and assumed its maintenance and operation. In 1956, Congress authorized the construction of the MR-GO to provide a tidewater channel to new harbor facilities that would supplement the existing port facilities as well as provide an alternate route to the Gulf of Mexico for oceangoing vessels. Intersecting the IHNC about 2.1 miles north of its intersection with the Mississippi River, the MR-GO was completed in 1967 with project dimensions of 500 feet by 36 feet deep. The lock was subsequently acquired in 1986.

**Intracoastal Waterway Locks, Louisiana Study.** The purpose of this study is to address the feasibility of increasing the capacity of the locks on the GIWW system west of the Mississippi River. Seven locks are included in the study area including the Algiers, Harvey, Bayou Boeuf, Leland Bowman, Calcasieu, Port Allen, and Bayou Sorrel. The preliminary results of the reconnaissance study indicate that the most immediate needs for capacity increases are at Bayou Sorrel and Calcasieu Locks. There is also a future need for capacity increases at Port Allen and Algiers Locks. The Project Study Plan for the feasibility study was submitted in April 1995 for approval and certification by higher authority.

**OTHER**

- **Strategic Plan, Port of New Orleans.** The plan was prepared in 1986. The three objectives of the plan included assessing the nature and consequences of environmental change, providing strategic direction for the port and its complementary institutions, and serving as basis for commitment and implementation. The plan serves as a master plan for the future development of the port to take the port into the 21st Century. It identified the facility development and improvements that are desired and required in the near term future (end of the century). Improvements identified were geared to keeping the Port of New Orleans competitive in the world market. The plan included a capital improvement program estimated at close to $200,000,000. Improvements identified include redevelopment of three major terminals, development of the Tchoupitoulas Corridor

(a major street improvement changing a two-lane street into a four-lane divided thoroughfare that will better accommodate truck traffic serving the river port area), and improvements to facilities along the IHNC and the MR-GO.

- **Progress Report on Tidewater Port Area.** This report, prepared in February 1993 by the Board of Commissioners for the Port of New Orleans, focuses on the current status of port facility development in the tidewater area and the development of the Almonaster-Michoud Industrial District. It describes current facilities and conditions and identifies future growth that is expected to occur.

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# PLAN FORMULATION

## INTRODUCTION

This section includes a description of current and projected future conditions pertinent to the study; a description of the problems, needs, and opportunities identified in the study; and a presentation on the development, evaluation, and screening of alternative plans to address the problems, needs,

## EXISTING CONDITIONS

Existing conditions pertinent to this study are those related to navigation between the Mississippi River at New Orleans, Louisiana, and the Gulf Intracoastal Waterway (GIWW) and the Mississippi River-Gulf Outlet (MR-GO) east of the river, and those related to the impacts of alternative plans developed to address the problems, needs, and opportunities identified in the study.

The Mississippi River provides deep-draft navigation access to the Port of New Orleans and upstream to the Port of Baton Rouge. The river and its tributaries also comprise a major inland waterway system which links the hinterland of the nation with other world ports via the deep-draft channel on the lower river. The Gulf Intracoastal Waterway extends from Brownsville, Texas, to Apalachicola, Florida; the main stem of the GIWW crosses the Mississippi River in New Orleans, Louisiana. Shallow-draft traffic moving between the Mississippi River and the GIWW east of the river, and GIWW traffic crossing the river must navigate the Inner Harbor Navigation Canal Lock and a 2 mile reach of the Inner Harbor Navigation Canal, which are features of the GIWW project. The Inner Harbor Navigation Canal extends a distance of approximately 3 miles from the GIWW to Lake Pontchartrain. The reach between the GIWW and the lake is a non-Federal channel which is maintained by the Port of New Orleans.

The Mississippi River-Gulf Outlet provides deep-draft access to a tidewater area of the Port of New Orleans, east of the Mississippi River. It extends from the Gulf of Mexico via a 76-mile land and water cut east of the Mississippi River to the IHNC in New Orleans. The MR-GO and GIWW share a 6-mile reach of channel extending eastward from the IHNC.

**Study Area.** The study area is located in Orleans, St. Bernard, and Plaquemines Parishes in southeastern Louisiana. The area is generally bounded by Lake Pontchartrain on the north, the Mississippi River on the south and west, and Lake Borgne, Breton Sound and the Gulf of Mexico on the east and south. (See Plate 1). The study area includes part of the city of New Orleans, Louisiana, which is coextensive with Orleans Parish, and the city of Chalmette, Louisiana, and the town of Pointe a la Hache, Louisiana, in Plaquemines Parish. The area potentially affected by changes in vessel traffic includes the navigation channels and related land areas in the study area and in the inland waterway system on the GIWW and the Mississippi River.

**Terrain.** The study area is generally of low relief and characteristic of an alluvial plain. The most prominent topographic features of the study area are the natural levees along the Mississippi River and its abandoned courses and distributaries. These levees form ridges which range from a width of about 5 miles and an elevation of 10 feet NGVD near the IHNC in New Orleans to narrow strips less than 1-foot NGVD near the Gulf of Mexico. The troughs between the ridges are comprised of marsh, swamp, bays, and lakes. Mississippi River flows are confined by a system of levees sloping gulfward from an elevation of approximately 22.5 feet NGVD at the IHNC in New Orleans.

The area between the Mississippi River and Lake Pontchartrain in New Orleans, the area generally between the Mississippi River and the MR-GO in St. Bernard Parish, and a strip of land east of the Mississippi River between Caernarvon and Pointe a la Hache are enclosed by levees with pumped drainage. The levees were constructed to protect developed areas from tidal flows and to convert wetlands for development. The dewatering of the organic soils in the areas located away from the alluvial ridges has resulted in the compaction and subsidence with resultant elevations as low as -10 feet NGVD.

**Development and Economy.** Due to its location near the mouth of the Mississippi River, New Orleans is the natural gateway to the entire Mississippi Valley. The economy of the area has traditionally been based on oil and gas production, manufacturing, agricultural production, and trade. More recently, tourism has become one of the principal industries. Waterborne commerce is of major importance to the Greater New Orleans area and the State of Louisiana. Louisiana has the greatest number of waterway miles (over 2,000) maintained by the Federal government. The Port of New Orleans, coupled with the Port of South Louisiana (just upstream), constitutes the

world's largest grain port. More than 4,000 ships call at its docks each year. The Port, along with the industrial developments along the Mississippi River between the Head of Passes and Baton Rouge, serves as a trans-shipment terminal for shallow-draft commerce utilizing the vast network of inland waterways formed by the river, its tributaries, and connecting streams. At any given time, approximately one of every four barges in the United States is in the New Orleans area. Within the Port of New Orleans, facilities are spread over three waterways: the Mississippi River, the IHNC, and the MR-GO. The Port of New Orleans estimates that about 17,000 people work in port services or facilities.

The Port of New Orleans has been a dominant factor in the economy of the area and that of the state as a whole, adding millions of dollars annually to the state's treasury and providing thousands of jobs through the many services needed to carry on domestic and foreign trade. It is also the nation's largest shallow-draft port. Simply put, inland ports ship cargo by barge to New Orleans for export, and imports are loaded onto barges for distribution throughout the area serviced by the inland waterway system. There are about 40 agencies representing over 100 steamship lines offering regular and frequent sailings between New Orleans and ports throughout the world. Fifty linear miles of docking facilities are located along both banks of the Mississippi River in the vicinity.

The Inner Harbor Navigation Canal (IHNC) and Lock were initially constructed by the Board of Commissioners of the Port of New Orleans in response to the need for more port areas to handle increased water traffic. The canal was originally built to dimensions of 20-feet x 200-feet, with 1,000 feet of land on each side to be used for port and industrial development. The lock was built to dimensions of 640-feet x 75-feet x 31.5-feet and was later purchased by the Federal government.

The Port of New Orleans continued to grow in the three decades following construction of the IHNC, and the lock began to experience congestion. As a result, Congress authorized the construction of the MR-GO to provide a tidewater channel to provide additional harbor facilities as well as an alternate route to the Gulf of Mexico for oceangoing vessels. This route to the Gulf is about 50 miles shorter than the route via the Mississippi River. The MR-GO allowed the port to compete for container business, which it would not have been able to do without the tidewater channel. The Almonaster-Michoud Industrial District (A-MID) has been the subject of intense planning to develop 7,000 acres of industrial land adjacent to the Jourdan Road Terminal on the north bank of the MR-GO in the tidewater port area. A-MID is completely within the city of New Orleans and is the only industrial land of its size left in the United States that close to the central business district

(downtown) served by water, rail, highway and air, and large enough where free trade zones and other industrial activities can be established. Industry currently operating in the A-MID include heavy industrial and deep port users, public port facilities, process industries, fabrication and assembly, light industrial and high technology plants, and trucking terminals. Approximately 105 companies employing 9,175 people operate in A-MID

Other significant economic activities in the area include shipbuilding, banking and finance, retail and wholesale commerce, service functions, commercial and sport fishing, and tourism. More recently, land-based and riverboat gambling have become important to the area's economy.

**Population and Employment.** The primary sites evaluated for the lock replacement project were in Orleans and St. Bernard Parishes. According to the US Census, between 1980 and 1990, the population of Orleans Parish (the City of New Orleans) declined from 551,927 to 496,938. During that same period, St. Bernard Parish has experienced a slight growth in population from 64,097 to 66,631. Average income in both parishes increased during the period from 1980 to 1990. Unemployment in these two parishes between 1980 and 1990 remained constant at 6.0 % in Orleans and 7.2 % in St. Bernard. There was a total of 208,900 people employed in Orleans Parish in 1990, down from 233,800 in 1980. The number of residents employed in St. Bernard Parish increased from 26,900 in 1980 to 28,500 in 1990.

**Climate.** The climate of the New Orleans area is subtropical marine and is influenced to a large degree by the many water surfaces provided by lakes, rivers, bayous, and by proximity to the Gulf of Mexico. Throughout the year, these water areas modify the relative humidity and temperature conditions, decreasing the range between extremes; when southern winds prevail, these effects are increased, imparting the characteristics of a marine climate. The winter months are mild. From about mid-November to mid-March, the area is subjected to tropical and cold continental air in periods of varying length. About 80 % of the December-February hourly temperatures range from about $51^{o}$ to $60^{o}$ (F). Rainfall is heavy during this period. The annual normal precipitation for New Orleans (Citrus Station) is 58.22 inches. Snowfall amounts are insignificant. During mid-June to mid-September, the prevailing southeast to southwesterly winds carry inland warm, moist air which is favorable for sporadic development of thunderstorms. In the New Orleans area, these showers tend to keep the temperatures from rising much above $90^{o}$ F. The

monthly mean temperatures vary from 53$^{o}$ to 83$^{o}$ F. The record high temperature of 102$^{o}$ F occurred in August 1980 at New Orleans. The record low temperature of 11$^{o}$ occurred in December 1989 at New Orleans.

Visibility. River fog forms when warm, moisture-laden air moves over the relatively cold waters of the Mississippi River during the winter and spring. The potential for widespread river fog is greatest in the river and adjacent wetlands. River fog is uncommon from May to November.

Extremes. While lightning usually accompanies summer showers, thunderstorms with damaging winds are relatively infrequent. Until recently, the greatest 24-hour amount of precipitation since 1871 was 14.01 inches on 15-16 April 1927. On May 8-9, 1995, new records were established throughout the metropolitan area, with amounts up to about 20 inches being recorded in a twenty-four hour period. Hail of a damaging nature seldom occurs, and tornadoes are infrequent. Since 1893, a total of 49 tropical storms has either struck or affected the coastal area of Grand Isle to the Louisiana-Mississippi state line. The maximum observed winds at landfall came from Hurricane Camille (14-22 August 1969) and measured 160 mph near the center with gusts to 190 mph. In 1965, Hurricane Betsy brought destructive winds to the New Orleans metropolitan area and over 50 deaths from drowning. An extreme wind of 125 mph from the east was estimated atop the Federal Building in New Orleans. Hurricane Florence (1988) was the last major storm to cross the study area.

**Water Levels.** Water levels for each of the major water bodies in the study area are discussed below.

Mississippi River. The Mississippi River discharges the headwater flows from about 43 % of the contiguous 48 states and water levels on the Mississippi River fluctuate with seasonal flood discharges, ranging approximately 20 feet in the Port of New Orleans. The river is subject to infrequent hurricane generated wind tide levels of extreme range.

The Mississippi River, at the entrance to the IHNC Lock, is approximately 0.5 of a mile wide and flows in a southeasterly direction. Stages in the river at the IHNC have ranged from a maximum of 17.52 NGVD feet on March 4, 1950 due to high discharges to -0.48 feet NGVD on January 4, 1954. The mean stage is 6.42’ NGVD. The Mississippi River levees at the IHNC lock have a crest elevation of 22.6 feet. The height of the Mississippi River levees at the Violet site, the site considered in our early evaluations, is 20.5 feet, including freeboard. Major floods have occurred on the Mississippi River in 1912, 1922, 1927, 1937, 1945, 1950, 1973, 1974, 1975, and 1983.

Velocities in the river range from 1-foot per second at low stages to 9 feet per second at high stages. During periods of high discharge, fast currents and eddies can create hazards to navigation.

IHNC. The mean stage of the IHNC on the northeast side of the lock is 1.37' NGVD. The maximum stage at the IHNC lock of 10.65' NGVD occurred on September 10, 1965 during Hurricane Betsy, and the lowest stage of -2.00' NGVD occurred on April 12, 1988.

Mississippi River-Gulf Outlet. The MR-GO carries flows to the Gulf of Mexico from Lake Pontchartrain via the IHNC and flows in a southeasterly direction. Water levels in the MR-GO are influenced by Gulf tides which range only a few feet.

Gulf of Mexico. Relative sea level rise (which results primarily from land subsidence, from other geologic activity, and possibly from global sea level rise) must be considered in designing any new lock. Southeast Louisiana has been subsiding at a rate of 2 cm per year since 1962. By comparison, the central Mississippi gulf coast has been subsiding at a rate of 0.15 cm per year.

**Water Salinities.** Salinity data for each body of water in the study area are discussed below.

Mississippi River. Saltwater from the Gulf of Mexico extends upstream of the mouth of the Southwest Pass of the Mississippi River most of the time. The extent of intrusion depends primarily on river discharge. Flow duration, wind velocity and direction, tides, and riverbed configuration all influence the upstream movement of saltwater. The toe of the saltwater wedge is usually well defined with relatively little mixing occurring at the freshwater-saltwater interface. Movement of saltwater into the river is primarily through Southwest Pass and also through South Pass. Since some mixing does occur at the freshwater-saltwater interface, chloride concentrations in the river increase downstream from the toe of the wedge rendering the water unsuitable for municipal and industrial uses. Data indicate that chloride concentrations at the river surface exceed the US EPA standard of 250 milligrams per liter (mg/l) for public water supplies anywhere from 15 to 25 miles downstream from the toe of the wedge. The saltwater wedge is dependent primarily upon discharge and the location of the saltwater wedge in the river to make it recede. The recession of the saltwater wedge downstream of New Orleans is generally rapid and responsive to increases in discharge.

IHNC. An environmental analysis of Lake Pontchartrain, conducted in 1980, noted that the canal showed definite evidence of saltwater stratification which occurs during a flooding tide. This occurs because the canal is connected to the Gulf of Mexico by both the Mississippi River and the MR-GO. More saline (and more dense) gulf water moves along the bottom and probably is the primary source of chlorides.

MR-GO. Salinity increases in the areas adjacent to the MR-GO have occurred because the MR-GO provides a more direct route of flow from the high salinity waters of the Gulf of Mexico into the upper areas of the estuarine system. The MR-GO is a straight and deep channel in comparison with the natural meandering shallow lagoons and characteristically sluggish water movement found in the area. Greater volumes, more rapid mixing, and deeper penetration of saltwater are responsible for higher salinities in surface waters and marsh areas adjacent to the MR-GO

Lake Pontchartrain. Before construction of the MR-GO, salinities in Lake Pontchartrain varied from an average minimum of 850 ppm to an average maximum of 4,250 ppm. The mean salinity at Little Woods in 1958 was 1,300 ppm; the average salinity rose to 3,000 ppm by 1965, after the MR-GO was completed.

Gulf Of Mexico. The Gulf of Mexico has, on the average, a salinity of 35,000 parts per million (ppm) total dissolved solids.

**Water Quality.** The following paragraphs provide summary information for the major waterways/water bodies in the area. Detailed information on water quality is contained in Appendix B, Section 1.

Mississippi River. The banks of the Mississippi River, from Baton Rouge to the Gulf of Mexico are lined with more than 115 industrial plants. Many of these industries utilize the Mississippi River as a source of process and cooling water, and all of these industries discharge to the Mississippi River. Additionally, wastes from various municipalities are discharged into the river. Pollutants contained in these and other wastes and inflows adversely affect the water quality. Values for the Mississippi River at New Orleans water quality parameters collected from 1970 - 1988 indicate that compliance with the U. S. Environmental Protection Agency (EPA) and the Louisiana Department of Environmental Quality (LDEQ ) criteria is generally good; with the exception of high levels of heavy metals and pesticides being detected. Samples specifically tested for organic compounds show the presence of over 100 detectable

compounds, but criteria for many of these have not been established, and exact concentrations cannot be determined. The LDEQ classifies the river as "Water Quality Limited." Occasional dissolved oxygen and fecal coliform violations would likely occur in the river during low flow. The 1993 sampling effort for this study produced results similar to results of historic sampling. Continued implementation and enforcement of EPA effluent limitation requirements should result in a reduction of heavy metals and the number of carcinogens.

IHNC. Water quality concerns in the IHNC include DO, coliform, pH, heavy metals, organics, and pesticides. Their presence has resulted in the LDEQ classifying the IHNC as "Water Quality Limited," the same as the Mississippi River. Pollution in the IHNC may result from discharge directly into the canal or from connecting streams, especially the Mississippi River. Direct discharges include stormwater runoff, industrial point sources, and vessel discharges. Several industries located along the IHNC discharge waste into the canal; these discharges are possibly the source of heavy metals in the canal. There are three pumping stations with a total capacity of 5,920 cfs discharging into the IHNC. These stormwater discharges could introduce significant amounts of biological oxygen demand (BOD) and coliforms into the IHNC during a relatively short period of time. There are no municipal waste discharges into the IHNC. (However, some wastes may be discharged into the channel through the pumping stations as a result of sewage from broken sewerage lines collecting stormwater). These problems are compounded by the sluggish nature of water movement through the canal. The 1993 sampling effort produced results similar to historic sampling results. No continuous long-term monitoring program is available for the IHNC.

Mississippi River-Gulf Outlet. The surface water temperature in the MR-GO is generally below state criteria. Dissolved oxygen (DO) is generally high, and BOD is generally low; DO increases and BOD decreases with distance from the IHNC. Criteria from LDEQ and U.S. Environmental Protection Agency (EPA) for total fecal coliform were exceeded. Heavy metals are also present in the MR-GO due to industrial discharge into the IHNC.

Lake Pontchartrain. The water in Lake Pontchartrain near the entrance of the IHNC is affected by water from the canal, especially the water of the IHNC north of the MR-GO confluence. These waters show high average DO levels, high phosphorus concentrations, low BOD levels, and occasional pH levels above and below LDEQ or EPA criteria. Mean fecal coliform levels exceeded the state criteria of 200/100 ml. Heavy metals and pesticides are also present. Nevertheless, Lake Pontchartrain near the IHNC exhibits reasonably good water quality.

**Biological Resources.** The undeveloped portions of the study area consist mainly of brackish to saline tidal marshes, various water bodies including bayous, canals, ponds, and lagoons, and to a lesser degree, bottomland hardwood forests and scrub/shrub areas. The forested areas are located primarily on the undeveloped areas of higher elevation that border the Mississippi River and its abandoned distributary channel ridges that course through the study area. Large areas of scrub/shrub are located on dredged material disposal areas alongside the MR-GO. Small remnants of once extensive cypress swamps occur in the vicinity of Violet. In many areas downstream of the IHNC, levees constructed for drainage and storm surge protection provide a sharp dividing line between the productive tidal wetlands and developed areas. Upstream of the IHNC, all land areas in Orleans and Jefferson Parishes are developed.

The tidal marshes are very productive ecosystems that support large populations of resident and migratory birds and terrestrial animals. Seagulls, terns, skimmers, various shorebirds, herons, egrets, diving ducks, puddle ducks, and pelicans are abundant in the tidal marshes. Terrestrial animals include nutria, muskrat, mink, otter, raccoon, swamp rabbit, gray and red squirrel. Forested areas support most of these species as well as many species of amphibians and reptiles. American alligators are common in the lower salinity brackish marshes. The detrital material formed from the dead parts of marsh plants provide nutrients to fuel the food chain in estuarine waters. The tidal waters sustain a wide variety of commercially and recreationally important fish and shellfish species. The Mississippi River supports limited populations of freshwater fish because of high ambient turbidity levels and the lack of overflow lands in the study area.

Most of the threatened and endangered species known to exist in the study area are transients or strays from areas where they are more likely to be found. An exception is the endangered brown pelican, which is common in the study area, especially during winter. These birds breed on islands closer to the Gulf of Mexico.

**Cultural Resources.** The study area is located adjacent to the Mississippi River in a section of the delta plain which was deposited only a few thousand to a few hundred years ago. The disturbance resulting from lock and canal construction and the infringement of industrial and residential development has destroyed any prehistoric or historic archaeological sites that may have existed in the area.

The area between the vicinity of the IHNC and the lower limits of the Violet site is a diverse region containing

properties eligible for the National Register of Historic Places. These properties have been identified by a number of cultural resource investigations conducted by contractors for the New Orleans District. Each of these studies has been coordinated with the State Historic Preservation Office and provided to the Advisory Council on Historic Preservation before a field examination of the area was completed by personnel from these offices.

The IHNC lock, constructed between 1918 and 1923, was the subject of a comprehensive study completed in 1987 that determined the IHNC lock eligible for the National Register of Historic Places (Frederick D. Dobney, et. al. Evaluation of the National Register Eligibility of the Inner Harbor Canal Lock in Orleans Parish, Louisiana. New Orleans: R. Christopher Goodwin and Associates, INC.). In 1991 the New Orleans District completed a research design for archeological and architectural investigations in the area (Herschel A. Franks, et. al. A Research Design for Archeological Investigations and Architectural Evaluations within the proposed Upper Site, New Lock and Connecting Channels, Inner Harbor Navigation Canal, New Orleans, Louisiana. Baton Rouge: Museum of Geoscience, Louisiana State University). This study concluded that the St. Claude Avenue Bridge, a Strauss Heel Trunion Bascule bridge built between 1918 and 1921, was also eligible for the National Register.

The Galvez Street Wharf, designed by the Port of New Orleans in 1922 and erected in 1929, was among the first improvements to the IHNC area. This rectangular, multi-bay industrial structure is supported by a metal frame with a roof of corrugated zinc. The building is considered significant for its historical associations with the early period of development of the IHNC.

Two National Register districts are located in the area: the Holy Cross Historic District and the Bywater Historic District. The Bywater and Holy Cross neighborhoods lie west and east, respectively, of the IHNC and generally between St. Claude Avenue and the Mississippi River. The Holy Cross Historic District is significant for its classic New Orleans architectural patterns. The majority of homes consist of single and double “shotgun” houses which possess either Italianate or Eastlake details. The New Orleans District completed an archeological study of the Holy Cross Historic District, and archeological testing concluded that architectural features associated with a 19th century brickyard and slave quarters, late 19th to early 20th century residences, commercial establishments, and truck farms were eligible for the National Register. A data recovery plan for these properties was developed (Earth Search, Archeological Survey and Testing in the Holy Cross Historic District, New Orleans, Louisiana, 1992). The Bywater Historic District is architecturally significant for the quality of its mixed collection of residential and commercial buildings dating from 1807 to 1935. In addition to commercial

buildings, four major building types are found in the area: shotguns, camelbacks, bungalows, and pyramidal cottages. A comprehensive architectural assessment and preliminary archeological review of 64 city blocks west of the IHNC were completed by R. Christopher Goodwin & Associates, Inc., between November 1991 and January 1992, and confirmed that it is unlikely that significant prehistoric archeological deposits are located within the area. More detailed information on cultural resources is contained in the Environmental Appendix.

The St. Claude and Lower Ninth Ward neighborhoods are to the north of St. Claude Avenue lying west and east, respectively, of the IHNC and extend north to Florida Avenue. The area north of Claiborne Avenue was constructed in the 20th century due to the late drainage of low swampland, and the dwellings in the neighborhood generally have no architectural or cultural significance.

The present IHNC is constructed on property that once belonged to the Ursuline Order of the Catholic Church. The Ursuline Convent and other associated structures were demolished when the canal was dug in the early 1920's. During the mid-19th century, the area was transformed into an urban setting as the City of New Orleans continued to expand down river.

**Hazardous, Toxic, and Radioactive Waste (HTRW).** An initial assessment of the potential for HTRW was conducted which served as the basis for completion of a HTRW remedial investigation of the IHNC canal bottom and the heavily industrialized area on the east bank of the IHNC between Claiborne and Florida Avenues. The primary focus of this investigation was to collect additional information that will assist in characterizing current and future risks, and to develop and evaluate potential long-term and permanent remedial action alternatives as might be necessary.

IHNC Canal Bottom. Bottom sediment samples from the canal show detectable total and Toxic Characteristic Leachate Procedure (TCLP) concentration levels of metals including arsenic, barium, chromium, lead and mercury. Except for herbicides, 2,4, D and 2,4,5-TP (silvex), all other targeted organic pollutants are below detection limits. We have determined that the canal sediments are not considered hazardous material. No constituents exceeded the EPA's TCLP criteria.

East Bank IHNC. The soil samples from the east bank are contaminated with pollutants released from industrial activities at the site. The contaminated soils occur at the nearsurface from the top of ground to depths of about 5 feet. With few exceptions, the majority of the pollutants in soils have detectable bulk concentration levels below the 1990 action levels proposed by the EPA. TCLP and ignitability tests performed on

soil samples yield results that generally pass the regulatory toxicity limits and ignitability criteria established by EPA.

The analytical data indicate that the majority of the soils to be excavated from the east bank is generally acceptable for disposal at an industrial landfill. The top five feet of soils excavated for land disposal may require special handling or treatment prior to disposal. Some nonaqueous, petroleum-product-rich liquids at the bottom of oil-saturated soils may require collection and proper disposal prior to excavation of soils. In addition, some groundwater may require treatment for metals. Soils from the east bank excavation area were not tested for aqueous disposal. Pending Louisiana Department of Environmental Quality approval, soils are assumed to be acceptable for disposal at a previously used MR-GO disposal site since contamination levels are similar to the canal bottom samples. A number of underground storage tanks located on the east bank of the IHNC are also items of concern. Although the majority of the soils generally passes published Federal criteria, the State of Louisiana may require special treatment.

West Bank IHNC. The Initial Assessment identified several areas of potential concern including the Galvez Street Wharf, the US Coast Guard Reservation, an underground storage tank located at the IHNC Lock, and an oil house apparently related to the New Orleans Public Belt Railroad, south of Claiborne Avenue. A remedial investigation for this portion of the study area was conducted by the St. Louis District for the New Orleans District. Analytical results revealed that contaminants, consisting of volatile, semivolatile, metals and pesticide compounds, were present in the parts per billion (ppb) to the parts per million (ppm) range in nine areas along the west bank of the IHNC. The contaminant levels were not detected at concentrations which would classify the soils and groundwater as hazardous by characterization as defined by Federal Regulations but are such that the Louisiana Department of Environmental Quality (LDEQ) may require remediation and/or permitting of operations during the construction phase of the new lock project.

Graving Site. A Hazardous, Toxic and Radioactive Waste (HTRW) Initial Site Assessment was completed for the Inner Harbor Navigation Canal Lock Graving Site. It was conducted according to guidance of the Corps of Engineers Regulation ER 1165-1-132, *Water Resources Policies and Authorities for HTRW Guidance on Civil Works Projects,* 26 June 1992. The agency data base searches and contractor work were performed according to American Society of Testing and Materials (ASTM) standards E 1527-94.

Based on information gathered during the preparation of the ISA, there is a low risk of encountering and HTRW problem. The entire excavation site and support lands (parking, equipment yards) had no visually or physically observed HTRW features, and

agency research as well as land use research support this field observation. There are several potential HTRW features near-by, so should the construction methods change, or the area of construction be more than evaluated, the HTRW risk will require additional review. These potential HTRW features pose no problem for the graving site as currently designed, and the project may proceed without delays.

**Existing Navigation Projects.** The following paragraphs provide the current status of the pertinent navigation projects in the area.

Inner Harbor Navigation Canal (IHNC). The IHNC, colloquially referred to as the Industrial Canal, is a waterway 5.5 miles long that provides access from Lake Pontchartrain to the Mississippi River, at mile 92.6 above Head of Passes (AHP), (approximately two miles downstream of Canal Street in New Orleans). The canal and lock were constructed by the Port of New Orleans between 1918 and 1923 with the lock being placed in service in 1923 as a unit of the IHNC. The lock rests on a foundation of 19,000 piles 60 feet long, and, with gates and machinery, weighs 225,000 tons. The concrete floor is 9 to 12 feet thick, the walls 13 feet wide at the bottom, decreasing to a 2-foot width at the top. The lock and canal also serves as an integral part of both the GIWW and MR-GO for approximately half of its length. The IHNC and lock served as a toll-link in the GIWW from Mobile to New Orleans (via the Rigolets and Lake Pontchartrain), until enlargement of the waterway was authorized by the River and Harbor Act of 1942. The existing IHNC lock is a reinforced concrete structure, 75 feet wide, 640 feet long, and 31.5 feet (MLG) over the sill at low water in the river. The IHNC has a controlling depth of 30 feet, with bottom widths varying from 125 feet to 300 feet. The IHNC lock is dimensionally inadequate, primarily as a result of the continually increasing barge traffic but also because of the larger oceangoing vessels now in service. The lock was owned by the Port of New Orleans and leased to the Federal government from 1942 until 1986. At that time the Federal government acquired the lock and turned ownership of the St. Claude and Florida Avenue bridges over to the Port of New Orleans. The lock is currently owned by the Federal government. The size of vessels traveling between the river and MR-GO is constrained by the existing lock.

Mississippi River-Gulf Outlet. This project provides a 36- by 500-foot ship channel between the Inner Harbor Navigation Canal in New Orleans, Louisiana, and the Gulf of Mexico, Louisiana; a 100- by 2,000- by 36-foot turning basin at its junction with the Inner Harbor Navigation Canal; and a new high

level bridge over the channel at Paris Road (Louisiana 47/I-510). The MR-GO affords a tidewater outlet to the Gulf that is about 37 miles shorter than the Mississippi River route. Foreshore protection along the south bank of the MR-GO from the Inner Harbor Navigation Canal to the end of the hurricane protection levee which parallels the channel, is also a feature of the project.

The Gulf Intracoastal Waterway Between Apalachee Bay, Florida and the Mexican Border. A series of Congressional Acts authorized work which eventually led to the construction of an inland coastal waterway from Apalachee Bay, Florida to the Mexican Border. This waterway is the Gulf Intracoastal Waterway (GIWW). Through its connection with the Mississippi River system and other important inland waterways, the GIWW provides for waterborne commerce throughout the eastern and southern seaboards, the Midwest, and the Great Lakes. The project, as authorized by the River and Harbor Act of 1925 and modified by the River and Harbor Act of 1946 provides for the following channel dimensions in Louisiana:

*Main Routes*: - 12 by 150 feet from Lake Borgne Light No. 29 to the Industrial Canal, and 12 by 125 feet from the Mississippi River to the Sabine River, including routes through both Algiers and Harvey Locks.

*Alternate Routes* - 12 by 125 feet from Morgan City to the Mississippi River at Port Allen, and 9 by 100 feet from Plaquemine to Indian Village on the Morgan City-Port Allen Route.

The GIWW, of which the IHNC is a crucial link, grew during the period following World War II. The IHNC lock is the only lock on the GIWW east of the Mississippi River. There are 7 locks on the GIWW in Louisiana west of the Mississippi River - five on the main stem and two on the alternate route. Table 1 provides a summary description of the eight locks located on the GIWW.

**Table 1**
**GIWW System - Physical Description of Locks**

| Waterway/Lock | GIWW Mile | River Mile | Miss. Length (Feet) | Width (Feet) | Sill Depth (Feet) | Lift (Feet) | Year Opened |
|---|---|---|---|---|---|---|---|
| GIWW (East) | | | | | | | |
| IHNC | 0 | 92.6 | 640 | 75 | 31.5 | 17 | 1923 |
| GIWW (West) | | | | | | | |
| Algiers | 0 | 88.0 | 760 | 75 | 13 | 18 | 1956 |
| Harvey | 0 | 98.2 | 425 | 75 | 12 | 20 | 1935 |
| Bayou Boeuf | 93.3 | n.a. | 1156 | 75 | 13 | 11 | 1954 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Leland Bowman | 162.7 | n.a. | 1200 | 110 | 15 | 5 | 1985 |
| Calcasieu | 238.9 | n.a. | 1206 | 75 | 13 | 4 | 1950 |
| GIWW (Morgan City to Port Allen Alternate Route) | | | | | | | |
| Port Allen | 64.1 | 227.6 | 1202 | 84 | 14 | 45 | 1961 |
| Bayou Sorrel | 36.7 | n.a. | 797 | 56 | 14 | 21 | 1952 |

As mentioned previously, the Inner Harbor Navigational Canal and lock, constructed by the Port of New Orleans and placed in service in 1923, was leased by the Federal government from 1942 until 1986. At this time, the Federal government acquired the lock from the Port of New Orleans. Since its construction, the IHNC, from the Mississippi River to the MR-GO, has been an integral part of and a vital link in the Gulf Intracoastal Waterway.

The Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana. The currently authorized project provides for a 55- by 750-foot channel from the Gulf of Mexico to Baton Rouge, Louisiana. The State of Louisiana requested phased construction. Phase I provides for a 45- by 750-foot channel from the Gulf to mile 181 above head of passes (AHP), near Donaldsonville, Louisiana and was completed in December 1988. Phase 2 consists of extending the 45-foot deep channel to Baton Rouge, Louisiana. Construction of Phase 2 was completed in December 1994. Further deepening will depend on future detailed studies.

Mississippi River Outlets, Venice, Louisiana. These outlets provide for a channel to -14 feet (MLG) over a bottom width of 150 feet between the Mississippi River at about mile 12 and Baptiste Collette Bayou on the east side and Grand-Tigre Passes on the west side. Jettied entrance channels to -16 feet (MLG) over a bottom width of 250 feet are also authorized.

**Waterborne Commerce.** Historically, the Port of New Orleans has been an important center of trade in the United States. As a result of its central location on the Gulf of Mexico and its access to other ports on the 14,500 mile arterial network of inland waterways, the Port of New Orleans serves as a major distribution center for waterborne commerce traffic. New Orleans is an entry and exit port for all types of cargo in foreign trade, especially in grain exports and petroleum imports. Records from the Waterborne Commerce Statistics Center (WCSC) show that from 1987-1989, the Port of New Orleans was the number one port in the United States in tonnage. The Port of Baton Rouge has consistently placed in the top ten by this same measure. With the 1990 redefinition of Lower Mississippi River port limits for ranking purposes, the Port of New Orleans has dropped to number six in foreign tonnage (1991). However, the newly defined ports of South Louisiana and Plaquemine have achieved the rankings of one and eight, respectively, with Baton

Rouge retaining its top ten status at number five. The Mississippi River/MR-GO system has retained its status as the heaviest U.S. concentration of foreign traffic into the 1990's.

Shallow Draft. Recent historical traffic statistics at the Inner Harbor Navigational Canal are contained in Table 2 which summarizes the Inner Harbor Navigational Canal shallow draft activity for the years 1984 through 1993. From the statistics shown, shallow draft tonnage has fallen in recent years. The reduction in traffic may be largely attributable to the elimination of shell dredging in Lake Pontchartrain. The wide fluctuation in average delays is not fully explained by changing traffic levels. Other influences include lock processing times caused by the differences in stages between the Mississippi River and the IHNC, arrival times, and chamber packing.

**Table 2**
**Summary of Shallow Draft Activity**
**IHNC Lock**
**(1984-1993)**

| Year | Total Traffic (1,000 tons) | Total Number of Tows | Average Delay Per Tow (Hours) |
|---|---|---|---|
| 1993 | 23,337 | 9,196 | 14.6 |
| 1992 | 23,530 | 10,601 | 6.3 |
| 1991 | 23,926 | 9,658 | 12.3 |
| 1990 | 23,412 | 9,891 | 16.2 |
| 1989 | 25,856 | 10,850 | 11.6 |
| 1988 | 27,128 | 11,123 | 11.9 |
| 1987 | 26,325 | 11,724 | 9.2 |
| 1986 | 26,608 | 11,733 | 15.8 |
| 1985 | 24,007 | 12,799 | 8.5 |
| 1984 | 22,193 | 12,381 | 8.3 |

Source: Lock Performance Monitoring System (LPMS)

Shallow-draft transportation is an alternative for freight that is too heavy or bulky to be shipped economically by other modes. Each year approximately 100,000 barges move in and out of the Port of New Orleans from the network of arterial inland waterways.

Table 3 gives a breakdown of the total traffic through the IHNC lock by commodity groups and direction of traffic.

**Table 3**
**Commodity Distribution of 1989 IHNC Lock Traffic**

| | Total IHNC Traffic (TONS) | % of Total Traffic | North/East Traffic (TONS) | % of NE Traffic | West/East Traffic (TONS) | % of WE Traffic |
|---|---|---|---|---|---|---|
| Farm Products | 498,998 | 1.9 | 480,667 | 2.8 | 18,331 | 0.2 |
| Metallic Ores and Prod. | 1,383,955 | 5.4 | 1,237,311 | 7.2 | 146,644 | 1.7 |
| Coal | 7,438,121 | 29.0 | 7,438,121 | 43.2 | 0 | 0.0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Crude Petroleum | 3,460,396 | 13.5 | 976,610 | 5.7 | 2,483,787 | 29.4 |
| Nonmetallic Minerals | 1,443,020 | 5.6 | 869,682 | 5.1 | 573,338 | 6.8 |
| Forest Products & Pulp | 160,901 | 0.6 | 159,883 | 0.9 | 1,018 | 0.0 |
| Industrial Chemicals | 1,598,829 | 6.2 | 1,040,767 | 6.1 | 558,063 | 6.6 |
| Agricultural Chemicals | 542,787 | 2.1 | 501,034 | 2.9 | 41,753 | 0.5 |
| Petroleum Products | 7,500,241 | 29.2 | 3,359,578 | 19.5 | 4,140,663 | 49.0 |
| All Others | 1, 619,197 | 6.3 | 1,134,456 | 6.6 | 484, 741 | 5.7 |
| TOTAL | 25,646,445 | 100 | 17,198,109 | 100 | 8,448,338 | 100.0 |

Approximately 67 % of the total traffic that moved through the IHNC lock in 1989 consisted of movements with an origin or destination north (the Mississippi River at New Orleans and all waterway points above) and east of the lock, dominated by coal and, to a lesser extent, petroleum products. The remaining 33 % of the traffic had an origin and destination east and west of the lock, comprised mostly of petroleum products, crude petroleum, industrial chemicals, and non-metallic minerals. Tables 4 and 5 show the IHNC lock tonnage by origin region and destination region. The two largest origin regions are the GIWW east (West of Mobile) and the Ohio River and Tributaries, with approximately 36% and 29% of the total traffic, respectively. Principal commodities that make up the bulk of traffic volume are petroleum and petroleum products on the GIWW East and coal on the Ohio River system. From a destination perspective, the two GIWW East regions, GIWW East (West of Mobile) and GIWW East (East of Mobile), are the largest regions and represent 33 % and 29 %, respectively, of total traffic. Crude petroleum, coal, and petroleum products represent the bulk of GIWW East (West of Mobile) destinations, while coal and, to a lesser extent, petroleum products dominate the commodities destined for the GIWW East (East of Mobile).

**Table 4**
**Tonnage by Origin Region**

| Origin Region | Tons | % of Total |
|---|---|---|
| Upper Mississippi | 502,395 | 2.0 |
| Lower Mississippi | 2,733,893 | 10.7 |
| Ohio River & Tributaries | 7,508,291 | 29.3 |
| GIWW West (LA Section) | 3,733,228 | 14.6 |
| GIWW West (TX Section) | 1,462,799 | 5.7 |
| GIWW East (West of Mobile) | 9,158,369 | 35.7 |
| GIWW East (Mobile & East) | 547,470 | 2.1 |
| Total | 25,646,445 | 100.0 |

**Table 5**
**Tonnage by Destination Region**

| Destination Region | Traffic (tons) | % of Total Traffic |
|---|---|---|
| Upper Mississippi | 626,788 | 2.4 |
| Lower Mississippi | 4,621,126 | 18.0 |
| Ohio River & Tributaries | 1,333,857 | 5.2 |
| GIWW West (LA Section) | 1,720,377 | 6.7 |

| | | | |
|---|---|---|---|
| GIWW West (TX Section) | 1,403,729 | 5.5 | |
| GIWW East (West of Mobile) | 8,535,936 | 33.3 | |
| GIWW East (Mobile & East) | 7,404,632 | 28.9 | |
| Total | 25,646,445 | 100.0 | |

More detailed information by commodity group and origin and destination regions is included in Appendix C (Volume 7, Economic Analysis).

GIWW system-wide commodity patterns (percentages) are shown for each lock in Table 6. Commodity group percentages for individual locks generally reflect the percentages of their respective segments. The importance of the GIWW system to the petrochemical industries (crude petroleum and petroleum products) of Louisiana and Texas is evident.

**Table 6**
**Commodity Group Percentages by Lock - 1989**

| Group | Port Allen | Bayou Sorrel | IHNC | Algiers | Harvey | Bayou Boeuf | Calcasieu | Leland Bowman |
|---|---|---|---|---|---|---|---|---|
| Farm Products | 1.6 | 1.6 | 1.9 | 2.0 | 9.2 | 3.9 | 2.1 | 2.5 |
| Metallic Ores | 6.6 | 6.1 | 5.5 | 0.8 | 7.5 | 3.4 | 4.7 | 4.7 |
| Coal | 0.1 | 0.0 | 28.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Crude Petroleum | 3.3 | 3.6 | 13.3 | 28.0 | 12.7 | 19.3 | 10.4 | 6.7 |
| Non-metal Minerals | 19.4 | 18.0 | 5.6 | 9.4 | 9.3 | 3.8 | 3.0 | 3.1 |
| Forest Products | 0.1 | 0.1 | 0.6 | 0.0 | 0.2 | 0.1 | 0.1 | 0.1 |
| Ind. Chemicals | 33.0 | 33.7 | 6.6 | 8.3 | 9.8 | 9.5 | 25.2 | 25.8 |
| Agri Chemicals | 2.7 | 2.8 | 2.1 | 2.4 | 0.8 | 2.1 | 1.8 | 2.9 |
| Petroleum Products | 32.6 | 33.4 | 29.5 | 46.5 | 48.4 | 50.2 | 51.5 | 53.0 |
| All Other | 0.6 | 0.6 | 6.3 | 2.6 | 2.2 | 7.9 | 1.2 | 1.2 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: Waterborne Commerce of the United States

Table 7 below displays a matrix of common traffic flows among locks in the GIWW system expressed as a percent of each lock's total traffic volume.

**Table 7**
**Common Traffic Flows Between Locks - 1989**

| | Percent of Traffic that Uses | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Lock | Port Allen | Bayou Sorrel | IHNC | Algiers | Harvey | Bayou Boeuf | Calcasieu | Leland Bowman |
| Port Allen | 100.0 | 97.1 | 0.3 | 0.0 | 0.0 | 1.5 | 78.1 | 78.6 |
| Bayou Sorrel | 99.2 | 100.0 | 0.4 | 0.2 | 0.1 | 1.8 | 80.1 | 80.6 |
| IHNC | 0.4 | 0.4 | 100.0 | 24.3 | 8.1 | 27.1 | 23.3 | 24.6 |
| Algiers | 0.0 | 0.2 | 28.5 | 100.0 | 0.0 | 74.2 | 58.8 | 63.5 |
| Harvey | 0.0 | 0.3 | 31.4 | 0.0 | 100.0 | 90.7 | 74.3 | 79.3 |
| Bayou Boeuf | 1.5 | 1.7 | 26.0 | 60.1 | 22.3 | 100.0 | 69.3 | 74.5 |
| Calcasieu | 46.9 | 47.0 | 13.6 | 29.1 | 11.2 | 42.4 | 100.0 | 100.0 |
| Leland Bowman | 44.8 | 45.0 | 13.6 | 29.9 | 11.3 | 43.3 | 96.7 | 100.0 |
| Total System | 32.2 | 31.5 | 31.3 | 26.6 | 8.1 | 32.8 | 54.6 | 56.4 |

Deep Draft. During the 1970's, traffic along the Mississippi River and MR-GO experienced tremendous growth, due mainly to the large increase in oil imports and grain exports. However, since then, there has not been any significant growth. Table 8 displays Mississippi River foreign import/export tonnage by commodity group for the years 1990 and 1991. As indicated, the majority of imports (65% in 1990) is comprised of crude petroleum, while the majority of exports (75% in 1990) consists of farm products.

**Table 8**
**Mississippi River Foreign (Import/Export) Tonnage (1990-1991)**
**By Commodity Group**

| | 1990 | | 1991 | |
|---|---|---|---|---|
| | Imports | Exports | Imports | Exports |
| Farm Products | 1,298,261 | 79,198,723 | 1,758,789 | 78,715,549 |
| Metallic Ores & Products | 10,895,916 | 1,704,685 | 9,842,140 | 1,450,320 |
| Coal | 0 | 12,873,855 | 23,732 | 15,486,216 |
| Crude Petroleum | 41,088,500 | 0 | 37,051,980 | 0 |
| Nonmetallic Minerals | 1,088,714 | 99,315 | 1,398,146 | 125,275 |
| Forest Products & Pulp | 358,880 | 1,032,163 | 371,354 | 1,071,538 |
| Industrial Chemicals | 521,457 | 2,834,247 | 549,241 | 2,674,211 |
| Agricultural Chemicals | 1,390,045 | 1,997,635 | 1,455,330 | 2,020,324 |
| Petroleum Products | 6,138,247 | 5,897,868 | 7,079,352 | 8,016,913 |
| All Other | 191,743 | 237,589 | 143,963 | 167,662 |
| Total | 62,971,763 | 105,876,080 | 59,674,027 | 109,728,008 |

Source: Waterborne Commerce of the United States

Table 9 shows the total tonnage (foreign and coastwise) by year on the Mississippi River.

**Table 9**
**Mississippi River Deep Draft Tonnage (1974 - 1992)**

| | Foreign | | | Coastwise | | | Total |
|---|---|---|---|---|---|---|---|
| Year | Imports | Exports | Total | Receipts | Shipments | Total | Deep Draft |
| 1992 | 63,036,000 | 112,249,000 | 175,285,000 | 11,581,000 | 20,764,000 | 32,345,000 | 207,630,000 |
| 1991 | 60,139,000 | 109,936,000 | 170,075,000 | 9,797,000 | 21,259,000 | 31,056,000 | 201,131,000 |
| 1990 | 63,160,000 | 106,042,000 | 169,202,000 | 10,465,000 | 22,032,000 | 32,497,000 | 201,699,000 |
| 1989 | 59,889,679 | 103,972,049 | 163,861,728 | 10,384,467 | 20,666,767 | 31,051,234 | 194,912,962 |
| 1988 | 45,325,616 | 97,464,079 | 142,789,695 | 13,971,968 | 21,826,430 | 35,798,398 | 178,588,093 |
| 1987 | 38,087,066 | 93,688,556 | 131,775,622 | 17,853,348 | 19,549,195 | 37,402,543 | 169,178,165 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1986 | 35,138,022 | 81,084,796 | 116,222,818 | 19,039,077 | 18,211,912 | 37,250,989 | 153,473,807 |
| 1985 | 27,040,313 | 81,009,372 | 108,049,685 | 21,737,400 | 19,215,546 | 40,952,946 | 149,002,631 |
| 1984 | 34,167,226 | 85,894,311 | 120,061,537 | 19,921,173 | 16,828,915 | 36,750,088 | 156,811,625 |
| 1983 | 32,320,125 | 95,763,623 | 128,083,748 | 18,256,055 | 20,844,285 | 39,100,340 | 167,184,088 |
| 1982 | 56,708,090 | 100,756,368 | 157,464,458 | 14,629,231 | 20,034,834 | 34,664,065 | 192,128,523 |
| 1981 | 80,094,423 | 98,269,761 | 178,364,184 | 21,553,015 | 23,189,745 | 44,742,760 | 223,106,944 |
| 1980 | 90,772,105 | 86,290,660 | 177,062,765 | 17,768,198 | 23,811,964 | 41,580,162 | 218,642,927 |
| 1979 | 105,858,988 | 73,255,062 | 179,114,050 | 12,780,791 | 20,274,910 | 33,055,701 | 212,169,751 |
| 1978 | 98,540,849 | 67,286,151 | 165,827,000 | 14,332,003 | 17,404,538 | 31,736,541 | 197,563,541 |
| 1977 | 96,028,423 | 59,628,562 | 155,656,985 | 9,789,919 | 19,836,015 | 29,625,934 | 185,282,919 |
| 1976 | 67,027,258 | 59,869,890 | 126,897,148 | 8,588,222 | 17,370,125 | 25,958,347 | 152,855,495 |
| 1975 | 45,934,905 | 47,615,390 | 93,550,295 | 8,670,706 | 21,104,606 | 29,775,312 | 123,325,607 |
| 1974 | 37,329,279 | 47,089,746 | 84,419,025 | 7,624,355 | 20,711,578 | 28,335,933 | 112,754,958 |

Source: Waterborne Commerce of the United States

Table 10 provides foreign import/export tonnage by commodity group for the MR-GO.

**Table 10**
**MR-GO Foreign Deep Draft Tonnage**
**By Commodity Group**

| | 1990 | | 1991 | |
|---|---|---|---|---|
| | Imports | Exports | Imports | Exports |
| Farm Products | 202,877 | 97,840 | 172,096 | 326,891 |
| Metallic Ores & Products | 670,495 | 119,039 | 634,869 | 120,836 |
| Coal | 0 | 22 | 0 | 23 |
| Crude Petroleum | 0 | 0 | 0 | 0 |
| Nonmetallic Minerals | 1,226,495 | 55,328 | 999,306 | 35,756 |
| Forest Products & Pulp | 36,348 | 109,495 | 36,903 | 193,969 |
| Industrial Chemicals | 90,818 | 478,860 | 104,632 | 440,990 |
| Agricultural Chemicals | 185,449 | 93,097 | 103,646 | 114,853 |
| Petroleum Products | 29,776 | 121,580 | 18,797 | 123,715 |
| All Others | 69,237 | 145,775 | 68,585 | 128,513 |
| Total | 2,511,495 | 1,221,036 | 2,138,834 | 1,485,546 |

Source: United States Bureau of Census.

The MR-GO is a critical component of the port because it provides access to the Port of New Orleans' primary container facilities. The MR-GO handles in excess of 90 % of all container traffic moving through the port. The volume of container traffic

has increased in recent years to the extent that New Orleans ranked as the 14th largest U.S. container port in 1990 and second largest on the gulf coast (behind Houston, Texas) in foreign container box volume.

There are deep-draft channels on either side of the IHNC lock; the Mississippi River and the MR-GO. The 45-foot Mississippi River channel is the primary route to New Orleans and points upstream. The MR-GO, with a 36-foot channel, provides a second access route to New Orleans. The port facilities served by each channel, while not completely isolated from each other, represent geographically distinct areas. The areas remain distinct because of the limited deep-draft traffic interchange. The sole route connecting the two areas requires use of the IHNC lock which is too restrictive for the vast majority of the calling fleet.

The major determinant of lock usage, as reported from field interviews with port industry representatives, is the need for a ship to be serviced by cargo handling facilities in both areas of the port (tidewater and river). In other words, if a ship can fit through the lock and requires service from both riverfront and tidewater facilities, the vessel will use the lock. While the number of deep draft vessels using the IHNC lock has remained relatively stable or declined over the past decade, this does not indicate that lock demand by deep-draft vessels has diminished. Unlike tows, ships are unable to reconfigure to fit into a lock. Interviews with port industry representatives and pilots indicate that ships that are too large to traverse the existing IHNC lock, voyage or “loop” from their points of cargo discharge down the access channel to their points of cargo loading. Thus, lock use by deep-draft vessels faces physical as well as economic considerations. Since, historically, ship dimensions have increased, the decrease in lock usage by deep-draft vessels may be partially due to physical constraints rather than economic decisions. Table 11 shows the deep draft vessel distribution.

**Table 11**
**Deep-Draft Vessel Type Distribution**
(Based on 40% sample of pilot’s reports -1992)

| | Percent of Total | |
|---|---|---|
| Vessel Type | Mississippi River | MR-GO |
| Container | 1.0 | 54.5 |
| Tanker | 29.4 | 1.5 |
| General Cargo | 12.8 | 23.7 |
| Bulk Carrier | 56.8 | 20.3 |
| TOTAL | 100.0 | 100.0 |

Table 12 shows the estimated maximum deadweight tonnage (DWT) for length, width and draft dimensions by vessel category. Given the 75-foot width of the existing lock, the maximum vessel sizes that can use the IHNC are general cargo ships of about

18,000 DWT, dry bulkers of 20,000 DWT, and container ships of about 13,000 DWT.

**Table 12**
**Estimated Maximum DWT for Length, Width, and Draft Dimensions by Vessel Category**

| Ship Dimensions | DWT (Rounded to the nearest 1,000 DWT) | | |
|---|---|---|---|
| | Bulk Carriers | General Cargo | Container |
| Length(ft) | | | |
| 640 | 38,000 | 31,000 | 23,000 |
| 900 | 124,000 | 93,000 | 55,000 |
| 1,200 | W.F. | W.F. | W.F. |
| Width (ft) | | | |
| 75 | 20,000 | 18,000 | 13,000 |
| 90 | 36,000 | 34,000 | 23,000 |
| 110 | 68,000 | W.F. | 46,000 |
| Draft (ft) | | | |
| 22 | 13,000 | 8,000 | 12,000 |
| 36 | 91,000 | 69,000 | 87, 000 |

**Notes: W.F. = Largest vessel of world fleet.**
**Largest vessel calculations for the draft dimension assume five feet underkeel clearance and a light loaded vessel..**

In general, for both the Mississippi River and the MR-GO, the number of ships in the smaller deadweight classes have decreased in recent years, whereas the number of ships in the higher deadweight class have increased. The Economics Appendix (Appendix D) provides additional information on deep-draft traffic and the limited number and sizes of deep-draft vessels using the IHNC lock.

General cargo ships represent the majority of ship traffic using the IHNC lock. Container vessels and tankers are absent from current usage. Deep draft vessels transiting the lock are concentrated in the extreme low end of the overall vessel size distribution for both the Mississippi River and MR-GO.

The history of lock usage by deep draft vessels has shown a marked decline over time; from 923 ship lockages in 1959 to 138 in 1991. Table 13 shows a summary of deep-draft usage (both tonnage and number of ships) from 1983 to 1991. Over this period, deep-draft vessels have averaged 171 lockages and 137,000 tons per year.

**Table 13**
**IHNC Lock- Deep Draft Traffic Summary**
**(1983-1991)**

| Year | Deep Draft Tonnage (1,000) | Number of Ships |
|---|---|---|
| 1991 | 134 | 138 |
| 1990 | 105 | 163 |
| 1989 | 76 | 131 |
| 1988 | 175 | 168 |
| 1987 | 259 | 192 |
| 1986 | 152 | 195 |
| 1985 | 157 | 192 |
| 1984 | 101 | 163 |
| 1983 | 75 | 195 |

Source: Lockmaster Logs, New Orleans District, US Army Corps of Engineers

**Navigation Problems.** Shoaling in the Mississippi River and Southwest Pass, as a result of sedimentation during periods of high flow, is an extensive and continuing problem. Heavy fog, particularly during winter and early spring, often restricts navigation on the river and on the MR-GO and occasionally halts all activity for extended periods. A number of bridges also cross the GIWW/MR-GO, the Mississippi River, and their connecting link, the IHNC. Clearances of these bridges are presented in Table 14.

**Table 14**
**Bridges Crossing Channels In Project Area**

| Location | Type | Clearances (feet) | | |
|---|---|---|---|---|
| | | Vertical | | Horizontal |
| | | Average Annual High Water | Stage | |
| GIWW/MR-GO: | | | | |
| Paris Rd. (LA 47) | Fixed | 135[1] | | 500 |
| MISSISSIPPI RIVER: | | | | |
| Crescent City Connection (Mile 96) | Fixed | 155.8 | 163.8 | 750 |
| Huey P. Long (mile 106) | Fixed | 138.0 | 146.8 | 750 |
| IHNC:[2] | | | | |
| Florida Avenue[3] | Bascule | Unlimited | | 91 |
| Claiborne Avenue | Vert. Lift | 156[1] | | 305 |
| St. Claude Avenue | Bascule | Unlimited | | 75 |

[1]- Clearance above mean high water

[2]- Reach of canal connecting MR-GO and the Mississippi River.

[3]- Will be replaced with a mid- or high-rise vehicular bridge and a vertical lift span rail bridge.

The existing Florida Avenue Bridge carries two railroad tracks and two single lane roadways across the IHNC. Due to the obstructive character of the bridge, the U.S. Coast Guard, on July 30, 1992, issued an Order to Alter under the provisions of PL 79-647 as amended (33 USC 511-523), commonly referred to as the Truman-Hobbs Act. The Port of New Orleans, with authorization of the Coast Guard, engaged a consultant to prepare plans and specifications for the bridge alterations. A recommended bridge replacement scheme has been proposed by the Port, primarily for rail service. Construction of the replacement bridge is scheduled to begin 1997.

The bridges on the IHNC must be operated in concert with the lock operations. During peak vehicular traffic hours in the morning and afternoon, a curfew is in effect on lock operations to allow commuter traffic to flow freely. The IHNC lock, with dimensions of 75- x 640- x 31.5-feet, limits the size of ships traveling between the river and the MR-GO. General cargo ships of about 18,000 DWT, dry bulk ships of about 20,000 DWT, and container ships of about 13,000 DWT are the largest, by category, that can safely use the existing lock. Likewise, the size and configuration of tows are also limited. The IHNC lock has long been considered to be dimensionally obsolete. Congestion at the lock is high primarily as a result of barge traffic moving between the Mississippi River and the GIWW. The lack of lay areas with appropriate mooring facilities, while waiting to lock through the IHNC, creates a less than desirable situation for tow boat operators.

**Vehicular Transportation.** There are 54 common carrier truck lines, in addition to dozens of drayage, heavy hauler, and refrigerated truck lines serving New Orleans. Easy access to Interstate Highway 10 (east-west) and direct connection to Interstates 55 and 59 (north-south) in the metropolitan area facilitate the movement of goods and traffic in the area. As shown in Table 15, three bridge crossings are located in the reach of the IHNC between the Mississippi River and the intersection with the GIWW/MR-GO. These include a low-level bridge at St. Claude Avenue, a mid-level bridge at Claiborne Avenue, and a low-level bridge at Florida Avenue. The existing traffic breaks down 35, 51, and 14 percent for St. Claude, Claiborne, and Florida, respectively. The IHNC bridge crossings provide access between St. Bernard Parish and the portion of the City of New Orleans bounded by the Mississippi River, the IHNC

and MR-GO with the City of New Orleans upriver of the IHNC. Alternative routes, which cross the IHNC located north of the MR-GO/IHNC intersection, add 20 or more miles one-way to the trip. Alternate routes are not considered desirable under normal circumstances. As a result, most vehicles will incur considerable delay before diverting to an alternate route. US Coast Guard Regulations and Louisiana Revised Statutes 38:24 require the Board of Commissioners of the Port of New Orleans to keep the St. Claude and Claiborne Avenue bridges at the Intracoastal Canal open to vehicular traffic crossing the bridge at the following times: 7:00 o'clock to 8:30 o'clock A.M. and from 5:00 o'clock to 6:30 o'clock P.M. Monday through Friday of each week. These requirements are inapplicable in the event of emergency.

**Rail Transportation.** New Orleans is served by six major rail lines including the Illinois Central Gulf, CSX Transportation, the Kansas City Southern, Norfolk Southern Corp., Union Pacific, and Southern Pacific Railway. In addition, the Public Belt Railroad is the switching carrier serving all of the mainline railroads in the Port of New Orleans. Each day it moves rail cars to the port wharves along the Mississippi River as well as the maritime terminals on the IHNC. Since American railroads are divided into eastern and western railroads, the presence of both kinds provides a unique advantage for shippers. The Norfolk Southern Railway crosses the IHNC at Florida Avenue and provides the only rail service to St. Bernard Parish and the east bank of Plaquemines Parish. At present, approximately one train crosses the IHNC at Florida Avenue every day.

## FUTURE CONDITIONS (WITHOUT-PROJECT)

The without-project condition serves as a baseline against which alternative improvements are evaluated.

If no Federal action is taken, and the existing lock is not replaced or an additional lock is not constructed, the lock will require extraordinary maintenance or possibly a major rehabilitation to maintain the same level of service, as it has been in operation since 1923. The lock has long been considered dimensionally inadequate and obsolete. Operating at top efficiency, barges will continue to experience the 10-15 hour average delays to lock through. Should traffic increase, delays would likewise increase. This makes it unable to safely pass existing traffic and efficiently accommodate any future traffic growth. The physical condition of the lock structure and machinery is such that, given the high rate of utilization, the need for rehabilitation is long overdue. A total collapse of the

facility would put a halt to almost all of the traffic moving through the area to or from the east. A faltering navigation system, or vital link in the system, can fatally undermine our national objective - economic development which results in employment opportunities.

Given the current state of affairs, it is assumed that the proposed new Florida Avenue bridges will be built by the State and the Port and placed into service prior to initiation of construction of the Federal lock replacement project. It is also assumed that the existing lock will be maintained and rehabilitated to continue to operate at its current level of service. It is further assumed that all existing waterway projects or those under construction would be in place and will continue to be operated and maintained.

**Development and Economy.** Current trends in development and the economy are generally expected to continue into the future. In recent years, the primary growth industry in the area has been the convention and tourism industry. This is expected to continue. The development of riverboat gambling in Louisiana has resulted in 15 gambling boat licenses being issued by the State. Most of these are outside of the New Orleans metropolitan area. A land-based casino is currently being planned in New Orleans. In the case of the IHNC, the economic downturn of the 1980s in the general area caused several businesses to go out of business along the IHNC. It is assumed that these businesses will not reestablish themselves. However, new development at A-MID over the next twenty years, when fully implemented, will create an increase in total direct spending of an estimated $724.6 million in the area/economy. Once A-MID is fully developed, the annual additional revenue that is estimated to be generated will produce about $61.8 million for state and local governments. The Port's Report on the Tidewater Port cites a comprehensive study of southeast Louisiana by the Fantus Company which determined that marine electronics and pharmaceuticals are ideally suited for location in the New Orleans area. The Port's Port Improvement Program (1990-1995) included over $50 million in capital funding for the Tidewater area.

**Population and Employment.** Population in the New Orleans metropolitan area is expected to grow. However, population in Orleans parish will continue to decline. In St. Bernard, population will continue to grow at about the same rate as it has in the last decade. Employment conditions are expected to improve in both Orleans and St. Bernard.

**Climate.** There are no dramatic changes expected to occur in climatic conditions in the future. Relative sea level rise

(which results primarily from land subsidence, from other geologic activity, and possibly from global sea level rise) must be considered relative to design, construction, and operation of a navigation project. The long term rate of subsidence in the area is approximately 0.48 feet per century.

**Biological Resources.** No significant changes are expected in the tidal wetlands of the study area. Like most of Louisiana's coastal wetlands, the wetlands of the study area are being lost to open water, mainly because of subsidence from the compaction of underlying sediments, the lack of freshwater and sediment input from rivers, and erosional forces. A slow, gradual deterioration of the remaining marsh, swamp, and scrub/shrub habitats is predicted. Populations of fish and wildlife resources dependent upon these tidal wetlands will also likely experience a gradual decline. Undeveloped forested tracts within the leveed and drained part of St. Bernard Parish will continue to be lost, mainly to residential development.

At the IHNC, the natural environment has given way to urban/suburban development. There are no significant tracts of undeveloped land that have not already been modified.

**Cultural Resources.** The area has already been impacted by a number of historic developments that have destroyed cultural resources. These trends are expected to continue into the foreseeable future. Eventually, the St. Claude Avenue Bridge will either require extensive rehabilitation or be replaced by a new bridge. Historic structures in the Holy Cross and Bywater Historic Districts will continue to deteriorate or to be modernized. While the New Orleans Historic District Landmarks Commission will prevent some modifications, continued changes will be inevitable.

**Hazardous, Toxic, and Radioactive Wastes (HTRW).** It can be assumed that in the future, more stringent environmental protection legislation may require cleanup of materials not currently classified as HTRW.

**Existing Navigation Projects.** It is assumed that operation and maintenance of the GIWW system will continue through the period of analysis to ensure continued navigability. In the event the IHNC lock is not replaced, it will require extraordinary maintenance so that it will continue to provide the current level of service. It is also assumed that the MR-GO will likewise be maintained for the period of analysis. All existing waterway projects, or those under construction, are to be

considered in place and will be operated and maintained through the period of analysis. Locks on the GIWW system are assumed to be using the most efficient locking policies. Waterway user taxes will continue in the form of the towboat fuel tax prescribed by the WRDA of 1986 (PL 99-662). Baptiste Collette Bayou, one of the distributary passes of the Mississippi River, is not considered a viable long-term alternative to use of the IHNC lock. The primary problem, beyond the added distance, is unpredictable weather conditions on the open channel across Breton Sound, particularly during winter months. The potential for quickly developing bad weather is compounded by the fact that the decision to commit to Baptiste Collette must be made 10 to 12 hours before actual exposure to the open channel. In addition, higher insurance premiums may be required from shippers on shipments routed via Baptiste Collette. Users have indicated that they would prefer facing delays at the IHNC rather than the uncertainties of Baptiste Collette. In addition, the American Waterway Operators have taken the position that Baptiste Collette should not be considered as a viable alternative to the IHNC Lock.

**Waterborne Commerce.** Unconstrained waterborne commerce is expected to grow at a medium growth rate described in Volume 7, Economic Analysis. This represents what is considered to be the most probable future scenario.

**Vessel Traffic.** In the absence of a project, the IHNC lock will remain an impediment to navigation. Significant growth in traffic will be constrained by the IHNC lock. As traffic increases, the lock will become an even greater constraint to navigation traffic.

**Navigation Problems.** There is a limit on the physical capacity of the existing lock, and in the absence of a project to improve navigation through the IHNC, current problems and conditions and delays are expected to continue and worsen over time. The outlook would be that the existing lock would be rehabilitated and continue to provide the same level of service that currently exists. During the five-year phased rehabilitation, nine intermittent closures of about 30-days each will be required. The existing navigation curfew during peak vehicular traffic hours (7:00 o’clock to 8:30 o’clock A. M. and from 5:00 o’clock to 6:30 o’clock P.M.) would remain in effect.

**Vehicular Traffic.** The future condition has generally the same configuration as currently exists with the exception of

Florida Avenue. At Florida, the existing bridge, which includes both vehicular and rail, will be replaced by two bridges. The rail bridge will be replaced with a new vertical-lift span bridge with 300 feet of horizontal clearance. The State of Louisiana (Department of Transportation and Development) is currently planning to construct a new 4-lane, high rise vehicular bridge with 300 feet of horizontal clearance. The Regional Planning Commission for Jefferson, Orleans, St. Bernard, and St. Tammany Parishes (RPC) has estimated the future use patterns of the new high-level Florida Avenue crossing, as well as the other crossings. The RPC maintains a set of travel demand models for use in maintenance of the region's Long Range Transportation Plan. The travel demand models use socioeconomic information which suggests the number and nature of trips generated in the traffic corridor. Limited growth of existing traffic volumes is forecast, based on modest population growth projections and small changes in related variables, such as employment. Their estimate was accomplished considering socioeconomic variables as well as the structural changes to the roadways currently being planned. By the year 2000, traffic is expected to shift to 33, 45, and 22 per cent on St. Claude, Claiborne, and Florida Avenues, respectively. The majority of the increase on Florida Avenue appears to be due to trips formerly located on Claiborne Avenue which will be assured of uninterrupted transit over the IHNC on the new high-rise Florida Avenue bridge. However, the poor access and single-lane feeder streets will continue to constrain potential Florida Avenue traffic. The state law requiring the Board of Commissioners of the Port of New Orleans to open to vehicular traffic the St. Claude and Claiborne Avenue bridges during peak vehicular traffic in the morning and evening, Monday through Friday of each week, is expected to remain in effect in the future.

**Rail Traffic.** Rail traffic will generally be the same as under existing conditions. The only exception is that there could be an increase in traffic crossing the Florida Avenue railroad bridge as development takes place in St. Bernard Parish. Any increase in industrial and port development could serve as the catalyst for increases in rail traffic.

## PROBLEMS AND OPPORTUNITIES.

The existing navigation problems at the IHNC are associated with delays to present traffic, the limited capacity of the existing lock to handle anticipated growth, and the physical condition of the lock structure. In considering the needs of

navigation, attention has also been given to minimizing the environmental and social impacts to ensure that communities adjacent to the project remain as complete, livable neighborhoods during and after construction of the project.

There is a limitation on physical capacity, and future vessels and tows will continue to experience delays. The basic problem addressed in this study is that of replacing the existing dimensionally inadequate lock at the IHNC. A new lock connecting the two port areas (river and tidewater) is considered by many to be essential for future development of the port. At the same time, a new, larger lock is critical to more efficient movement of shallow-draft traffic on the GIWW system and deep-draft traffic between the river and tidewater port areas. The situation is complicated by the three bridges crossing the canal that serve vehicular traffic. The bridges are located at St. Claude Avenue, Claiborne Avenue, and Florida Avenue. During peak vehicular traffic periods in the morning and afternoon, a curfew is in effect for navigation traffic which limits the number of lockages per day. Due to its urban setting, the lock replacement project has the potential to serve as the catalyst for facilitating improvements to the infrastructure of the neighborhoods adjacent to the IHNC, to improve the surface transportation network in the area, to provide much needed jobs, and to improve the social well-being of area residents.

**PLANNING CONSTRAINTS.**

Legislative and executive authorities have specified the range of impacts to be assessed and have set forth the planning constraints and criteria which must be applied when evaluating alternative plans. Plans must be developed with due regard to the benefits and costs, both tangible and intangible, as well as associated effects on the environment and the social and economic well-being of the region. Federal participation in developments should also assure that any plan is complete within itself, efficient and safe, economically feasible, environmentally acceptable, and consistent with local, regional, and state plans. In view of the obvious need for a connection between the river and tidewater ports coupled with the need for a more efficient connecting link for shallow draft traffic, this study was geared toward selecting the plan which best accommodates those needs based on current and projected traffic. The recommended plan should be acceptable to the waterway users (both shallow and deep-draft) as they will eventually pay a substantial portion of the costs.

Since the existing lock is in a highly congested area, replacement at the IHNC is difficult. Innovative engineering and

construction techniques were examined and developed to identify feasible options at this location. Feasibility in this case includes consideration of environmental/social impacts, including impacts to neighborhoods.

Community participation, as directed by the Congressional guidance contained in both the US House and US Senate Appropriation Committee Reports, in conjunction with the FY 91 budget and coordination with elected officials and various stakeholders, were integral parts of our planning process.

Minimizing relocations and disruption, while enhancing the social well-being of local residents and minimizing degradation of existing neighborhoods, also constitute constraints. The historical significance of the Holy Cross and Bywater neighborhoods, coupled with the significance of the existing lock and bridges also serve as factors considered in planning a replacement lock. Construction of replacement bridges at Florida Avenue, currently being designed by the State of Louisiana and Port of New Orleans, represents the future without-project condition.

**FORMULATION PRINCIPLES**

The Guidance for Conducting Civil Works Planning Studies (ER 1105-2-100) requires the systematic development of alternative plans which contribute to the Federal objective. Alternatives should be formulated in consideration of four criteria: completeness, effectiveness, efficiency, and acceptability.

• Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. This may require relating the plan to the other types of public or private plans if the other plans are crucial to realization of the contributions to the objective.

• Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.

• Efficiency is the extent to which an alternative plan is the most cost effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the Nation's environment.

• Acceptability is the workability and viability of the alternative plan with respect to acceptance by State and local

entities and the public and compatibility with existing laws, regulations, and public policies.

In general, when formulating alternative plans, an effort is made to include only increments that increase the net NED benefits.

## ALTERNATIVE PLANS

Alternative plans for addressing the navigation needs in the study area were limited to measures for improving the efficiency of commerce projected to move through the Port of New Orleans; specifically, traffic projected to have a need for a connection between the Lower Mississippi River and the GIWW, east of the Mississippi or the MR-GO. Existing navigation depths of 12 feet and 36 feet for the GIWW and MR-GO, respectively, were assumed over the project life. The Mississippi River channel is currently 45-feet deep to Baton Rouge. A project depth of 55-feet was authorized but will probably not be constructed until some time in the future when economic conditions and traffic warrant the deeper channel.

Given the constraints of the current and projected channel sizes, structural alternatives were developed ranging from maintaining the existing lock capacity to increasing lock capacity to accommodate the larger vessels and/or volumes of traffic which might reasonably be assumed to make use of a lock connecting the Lower Mississippi River with the GIWW and MR-GO. The minimum lock capacity considered was governed by the size of the existing lock. However, consideration was given to the construction of a shallower lock with a sill depth less than the existing lock, solely for the purpose of providing additional barge capacity.

### Preliminary Plans Considered

Fourteen plans for a new lock and connecting channels located at 7 sites were studied in conjunction with the preparation of the Site Selection Report dated March 1975. These included the Bohemia Site, Scarsdale Site, Caernarvon Site, Upper and Lower Sites (near Violet), Saxonholm Site, IHNC-center channel, IHNC east of center channel, and combinations of the above. These sites are shown in Plate 2. These sites were compared and ranked independently by the Corps and the Port of New Orleans. The criteria by which the alternatives were ranked included cost, construction difficulty, navigation benefits, navigation adequacy, local economics, relocations, social impacts, ecological impacts, operation and maintenance

difficulties, and public sentiment. Two sites, the IHNC East of Galvez Street wharf and the lower site at Violet, were compared in detail in the 1975 Site Selection Report by the New Orleans District. The Site Selection Report recommended construction of a new lock at the lower site near Violet.

Subsequent to the submission and approval of the site selection report, President Carter in his message to Congress in April 1977, concerning the Fiscal year 1978 budget, recommended that:

> "The project should be modified to eliminate consideration of the new channel location. Further study should be carried out to determine whether repair or replacement is needed of the existing lock at the existing site. If replacement and expansions are deemed necessary, special care should be taken to minimize dislocation and disruption of residents near the site."

In 1982, the New Orleans District prepared a preliminary draft evaluation report that compared 28 plans at both Violet and the IHNC locations (Plate 3). These plans included lock extensions, lock replacements, adjacent barge locks, and adjacent ship locks. At Violet, barge and ship locks were also evaluated. Lock widths evaluated varied from 75 to 150 feet, depths from 22 feet to 40 feet, and lengths of 640 feet, 900 feet, and 1200 feet. In addition, congestion fees (a non-structural measure), alone and in conjunction with structural plans, were also considered. The tentatively selected plan identified at that time was a lock 40 feet deep by 110 feet wide by 1200 feet long, located adjacent to and 400 feet east of the existing lock. The report was never finalized or released to the public.

In response to the WRDA of 1986 (PL 99-662) which specifically directed the Corps to evaluate the Violet and IHNC sites, the Corps initiated studies to reevaluate the Violet and IHNC sites in FY 1987. In March of 1990 at a meeting of the Inland Waterway Users Board held in New Orleans, the District announced their intention to recommend elimination of Violet from further consideration. In January of 1991, the New Orleans District submitted a report which provided the rationale for eliminating the Violet site from further consideration and requested approval of limiting further detailed studies of a replacement lock to the IHNC site and abandoning consideration of the Violet site. In late June 1991, HQUSACE concurred in conducting no further detailed studies of the Violet site.

In May 1989, the New Orleans District also evaluated the continued maintenance of the MR-GO as a deep-draft waterway. While the MR-GO does not represent the primary route to the Port of New Orleans in terms of draft provided or tonnage handled, it is a critical component of the port in that it provides access to the port's primary container facilities. In fact, the MR-GO handles in excess of 90 % of all container traffic moving through the port. The volume of container traffic through New Orleans has increased in recent years to the extent that New Orleans,

traditionally a bulk and breakbulk oriented port, in 1990 ranked as the 14th largest U.S. port and second largest on the gulf coast (behind Houston, Texas) in foreign container box volume. The importance of the MR-GO channel to the port is also indicated by the fact that the MR-GO handles approximately 35 % of the port's breakbulk general cargo tonnage.

The analysis identified relocation of the MR-GO container facilities to the Mississippi River and traffic diversion to other ports as the two most likely responses to MR-GO closure. While identifying only a portion of the costs that would be required to relocate container operations to the Mississippi River, those costs were greater than the cost of continued project maintenance which included a then-projected 41 % increase in existing maintenance costs by the year 2002. The result was a benefit-cost ratio of 1.4 for continued maintenance. The traffic diversion alternative quantified only the change in vessel line-haul costs. These additional costs also exceeded the cost of projected channel maintenance. The benefit-cost ratio of continued channel maintenance for this scenario was 1.6. The average annual costs of these two alternatives ranged from $13.4 to $15.1 million.

The port facilities served by the MR-GO and Mississippi River (main channel), while not completely isolated from each other, represent geographically distinct areas. The areas remain distinct because of limited deep-draft traffic interchange. The sole route connecting the two areas requires use of the IHNC lock, which is too restrictive to the vast majority of the calling fleet. Therefore, for most deep-draft vessels, the selection of one of these two channels determines which port facilities can be accessed. Discontinuing the maintenance of the MR-GO and eventual closure to deep draft traffic, as suggested by some environmental groups, would not in any way address the problems of the IHNC lock and its use as an integral component of the inland waterway system. If anything, closure of the MR-GO would worsen the navigation problems of the IHNC to the extent that closing the channel results in induced deep-draft use of the IHNC lock. Historically, the majority of traffic through the IHNC lock has been shallow draft.

**Screening of Sites - IHNC and Violet**

Information presented in this section reflects the best available information at the time the screening of the two sites occurred (1991).

**IHNC site.** The IHNC site would utilize an existing waterway and provide a more efficient navigable connection between the lower Mississippi River and the GIWW and MR-GO. The

general location of the site is shown on Plate 3. We evaluated a plan 400 feet east of the existing lock.

Construction of any plan at the IHNC site would involve two basic tasks: construction of the lock complex and construction of bridge relocations, which would be timed to minimize social and vehicular disruptions.

The plan would include construction of two bridge relocations across the IHNC and consist of four-lane semi-high level bridge replacements at St. Claude Avenue and Claiborne Avenue.

The total construction time for the bridge relocations and lock complex would take approximately 9 years.

Excavation of the new lock and connecting channels would require disposal of 5,200,000 cubic yards of material, most of which would be used to create wetland habitat in areas where marsh has deteriorated or been replaced by open water.

National Economic Development Impacts. The first cost (October 1990) of the IHNC shallow-draft lock plan with a new lock 400 feet east of the existing lock is estimated at $363.6 million. The total annual cost is estimated at $53.4 million, including approximately $51.0 million for interest and amortization of the initial investment and $2.4 million for operation and maintenance. A deep draft lock plan would cost $415.4 million. The total annual cost is estimated at $59.2 million, including $56.5 million for interest and amortization of the initial investment and $2.7 million for O&M costs. The costs of eliminating the operation and maintenance of the existing lock is treated as a benefit. Annual costs for the shallow draft only alternative included $1.1 million representing the loss of deep draft services. The national economic development (NED) costs do not include the cost of social mitigation.

The benefits attributable to plans at this site are estimated to average $74.9 million for shallow-draft and $75.8 million for deep-draft traffic. These benefits result from savings in transportation by providing a more efficient connection between the lower Mississippi River, the GIWW and the MR-GO; from savings
to the existing project as a result of eliminating the need for future rehabilitation and O&M of the existing lock. The average annual net benefits are estimated at $21.5 million for shallow draft and $16.6 million for deep-draft. The ratio of average annual benefits to average annual costs is 1.4 to 1 for shallow draft and 1.3 to 1 for deep-draft.

Environmental Impacts. The following paragraphs discuss impacts for various environmental components.

*Biological resources*. The impacts upon aquatic values would be limited to the affected waterways and related project-induced changes in water quality; these impacts are expected to be

slight. Overall negative impacts upon biological resources would be minor, and positive impacts from wetlands creation with dredged materials would be significant. Several hundred acres of wetland habitat would be created east of the IHNC in an open water area. The plan would require disposal of 5.2 million cubic years of material and have greater releases of lock water than the existing lock.

*Cultural Resources.* Any plan at this site would impact the Holy Cross and Bywater Historic Districts which are listed in the National Register of Historic Places. In addition, the existing IHNC lock has been determined to be eligible for the National Register of Historic Places. Coordination with the Advisory Council on Historic Preservation and the State Historic Preservation Officer will be required. Execution of a memorandum of agreement with these agencies will be required to identify what mitigating measures will be incorporated into our plan.

*Recreation Resources*. Project-related increases in traffic may cause potential congestion patterns between commercial and recreation vessels in the MR-GO. Heavier wake activity may impact smaller recreational boats and the existing shoreline from which some occasional bank fishing might occur.

*Social Impacts*. Plans at the IHNC site have the potential for stimulating a healthier regional economy which would result in improved community facilities and greater social bonds. During lock and bridge construction, high noise levels near the lock site and disruption of vehicular traffic would adversely affect the well-being of some residents in the area. In addition, response times for services (fire, police, and emergency medical) would be impacted. In the long term, the adjacent plan would cause the relocation of approximately 620 people in 223 residential units and 93 structures, about 150 job displacements, and take about 9 years to actually construct. Several neighborhood businesses (groceries, salons, restaurants, repair shops, etc. ) employing about 160 people would also be impacted.

*Regional Development.* This plan has potential for stimulating regional development and growth.

**The Violet Site.** A lock at Violet could provide a navigable connection between the lower Mississippi River and the GIWW and MR-GO. The general location of the Violet site is shown on Plate 3. The plan's features would consist of a new lock, a new connecting channel between the new lock and the MR-GO with paralleling hurricane protection levees, a new eased barge channel at the junction of the MR-GO and the GIWW, and a navigable floodgate at Violet Canal.

Conventional construction would be used within an earthen cofferdam. When the lock construction is complete, the flood protection tie-ins would be connected to the levees outside of

the cofferdam and guidewalls constructed. The lock would then be ready for operation after demolishing the cofferdam and using that material for backfill, as required.

During the project construction period a four-lane high-rise bridge would be constructed at Judge Perez Drive and a two-lane high rise bridge would be constructed at River Road (St. Bernard Highway) as part of the project. These bridges would be required to maintain the existing transportation routes which also serve as hurricane evacuation routes. In addition, a low-level vertical lift span railroad bridge across the tailbay would be included.

The total construction period for the lock is estimated to require 9 years and is expected to result in minor residential and business relocations. In addition, the Millaudon Middle School would require relocation.

Excavation for the new channels and levees would be accomplished primarily by bucket dredging. The project would require about 27,350,000 cubic yards of excavation. About 15,000,000 cubic yards of excavated material would be used for backfill in constructing the required hurricane protection levees and for tying in to the mainline Mississippi River levees.

National Economic Development Impacts. The first cost of the Violet shallow-draft lock plan is estimated at $384.2 million (October 1990 prices). The total annual cost is estimated at $51.4 million, including $47.0 million for interest and amortization of the initial investment and $2.34 million for O&M. The first cost of a deep-draft plan is estimated at $420.5 million, and the total annual cost is estimated at $55.3 million, including $50.6 million for interest and amortization of the initial investment and $2.7 million for O&M. Annual costs include $2.0 million for mitigation of environmental losses. Also included in interest and amortization costs for the shallow draft-only alternative is $1.2 million representing the loss of deep draft service. The NED costs do not include the cost of social impact mitigation.

The average annual benefits attributable to the Violet shallow-draft plan are estimated at $58.5 million and $59.8 million for a deep-draft plan. These benefits result from savings in transportation by providing a more efficient connection between the lower Mississippi River, the GIWW, and the MR-GO; from savings in improved vehicular crossings by eliminating IHNC bridge openings; and from savings to the existing project as a result of eliminating the need for future rehabilitation and O&M of the existing lock. For shallow-draft, the ratio of average annual net benefits to average annual costs is estimated to be 1.1 to 1. For deep-draft, the average annual net benefits are $4.5 million, and the ratio of average benefits to average annual costs is estimated to be 1.1 to 1.

Environmental Impacts. The following paragraphs discuss impacts for various environmental components.

*Biological Resources*. Project impacts on biological resources related to increased lock water releases and increased vessel traffic would be similar to those of the IHNC plan.

Project construction would require the excavation of about 27,350,000 cubic yards of dredged material and 350,000 cubic yards associated with easing the barge channel at the junction of the MR-GO and GIWW to facilitate traffic. Construction of the lock tailbay channel would impact six scenic streams included in the Louisiana Scenic Streams system. Permits to impact these streams would require an act of the state legislature. Lock construction would also render the Violet siphon ineffective. This structure was built to enhance wetlands near Violet by diverting nutrient-rich freshwater from the Mississippi River into area marshes. Replacement of the Violet siphon flows would be difficult and expensive to accomplish due to the location of the lock. Estimated cost of replacement is $2,750,000.

Lock construction at Violet would cause direct loss of 550 acres of brackish marsh, 240 acres of bottomland hardwood forest, 220 acres of scrub/shrub wetlands, and 160 acres of MR-GO disposal area. An additional 600 acres of wetland habitat would be impacted during construction (temporary construction easement) of the tailbay levees.

Construction of the eased barge channel would cause direct loss of 110 acres of marsh and an indirect loss of an additional 243 acres of bottomland hardwood forest and scrub/shrub wetlands.

Numerous mitigation measures were considered to compensate for impacts to marsh, bottomland hardwood forest, and scrub/shrub wetlands. Efforts were made to develop mitigation plans located entirely within St. Bernard Parish so that they would be more acceptable; however, this was impracticable. The least costly plan for marsh and scrub/shrub wetland mitigation is construction of a stone dike in Lakes Pontchartrain and Borgne to protect the eroding shoreline. Grass seeding would be done as sediment builds up behind the dikes. Mitigation for bottomland hardwood forest would involve purchase and reforestation of pasture lands in nearby Plaquemines Parish. This mitigation plan would not totally replace habitat values or areas of wetlands eliminated by the Violet site plan. Total estimated cost of the mitigation plan is $10,000,000.

Overall, the net impacts of this plan upon biological resources would be significantly adverse.

*Cultural Resources.* The plan at Violet would not impact any known cultural resources presently listed in the National Register of Historic Places.

*Recreational Resources.* Marsh losses due to project construction would result in a minor loss of potential recreational use. A loss of aesthetic value and negative impacts

to six state designated natural and scenic streams would also occur.

*Social Impacts.* The Millaudon Middle School, with about 500 students and 45 employees, would require relocation. In addition, port related and maintenance facilities with about 100 employees would have to be relocated. Four residences would have to be relocated, and about 50 residences would experience reduced access. An automated oil pipeline facility would also have to be relocated.

*Regional Development Impacts.* The regional development impacts of lock plans at this site have potential for stimulating regional development and growth.

Based on our analysis, we concluded that a new lock is needed between the Mississippi river and the MR-GO/GIWW. The residents of St. Bernard are unalterably opposed to a new lock and connecting channel being located at Violet. The old Police Jury and currently the Parish Council, the governing authority of St. Bernard Parish, is unequivocally opposed to construction of a new lock and connecting channel project at Violet because it would bisect the parish and cause major adverse environmental impacts. Any plan at Violet would result in the destruction of large areas of wetlands, making Violet an unacceptable site for a new lock project.

**Comparison of Sites.** On the basis of preliminary costs, a site at Violet is more expensive, and a site adjacent to the existing IHNC lock is more attractive. From the standpoint of operational efficiency and intraport movement, the advantages of the IHNC site are considerable. In addition, environmental impacts for any new lock and connecting channel project at Violet are significant and adverse. Loss of wetlands, particularly in Louisiana, is a very sensitive issue. The sensitivity is evidenced by the passage of the Wetlands Conservation and Restoration Fund by the voters of Louisiana on October 7, 1989, and the state's participation in studies to seek solutions to the coastal problems.

Public Law 91-190, the National Environmental Policy Act (NEPA), declared that it was Federal policy to use all practicable means "to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans."

Executive Order (EO) 11990, Protection of Wetlands, directs the Corps to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in carrying out civil works activities. The key requirement of the Executive Order is determining whether a practicable alternative to locating an action in wetlands exists. This requires the

identification and evaluation of alternatives that could be located outside of wetlands (alternate sites; other means that would accomplish the same purpose[s] as the proposed action [alternative actions], and no action). If there is no practicable alternative to locating an action in wetlands, the EO requires that the action include all practicable measures to minimize harm to wetlands and preserve and enhance the natural and beneficial values. Provision for Corps compliance with this EO is incorporated in standing Corps planning guidance, as part of the specific and general environmental considerations required.

Representatives of the Louisiana Department of Natural Resources have indicated that they could not conceive of a possible project design that could be constructed at the Violet site in a manner that could be consistent with the Louisiana Coastal Zone management program. In addition, the Corps would have to comply with the state laws regarding scenic streams under the Louisiana Scenic Streams program. All of these factors would make selection of any plan at Violet very difficult to implement. We concluded that, if private interests were applying for a permit for such a project that impacts wetlands as we would propose at the Violet site, the New Orleans District Engineer would not issue such a permit because there is a practicable alternative that does not impact wetlands. In testimony before a Congressional hearing on September 12, 1990, the ASA's Deputy for Planning Policy and Legislature Affairs stated the Department of the Army's policy. "We apply the same decision criteria to the Army Civil Works projects as we do on whether to grant permits for non-Corps activities."

In March 1990, the Inland Waterway Users Board met at New Orleans. At the Board's request, we presented a status briefing on the project. During the briefing we stated that "in order to comply with the President's stated policy of no net loss" relative to projects in wetlands, construction of a new lock and connecting channels project at Violet would require extensive mitigation to replace the type and quality of habitat. In addition to the adverse impact on wetlands, a Violet site has always encountered strong opposition from local elected officials and local citizen groups in St. Bernard Parish.

In conforming with Executive Order 11990, in keeping with the Federal policy of "no net loss" of wetlands, and in responding to the spirit of guidance and policy letters issued by the Chief of Engineers concerning the environment, the New Orleans District, in January of 1991, recommended that the Violet site be eliminated from further consideration for a replacement lock. The New Orleans District concluded that any plan at the Violet site is environmentally unacceptable, even though a lock is engineeringly and economically feasible. In June 1991, HQUSACE concurred in the District's recommendation to conduct no further studies of the Violet site.

**Screening of Sites at the IHNC**

In 1992, subsequent to dropping the Violet site from further consideration, the New Orleans District evaluated preliminary plans at the IHNC. Eight preliminary alternative plans were then developed for a replacement lock in the vicinity of the existing IHNC Lock. These plans are comprised of various combinations of sites, construction techniques, and bridge replacement scenarios. The evaluation and comparison of the plans is limited to trade-offs between NED effects and social impacts. The impacts of any of the alternative plans on the natural environment are similar and insignificant. The preliminary plans are described below with the locations shown on Plates 4 through 7.

- Plan 1 - 200-Foot East of Existing Lock-Conventional Construction, with mid-level replacement bridges at St. Claude and Claiborne Avenues.
- Plan 2 - 200-Foot East of Existing Lock- Float-In Construction, with mid-level replacement bridges at St. Claude and Claiborne Avenues.
- Plan 3 - 200-Foot West of Existing Lock-Conventional Construction, with mid-level replacement bridges at St. Claude and Claiborne Avenues.
- Plan 4 - In situ Replacement-Relieved Deck Construction, with mid- level replacement bridge at St. Claude and the existing Claiborne Avenue Bridge.
- Plan 5 - North of Claiborne Avenue Location-Float-In Construction, with mid-level replacement bridge at St. Claude and the existing Claiborne Avenue Bridge.
- Plan 7 - North of Claiborne Avenue Location-Float-In Construction, with low-level replacement bridge at St. Claude and a mid-level replacement bridge at Claiborne Avenue .
- Plan 8 - North of Claiborne Avenue Location-Conventional Construction, with low level replacement bridge at St. Claude and existing Claiborne Avenue Bridge.

The four sites represent the full range of technically feasible locations. The 200-Foot East plans generate the highest benefits but also generate the most severe social impacts. The 200-Foot West plan, the In Situ plan, and the North of Claiborne Avenue plans were developed in response to the concerns of local residents and elected officials over the extensive social impacts to the neighborhoods in the vicinity of the IHNC Lock.

A significant amount of the social impacts (e.g., relocations, bisection of neighborhoods with bridge approaches, construction disruptions) are caused by the construction of the bridge replacements required for some of the lock plans. One of the significant advantages of the In-Situ plan and the North of

Claiborne Avenue plans is that they can be aligned to preclude the replacement of the Claiborne Avenue Bridge. With those plans, the St. Claude Avenue Bridge would also be replaced in-situ and not relocated to the east or west as with the 200-Foot East and 200-Foot West plans.

The technique used for the construction of the lock also has a significant effect on the cost and social impacts of some of the alternative plans. The New Orleans District identified a float-in method of construction as the least-cost construction option at the North of Claiborne Avenue site and the only construction method capable of taking full advantage of the mitigation potential of the North of Claiborne Avenue site. The float-in method of construction involves a prefabricated lock constructed off-site, floated in, in two pieces (730 feet long and 180 feet wide), mated, and sunk into place by ballasting with concrete. The lock would be sunk onto a pile foundation driven below the waterline using pile followers. The construction excavation would be dredged to the required elevation; therefore, no dewatering would be required.

Other variations of these seven plans were considered and dismissed. During the site evaluation process, the planning team considered the possibility of a hybrid plan which matches a 200-Foot East alignment with the community-preferred low-rise replacement bridge at St. Claude Avenue. The planning team quickly discovered that the reduction of social impacts attributable to a low-rise replacement bridge is not the same for the 200-Foot East alignment as it is for the North of Claiborne Avenue alignment. The shift of the new bridge opening centerline 200 feet east of the existing centerline would alone require real estate acquisitions and shift the noise contours further into the residential areas, effects not encountered with a replacement bridge consistent with the existing centerline. Furthermore, the necessity to replace the Claiborne Avenue Bridge would remain. The planning team also recognized that a 200-Foot East plan featuring a low-rise replacement bridge at St. Claude Avenue would require that the bridge deck be located adjacent to the new lock chamber. In this case, the new bridge would simply replicate current levels of bridge interference to navigation and reduce project benefits in this category. In contrast, a low-rise replacement bridge associated with a North of Claiborne Avenue alignment would not cause this type of interference since the approach point for waiting tows would be located at a point between the low-level bridge and the lock chamber.

A summary of the economic analysis of the plans is presented in Table 15.

Insert Table 15

Table 15 is a summary of the Economic Analysis of the plans being considered. To Be Inserted.

The benefit and cost estimates displayed in Table 15 represent a partial updating of a feasibility scope economic analysis that was completed immediately prior to the initiation of the open planning process, a process that recognizes and addresses concerns of stakeholders. Elements of the analysis that were updated included the traffic base (from 1985-1989), transportation rates, price level, discount rate, and project base year. Mitigation costs used in the initial screening are based on initial estimates developed by a contractor, subsequently refined by the Corps.

A single chamber size, 900 feet long by 110 feet wide by 22 feet deep, was selected as the basis for site screening in order to limit the scope of the screening process. This size was selected because it was determined to be the NED optimized chamber size in the earlier feasibility analysis. It is not expected that the ranking of sites on the basis of net benefits would be affected by the chamber size selected for the comparison. The conventional, cast-in-place construction method design was based on engineering judgment and experience from similar projects. The float-in design was prepared in substantial part by EBASCO Services Incorporated. EBASCO designed the Sidney A. Murray Hydroelectric Power Station which was successfully floated in and installed at the Old River complex in Louisiana.

In the screening of the IHNC plans, we eliminated Plan 3, the 200-Foot West plan, and Plan 4, the In Situ plan, by comparing them to the 200-Foot East plans. Plan 3 (the 200-Foot West plan) was eliminated because, when compared to the 200-Foot East plans, it had lower net economic benefits and more severe social impacts. Plan 4 (the In Situ plan) also had lower net economic benefits than the 200-Foot East plans and was unacceptable to navigation interests. The In Situ plan would result in a shut-down of this reach of the IHNC/GIWW for approximately 2.5 years. Such a shut-down would severely disrupt shallow-draft navigation as well as impact deep-draft navigation that might normally use the lock. The plan also had lower net benefits than some other plans.

Plan 2 (the 200-Foot East - Float-In Construction plan) was eliminated because net benefits were less than Plan 1 (the 200-Foot East-Conventional Construction plan).

Of the North of Claiborne Avenue plans (Plans 5, 6, 7 and 8), Plan 6 was determined to be the environmentally preferable plan and also yielded the greatest net benefits.

**Plans Considered in More Detail.** Two of the preliminary plans for the replacement of the IHNC Lock (plans 1 and 6) were selected for further analysis. The navigation features of these plans are described below. The costs of the plans, the magnitude of social impacts, and the mitigation costs of the plans are

determined by site of the lock, the bridge relocations required to accommodate the lock site, and the construction techniques utilized. An economic comparison of the plans, the social impacts of the plans, and the mitigation measures developed for the plans are described in subsequent sections of this report.

- 200-Foot East: conventional construction, pile foundation; lock centerline is 200 feet east of existing lock centerline; mid-level, vertical lift replacement bridges at Claiborne Avenue and at St. Claude Avenue which includes two access loops on the west side; all pile driving requires a hydraulic hammer.

- North of Claiborne Avenue: float-in construction within the existing canal, prepared soil foundation; lock centerline is directly aligned with existing lock centerline; raised lift-span towers for the existing Claiborne Avenue bridge, low-level replacement bridge at St. Claude Avenue which does not include any access loops; all pile driving requires a hydraulic hammer; double by-pass channel around the construction site on the east side of the canal to provide navigation usage during construction.

Float-in construction is the more cost effective method for the North of Claiborne site. This method of construction avoids costs associated with a massive sheet pile cofferdam, additional levees and floodwalls, additional rights-of-way and residential relocations, additional social mitigation, and additional costs to accommodate navigation during the longer construction period that would be required for conventional construction methods. Additionally, the conventional construction would incur higher interest costs during construction due to the longer period of construction.

In addition to being the least cost construction technique at the North of Claiborne site, the float-in method of construction has significant mitigation-related advantages over the conventional cast-in-place construction for the IHNC sites. The major structural features would be constructed at off-site fabrication facilities resulting in less on-site construction activities and less noise in the local neighborhoods. The remaining on-site construction would be performed from a floating plant, reducing construction traffic through the neighborhoods. Additionally, the need for cellular cofferdams encircling the construction site would be eliminated resulting in significantly reduced pile driving requirements.

Finally, regardless of a particular construction option, a navigation bypass channel in conjunction with the North of Claiborne site is necessary to avoid shutting down a vital link in the GIWW for 5-6 years of construction. Float-in construction affords ample room in the vicinity of the IHNC to construct a navigation bypass channel without necessitating residential

relocations. On the other hand, construction of a bypass channel around the cofferdam associated with conventional construction would necessitate relocation of the IHNC levees and floodwalls and consequent residential relocations.

Economic Comparison. A summary of benefit and cost data for the plans considered in more detail is presented in Table 16. Selection of the 200-Foot East

**Table 16**
**IHNC Lock Replacement Study**
**Site Optimization**
**900' x 110' x 22' Replacement Locks**
**1991 Price Levels, 8.5 Percent**
**($1,000)**

| Item | *Plan 1* 200-Ft. East Conv. Const. Mid-St. Claude Mid-Claiborne | *Plan 6* N. of Claiborne Float-In Low St. Claude Existing |
|---|---|---|
| Claiborne | | |
| *Benefits* (capitalized annual values) | | |
| Shallow Draft | $1,419,104 | $1,419,104 |
| Vehicular | 44,643 | (26,201) |
| Total Benefits | $1,463,747 | $1,392,503 |
| *Costs* | | |
| Lock Construction | 227,457 | 293,499 |
| Rights-of-Way | 15,447 | 72,372 |
| Bridges | 124,677 | 10,915 |
| Relocations | 20,660 | 21,059 |
| Mitigation | | |
| Socio-Economic | 46,057 | 7,022 |
| Subtotal Construction | $434,298 | $ 404,867 |
| Industry Losses - Closure | 5,500 | 7,022 |
| Total Cost | $439,798 | $ 437,867 |
| Interest Costs During Construction | 169,876 | 182,261 |
| Interest Costs on Closure | 2,122 | 5,212 |
| Interest Costs on Mitigation | 44,119 | 5,273 |
| Total Present Value Costs | $655,915 | $ 630,613 |
| *Net Benefits* | | |
| Present Value Net benefits (Rounded) (Base Year: 2007) | $807,800 | $ 761,900 |

alternative for the final array was based on conventional NED criteria. This plan produced the highest apparent net benefits

of the eight plans. The North of Claiborne alternative was selected because the significant reduction in community impacts realized qualifies it as the environmentally preferable plan. Furthermore, it is the only plan which enjoys any support from the neighborhoods, local elected officials, or the local sponsor.

The support of virtually all stakeholders -- to include navigation interests -- for the North of Claiborne plan is worth examining. Their support stems from a conclusion that the local opposition is so overwhelming that it would preclude building the 200-Foot East plan. Therefore, none of the benefits would accrue. Of the $46 million difference in net benefits, $31 million are attributed to costs sustained by navigation interests from the difference in IHNC closure durations of the two plans. The maritime industry's acceptance of this difference in closure costs stems from their view that no plan as destructive of politically powerful non-beneficiaries as is the 200-Foot East plan will ever be built. Thirty years of the project's history tend to support this view.

An additional $71 million of the difference between the two plans results from vehicular benefits forgone in the North of Claiborne Avenue plan. The vehicular benefits attributed to the 200-Foot East plan derive from the extensive bridge replacements that are elements of that plan. These benefits accrue largely to beneficiaries in the local metropolitan area.

In summary, given lower construction costs, all net benefits foregone by the North of Claiborne Avenue site are borne by stakeholders in the maritime industry or local metropolitan area. Representatives of each group prefer the North of Claiborne Avenue site: maritime interests because they believe the 200-Foot East plan is not implementable; local metropolitan interests because they perceive the negative social impacts of the 200-Foot East plan to outweigh the incremental vehicular benefits.

Socioeconomic Impacts of Plans. Careful and comprehensive measurement of social and economic impacts is rarely more important to the plan formulation process than in the case of the IHNC lock replacement study. Public Law 91-190, the National Environmental Policy Act of 1969 (NEPA), requires that all impacts to the human environment be presented in the environmental impact statement (EIS). In traditional Corps of Engineers projects, all significant impacts are usually confined to natural environmental components. The IHNC Lock is an exception. Most of the alternatives proposed at the existing location are massively disruptive of a crowded urban district which includes no project beneficiaries. A number of attempts have been made over the life of this study to engage the local residents in a process whereby impacts to the neighborhood could be mitigated, or otherwise reduced, to an acceptable level. As part of this effort, the New Orleans District (NOD) separately

contracted with a local planning firm (Gregory C. Rigamer and Associates, Inc.) with experience in analyzing project impacts of similar scale. This firm assessed the full range of socio-economic impacts and proposed mitigation measures which could form the basis for negotiation. The contractor concluded that project impacts are sufficiently diverse and severe that full mitigation is not possible. The NOD has used the intermediate product of this process, i.e., the September 1991 Socio-Economic Impact Analysis and Mitigation Plan (SIA), to develop independently a preliminary set of mitigation measures which are linked to construction impacts and which would most likely have been included in a broader, negotiated mitigation plan.

In the course of the Rigamer study, the contractor concluded that the four neighborhoods comprising the IHNC site were already highly stressed from a combination of factors. This is manifested in declining population and property values, a depressed housing market, crime, high vacancy rates, and high unemployment. He further concluded that the lengthy construction period and the nature and severity of the impacts would so exacerbate the area's decline as to undermine the viability of the neighborhoods. The initial objective of the Rigamer proposal was, therefore, aimed at stabilizing the neighborhoods with an extensive program of pre-construction measures which, taken together with lesser direct mitigation measures taken during construction, would enable the community to withstand project impacts. Recognizing that neither this plan, nor any other plan, can fully compensate the community, the contractor also recommended that we revisit the feasibility of a previously investigated site in the IHNC north of the Claiborne Avenue bridge. This location eliminates all residential relocations and most of the noise impacts, and it is compatible with minimal bridge modifications. These represent the most severe of the project impacts. Subsequent analysis confirmed the technical implementability of the North of Claiborne plan.

The following sections will compare the most basic and harmful of major impacts associated with the two sites and is not intended to either review the broader range of impacts, as the 1991 SIA did, or to substitute for a detailed environmental impact analysis which appears in the evaluation report/environmental impact statement.

Table 17 compares the impacts of each alternative in terms of a few critical variables. These variables are classified into three major impact categories where the most onerous of project impacts can be readily summarized: displacement, noise, and transportation effects.

This table should be viewed with the following in mind:

1) The source of the data for the 200-Foot East alternative was the aforementioned SIA. Comparable estimates for the North of Claiborne Avenue alternative were subsequently compiled in-house.

2) Some pile driving for lock and bridges under the 200-Foot East plan occurs simultaneously and has been accounted for.

3) Pile driving noise is measured using the Day-Night Sound Level (Ldn) model which averages noise levels detectable at a specific distance from the noise source within a standard interval of time.

Table 17 -
Inner Harbor Navigation Canal Lock Replacement
Social Impact Analysis
Comparative Impact of Construction Alternatives

The Ldn classifications are as follows: "75 Ldn" refers to a region which falls within 350 feet of the noise source for lock construction and within 240 feet of noise source for between 350 and 1280 feet of the noise source for lock construction and between 240 and 845 feet of the noise source for bridge construction. The terms "unacceptable" and "normally unacceptable" are associated, respectively, with each noise region, refer to the level of severity of noise, and were intended by the Department of Housing and Urban Development (HUD) to serve as criteria for deciding whether an area was sufficiently distant from particularly noisy facilities, such as airports, highways, and railroad yards, to qualify for federal urban development assistance.

4) In order to focus on impacts to the local community, the various effects of either alternative on the U.S. Coast Guard Station have been omitted.

The displacement, noise, and transportation effects of the detailed plans are discussed in the following paragraphs.

*Displacement Effects* Displacement effects refer to the consequences which follow from the acquisition of real property required for project construction. The rights-of-way requirements under the 200-Foot East plan result in the acquisition of 145 residential properties and the displacement of 312 people. Although owners would be compensated for the fair market value of their property to the fullest extent permissible under the terms of Uniform Relocations Assistance and Real Property Acquisition Policies Act of 1970, PL 91-646, as amended, not all residents who desire to relocate within the immediate neighborhood will be able to find suitable housing. Furthermore, the two neighborhoods most adversely affected under the 200-Foot East plan are also the most settled, a quality which is consistent with their historical character and not replaceable in-kind. In contrast, the rights-of-way associated with the North of Claiborne Avenue alternative completely avoid the requirement for the acquisition of residential property.

*Noise Effects* Of all major impacts, pile driving and associated construction noise are the most intrusive. For this reason, noise effects were quantified in terms of the number of months a resident is exposed to noise created by pile driving activities. Under the 200-Foot East plan, pile driving associated with bridge piers and approach ramps occur at the same time as pile driving for the lock foundation and so a number of residents will be doubly affected. Therefore, noise effects were measured in terms of the number of "person-months" of pile driving. By this measure, the lock and bridge configuration representing the North of Claiborne Avenue alternative reduces

the community's exposure to noise by 86 %, from 177,000 person-months to 24,000 person-months. This reduction is attributable to five construction features:

1) the lock construction site is farther removed from residential areas,
2) the duration of pile driving for lock construction is greatly reduced,
3) the low-rise replacement bridge at St. Claude Avenue requires less construction time than a mid-rise bridge,
4) the replacement bridge at St. Claude Avenue does not include replacement bridge ramps or the addition of bridge loops, and
5) the Claiborne Avenue Bridge is not replaced.

Furthermore, since those individuals who reside within 75 Ldn of construction are exposed to more intense noise than those who reside between 65 and 75 Ldn of construction, the noise reduction benefits associated with the North of Claiborne Avenue plan is correspondingly understated.

*Transportation Effects* The effects associated with bridge closures are the most pervasive and most difficult to quantify. Under the 200-Foot East plan, the St. Claude Avenue Bridge would be closed for 4.5 years and the Claiborne Avenue Bridge would be closed for 7 months. Closure of the St. Claude Avenue Bridge would deny direct pedestrian access to either side of the IHNC and a mid-rise replacement bridge would not restore to the 750 daily pedestrians their current level of access. Under the North of Claiborne Avenue plan, the St. Claude Avenue Bridge would be closed nearly 3 years.

The prospect of an extended closure of the St. Claude Avenue Bridge could be very damaging to those businesses located on St. Claude Avenue in the vicinity of the IHNC -- businesses which depend upon trans-canal traffic. Although the severity of impacts will vary from business to business, overall, one can expect that the commercial value and economic viability of these businesses will be diminished. Closure of the St. Claude Avenue Bridge would also require that bridge traffic detour through connecting neighborhood streets to Claiborne and Florida Avenues. Detouring traffic would introduce substantial vehicular noise and congestion into residential areas currently separated from main thoroughfares. Similar kinds of impacts will occur upon closure of the Claiborne Avenue Bridge under the 200-Foot East plan, although they will be of shorter duration.

The general impacts described correspond to a reconnaissance-scope detour plan which was developed as input for the 1991 SIA. In this plan, certain neighborhood streets were simply identified as likely detour routes and, as such, constitute a worst-case scenario. On a fundamental level, the plan included no accommodations for re-routing public transit and access requirements of emergency vehicles. The current detour

plan also lacks the detail necessary to determine the volumes and pattern in which local and commuter traffic will redistribute once a larger Florida Avenue Bridge is constructed (by the State of Louisiana separate from this project) and the St. Claude Avenue Bridge is closed. The nature of this redistribution is a function of the set of traffic control features adopted in the final plan. Prior to project construction, a feasibility-scope traffic engineering study will be required to analyze current and future traffic volumes and types, to determine future vehicular requirements, to balance safety and efficiency objectives and, finally, to plan the redistribution of traffic during construction. The transportation network emanating from this study and, thus, the severity of associated impacts to the neighborhoods will be largely determined by the presence of one or more newly constructed access road linking Florida Avenue to main arteries beyond the affected neighborhoods. It is possible that construction of access roads as permanent components of the transportation network may permanently change traffic patterns in such a way that adverse impacts to the community are considerably reduced. Thus, the degree to which traffic-related impacts are overstated will depend upon the results of the forthcoming traffic engineering study.

Without the benefit of detailed studies, however, it is clear that the North of Claiborne Avenue plan is significantly less disruptive of circulation patterns in that only one crossing, St. Claude Avenue, is involved and closure time is reduced by over one and a half years, or 35 %.

*Mitigation Features of Plans Considered.* Since full mitigation for most of the impacts is not possible, the question of proper incremental analysis arises. The objective of marginal analysis in mitigation planning is normally to determine the level of mitigation at which the benefit of the last proposed increment just equals its marginal cost. In practice, mitigation planning within the Corps of Engineers is almost exclusively confined to the natural resource arena. In the case of social mitigation, however, analysis and mitigation of impacts over the entire range of community resources covered in Section 122 of the River and Harbor Act of 1970 (Public Law 91-611) do not enjoy the benefit of a common measure such as the Habitat Unit used to scale fish and wildlife mitigation features. Nor is the cumulative and interactive nature of multiple impacts well addressed by judgmental scaling one resource at a time. Once all measures for "in-kind" mitigation are exhausted, residual impacts can only be offset by "out-of-kind" mitigation. The plan objective becomes identification of a set of actions which replace one array of community resources with another array sufficient to restore to the community an equal level of satisfaction. Support for this approach was contained in

instructions in the FY-91 Appropriations Act and in prior guidance.

The scope of appropriate mitigation activities suggested in Section 122 and the extent of measures considered to date by the district are extremely broad. It has been proposed that the plan be separated into "normal" and "extraordinary" features, at least for purposes of cost allocation. As discussed above, however, we believe that a mutually agreeable mitigation plan is likely to result from a negotiation process in which "out-of-kind" mitigation and over-mitigation in certain areas are required. Therefore the distinction between "normal" and "extraordinary" mitigation is blurred, if relevant at all.

The mitigation actions which follow do not constitute either a specific proposal or a commitment by the Corps of Engineers to implement any of them, in whole or in part. A final project mitigation package will only result from future active involvement with affected parties. The purpose of the mitigation plans developed for this stage of evaluation is to establish an array of actions which together constitute a level of mitigation commensurate with the scale of corresponding impacts and to estimate their cost.

The cost to implement the mitigation actions described below is detailed in Table 18 for the 200-Foot East alternative and in Table 19 for the North of Claiborne Avenue alternative. The elements of the mitigation plan and their cost are a composite of various recommendations contained in the SIA and others which were developed within the district.

*Preconstruction Mitigation*. As stated earlier, the Rigamer study concluded that the neighborhoods in the vicinity of the IHNC are already highly stressed and would require an extensive program of pre-construction measures as well as direct mitigation measures during construction to offset the impacts of the 200-Foot East plan. Without such actions, sustainability of the neighborhoods would be jeopardized. The pre-construction mitigation package includes upgrading the community's infrastructure (streets, street lighting, and drainage), the addition of public facilities (police substation, community college, and playgrounds), and a program of long-term housing rehabilitation. Pre-construction mitigation plan costs are summarized in Tables 15 and 16. Since the North of Claiborne Avenue alternative eliminates all residential relocations, most noise impacts, and is compatible with minimal bridge modification, it is the judgment of the district that the package of pre-construction mitigation measures would not be required.

*Direct Mitigation.* Costs for mitigating construction-related impacts associated with displacement effects, noise effects, and transportation effects were developed for the plans considered in detail.

1. Displacement Effects. Mitigation in this area is focused on the displacement of commercial enterprises and historic structures.

- Job training is intended to allow a number of workers who may lose employment because of displacement to become employed again as part of the lock/bridge construction crew, presumably at a higher level of skill.
- The City of New Orleans is expected to lose revenue should displaced businesses either liquidate or move to a nearby parish. Mitigation consists of estimating the loss to the city, which the SIA has done, and to compensate the municipal government in a lump-sum payment.
- Historic values are preserved by relocating residential structures which have historical significance and by documenting community historical landmarks prior to their demolition, i.e., the St. Claude Avenue bridge and the IHNC lock.

Table 18 - See Previous Report

Inner Harbor Navigation Canal Lock Replacement
Social Mitigation Costs
200-Foot East: Conventional Construction

Table 18 (cont.) - See Previous Report

Table 18 (cont.) - See Previous Report

Table 19 - See Previous Report

Inner Harbor Navigation Canal Lock Replacement
Social Mitigation Costs
North of Claiborne Avenue; Float-In
Low St. Claude - Existing Claiborne

Table 19 (cont.) - See Previous Report

Table 19 (cont.) - See Previous Report

2. Noise Effects. Partial mitigation for the effects of noise is accomplished in two ways: 1) modifying the intensity of noise at the source and receptor level, and 2) direct financial compensation for lost real estate values during construction.

- An important method of reducing construction noise consists of restricting vehicular traffic to and from the lock/bridge sites along well-defined and isolated roadways. The details of this feature will emerge through the aforementioned traffic engineering study and are not included in this plan.
- Residents can be protected from noise to a certain degree by installing specialized insulation into their homes. Since many residences in the affected area are either not air-conditioned or are only fitted with substandard or depreciated air-conditioning units, the installation of new cooling equipment is essential. Furthermore, residents would be reimbursed directly for their added electrical utility cost for operating these units, but only to the extent that utilities are consumed during periods of pile driving.
- Interference with and decline of outdoor recreation due to construction-related noise is addressed by substituting indoor for outdoor recreation. Indoor recreation is provided by constructing and operating (for the term of pile driving activity) as many as four, fully staffed, sound-protected community recreational facilities in those areas which lie within the 65 Ldn noise contours.
- The SIA concluded that, because of construction noise, the number of vacant rental units would increase and that the value of residences marketed for sale would decrease. Since these effects occur only during construction, their magnitude is limited and identifiable. The government, by means of a professionally-staffed administrative unit, can compensate owners on a case-by-case basis as future claims are systematically processed and verified.

3. Transportation Effects. Mitigation for the effects of bridge closure are confined to the accommodation of pedestrian traffic and public transit.

- Closure of the St. Claude Avenue Bridge would leave the nearly 750 pedestrians who cross the bridge daily with no alternative access to the Industrial Canal unless specific facilities are provided. Construction of a pedestrian bridge which does not interfere with navigation traffic represents the most direct approach to mitigation but is not practical due to the nature of traffic and proposed demolition and construction activity. Instead, the cost to restore pedestrian access was estimated on the basis of providing shuttle bus service which would route through the Claiborne Avenue Bridge. "Mini-Bus" service would be at no charge to pedestrians and the termini of this service route would be

strictly limited to St. Claude Avenue on either side of the IHNC.

- Coordination with the Regional Transit Authority (RTA) and the City of New Orleans was required in the development of a traffic detour plan. Furthermore, RTA would be reimbursed for the additional operating cost associated with re-routed public transit.
- The construction of approach ramps and loops for a mid-rise St. Claude Avenue Bridge would damage the current aesthetic quality of the immediate neighborhoods. To buffer the visual impact of these bridge features, construction would include an appropriate degree of landscaping.

The New Orleans District concluded that the 200-Foot East plan is unacceptable under NEPA from a socio-environmental standpoint, even though a lock is engineeringly and economically feasible. NEPA declared that it is Federal policy to "create and maintain conditions . . . and fulfill the social, economic, and other requirements of present and future generations of Americans."

The substantially more intrusive nature of the 200-Foot East plan, particularly regarding noise, bridge replacements, and residential/commercial displacements, is the heart of the problem. These impacts are further compounded by the length of the construction period. The alignment is so inherently objectionable that no adequate compensation can be developed, particularly as long as a significantly less disruptive lock plan is known to exist. As stated in the previous section describing the mitigation plans, the measures presented in Tables 19 and 20 do not represent our specific plan; they reflect our appreciation of reasonable starting points for discussions with the affected neighborhoods. Although the magnitude of the difference in the cost of the two plans is instructive, what is not clearly reflected in the tables is the difference in the probability of successfully negotiating a mitigation plan at all.

At the gross investment level, the measures suggested for the 200-Foot East plan provide a total cost of $90 million; at North of Claiborne, the cost is about $12 million. Recognizing that neither set of mitigation measures represents full compensation, our experience in discussions to this point indicates that, in the view of the elected officials and the neighborhood residents, the nature and magnitude of uncompensated and intangible impacts at the 200-Foot East site are such that a plan several times more costly would still be rejected. In contrast, the North of Claiborne site entails fewer uncompensated and intangible impacts because of its less intrusive alignment and significantly lower noise levels. In short, the estimated mitigation costs for the North of Claiborne site shown in Table 20 probably bear a close resemblance to the actual cost of a viable plan.

As an example, consider the profound noise impacts experienced during construction. Although noise effects are primarily construction-related and thus temporary, the extensive duration of pile driving alone can be understood to deny residents the full use and enjoyment of their property, even after mitigation. Even if the Corps can negotiate a mitigation plan for the 200-Foot East plan with community leaders, this would not preclude the likelihood that any number of affected parties, acting individually or collectively, will pursue lawsuits against the Corps contending that they and the neighborhoods were not fully compensated. Several community leaders have already indicated that they intend to block lock construction through legal action. With past experience as a guide, the only certainty associated with resolving the current impasse through the judicial system is that it will take years and be very expensive. While this can be said of both plans, to the extent that the North of Claiborne Avenue plan is much less intrusive on all counts and particularly with respect to noise, the likelihood of litigation is certainly less, and amicable resolution is a much higher probability. Discussions with local interests to this point clearly demonstrate that no acceptable mitigation plan could be developed for the 200-Foot East chamber location. As shown in correspondence attached to this report, this view is also strongly held by the local sponsor and local elected officials.

Continued pursuit of the 200-Foot East Plan comes at a cost of $20 million a year in navigation delay costs, in addition to the substantial navigation delay costs associated with past recommendations of similar plans which were strongly opposed locally. If only a third of the implementation delay experienced since 1960 can be attributed to this impasse, the present value of the cost is over $300 million, more than six times the apparent net benefit advantage of the 200-Foot East plan, even if substantial added mitigation costs needed to gain acceptance of 200-Foot East are ignored.

From the economic data presented in Table 19 one can conclude that the North of Claiborne Avenue plan has a B-C ratio greater than 2:1 and net benefits of about $760 million. More importantly, it is a viable plan which can bring a solution to the delay problems at IHNC. The 200-Foot East plan cannot do this. The Port of New Orleans gains little immediate benefit from the national economic development solution to this problem unless a deep draft facility is constructed, and the neighborhoods gain nothing. No incentive exists for these entities to bear the burdens presented by the 200-Foot East plan. Local interests have successfully resisted such plans over the long, costly history of this study and will continue to do so.

In summary, our analyses and experience to date eliminate the 200-foot East site as a candidate NED plan based on non-implementability as well as the acceptability criteria contained

in ER 1105-2-100. Further, in view of the magnitude of uncompensated and intangible impacts associated with the 200-Foot East plan, we do not believe that it is an environmentally sustainable plan within the broad NEPA context.

The information in the above section was submitted through channels to higher authority in September 1992 and concurrence by ASA(CW) to focus further study efforts on the North of Claiborne Avenue site was obtained in April 1993.

## PLANS CONSIDERED IN THE FINAL ARRAY

For comparative purposes, the final array of alternative plans being considered include (1) No Action, (2) construction of a new bridge at St. Claude Avenue (commonly referred to as the Bridge Only Alternative), and (3) constructing a new lock at the North of Claiborne Avenue site in the IHNC. Alternative lock sizes evaluated at the North of Claiborne Avenue site consisted of various lock depths (shallow, 22-foot and deep draft, 36-foot), widths (90-foot and 110-foot), and lengths (900-foot and 1,200-foot).

**Alternative 1 - No Action/Continued Operation of the Existing Lock (Future without the project)** This alternative represents the Corps best estimate of how the IHNC lock and connecting channel would exist in the future, including changes expected to occur over the 50-year period of analysis assuming no further Federal actions to replace or significantly modify the existing lock are taken. The future without project condition consists of extraordinary maintenance of the existing lock to maintain the existing level of service to navigation for the next 50 years. It is expected that this extraordinary maintenance would take place over a 4-year time frame once a decision is made that a new lock would no longer be pursued. For purposes of our evaluation, we assumed that this action would be initiated in 1999 and will include the following items:

- Construction of four spare gate leaves to be stored at an off-site location and used as substitutes when other gates are removed for maintenance. Maintenance on gates will be conducted on a 12-year cycle with gates being removed in a staggered cycle.
- Construct a spare set of miter gate machinery (strut arms, sector gears, and drive gears) and store at an off-site

location. Canal end reverse-head machinery would also be raised.

- Retrofit existing lock concrete with steel wall armor or other lining material. In high damage areas, ultra-high-molecular-weight plastics may be usable in lieu of steel wall armor. The retrofit would include an estimated 50% of the chamber area from elevation -4 feet to the top of the lock wall. Cracks would be repaired by pressure injection grouting in the chamber monoliths. In addition, the vertical joints between the gatebay and chamber monoliths would be sealed and made watertight.
- Replace the existing prefabricated buildings with permanent masonry concrete structures with control panels and facilities as needed.
- Replace the existing emergency crane with a new 175-ton capacity crane (at 55’ radius). The present cable unlatching system for the bulkheads will be replaced with hydraulic cylinders.

Intermittent lock closures would be required. We estimated that two separate closure periods required within the four-year period. Each of the closures would last between 6 to 8 weeks.

The extraordinary maintenance would not result in significant gains in efficiency for navigation and is estimated to cost approximately $16,100,000 more than normal operation and maintenance (O&M). Normal O&M costs are not included in this estimate.

For purposes of our analysis, the following were also assumed.

a. All GIWW locks will continue to be operated and maintained to ensure continued navigability.
b. Existing locks are using the most efficient locking policies.
c. All other existing waterway projects and those under construction will also be operated and maintained.
d. The waterway user taxes will continue as prescribed by WRDA 86, (PL 99-662).
e. Baptiste Collette is not considered a viable long-term alternative to use of the IHNC lock.
f. Traffic demands will grow at the medium rate.
g. The existing Florida Avenue Bridge will be replaced with a new high-level vehicular bridge by the Louisiana DOTD, and the Port of New Orleans will replace the rail element with a new low-level vertical lift-span rail bridge. The rail bridge will also have one vehicular lane going each way to

accommodate local traffic.

**Alternative 2 - Bridge Only.** This alternative would consist of replacing the existing low-level St. Claude Avenue Bridge with a new 200-foot, double bascule, mid-level bridge, a relatively small-scale improvement. (See Plate 8.) The 200-foot span would require closing down the canal to navigation during demolition of the old lock. The bridge only plan would also include rehabilitation of the existing lock (as defined in the future without project condition), modification of the existing Mississippi River levee protection to tie the protection into the existing lock, modification of adjacent streets to make the bridge functional, and a detour route to accommodate traffic during bridge construction. Mitigation of the social impacts would also be required.

A mitigation plan was developed to offset the anticipated impacts of the bridge only plan. The plan includes a pile testing program to define potential noise and vibration impacts to neighboring residential and commercial facilities, a detour plan for vehicular traffic, soundproofing of residential units adjacent to the construction area and within the 65 Ldn noise level, traffic control measures, provision of emergency services to offset increased response times, resurfacing some adjacent streets, aesthetic measures, compensation for lost business revenues for affected businesses, shuttle service to offset pedestrian linkage, and compensation to RTA for lost ridership. In addition, the impact on the Holy Cross and Bywater Historic Districts, listed on the National Register of Historic Places, and the two locally designated historic districts would have to be mitigated. The total cost for this alternative is estimated to be $55,569,000.

**Alternative 3 - Construction of a new lock North of Claiborne Avenue.**

The location of the proposed new lock is between the Claiborne Avenue and Florida Avenue bridges in the IHNC. Six alternative scenarios (lock sizes) were evaluated. These included the following :

a. 900′ x 90′ x -22′ (NGVD),
b. 900′ x 110′ x -22′ (NGVD),
c. 900′ x 110′ x -36′ (NGVD),
d. 1200′ x 90′ x -22′ (NGVD),
e. 1200′ x 110′ x -22′ (NGVD), and
f. 1200′ x 110′ x -36′ (NGVD).

Each of the plans identified above was evaluated both with and without curfews in our analysis.

All of these plans include provision of a temporary navigation by-pass channel to be used during lock construction,

construction of a new low-level St. Claude Avenue Bridge, modifications to the Claiborne Avenue Bridge, construction of and designation of vehicular detour routes to be used primarily during times when a bridge is out of service, and demolition of the existing lock.
(See Plate 9.) Also included are mitigation measures to offset the impacts of project construction and the inconvenience and disruptions expected in the neighborhoods around the IHNC. These measures are discussed in a subsequent section.

General lock and site data. The new lock will be located in the IHNC at the north of Claiborne Avenue site, about one mile north of the east bank of the Mississippi River (river mile 92.6 AHP). The lock will include direct-head and reverse-head miter gates and lock culvert (tainter) valves. An interior, ported manifold system with 14.5 feet square culverts will be used for the -22 and -36 foot (NGVD) lock depths for the 900-foot long usable chamber. For the 1200-foot long usable chamber, the culvert size is 15- by 18-feet. The lock will be pile founded (See Plate 10). A precast, concrete float-in lock will be constructed at a graving site, located approximately 6 miles from the existing lock, just west of where the Paris Road Bridge crosses the MR-GO (See Plate 25). The graving site will consist of an earthen excavation and closure berm. A pile founded work platform will be provided with a slab elevation of EL -26 NGVD. The channel between the graving site and the staging area will be at least elevation -30 NGVD, sufficient draft for transporting all modules. The voided lock module base section will be fabricated and floated to the Galvez Street staging area. On-site the north bypass channel, lock foundation (excavation and pile-driving) and Galvez Street staging area will be constructed. The foundation will be installed concurrent with construction of the first module. At the staging area, the miter and culvert gates and machinery will be installed, and the upper lock walls will be completed. Completed lock modules will be installed by positioning partially ballasting and then lowering the module onto the setting pads. After proper alignment is obtained on the pads, the base grouting and lock wall ballasting will be completed. Plates 11a and 11b show plan and wall profiles and cross-sections of the new lock. The lock will be opened to traffic as a pass-through only. Lock backfill will be placed and levee tie-ins completed. Lock guidewalls will be completed, and the lock will be opened to navigation. It is estimated that the 1,200-foot lock will take approximately 5.5 years to construct. A more detailed description of the lock construction is included in Appendix B, Engineering Investigations.

Since the new lock will be situated in the existing channel, temporary bypass channels that allow for continued navigation through the area will be required. The intent is to reduce canal closure to an absolute minimum because of the extreme cost of closure to navigation. Two types of bypass channels are included

at different phases of project construction: (1) a two-way bypass channel between Claiborne and Florida Avenues on the east side of the canal during new lock construction, and (2) a one-way, demolition phase bypass channel between St. Claude and Claiborne Avenues on the east side, after the replacement lock is in operation and during demolition of the existing lock. The two-way bypass channel will consist of a transit bypass lane and a laying bypass lane as shown on Plate 10. Each channel is 110 feet wide; the laying channel is 20 feet deep; the transit channel is 31 feet deep. Three protection cells each will be placed at the north and south ends of the bypass channel to contain vessels. Navigation aid markers and lighting will be provided for safe channel passage. Tug assistance vessels will be stationed at the north and south protection cells and will have two-way, marine communication with vessels. The one-way bypass channel will be 12 feet deep, approximately 85 feet wide, and will be operated only after the new lock has been completed and the old lock is being demolished. Although navigation will be slowed by limitations resulting from the bypass channels, the canal will not be closed. During demolition of the existing lock, deep-draft navigation will be curtailed.

The Mississippi River flood protection levees (MRL) and floodwalls must be extended from the existing lock northward approximately 2,500 feet on the east and west banks to tie into the new lock as shown on plates 12 and 13. The MRL design grade is elevation 22.4 feet NGVD. The existing hurricane protection floodwalls will serve as hurricane flood protection during project construction, but they will have to be selectively demolished as required to construct the new MRL levee/floodwall to elevation 22.4 feet NGVD. Existing MRL forebay levees will be maintained as an all-earth section and will be shaped, where needed, to a crown elevation 22.4 feet NGVD, with 1 vertical on 3 horizontal side slopes landside and floodside.

The existing lock will be demolished after the new lock is completed and placed in service. The disruption to navigation will be kept to the minimum required to complete demolition and debris removal. The existing lock must be removed in its entirety for completion of the 200-foot bottom width replacement channel to full width.

Permanent mooring facilities will be provided on the river side of the new lock between the St. Claude Avenue Bridge and Claiborne Avenue Bridge. (See Plate 14.) Similar facilities will be provided on the north end of the lock between the lock and the new Florida Avenue bridge. (See Plate 15.) These mooring facilities, or lay areas, will provide safer operating conditions for navigation traffic than currently exists.

*Bridges.* Based on on-going coordination with the Louisiana DOTD and the Port of New Orleans, it is assumed that prior to construction of the lock project, the existing Florida Avenue

Bridge will be replaced by the State of Louisiana with a new 4-lane, high-level, fixed-span vehicular bridge. The Port of New Orleans is replacing the railroad bridge, under the Truman Hobbs authority, with a vertical lift span railroad bridge that will initially have one vehicular lane each way for local traffic. The U. S. Coast Guard has declared the existing bridge an unreasonable hazard to navigation. The new Florida Avenue Bridges will be constructed with or without the lock project and constitute the without project condition relative to the Florida Avenue.

The existing St. Claude Avenue Bridge will be demolished and replaced with a new low-level, double bascule bridge with a 200-foot horizontal clearance and unlimited vertical clearance as part of the IHNC project as shown on Plate 16. The limited channel width in the permanent mooring area between St. Claude and Claiborne Avenues (planned after demolition of the existing lock) makes 200 feet a reasonable width (acceptable to the Coast Guard). The replacement at St. Claude Bridge, to be built on the same alignment, will include partial reuse some of the existing bridge approach ramps. The Claiborne Avenue Bridge superstructure will be replaced as shown on Plate 17. The bridge superstructure will be replaced with higher towers, a new movable span, and new electrical and mechanical equipment.

While bridges at St. Claude and Claiborne Avenues are out of service, traffic will be rerouted to a detour route that was developed in conjunction with the Regional Planning Commission, the Metropolitan Planning Office (MPO) for Federal and state transportation funds (See Plate 18). The detour route utilizes the new Florida Avenue vehicular bridge currently being planned by the State of Louisiana. As planned, no more than one bridge will be out of service an any given time.

*Relocations.* Data on the location of roads, railroads, and utilities was gathered by searching permits, visiting sites, and by initial contacts with facility owners. In-house relocation plans were developed using accepted design criteria or using the owners' specifications.

*Roads and Bridges.* Roads and bridge designs are based upon applicable design criteria such as the AASHTO Bridge Manual or upon input by the neighborhood working group. Our plan has not been endorsed by the facility owners, but they do recognize the adverse social impacts associated with other plans. The relocation of two bridges is necessitated by this work. One relocation is necessitated by its foundations being removed to make room for the new channel. The other is necessitated by the bridge being placed on the river side of the new lock and not having adequate vertical clearance for high river stages. Construction of the new bridges will be phased so that only one bridge is closed at a time.

The first bridge span to be replaced is the Claiborne Avenue Bridge. Once the new lock is completed, this bridge will be located on the Mississippi River side of the lock. Replacement of this bridge will consist of new lift towers, a new lift span, and new machinery constructed upon the existing foundation. The existing foundation may require major rehabilitation. The approaches and approach grade would remain the same. (See Plate 17.)

The next bridge to be replaced is the St. Claude Avenue Bridge. The east foundation must be removed to construct the lock demolition bypass channel. The new structure will be a double bascule bridge with approximately 200 feet of horizontal clearance. (See Plate 16.) This design was preferred by the neighborhood working group since there are no towers and pedestrian crossing would be allowed.

*Railroads.* The only railroad relocations required are those that lead to the Galvez Street Wharf. These tracks will be removed since the Galvez Street Wharf will be demolished and there is no other use for these tracks.

*Utilities.* Utility owners will remove all existing facilities except where the work is incidental to lock demolition. Owners will be contacted concerning our intent to remove their lines contained in the lock gallery, and a hold harmless statement will be obtained. Owners will design and construct power lines, telephone cables, and pipelines to the current capacities of the existing facilities.

Utility relocations will be constructed within project rights-of-way or public servitudes within the city streets. If the criteria furnished by the owner results in a betterment, we will discuss the betterment with the owner, and we will not allow payment for betterments as a Federal expense.

The relocation of utilities will be accomplished by the utility owners. These relocations are necessitated by conflicts of the existing utilities with the proposed project. These conflicts result from the narrow channel crossing, congested construction corridor, owners' need for non-interruption of existing service, and sequence of project construction. The plan consists of constructing three utility corridors. (See Plates 19 - 21.) Each corridor will contain one trench crossing the channel.

Hydraulics. The major considerations in the hydraulic design of the lock were the differential heads. In addition to normal stages, the lock must be designed to provide MRL level of protection on the river side as well as SPH protection on the lake side of the lock. The lock depth required to minimize the hawser forces was considered. Filling and emptying systems were also a major consideration. These systems were not only designed to minimize lockage times, but also to accommodate a reverse head situation. Safety was also a major consideration.

Foundations and Geology. The primary concerns addressed slope failures of the proposed levee re-alignments and the development of a foundation for the lock structure. Sheetpile seepage control was developed for the perimeter of the lock. A prepared foundation to support the lock without piles while limiting settlement was designed. A drainage blanket underneath the foundation was also designed in order to limit uplift pressures.

Project Mitigation. Given the unique circumstances associated with the urban setting of the project, a shift in focus from the natural environment to the social environment required a corresponding departure from traditional methods of environmental impact analysis and mitigation planning. In practice, mitigation planning within the Corps is almost exclusively confined to the natural resource arena. However, in this case, analysis and mitigation of impacts over the entire range of community resources covered by Section 122 of PL 91-611 does not enjoy the benefit of a common measure, such as the Habitat Unit used to scale fish and wildlife mitigation features. Nor is the cumulative and interactive nature of multiple impacts well addressed by judgmental scaling, one resource at a time. Once all measures for “in-kind” mitigation are exhausted, residual impacts can only be offset by “out-of-kind” mitigation. The plan objective becomes identification of a set of actions which replace one array of community resources with another array sufficient to restore the community to an equal level of satisfaction. Pursuant to this objective and in accordance with the specific Congressional guidance provided, a broad based community participation process was established to assist us in the development of general mitigation features as an integral part of the lock replacement plan. The impacts for the different size locks are virtually the same. More details and information on the development and process used in developing the mitigation plan, as well as the specific elements of mitigation being proposed, are contained in Appendix A, Mitigation Plan. The environmental impact statement includes a discussion of the environmental impacts expected to occur.

The North of Claiborne Avenue site reduces the scope of project impacts from all sites previously considered to the degree that mitigation planning was able to focus on the normal construction procedures and direct mitigation and minimize requirements for general mitigation. Plans at this site effectively address the three primary categories of social impacts that are of most concern to the affected community - residential dislocation, construction noise, and traffic congestion. There are no residential dislocations required to implement this project. The soil-founded, pre-fabricated lock design significantly minimizes the construction related noise.

Traffic congestion will be minimized by constructing a new roadway (a detour route) through an undeveloped tract in St. Bernard Parish and implementation of a comprehensive traffic management plan which includes recommendations made by the Regional Planning Commission. These include measures to preserve the current level of service that the bridges provide to all users (public transportation, emergency service, school transportation, pedestrians, etc.).

The key elements of the mitigation plan are discussed below under normal procedures, direct mitigation, and general mitigation.

*Impact Avoidance.* Impact avoidance procedures are actions taken to avoid adverse construction impacts which represent prudent engineering design and construction practice.

*Noise*. Measures will include contract provisions that will limit noise to a certain level with a given distance from the construction site. Pile testing will be required at selected locations to measure noise levels and define the 65 Ldn level or similar measure. Contractors will be required to use specialized pile driving equipment, such as a vibratory hammer, and monitor noise levels to ensure compliance.

*Transportation.* Specific routes away from residential and commercial areas will be designated for construction-related traffic and remote locations for construction staging areas. Damage to roads caused by construction activities will be repaired. Detour signage will be erected when individual streets are closed due to utility relocations. A new detour route would link West Judge Perez Drive and St. Bernard Highway in order to improve circulation of commuter traffic during periods of bridge closure and to relieve neighborhood traffic.

*Aesthetics*. Measures to be accomplished include utilizing textured surfaces on floodwalls, bridge approaches, and bridge piers; landscaping areas surrounding levees, floodwalls and bridge approaches; improving lighting along detour routes (existing and new); and backfilling both sides of the new lock to create green space.

*Air Quality.* Measures include wetting levees and construction areas (roads) and installing a monitoring system to ensure that air quality is preserved within specified levels.

*Employment.* Contract specifications will require the contractor to use the local work force in order to achieve minority and local resident participation.

*Safety.* Measures will include signage, fences, and lighting of construction areas. Measures will also include media notices during certain construction activities.

*Cultural Resources.* Implement a program of recordation to document structures with historical and/or cultural significance.

*Direct Mitigation.* This refers to actions taken by the Corps in cooperation with local government, community groups and residents to minimize those adverse impacts which remain

following the implementation of the normal procedures that are described above.

*Noise.* This includes soundproofing any residential or commercial structure that lies within "unacceptable" levels of noise that are related to lock or bridge construction.

*Transportation.* Measures will include synchronized traffic signals, electronic message boards, an incident management plan to facilitate removal of disabled vehicles, preservation of emergency response capabilities, and provision of additional school crossing guards. In conjunction with the Civil Defense officials, a backup hurricane evacuation plan will be developed for times when a bridge is out of service. Local streets that will serve construction traffic will be resurfaced. Remedial actions such as subsidized fares for RTA riders and direct payments to schools will be made if additional transportation expenses are incurred.

*Cultural Resources.* Measures will include salvaging one or more components of the old lock and/or bridge; publishing a brochure addressing historical features of the lock and bridge, or surrounding community; and erecting a display with markers patterned on those associated with National Register locations, featuring appropriate information.

*Aesthetics.* Measures include replacing the stand of mature oak trees adjacent to the existing lock with new plantings, constructing a walk/jog path along the floodwall to replace the use of the existing levee crown, constructing observation decks to provide visual access from levee/floodwall, providing lighting and green space, expanding green space at lock site by tying lock walls to the Claiborne and Florida Avenue Bridges on the east side and Claiborne Avenue Bridge on west side, and landscaping the public rights-of-way along the detour route.

*Employment.* Notify residents in advance of project construction that specifications will require hiring local residents and provide a list of job skills that will be required. That will enable those interested to pursue any job training that may be necessary.

*Air Quality*. Use barriers around construction sites to reduce dust.

*Safety.* Mandate in specifications that evening security patrols to discourage vandalism and theft be included in the contract.

*Business and Industry.* Provide monetary compensation to those commercial establishments and landlords that experience a demonstrable decline in sales and rents during the period of bridge closure.

*General Mitigation.* General mitigation refers to actions taken by the Corps in cooperation with local government, community groups and residents to alleviate those adverse impacts which remain following the implementation of both normal procedures and direct mitigation measures previously described.

Residual impacts from noise, to transportation, aesthetics, employment, community and regional growth, property values, and community cohesion have been identified. A program of general mitigation is required in order to restore the community to a level of well-being equal to that which existed prior to project construction. The Port of New Orleans will assist in coordinating the implementation of the following elements of general mitigation:

a. Work with displaced lessees on the IHNC to encourage them to relocate in Orleans Parish. Incentives may include new leases on concessionary terms.

b. Implement a program of street improvements, lighting and drainage improvements in a four-block area on each side of the IHNC.

c. Establish a business incubator in the area to serve as a stimulus for local business development.

d. Establish a housing trust to serve as a source of seed money for a program of progressive housing rehabilitation.

e. Expand the skilled labor work force within the affected community. Local residents would be eligible for tuition assistance grants for training at local vocational-technical schools or similar type school for skills required for project construction.

The specifics on mitigation elements to be implemented are contained in the Volume II, Appendix A, Community Impact Mitigation Plan. A breakdown of costs for mitigation elements is likewise contained in the appendix. Recognizing that conditions change over time, items identified in the mitigation plan may require some modification as conditions and priorities in the community change during the implementation period of the project.

## ASSESSMENT AND EVALUATION OF ALTERNATIVE ACTIONS

Information presented in the following paragraphs describes the alternative actions considered, the beneficial and adverse impacts, and tradeoffs for each of the three plans described in detail above. Known implementation problems and responsibilities associated with each alternative are also discussed

### Alternative 1 - No Action/Continued Operation of the Existing Lock (Future without the project condition)

Brief Description. This alternative action is essentially the no action plan and represents the conditions expected to occur without a new lock project. It includes extraordinary maintenance of the existing lock over a four-year period to ensure that the current level of service can continue to be provided over the next 50 years.

Impact Assessment.

*National Economic Development.* The first cost is estimated at $16,100,000 above the normal operations and maintenance cost.

*Environmental Impacts.* There will be no significant impact on the biological resources of the area, the water quality, or the social setting of the area. From a cultural resource perspective, there will be minor impact on the historical integrity of the existing lock, a property listed on the National Register of Historic Places. No additional impacts to the adjacent districts are expected.

Evaluation and Tradeoffs. These are the conditions expected to exist in the future, absent a new lock and/or bridge project to improve conditions. The lock capacity will remain the same as it is now.

Implementation. The status quo would continue with the Federal government rehabilitating the lock and continuing to operate and maintain the existing level of navigation service.

**Alternative 2 - Bridge Only**

Brief Description. This bridge only plan would consist of demolishing the existing bridge; constructing a new mid-level, 200-foot horizontal clearance, double bascule bridge at St. Claude Avenue; constructing a detour route to accommodate traffic during construction; connecting the MRL levee protection to the existing lock; and extraordinary maintenance of the existing lock. This bridge would be much higher than the existing low-level bridge and will have impacts to the community of the west side of the canal. On the east side it would be constructed within the same footprint of the existing bridge and not affect the traffic patterns on that side of the canal. Mitigation of social impacts associated with the bridge construction would also be required.

Impact Assessment.

*National Economic Development.* The first cost of the 200-foot horizontal clearance bridge only plan is estimated at $55,569,000. The total present value cost is estimated to be $65,401,000 including $49,949,000 for construction and $15,452,000 for mitigation. The base year for the project is 2004.

*Environmental Impacts.*

*Biological.* Impacts on the biological environment would be negligible. Any impact that would occur would be temporary in nature.

*Water Quality.* Impacts on water quality will be localized, minor, and of short duration. Some turbidity during construction will occur.

*Cultural.* Careful planning and design will be required to ensure that adverse impacts on the integrity of the National Register properties and locally designated historic properties in the area (Holy Cross, Bywater and the IHNC lock) are minimized. After consultation with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP), the existing St. Claude Avenue bridge that will be replaced will have to be documented to Historic American Engineering Record standards as it too has been evaluated and determined to be eligible for the National Register of Historic Places. Close coordination with the New Orleans Historic Districts Landmarks Commission (HDLC), the local agency empowered by the city to protect locally designated historic properties, will be required. For new construction, the HDLC is generally concerned that the construction be visually compatible with the buildings and environment with which they are related; the general design scale, gross volume, arrangement of site plan, texture, material and exterior architectural features shall be in harmony with its surroundings and shall not impair the “toute ensemble” of the neighborhood; and quality and excellence in design should be major determinants. For demolition of landmarks or historic structures, the HDLC is generally concerned about the historic significance, the “toute ensemble” of the district, the special character and aesthetic interest that the structure adds to the district. The new bridge would require destroying the old bridge. The new mid-level bridge would rise about 39 feet higher than the existing bridge. This double bascule bridge would not have any superstructure and can operate faster than the existing bridge. On the east side, the bridge would be constructed within the same footprint as the existing bridge and would not affect vehicular traffic patterns on the east side of the canal. However, it will significantly affect the traffic patterns on the west side of the canal. In order to function properly, an overpass would be required at the intersection of Poland Avenue. Poland and St. Claude are truck routes for many port and river front activities.

*Social.* Implementation of this plan is expected to have significant impacts on traffic, noise impacts from construction activity, increase response times for emergency services to residents on the east side of the IHNC, adversely impact the existing neighborhood setting and aesthetic qualities, and disrupt pedestrian usage of the existing bridge by local residents. Mitigation of the social impacts related to this construction of a new bridge would be required.
Businesses on the west side would also be directly impacted as a result of the bridge approach having to be extended about one and a half blocks past Poland Avenue because of the overpass required on St. Claude at Poland. Both Poland and St. Claude Avenues are truck routes for many port and river-front activities. There are also concerns about a new bridge potentially inducing more

traffic at higher speeds through the neighborhoods which have schools and other community facilities in close proximity to the proposed new bridge. These would also be negatively impacted by rerouting of traffic on the side streets. Safety is a significant concern because of the potential for increased traffic. This could also impact the integrity of the historic character of the neighborhood. In addition, pedestrian access from one side of the canal to the other would be significantly more restrictive than with the existing conditions.

Evaluation and Tradeoffs. The 200-foot double bascule mid-level bridge plan would not provide flexibility to construct the new lock and related features of the lock project when traffic increases demonstrate that construction of a new lock is warranted, without replacing the bridge or suffering shutdown of the canal to navigation while the old lock is being demolished. This has been estimated to require about 18 months.

The bridge-only plan initially generates a reduction in the average delay. However, the magnitude of the reduction diminishes over time and finally reaches the point where the delays would return to those of the without project condition.

The bridge-only plan would have significant negative impacts to the local communities on either side of the canal. This would lead to a lack of public acceptance for the plan, which has clearly been a problem over the years for this project.

Implementation. Mitigation of project impacts on the human environment related to construction of a new bridge would be required. In spite of our mitigation plan, there are still potential problems with implementation of this plan. Local neighborhoods have indicated they would strongly oppose such a plan. Concerns voiced have ranged from the anticipated impacts of increased traffic, speed of traffic movements, conflicts with the historical integrity of the neighborhoods, changes in the setting and aesthetics with a new mid-rise bridge, etc. Also impacted will be a church and school on one of the side streets that the traffic will have to use to gain access to the bridge, and some of that traffic will be truck traffic. Safety is a significant concern here because of this increased traffic. Increased traffic will also impact parking and accessibility along side streets and add to the air and noise pollution of these areas. The integrity of the historic nature of the neighborhood could be adversely impacted. The existing bridge itself, has been evaluated and meets the criteria for inclusion on the National Register of Historic Places, although it has not yet been listed. In addition, the impacts of such a plan on the National Register Districts and the locally designated historic districts would have to be coordinated in order to achieve agreement with the appropriate historic preservation agencies and the State Historic Preservation Officer. The New Orleans

Historic Districts Landmarks Commission has already expressed opposition to a bridge only plan. Without reaching agreement and executing a Memorandum of Agreement, implementation might not be accomplished.

**Alternative 3 - North of Claiborne Avenue**

Brief Description. This alternative consists of constructing a new lock in the IHNC north of Claiborne Avenue. Various size locks as previously identified were considered. The plan also includes a low level replacement of the St. Claude Avenue Bridge, retrofitting the Claiborne Avenue Bridge, construction of and designation of detour routes on both sides of the IHNC, construction of a temporary two-way navigation bypass channel around the lock construction site, and construction of a one-way shallow-draft bypass around the existing lock to be used during demolition of the existing lock. A project mitigation plan will also be implemented to offset the project's impacts to ensure that the human environment in the neighborhoods on either side of the IHNC remain viable.

Impact Assessment.

*National Economic Development.* The first costs vary from $413,253,000 to $496,295,000, depending on the lock size. The total present value cost estimated also varies from $634,683,000 to 800,555,000, including mitigation. Total average annual costs range from $51,510,000 to $64,013,000, including annual O&M expenditures ranging from $1,382,000 to $1,384,000.

*Environmental Impacts.*

*Biological.* The offsite construction facility (graving site) designated for partial prefabrication of the lock modules, would require 25 acres of freshwater wetlands. Loss of the wetland habitat would be fully mitigated by creation of brackish marsh in a large area of shallow, open water, with clean soil dredged from the east bank of the IHNC for construction of the north bypass channel. An estimated 137 acres of brackish marsh and tidal flats would be developed. The U.S. Fish and Wildlife Service Habitat Evaluation Procedures were used to analyze the impacts and mitigation requirements.

Sediments from the bottom of the IHNC and surface soils from the east bank of the canal have been found to contain contaminants at levels which preclude its use for wetland development. This material would be hydraulically dredged and pumped to a previously-used disposal area along the south bank of the MR-GO in Orleans parish. The disposal area currently contains scrub/shrub uplands and wooded, jurisdictional wetlands of low quality. The 240 acre disposal site is dominated by black willow and Chinese tallow, an undesirable exotic. No mitigation

is proposed for disposal of dredged material in this site because of its existing low habitat quality.

*Cultural.* This plan would require demolition of the IHNC lock, the St. Claude Avenue Bridge, and the Galvez Street Wharf. All of these properties have been determined eligible for the National Register of Historic Places. The loss of these three structures would be mitigated by recordation to the Historic American Engineering Record standards prior to demolition. In addition, the Galvez Street Wharf would be documented to Historic American Building Survey (HABS) standards before demolition. Additional consultation with the SHPO and the Advisory Council on Historic Preservation would be necessary in order to reach agreement on the details of the mitigation plan for each of these structures. A formal Memorandum of Agreement (MOA) is required. There would be no impact to any other historic or prehistoric archeological properties in the project area. No structures in either the Bywater or Holy Cross Historic Districts would be moved or destroyed.

*Water Quality.* No significant, long-term changes in water quality will result from implementation of this project. Existing water quality conditions show that the Mississippi River possibly violates aquatic life criteria for chromium, copper, mercury, and lead. Likewise, the IHNC possibly violates copper, mercury, and lead aquatic life criteria. The MR-GO possible violates lead, zinc, and mercury criteria. Most water quality samples contain levels of copper and mercury in exceedence of the aquatic life criteria.

Elutriate testing done in conjunction with this study shows that elevated concentrations above acute aquatic life criteria can possibly be expected during dredging and disposal operations. Historic testing shows that copper levels periodically exceed the applicable acute aquatic life criteria for ambient water conditions. Levels of zinc in ambient waters of the project area generally do not exceed the chronic or acute aquatic life criteria levels. However, the elutriate testing shows that zinc and copper levels will probably increase above the acute aquatic life criteria in the Mississippi River, IHNC and the waters adjacent to the MR-GO disposal area and the proposed mitigation site.

Because dredging and disposal activities have only localized, short-term effect, long-term water quality impacts are not expected. Slight increases in concentration of other parameters may be expected as a result of dredging activities, although no long-term changes in water quality will result.

Increases in concentrations of suspended sediments during the dredging period would also be expected. Because of the normal heavy sediment load carried by the Mississippi River, the increase in suspended solids would not cause any significant adverse impacts. Increased suspended solids would not cause any significant adverse impacts. Increased suspended solids in the

IHNC and the waters adjacent to the MR-GO disposal area and the proposed mitigation site are also expected, but due to the short duration of dredging and disposal, impacts would not be significant. Once project construction is complete, all water quality constituents, with the exception of turbidity, are expected to return to normal levels and no long-term changes in water quality are expected.

*Social.* In addition to the impacts previously identified, this plan is expected to have impacts on transportation, aesthetics, noise, air quality, employment, and the overall social well-being of the area over the extended implementation period. The social fabric and impacts expected to occur are not tied to the size of the lock but to the type and duration of activities required to accomplish the project. An extensive mitigation plan has been developed, in coordination with representatives of the neighborhoods, to ameliorate these impacts.

Evaluation and Trade-offs. This plan fully addresses the study objectives, including the dimensional obsolescence of the existing lock, and provides for a safer, more efficient connection for commercial navigation between the lower Mississippi River, the GIWW, and the MR-GO. The plan would have adverse impacts on the community which will be offset by implementation of the mitigation plan. Navigation interests will also have to tolerate many inconveniences including periodic short term restrictions or closures of the waterway during project construction. In the end, after the project is constructed, all stakeholders should benefit from the improvements proposed as part of the project.

Implementation. All costs for the project are allocated to commercial navigation. In accordance with PL 99-661, a shallow-draft lock would be shared 50 % from Federal Appropriated funds and 50 % from the Inland Waterway Trust Fund. In this particular case, since the NED plan is a shallow-draft lock, and the deep-draft increment is justified only on an overall basis, non-Federal interests will be required to bear 100 % of that incremental cost. The Federal government (Corps of Engineers) will construct the project and subsequently operate and maintain the lock project.

## ANALYSIS AND COMPARISON OF STRUCTURAL PLANS (PLANS 2 & 3)

A breakdown of the expenditures by year (first costs) for each of the structural plans considered is presented in Table 20.

The costs presented in that table include all costs associated with construction of each plan including the costs of constructing navigation features (channels, locks, etc.), bridges, utility relocations, real estate, major replacement of lock machinery, engineering and design, and construction management. Table 21 presents a cost summary for various alternatives showing total costs, total present value costs, and a breakdown of annual costs by category (construction costs, mitigation costs, navigation losses, permanent losses, annual O&M). The costs, based on 1996 price levels, reflect a discount rate of 7.625 %. The annual maintenance cost is the average annual cost of operating and maintaining the plan. The average annual benefits are the savings in transportation costs of the commerce moving through the area (savings in costs resulting from increased lock efficiency and capacity). The average annual net benefits are the difference in average annual benefits and average annual costs. The higher the net benefits, the better the plan is from a national economic development standpoint. The benefit-to-cost ratio is the ratio of average annual benefits to average annual costs.

There is a degree of uncertainty regarding the extent of growth of traffic through the proposed lock. Table 22 reflects a medium growth scenario which represents the most probable future condition. It includes annual costs, annual benefits, net benefits, benefit to cost ratios (BCRs) for each plan, the base year for each plan, and the net benefits adjusted to 2010. Table 23 presents a summary of annual benefits for each alternative, with and without curfews.

Insert Table 20

See the Economic Appendix - Table 10-1; Page E-259

Table 20 is the Construction Expenditures By Year Exclusive of Mitigation Cost (1994 Prices; $1,000's)

Insert Table 21

See the Economic Appendix - Table 10-3; Page E-261

Table 21 is the cost summary for various alternatives showing total costs, total present value costs, and a breakdown of annual costs by category.

**Identification of the National Economic Development Plan**.

The plan that reasonably maximizes net contributions to economic development is designated the National Economic Development (NED) plan. In the case of the IHNC, the NED plan is the most economically efficient evaluated in terms of net benefits. Plan 3b, which is a shallow draft lock compatible with the GIWW system and having dimensions of 110- x 900- x -22-feet (NGVD), is designated the NED Plan. The efficiency and ranking of NED plans in terms of maximum net annual benefits are shown in Table 22. The table summarizes the annual costs, annual benefits, and BCRs for each alternative with and without bridge curfews. Net benefits represent the difference between total annual benefits and total annual costs. Maximum net benefits define the NED plan.

Since all annual benefits and annual costs reflect the base year of the alternative in question, it is necessary to account for the fact that alternatives have different implementation dates when identifying the alternative that generates the maximum net benefits. To account for this effect of differing base years, the net benefits of each alternative can be shifted forward or backward, using present value techniques, such that all alternatives reflect a common point in time. This adjustment is reflected in Table 23 by using the year 2010 as the common reference point. For NED identification purposes, the result of this common reference adjustment is that alternatives with a base year prior to 2010 show a greater value for net benefits than that associated with its actual base year (net benefits are compounded), and alternatives with a base year after 2010 show a lower value for net benefits (benefits are discounted). It should be noted that the selection of a different common reference point does not affect the relative standing of alternatives; only the absolute amount of the net benefits would be affected.

Net benefits are maximized with the 110- x 900- x -22-foot (NGVD) alternative with bridge operating curfews ($62.7 million). This alternative also produces the highest BCR among the lock construction alternatives (2.2 to 1).

The bridge-only alternative produces a higher BCR (3.75 to 1), but it represents a significantly smaller scale improvement which does not address the dimensional obsolescence of the existing lock. As a result, the net benefits of the bridge only alternative ($20.9 million) are considerably lower than any of the lock construction alternatives.

Insert Table 22

See Economic Appendix - Table 10-7; E-270 **See Addendum**

Table 22 presents the mid-growth scenario which represents the most probable future condition. It includes annual costs, annual benefits, net benefits, BCRs for each plan, the base year for each plan, and the net benefits adjusted to 2010(?).

Table 23 Annual Benefits Summary

See Economic Appendix - Table 10-6; E-267 **See Addendum**

Table 23 presents the Annual Benefits Summary for each alternative, with and without curfews.

**Identification of the Tentatively Selected Plan** (TSP).

ER 1105-2-100 (Dec 90) states that "local interests may prefer a plan that is larger than the NED plan even though sufficient justification for full Federal participation cannot be developed. A locally preferred plan may be recommended for implementation by the Corps. The incremental cost between the Federally supportable plan (NED) and the locally preferred plan are entirely a non-Federal responsibility." The above cited ER also states that the cost for the exception will be shared on the same basis as the NED plan.

The Port of New Orleans has always supported construction of a ship (deep-draft) lock as a replacement for the existing IHNC lock, which accommodates deep-draft traffic up to 31.5 feet. In a letter dated April 13, 1992, the Port formally indicated its agreement with the District's proposed location, which was included with the report submitted to Higher Authority (HQUSACE) for approval of the screening of the alternative IHNC plans, the north of Claiborne Avenue site. They agreed that the proposed new lock would involve minimal impact in the residential communities. In addition, the Port has indicated they are willing to pay for the additional increment of cost to provide a deep-draft lock that is compatible with traffic using the MR-GO.

Table 24 presents a summary breakdown of first costs for the NED and the tentatively selected plan (TSP) as identified in the draft report that was distributed for public review.

**Table 24**

**Summary Estimate of First Costs for the**

**NED and Tentatively Selected Plans***

| Account | Description | NED | TSP |
|---|---|---|---|
| 01 | Lands & Damages | $43,200,000 | $43,200,000 |
| 02 | Relocations | 72,400,000 | 72,500,000 |
| 05 | Locks | 200,600,000 | 253,300,000 |
| 09 | Channels and canals | 16,600,000 | 22,000,000 |
| 11 | Levees and Floodwalls | 10,600,000 | 10,800,000 |
| 25 | Mitigation | 33,000,000 | 33,000,000 |
| 30 | Engineering & Design | 50,300,000 | 56,100,000 |
| 31 | Construction Management | 16,400,000 | 19,800,000 |
| | T o t a l | $443,100,000 | $510,700,000 |

* Includes sunk costs

Although the NED plan is a shallow-draft lock, there are additional benefits to be derived from deep-draft traffic. However, the magnitude of the benefits is not sufficient to incrementally justify a deep-draft lock at the current interest rate. On an overall basis, a deep-draft lock, generally compatible with MR-GO traffic, is economically justified and therefore is being recommended for construction.

The fully funded costs are estimated to be $690,998,000 for the NED plan and $794,827,000 for the tentatively selected plan.

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# SUMMARY COORDINATION, VIEWS AND COMMENTS DURING THE CURRENT STUDY

## STATE OF LOUISIANA

In 1986, the Governor of Louisiana indicated that the State of Louisiana supports the effort to replace the existing lock and would provide formal assurances at the appropriate time. The Board of Commissioners of the Port of New Orleans, a state agency, has indicated their willingness to provide the non-Federal share of the locally preferred plan.

The State Historic Preservation Office in concert with the Advisory Council on Historic Preservation have been consulted. Coordination will continue until a Memorandum of Agreement regarding safeguards to be taken in compliance with historical statutes is executed.

## OTHER FEDERAL AGENCIES

The US Fish and Wildlife Service has evaluated the proposed alternative plans and provided a Coordination Act Report (CAR). This document has been considered in our evaluation of alternatives. and is included in Volume 6, Appendix D.

## NAVIGATION INTERESTS

Numerous letters have been received from port authorities, businesses, and industries that use the inland waterway system and rely on the IHNC directly or indirectly to accommodate their needs or the needs of traffic servicing their operation. These are included in Exhibit II to this report.

## THE INLAND WATERWAYS USERS BOARD

At the March 1994 meeting of the Inland Waterways Users Board, the New Orleans District made a presentation of the tentative findings of our studies. When the presentation was made, questions were raised that centered on two issues:

1) How did we determine the size of the “base only” lock alternative?

The Users Board basically questioned our requirement of a 22-foot floor/sill depth and a 110-foot width for the base barge lock option.

2) Why did we eliminate a plan to only replace the St. Claude Avenue Bridge?

At the July 1994 meeting the District gave a detailed presentation addressing the board's concerns. Information presented is summarized below.

**Base barge lock alternative.** Even with the limited dimensions at the existing lock, it is not uncommon for more than one tow to be processed in a single lockage. It is this chamber packing that plays a significant role in identifying the optimal surface dimensions of a new lock. Unlike other segments of the inland system where lock size plays an important role in determining typical tow sizes, the GIWW on each side of the IHNC lock represents the controlling element for tow size; therefore, improvements to the lock will not change the existing tow size distribution. The ability to pack this distribution into chambers of varying dimensions becomes the issue.

Table 25 shows the distribution of individual barge sizes that comprise the fleet using this lock.

**Table 25**
**Distribution of Barge Sizes**

| Length | X | Width | Percent |
|---|---|---|---|
| 195 | | 35 | 35 |
| 280 | | 50 | 20 |
| 175 | | 26 | 5 |
| Others | | | 16 |
| Total | | | 100 |

Table 26 shows the distribution of tow sizes using the IHNC lock.

**Table 26**
**Tow Size Distribution**

| Barges/Tow | Percent |
|---|---|
| 1 | 32.6 |
| 2 | 27.2 |
| 3 | 12.2 |
| 4 | 10.1 |
| 5 | 5.9 |
| 6 | 4.1 |
| 7 | 0.9 |
| 8 | 3.0 |
| 8+ | 4.0 |
| Total | 100.0 |

| Length (ft) | Percent |
|---|---|
| <300 | 15.8 |
| 301 - 400 | 12.1 |
| 401 - 500 | 11.6 |
| 501 - 600 | 18.0 |
| 601 - 700 | 5.9 |
| 701 - 900 | 14.9 |
| >900 | 21.6 |
| Total | 100.0 |

| Width (ft) | Percent |
|---|---|
| 35 | 44.4 |
| 50 - 54 | 37.6 |
| Other | 18.0 |
| Total | 100.0 |

Using these data, we evaluated combinations of the most common barge and tow sizes and settled on four surface dimensions which we studied in detail.
These included 900 feet by 90 feet , 900 feet by 110 feet, 1200 feet by 90 feet, and 1200 feet by 110 feet.

The results of our optimization process, as shown in Table 27, clearly identifies the 900-foot by 110-foot lock, with a 22-foot floor depth, as the plan with the maximum net benefits (the NED plan).

**Table 27**
**Benefit-Cost Summary**
**Barge Lock Alternatives**
**(Most Probable Growth Scenario)**
**22 foot Floor Elevation**
**(1993 , $1,000 , 8%)**

| | 900 x 90 | 900 x 110 | 1200 x 90 | 1200 x 110 |
|---|---|---|---|---|
| Capacity (million tons) | 44.8 | 57.0 | 61.3 | 73.5 |
| Total Annual Benefits | 12,781 | 118,366 | 114,633 | 115,558 |
| First Cost | 485,816 | 503,816 | 523,816 | 544,816 |
| Total Annual Cost | 67,168 | 68,949 | 70,745 | 73,167 |
| BCR | 1.68 | 1.72 | 1.62 | 1.58 |
| Net Benefits | 45,613 | 49,417 | 43,888 | 42,391 |

*Floor/sill depth issue*. The floor and sill depths are the same for this lock. Using established Corps criteria (based on model studies) for a side port emptying and filling system, we initially set the floor depth to 25 feet and the sill depth at 22 feet to accommodate safety concerns. We then investigated raising the floor to match the sill based on economic reasons. First, we raised the floor to 22-feet and then raised both the floor and sill to 18 feet. Table 28 shows the comparison of these three floor depths.

**Table 28**
**Incremental Benefit-Cost Comparison**
**900 x 110 @**
**18, 22, and 25 Foot Floor Elevations**
**(1993, $1,000, @ 8.0 Percent)**

| | 25 ft. to 22 ft. | 22 ft. to 18 ft. |
|---|---|---|
| Increase in Avg. Delay Time (min) | 5.0 | 43.0 |
| Increase in Processing Time (min) | 0.8 | 4.1 |
| Average Annual Benefit Decrease ($1,000) | 125 | 1,484 |
| First Cost Decrease ($1,000) | 1,500 | 3,800 |
| Avg. Annual Cost Decrease ($1,000) | 144 | 365 |

| | | |
|---|---|---|
| Change in Net Benefits ($1,000) | 19 | (1,119) |

The decision to go to the 22-foot depth from the 25-foot depth was rational from an economic standpoint. However, making the lock shallower to 18-foot would not be economically rational.

In the case of the IHNC Lock, the reason the cost reduction to make the barge lock floor 18 feet instead of 22 feet is only about $3.8 million, which is less than 1 % of the estimated project cost, is the fact that pure lock construction cost is less that 50 % of the total cost of the project.

Raising the floor depth reduces the amount of concrete and steel required for the lock walls and gates, but this also increases the amount of fill required for the prepared foundation under the lock structure.

In the past, members of the Users Board have stated that the Algiers and Port Allen locks have shallow floor depths, and they are operating fine. This may well be true from a safety point of view, but they may not be operating at peak economic efficiency. Table 29 shows a comparison of filling times at the Algiers and Port Allen locks when compared to the IHNC lock. When comparing the IHNC with Algiers, it is obvious that the filling times are comparable for low heads, but differ considerably for higher heads. The Algiers Lock has a much smaller surface area to fill (about 58% of the proposed IHNC lock), and it also has different gates (sector versus miter); therefore, the Algiers lock has a different emptying and filling system. It fills and empties through and around the gates, so a comparison of those two locks would not be an accurate comparison.

**Table 29**
**Comparative Filling Times**

| Lock Design Draft | Lift (ft) | Fill Time (min) |
|---|---|---|
| Algiers/9 feet | 3 | 5 |
| (Sector Gated) | 7 | 6 |
| | 11 | 14 |
| Port Allen/9 feet | 3 | 7 |
| | 7 | 9 |
| | 11 | 13 |
| IHNC/11 Feet | 3 | 4 |
| (Filling times for floor | 7 | 5 |
| el. @-22 ft. NGVD) | 11 | 6 |

The Port Allen lock has mitre gates, a side-port filling/emptying system, and has approximately the same surface area as the proposed IHNC lock. The only difference is the floor and sill are shallower that the existing criteria dictates. The floor and sill are at a depth of 14 feet. From Table 30, it is obvious that the filling times are greater for the Port Allen

lock. That increased time costs the navigation traffic in delay costs.

Our analysis is based on sound safety, engineering, and economic reasons. The length and width were optimized based on chamber packing fully recognizing the controlling dimensions of the GIWW on each side of the lock. Also the floor depth for the base barge lock was based on safety considerations of entering the lock and filling and emptying the lock. Finally, if we were to compromise on the safety issue, it would not be economically rational to make the lock shallower than the proposed 22-foot depth.

**St. Claude Avenue Bridge Alternative.** Complicating the operation of the existing lock is a Coast Guard regulation that requires the Port of New Orleans, the owner of the St. Claude Bridge, to keep the bridge open to vehicular traffic during the week in the morning and in the afternoon during rush hour. Both the Claiborne and St. Claude Avenue bridges are very important commuter routes between downtown New Orleans and St. Bernard Parish. While the lock chamber is packed just before the curfew begins and just prior to the curfew ending, this curfew reduces the available operation time for the lock during the work week.

Further complicating matters is the fact that each time the lock is operated, the St. Claude Avenue bridge must also be operated. This increases the lock processing time by a small increment, averaging about 3 minutes for each lockage, or about 6% of the total processing time at the existing lock. So the St. Claude Avenue bridge does cause some of the problems at the existing lock.

We evaluated 3 different bridge scenarios at St. Claude Avenue:

(1) a low level, double bascule bridge which is part of the north of Claiborne lock replacement plan;
(2) a 200-foot double bascule mid-level bridge (the bridge only scenario); and
(3) a 300-foot vertical lift span bridge which was part of the phased construction scenario.

The low level bridge can be constructed in the same footprint as the existing bridge and was developed because the neighborhood residents at the beginning of our public involvement/neighborhood working group process strongly objected to a bridge much higher than the existing bridge. This bridge would not adversely impact traffic patterns on either side of the canal, would not impact pedestrian accessibility to the bridge, and would have minimal impact to the historical/cultural aspects of the historic districts on either side of the canal. The bridge would not have any massive superstructure above the span and would operate just as fast or slightly faster than existing bridge.

The 200-foot horizontal clearance, mid-level, double bascule bridge is higher than the low-level bridge previously described. It would have more of a visual impact on the area than the low level bridge even though it does not have the steel superstructure. The issue of elevated bridge approaches being located next to residences has been a significant issue with the local people. The neighborhood residents are opposed to all mid-level bridge plans.

We also looked at a mid-level bridge with a 300-foot horizontal clearance that would be needed if a new lock would be constructed in the future (phased construction). The mid-level bridge, with a 200-foot horizontal clearance, would not provide enough area to construct the by-pass channel around the existing lock during demolition as we are providing for the lock replacement plan. The 300-foot span would accommodate this. However, that bridge would have to be a vertical lift span bridge as the 200-foot span is the practical design limit for a double bascule bridge. This lift-span bridge would have the same negative impacts to the neighborhoods on each side of the canal as previously described. The significant negative community and cultural impacts of the mid-rise bridge plans at St. Claude Avenue are not acceptable to the public.

The following tables will address the economic aspects of the various bridges. Table 30 shows that the bridge-only plan initially generates a reduction in the average delay. However, the magnitude of the reduction diminishes over time and finally reaches the point where the delays would return to those with the without project condition.

**Table 30**
**Selective Alternative Summary**
**Average Delay (hours)**
**Most Probable Scenario**

| Alternative | 1990 | 2000 | 2010 | 2020 | 2030 |
|---|---|---|---|---|---|
| Without Project | 10.4 | 25.3 | 40.7 | 52.5 | 54.5 |
| Bridge-Only | 3.7 | 7.9 | 27.5 | 40.7 | 54.5 |
| North of Claiborne Avenue | | 0.3 | 0.4 | 0.6 | 0.7 |
| 1.0 | | | | | |

Table 31 shows that the shallow draft benefits associated with the bridge-only and North of Claiborne Avenue alternatives. They generally follow the pattern of delay reductions reflected in Table 30.

**Table 31**
**Selective Alternative Summary**

**Shallow Draft Benefits ($1,000,000)**
**Most Probable Scenario**

| Alternative | 1990 | 2000 | 2010 | 2020 | 2030 |
|---|---|---|---|---|---|
| Bridge-Only | 8.6 | 25.4 | 20.8 | 18.1 | 0.0 |
| North of Claiborne Avenue | | 13.0 | 36.5 | 65.9 | 91.8 |
| 103.0 | | | | | |

The magnitude and duration of the delay reductions and benefits are a function of the growth in traffic. Table 32 summarizes the commodity growth rates used in developing the most probable scenario used in our plan formulation process. The aggregate rate for all commodities is fairly steady over the period of evaluation: 1.3 % for the first two 10-year periods and about 1.2 % thereafter. However, the rates for individual commodity groups show considerable variation among groups, as well as variation over time within groups. In fact, for the 1990-2000 period, three groups show a negative growth rate. One of these groups is crude petroleum, the commodity with the third highest tonnage using the lock.

**Table 32**
**Summary of Annual Commodity Growth Rates**
**Most Probable Scenario (%)**
**IHNC Lock**

| Group | 1990 to 2000 | 2000 to 2010 | 2010 to 2060 |
|---|---|---|---|
| Farm Products | 2.1 | 1.9 | 1.9 |
| Metallic Ores & Minerals | -0.9 | -0.3 | -0.3 |
| Coal | 2.6 | 1.5 | 1.5 |
| Crude | -3.7 | 2.5 | -0.6 |
| Non-metallic Minerals | 0.5 | 0.5 | 0.5 |
| Forest Products | 1.6 | 0.8 | 0.8 |
| Industrial Chemicals | 2.8 | 1.7 | 1.7 |
| Agricultural Chemicals | 3.0 | 1.5 | 1.5 |
| Petroleum Products | 1.5 | 1.0 | 1.0 |
| Miscellaneous | -10.5 | 0.7 | 0.7 |
| Total Tonnage | 1.3 | 1.3 | 1.2 |

Table 33 shows the total tonnage and annual rates for 10 year intervals for the most probable growth rate. The characteristics of these projections are that they are based on national level influences, that the projections incorporate responses to the Clean Air Act requirements, and that these

national level projections are generally consistent with the Inland Waterway Investment Study. We believe the growth rates are realistic and are well within the bounds of typical economic activity.

**Table 33**
**IHNC Traffic Projections**
**Most Probable Scenario**

| | 1990 | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|
| Tons (1,000,000) | 23.5 | 26.9 | 30.3 | 33.9 | 38.2 | 43.2 | 49.1 | 55.9 |
| Compound Annual Growth from Previous Period | - | 1.3 | 1.3 | 1.1 | 1.2 | 1.2 | 1.3 | 1.3 |

The major commodities moving through the existing IHNC lock are coal, petroleum products, and crude petroleum representing 34, 26, and 10 percent, respectively. These three commodity groups represent 70 % of the total IHNC traffic. Coal and petroleum products represent about 75 % of the projected traffic increases.

Four utility companies located in Mississippi and Florida represent over 90% of the total coal traffic. These companies were surveyed in order to determine their anticipated response to the upcoming Clean Air requirements. Possible responses include no action, substitution of lower sulphur coal (Powder River basin and/or Appalachian), South American imports, and switching to natural gas. The largest user (representing one third of the total volume) indicated that no action was necessary on their part to comply with the new emission standards. While considering other options, the remaining companies each indicated that their most likely response would be to shift the low sulphur coal. These actions, along with the 1993 Department of Energy base case projections for coal-generated electricity demand for the south Atlantic Region (which includes Mississippi, Alabama, Georgia, and Florida), were combined to produce the annual rates used for the projections indicated.

Figure 1 displays the actual tonnage through the lock for the last ten years (1984-1993) compared to our projections. The solid line passing through the dots represents a fitted trend line for this actual data. The upward slope reflects a statistically significant pattern of growth over the period. Our

projections are not an extension of the past trend but are based on discussions with the utility companies.

Figure 2 shows our projections of petroleum products which are based on 1993 Department of Energy region specific base case projections for a number of specific commodities that comprise the petroleum products group. The result was a composite growth of 1.5 % through the year 2000 then falling to 1.0 % thereafter.

Figure 3 shows the comparison with historical trends of this commodity group. Like coal, petroleum products reflect a statistically significant pattern of historical growth.

Figure 4 shows the crude petroleum rates based on 1993 Department of Energy base case projections of gulf coast, onshore production. The base case reflects a statistically significant reduction in activity through the year 2000 with an upturn in activity thereafter.

Table 34 shows a benefit cost comparison of our lock replacement plan and the bridge-only plan. This shows that while the bridge-only plan is significantly less costly (approximately 15 % of the North of Claiborne plan), it generates only about thirty percent of the total annual benefits. As a result, the net benefits, the difference between the average annual benefits and costs, which are the basis for the NED plan identification, are significantly higher with the North of Claiborne Avenue alternative.

Figure 1

COAL
Most Probable Growth Rate

Figure 2

Petroleum Products
D.O.E.  Growth Rates

Figure 3

Petroleum Products
Most Probable Growth Rate

Figure 4

Crude Petroleum
Most Probable Growth Rate

Since the bridge-only alternative generates short-term improvements, we evaluated a plan that would include new lock construction in the future when traffic dictated. Our estimate is that a new lock would need to be in operation by 2013 as compared to being in operation in 2011 with the construction of our proposed lock replacement plan. This Phased Construction alternative would include a 300-foot vertical lift span bridge. While similar in first costs to the north of Claiborne alternative, the annual costs of this phased alternative are lower because of the cost associated with lock construction are delayed by about 2 years. The benefits of phased construction are also lower than the North of Claiborne alternative because the years of benefit accrual involve only improvements associated with removal of bridge interference. Therefore, the net benefits of the phased alternative are higher than the bridge-only alternative, but the net benefits are still substantially lower than the North of Claiborne Avenue alternative.

**Table 34**
**Benefit-Cost Summary**
**Most probable Growth Scenario**
**(1993, $1,000, 8.0%)**

| | Bridge Only* | 900 x 110 x 22 | Phased Approach** |
|---|---|---|---|
| Total Annual Benefits | 23,323 | 133,262 | 67,266 |
| Total First Cost | 53,669 | 444,254 | 442,061 |
| Total Annual Costs | 4,987 | 33.262 | 31,847 |
| BCR | 4.6 | 2.2 | 1.9 |
| Net Benefits | 30,919 | 72,582 | 31,847 |
| Public Acceptance | No | Yes | No |

*Mid-rise 200-foot horizontal clearance double bascule St. Claude Bridge
**Mid-rise 300-foot horizontal clearance twin tower St. Claude Bridge operation in 2005 and
lock operational in 2013.

**City of New Orleans Agencies**.

Both the New Orleans Historic Districts Landmarks Commission and the New Orleans City Planning Commission expressed opposition to a mid-level “bridge-only “ plan.

**Neighborhood Organizations.**

The Bywater Neighborhood Association, which represents the area on the west side of the canal, expressed opposition to any mid-level bridge. “The impacts of such a proposal would have

devastating effects on the surrounding area which could not be adequately mitigated. . . These impacts would cause a serious and rapid decline of Bywater. Our Board of Directors has been unwavering in its opposition to a mid or high rise bridge at St. Claude Avenue and we will fight to its natural conclusion any proposal which would destroy our neighborhoods."

The Holy Cross Neighborhood Association submitted their recommendations for mitigation, which is included in Appendix A, Mitigation. Recommendations which were considered appropriate have been incorporated into the proposed project mitigation plan.

The Holy Cross Neighborhood Association, the Lower Ninth Ward Neighborhood Council, Inc., and the Holy Cross Community Development Corporation, as well as several local citizens all echoed their disapproval of any mid- or high-level bridge at St. Claude Avenue.

*Neighborhood Working Group.* As a part of our coordination with the community and in compliance with the guidance received from the Appropriations committees of both the House and Senate in conjunction with the FY-91 Appropriations Act, a Neighborhood Working Group (NWG) was established to represent community interests and provide a broad based community participation to ensure that the local community is informed about the planning process and that it has a voice in the process. The NWG consisted of representatives of the Holy Cross Neighborhood Association, the Bywater Neighborhood Association, and the Lower Ninth Ward Council, as well as the City Planning Department, the Historic Districts Landmarks Commission, the Regional Planning Commission, business interests, elected officials, and others. This group met periodically to discuss neighborhood concerns in an attempt to develop a comprehensive plan to identify and mitigate the social and cultural impacts of the project to the maximum extent practicable. The intent was to ensure that during the development of the IHNC lock replacement project, the communities adjacent to the project remained as complete, livable neighborhoods during and after construction of the project. The primary focus of the NWG was to give maximum consideration to lock replacement alternatives which minimize residential and business disruption while meeting the goals of improving waterborne commerce.

Upon completion of a framework for mitigating the project impacts, the NWG requested that we bring the results to the community. On January 3, 1995 and January 10, 1995, we held two meetings to afford neighborhood residents an opportunity to provide input.

The New Orleans District sent approximately 25,000 brochures explaining the project and announcing the meetings. A total of about 250 people attended the two meetings. They were generally critical of the project, and it was obvious that many of those in attendance felt that the project would have negative impacts on

their community. A summary of the key issues surfaced at the meetings as well as summaries of the neighborhood working group meetings and their proposed mitigation plan are included in *Volume II, Appendix A - Mitigation.*

## Navigation Interests

As a part of our coordination with navigation interests, we convened a navigation working group to assist us in developing the north of Claiborne Avenue plan to ensure that the plan was workable and acceptable to navigation interests.

Navigation interests have always supported improvements at the IHNC. Throughout the Gulf Coast region, they have expressed concern about any further delay in constructing a new lock at the IHNC. Exhibit II contains letters from several ports and navigation interests endorsing construction of a new lock at the IHNC.

## PUBLIC VIEWS AND COMMENTS

As part of the planning process, the draft report was sent out to agencies and the public for review and comment in early December 1996. As part of the public review process, a public meeting was held at Holy Cross School on January 27, 1997. It was attended by approximately 325 people. The public comment period was held open until March 4, 1997. As a result of the comments received during the public review period, changes to the tentatively selected plan (TSP) presented in the draft report, have been incorporated into the recommended plan in the final report.

The primary change has been the inclusion of a temporary bridge at St. Claude Avenue during the construction of the new bridge at St. Claude. This will effectively alleviate the concerns about impacts to businesses and the impact to Holy Cross School. The temporary bridge will insure that traffic moves across St. Claude Avenue throughout the construction period. The 4-lane temporary bridge will accommodate the traffic just as the existing bridge does. In addition, innovative construction techniques at Claiborne Avenue will result in closure of the Claiborne Avenue bridge for about 2-4 weeks, while the lift span and towers are replaced.

Other changes include a "fold down" floodwall on the levee in the Holy Cross area. The floodwall would be in the raised position about 3 weeks per year. During the rest of the year the view of the river and canal would be unobstructed. The "fold down" sections can serve as a bike/walk/jog path when not needed

for flood control purposes. In addition, there have been revisions to the mitigation plan.

Volume 9 (Public Views and Comments) documents the comments resulting from the public review period. Brief responses are also included in that volume.

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# DESCRIPTION OF THE RECOMMENDED PLAN

The recommended plan will provide a more efficient connection between the Mississippi River and the GIWW and MR-GO and addresses the concerns expressed by various stakeholders during the planning process. Specific features of the plan are described below and shown on Plates 9-21. A more detailed description of specific project features is contained in Volume 3, Appendix B, Engineering. The plan includes revisions made to the tentatively selected plan as a result of comments received during the public review period. The main changes were the inclusion of a temporary vehicular bridge at St. Claude Avenue and revisions to the community impact mitigation plan.

## PLAN FEATURES

The location of the proposed new 110- by 36- by 1,200-foot lock is between the Claiborne Avenue and Florida Avenue bridges in the IHNC. The plan includes provision of a temporary navigation by-pass channel to be used during construction, construction of a new low-level St. Claude Avenue Bridge, construction of a temporary bypass bridge at St. Claude Avenue, modifications to the Claiborne Avenue Bridge, extending the Mississippi River flood protection levees to the new lock site, and demolition of the existing lock. Also included are community impact mitigation measures to offset the impacts of project construction and the inconvenience and disruptions expected in the neighborhoods around the IHNC. These measures are discussed in a subsequent section. Beautification measures and aesthetic treatment of project works are included as an integral part of the lock project.

**a. New Lock.** The new lock will be located in the IHNC (river mile 92.6), north of Claiborne Avenue, about one mile north of the east bank of the Mississippi River. The lock chamber will be 110 feet by 1,200 feet usable length, with direct head and reverse head miter gates and lock culvert (tainter) valves, and an interior, ported manifold with 14.5 feet square culverts. The lock will be pile founded. A precast, post-tensioned, concrete shell lock will be constructed at an off-site graving site and floated to the staging area in four pieces. There the lock walls, miter gates and machinery will be completed, and the sections will be moved to their final location. The completed modules will be installed by positioning, partially ballasting and then lowering the modules onto the setting pads. After proper alignment is obtained on the pads, the base grouting and lock wall ballasting will be completed. Plate 11 shows the pile foundation on which the lock will rest. The modules will be

floated in, one at a time, from the lake (north) side, beginning with the river (south) module. The joints used to connect the monoliths will also act as expansion joints. The construction excavation will be dredged to the required elevation, and thus no dewatering is required. Setting piles will be used to set the floated-in structure into final position and for aligning the culverts prior to final grouting. A more detailed description of the lock design and construction is included in Appendix B, Engineering Investigations.

Since the new lock will be situated in the existing channel, temporary bypass channels to allow for continued navigation through the area will be required. The Corp's intent is to reduce canal closure to an absolute minimum because of the extreme cost of closure to navigation. Two types of bypass channels are included at different phases of project construction: (1) a two-way bypass channel between Claiborne and Florida Avenues on the east side of the canal during new lock construction and, (2) a one-way, demolition-phase bypass channel between St. Claude and Claiborne Avenues on the east side, after the replacement lock is in operation and during demolition of the existing lock. The two-way bypass channel will consist of a transit bypass lane and a laying bypass lane as shown on Plate 9. Each channel is 110 feet wide; the laying channel is 20 feet deep, and the transit channel is 31 feet deep. Three protection cells will be placed at both the north and south ends of the bypass channel to contain vessels. Navigation aid markers and lighting will be provided for safe channel passage. Tug assistance vessels will be stationed at the north and south protection cells and will have two-way, marine communication with vessels. The one-way bypass channel will be 12 feet deep, approximately 85 feet wide, and it will be operated only after the new lock has been completed and the old lock is being demolished.

The existing lock will be demolished after the new lock is completed and placed in service. The disruption to navigation will be kept to the minimum required to complete demolition and debris removal. The existing lock must be removed in its entirety for completion of the 200-foot bottom width replacement channel to full width.

**b. Levees and Floodwall.** The Mississippi River flood protection levees (MRL) and floodwalls must be extended from the existing lock approximately 2,500 feet on the east and west banks to tie into the new lock as shown on Plates 12 and 13. The MRL design grade is elevation 22.4 feet NGVD. The existing hurricane protection floodwalls will serve as hurricane flood protection during project construction, but they will have to be selectively demolished as required to construct the new MRL levee/floodwall to elevation 22.4 feet NGVD. Existing MRL forebay levees will be maintained as an all-earth section, to the extend possible, and

will be shaped where needed to a crown elevation 22.4 feet NGVD, with 1 vertical on 3 horizontal side slopes landside and floodside. Part of this levee will include a "fold-down" floodwall.

**c. Brdge Modifications and Replacements.** It is assumed that prior to construction of the lock project, the existing Florida Avenue Bridge will be replaced by the State of Louisiana with a new 4-lane, high-level, fixed-span vehicular bridge. The Port of New Orleans is replacing the railroad portion of the bridge, under the Truman Hobbs authority, with a 300-foot vertical-lift span railroad bridge that will have one vehicular lane each way for local traffic. The U.S. Coast Guard has declared the existing bridge an unreasonable hazard to navigation. The new Florida Avenue railroad bridge will be constructed with or without the lock project and constitutes the without project condition relative to Florida Avenue. The existing St. Claude Avenue Bridge will be demolished and replaced with a new low-level, double bascule bridge with a 200-foot horizontal clearance and unlimited vertical clearance as part of the IHNC project. Before the construction of the new bridge, a temporary 4-lane bypass bridge, consisting of 2 single bascule spans (one over the lock and one over the temporary bypass channel), will be constructed and placed in service. Plates 17 - 19 show the bridge plan and details of the proposed temporary bridge which will eliminate the need to close this bridge at all during construction. The limited channel width in the permanent mooring area between St. Claude and Claiborne Avenues (planned after demolition of the existing lock) makes 200 feet a reasonable width, acceptable to the Coast Guard. The replacement St. Claude Bridge, to be built on the same alignment, will be constructed within existing rights-of-way. The touchdown points of the approaches will remain the same. The Claiborne Avenue Bridge superstructure will be replaced as shown on Plate 20. The bridge superstructure will be replaced with higher towers, a new movable span, and new electrical and mechanical equipment. A short 2-4 week closure of this major vehicular artery will be required for this construction.

A temporary bypass bridge will be constructed prior to the new St. Claude Avenue bridge being constructed to eliminate the need to close this major artery at all during construction. The temporary bridge will be two single leaf bascule spans independent of each other. Only one will be moveable at a time. Refer to Volume 3, Appendix B, Executive Addendum, Engineering Investigations for more details.

The first bridge to be constructed is the Claiborne Avenue Bridge. Once the new lock is completed, this bridge will be located on the Mississippi River side of the lock. Retrofitting of this bridge will consist of providing new lift towers, a new lift span, and new machinery constructed upon the existing

foundation. The existing foundation. The approach grade would remain the same.

The next bridge to be constructed will be the St. Claude Avenue Bridge. The existing bridge will be replaced. The east foundation must be removed to construct the lock demolition bypass channel. The new structure will be a double bascule bridge with approximately 200 feet of horizontal clearance. This design was preferred by the Neighborhood Working Group since there are no towers and pedestrian crossing would be allowed. A temporary bridge consisting of two single bascule bridges (one over the lock and the other over the by-pass channel) providing 4-lanes of traffic will accommodate all of the existing traffic and require no closure of this bridge. During the short period of time required to tie the new bridge to the approaches (estimated to be about two months on each end), traffic will be restricted to two lanes. Most of this will take place during the summer as to not impact schools in the area.

d. **Other (Relocations).** Data on the location of roads, railroads, and utilities were gathered by searching permits, visiting sites, and by initial contacts with facility owners. In-house relocation plans were developed using accepted design criteria or by using the owners' specifications.

Utility owners will remove all existing facilities except where the work is incidental to lock demolition. Owners will be contacted of our intent to remove their lines contained in the lock gallery, and a hold harmless statement will be obtained. Owners will design and construct power lines, telephone cables, and pipelines to the current capacities of the existing facilities.

Utility relocations will be constructed within project rights of way or public servitudes within the city streets. These relocations are a project cost, but they are paid for by the owners, not the Federal government.

Roads and Bridges. Road and bridge designs are based upon applicable design criteria such as the AASHTO Bridge Manual or upon input by the neighborhood working group. The relocation of two bridges is an integral part of the lock replacement project. One relocation is necessitated by its foundations being removed to make room for the new channel. The other is necessitated by the bridge being placed on the river side of the new lock and not having adequate vertical clearance for high river stages. Bridge construction will be phased so that only one bridge is closed at a time, ensuring that two crossings of the IHNC will be in operation at all times.

Railroads. The only railroad relocations required are those that lead to the Galvez Street Wharf. These tracks will be removed since the Galvez Street Wharf will be demolished.

Utilities. The relocation of these utilities will be accomplished by the utility owners. These relocations are necessitated by conflicts of the existing utilities with the proposed project. These conflicts result from the narrow channel crossing, congested construction corridor, owners' need for non-interruption of existing service, and sequence of project construction. The plan consists of constructing three utility corridors, with each containing one trench crossing the channel (See Plates 21-23). The required utility relocations are shown in Table 35.

**Table 35**
**Required Relocations Due To Project Construction**

| UTILITY OWNER | DESCRIPTION OF UTILITY |
|---|---|
| South Central Bell (SCB) | 1-4 Duct Structure |
| South Central Bell | 2-12 Duct Structures |
| Cox Cable of New Orleans | 1-3/4" Coaxial Cable |
| New Orleans Public Service(NOPSI) | 6-24KV Feeder Lines |
| New Orleans Public Service(NOPSI) | 1-Dual High Pressure Gas Distribution Pipeline |
| Sewerage and Water Board (S&WB) | 2-500 MCM, 3 Conductor, Rubber Insulated Steel Wire Armored Cable |
| Sewerage and Water Board | 1-500 MCM, 3 Single Conductors, EPR Insulated, Shielded with PVC Jacket |
| Sewerage and Water Board | 2-20" Cast Iron Water Mains |
| Sewerage and Water Board | 1-48" Cast Iron Water Main |
| Sewerage and Water Board | 2-30" Concrete Gravity Sewer Main |
| Sewerage and Water Board | 1-66" Steel Sewer Force Main |
| Sewerage and Water Board | 1-54" Steel Sewer Force Main |
| Sewerage and Water Board | 1-13,000 GPM Sewer Lift Station |

e. **Mitigation**. Given the unique circumstances associated with the urban setting of the project, a shift in focus from the natural environment to the social environment required a corresponding departure from traditional methods of environmental impact analysis and mitigation planning. In practice, mitigation planning within the Corps is almost exclusively confined to the natural resource arena. In the case of mitigation for this project, however, analysis and mitigation of impacts over the entire range of community resources covered by Section 122 of PL 91-611 does not enjoy the benefit of a common measure such as the Habitat Unit used to scale fish and wildlife mitigation features. Nor is the cumulative and interactive nature of multiple impacts well addressed by judgmental scaling, one

resource at a time. Once all measures for “in-kind” mitigation are exhausted, residual impacts can only be offset by “out-of-kind” mitigation. The plan objective becomes identification of a set of actions which replace one array of community resources with another array sufficient to restore the community to an equal level of satisfaction. Pursuant to this objective and in accordance with the specific congressional guidance provided, a broad-based community participation process was established to assist us in the development of a general mitigation plan as an integral part of the lock replacement plan. More details and information on the process used in developing the mitigation plans as well as the specific elements of mitigation being proposed are contained in Volume II, Appendix A, Community Impact Mitigation Plan. The environmental impact statement (EIS) includes a discussion of the specific project impacts expected to occur.

The North of Claiborne Avenue site reduces the scope of project impacts from all sites previously considered to the degree that mitigation planning was able to focus on the impact avoidance procedures, direct minimization of impacts, and compensation for those impacts direct minimization could not adequately address. Plans at this site effectively address the three primary categories of project impacts that are of most concern to the affected community - residential dislocation, construction noise, and traffic congestion. There are **NO** residential dislocations required to implement this project. The pre-fabricated lock design significantly minimizes the on-site construction related noise. In addition, noise monitoring will be required of contractors. Traffic congestion will be minimized by constructing a new temporary bypass bridge at St. Claude Avenue and utilizing innovative construction methods at Claiborne Avenue. These measures will essentially preserve the current level of service that the bridges provide to all users (public transportation, emergency service, school transportation, pedestrians, etc.).

Impact Avoidance Procedures. Impact Avoidance procedures are actions taken to avoid adverse construction impacts which represent prudent engineering design and construction practice. These actions are incorporated in the construction but are not considered mitigation even though they avoid project impacts.

*Noise*. Construction contracts will include provisions that will limit noise to a certain level within a given distance from the construction site. Pile testing will be required at selected locations to measure noise levels and define the 65 Ldn level or similar measure. While the contractors will be given discretion in the manner of compliance with the standard, the form of compliance would likely include the employment of specialized, remote deployment or isolation of equipment, quieter equipment, and the placement of baffle walls or some other sound

absorption devices. Contractors may also be required to use specialized pile driving equipment, such as a vibratory hammer and an underwater hydraulic hammer. They will be required to monitor noise levels to ensure compliance. Also specific routes away from residential areas will be designated for construction related traffic.

*Transportation.* Specific routes away from residential and commercial areas will be designated for construction-related traffic and remote locations for constructing staging areas. Damage to roads caused by construction activities will be repaired. Also a temporary bypass bridge will be constructed at St. Claude Avenue. Detour signage will be erected when individual streets are closed due to utility relocations. An offsite parking area will be provided for construction workers associated with the construction of levees and floodwalls. Also most of the debris from demolition will be moved by barge.

*Aesthetics*. Measures to be accomplished include utilizing textured surfaces on floodwalls, bridge approaches, and bridge piers; landscaping areas surrounding levees, floodwalls and bridge approaches; improving lighting along detour routes (existing and new), and backfilling both sides of the new lock to create green space.

*Air Quality.* Measures will be included to ensure compliance with Federal and State Air Quality Standards to preserve air quality within specified levels. The contractors will be required to monitor air quality in order to verify compliance. Measures may include wetting levees and construction areas (roads) and the use of a monitoring system to reduce dust.

*Photo/video documentation.* A video/photo documentation program will be implemented to establish existing conditions at the beginning of the construction period.

*Employment.* Contract specifications will require the contractor to use the local work force in order to achieve minority and local resident participation.
Local residents will be provided a list of job skills that will be required and training opportunities that may be necessary.

*Safety.* Measures will include signage, fences, and lighting of construction areas. Measurers will also include media notices during certain construction activities. Additionally, school crossing guards will be provided on each side of the canal.

*Cultural Resources.* The Corps will, in consultation with the Advisory Council on Historic Preservation, the State Historic Preservation Officer, and the New Orleans Historic Districts Landmarks Commission, implement a program of recordation to document structures with historical and/or cultural significance.

*Air Quality*. Measures will include using mesh barriers around construction sites to reduce dust.

The key elements of the mitigation plan are summarized below under direct impact mitigation, and indirect compensation of impacts.

Direct Impact Mitigation. This refers to actions taken by the Corps in cooperation with local government, community groups, and residents to minimize those adverse impacts which remain following the implementation of the impact avoidance procedures that are previously described.

*Noise.* Measures will include soundproofing residential or commercial structures that lie within high levels of noise that are related to lock or bridge construction. Pile driving will be scheduled for summer when schools are out of session. Optional temporary relocation of residents close to the new St. Claude Avenue Bridge will be made available.

*Transportation.* Measures will include synchronized traffic signals, electronic message boards, an incident management plan to facilitate removal of disabled vehicles, preservation of emergency response capabilities, and provision of additional school crossing guards. In conjunction with Civil Defense officials, a backup hurricane evacuation plan will be developed for a bridge construction periods. Local streets that will serve construction traffic will be resurfaced. A detour route from St. Bernard Highway to Florida Avenue would be constructed to improve commuter traffic. Provisions to incorporate rail service on the new St. Claude Bridge will be included.

*Cultural Resources.* Measures will include salvaging one or more components of the old lock and/or bridge; publishing a brochure addressing historical features of the lock, bridge, and surrounding community; and erecting a display, or displays, with markers patterned on those associated with National Register locations, featuring appropriate information.

*Aesthetics.* Measures include an attempt to transplant the better specimen trees from the oak grove adjacent to the existing lock to nearby sites in the community and replacing the stand of mature oak trees adjacent to the existing lock with new plantings, constructing a walk/jog path along the floodwall to replace the use of the existing levee crown, constructing observation decks to provide visual access from the levee/floodwall, providing lighting and green space, expanding green space at lock site by tying lock walls to the Claiborne and Florida Avenue bridges on the east side and Claiborne Avenue Bridge on west side, and landscaping the public rights-of-way.

*Employment.* Measures will include notifying residents in advance of project construction that will require hiring local residents and providing a list of job skills that will be required. That will enable those interested to pursue the job training that will also be provided by this mitigation plan..

*Safety.* Barriers and evening safety patrols will be required to discourage vandalism . Increased police protection and school crossing guards will also be required.

*Business and Industry.* Measures include providing monetary compensation to those commercial establishments and landlords that experience a demonstrable decline in sales and rents during the period of bridge construction. This will be handled on a case by case basis.

*Training.* Expand the skilled labor work force within the affected community. Local residents would be eligible for tuition assistance grants for training at local vocational-technical schools, or similar type school, for skills required for project construction.

Indirect Compensation of Impacts. This refers to actions taken by the Corps in cooperation with local government, community groups and residents to alleviate those adverse impacts which remain following the implementation of both impact avoidance procedures and direct impact minimization measures previously described. Residual impacts from noise and residual impacts to transportation, aesthetics, employment, community and regional growth, property values, and community cohesion have been identified. A program of indirect compensation is required in order to restore the community to the level of well-being equal to that which existed prior to project construction. This program includes the following:

a. Working with displaced lessees on the IHNC to encourage them to relocate in Orleans Parish. Incentives may include new leases on concessionary terms.

b. Implementing a program for streets improvements, and improvements within an area, yet to be determined, on each side of the IHNC.

c. Establishing a business assistance program in the area to serve as a resource center and stimulus for local business development.

d. Establishing a Neighborhood Revitalization Program to serve as a source of money for a program of housing rehabilitation and educating local residents on maintaining their housing. Also included will be clearing vacant lots, and demolishing and rebuilding abandoned housing.

e. Community facilities, such as parks, playgrounds, community gardens, and tot lots will be provided.

f. Additional police and emergency medical services during the construction period will be paid for from the mitigation fund .

Details on mitigation elements are contained in Volume II, Appendix A, Community Impact Mitigation Plan. Costs estimates for mitigation elements are likewise contained in the appendix.

**DESIGN AND CONSTRUCTION CONSIDERATIONS**

General. The innovative pre-cast, post-tensioned, float-in construction technique will shorten the on-site construction time required by allowing for the pile foundation to be prepared and other site work to be accomplished at the same time the lock shell is being fabricated at the graving site. The evolution of this innovative lock design, construction technique, and location have resulted from a sensitivity to potential impacts to the human environment that would result from a more conventional approach.

The following is a summary of the conceptual construction sequence for the major elements of the project which are depicted in the computer enhanced photographs contained in Exhibit 1.

(1) Existing conditions showing the north of Claiborne Avenue location.

(2) The new bridges at Florida Avenue.

(3) Site preparation which will include removing the trees, demolition and relocation of the US Coast Guard station, removal of the Galvez Street Wharf, and relocation of the businesses along the east side of the IHNC.

(4) Construction of the new levees and floodwalls to provide MR&T protection back to the new lock location and to provide hurricane protection on the tidewater side of the new lock location will be next. Mississippi River flood protection requires about 10 additional feet above the current level of protection along the canal.

(5) Construction of a navigation bypass channel between Claiborne and Florida Avenues would then take place. The navigation bypass channel will include two lanes, one to accommodate barge traffic (22 feet) and one to accommodate ship traffic (31 feet). It is intended that the bypass channel will accommodate traffic with the use of tug assistance for tows and ships. Construction of protective cells near Florida and Claiborne Avenues will also be accomplished.

(6) Site preparation, including excavation for lock and construction of the pile foundation and preparation for the precast lock modules, will then be accomplished. This will include construction of protective cells that will delineate and protect the lock construction area within the normal channel.

(7) Floating-in the individual sections of the precast lock.

(8 & 9) Completing the lock walls machinery and gates at the work platform in the staging area.

(10) Moving the sections and attaching sections to their foundation.

(11) Completing construction of the lock at its final location.

(12) Construction of the levee tie-ins to the lock structure to provide protection from both river flooding and hurricane surge protection will then be accomplished. The area between the lock and protection levees will be backfilled and eventually developed as green space with the exception of the area along the turning basin which will be used for port related facilities. This area will also include sufficient space for development of lock support facilities (work center/shop, parking etc.). The guidewalls for the new lock will be completed and the Claiborne Avenue bridge towers will then be removed.

(13) The towers, lift span, and mechanical equipment for the Claiborne Avenue bridge will then be replaced. After the new lock is fully operational, construction of the temporary bridge at St. Claude Avenue (not shown) will take place.

(14) Demolition of the old lock, estimated to take about 18 months, will then be accomplished in several phases. This will include removal/demolition of the St. Claude Avenue bridge.

(15) The new channel will be dredged upon completion of the lock.

(16) The new St. Claude Avenue double bascule bridge and lock entrance channel mooring cells between St. Claude and Claiborne Avenue will then be constructed.

Relocations. A complete listing of all facilities affected by the IHNC Lock Replacement was developed. These facilities included roads and bridges, railroads, and utilities. Only those facilities that would interfere with excavation were relocated. The Claiborne Avenue Bridge also had to be modified since it would not provide adequate clearance for high river stages.

Hydraulic Design. The major considerations in the hydraulic design of the lock were the differential heads. In addition to normal stages the lock must be designed to provide MRL level of protection on the river side as well as SPH protection on the lake side of the lock. The lock depth required to minimize the hawser forces was also considered. Filling and emptying systems were also a major consideration. These systems were not only designed to minimize lockage times but also to accommodate a reverse head situation.

Foundations and Geology. The primary concerns addressed slope failures of the proposed levee re-alignments and the development of a foundation for the lock structure. Sheetpile seepage control was developed for the perimeter of the lock. A foundation to support the lock without piles while limiting settlement was designed. A drainage blanket underneath the foundation was also designed in order to limit uplift pressures.

## PLAN ACCOMPLISHMENTS

The recommended plan, as previously described, would achieve the goals of the study, resolve the identified problems to an acceptable level, realize potential opportunities, and meet identified needs.

Construction of the plan would eliminate the delay currently experienced by navigation traffic and would significantly increase the tonnage capacity of the lock. Construction of the lay areas would provide for safer navigation passage through the area. Construction of the bridge improvements and the related detour route would facilitate movement of vehicular traffic.

Implementation of mitigation measures prior to and during construction of the project would offset the identifiable project impacts to the extent practicable and insure that the neighborhoods on both sides of the IHNC remain viable.

## ECONOMICS

As a result of the changes made to various construction and mitigation features to address community impacts, changes to the project costs and benefits reflected in the Economic Analysis, Appendix E, Volume 7 have resulted. The project changes include the construction of a temporary bridge at St. Claude Avenue, redesign of the Claiborne Avenue Bridge, redesign of the proposed floodwall between St. Claude Avenue and the Mississippi River, moving a number of features previously identified as mitigation to construction, and modification to several mitigation features.

The impacts of these changes on project costs, benefits, and the recommended plan are described below.

Project costs. Project construction expenditures by year in 1996 dollars, exclusive of mitigation costs, are displayed in Table 36. The implementation periods and base years for the two plans are unaffected by the changes in project features described above. However, total first costs have increased by approximately $18.4 million for both plans. The increase reflects temporary bridge/bridge redesign, floodwall redesign, previously identified mitigation features shifted to construction, and several minor cost estimation refinements (increases and decreases) to elements of the plan that were otherwise unchanged.

**Table 36**
**Construction Expenditures By Year**
**Exclusive of Mitigation and Sunk Costs**
(1996 $1,000's)

| Year | 900 x 110 x 22 | 1200 x 110 x 36 |
|---|---|---|
| 1998 | 5,328.4 | 6,157.2 |
| 1999 | 33,832.9 | 34,774.7 |
| 2000 | 30,792.3 | 31,330.4 |
| 2001 | 30,773.4 | 22,176.4 |
| 2002 | 14,385.3 | 16,693.0 |
| 2003 | 66,171.9 | 77,053.6 |
| 2004 | 44,288.6 | 49,056.0 |
| 2005 | 53,785.5 | 59,547.3 |
| 2006 | 33,303.4 | 39,168.4 |
| 2007 | 54,631.0 | 49,461.7 |
| 2008 | 24,408.7 | 46.633.9 |
| 2009 | 29,198.6 | 24,816.7 |
| 2010 | - | 22,230.7 |
| Total | 410,900.0 | 479,100.0 |

Mitigation costs by year are identified in Table 37. As indicated above, some previously identified mitigation costs have shifted to construction items. These costs amounted to approximately $5.0 million. Another $7.0 million of previously identified mitigation costs have been eliminated as a direct result of the inclusion of the temporary St. Claude Avenue Bridge and the redesign of the Claiborne Avenue Bridge. These reductions have been offset by the inclusion of an equal amount of additional mitigation costs. Total mitigation costs are therefore unchanged from those previously presented.

**Table 37**
**Mitigation Expenditures By Year**
(1996 $1,000's)

| Year | 900 x 110 x 22 | 1200 x 110 x 36 |
|---|---|---|
| 1999 | 6,570.0 | 6,570.0 |
| 2000 | 187.5 | 187.5 |
| 2001 | 187.5 | 187.5 |
| 2002 | 6,376.8 | 6,376.8 |
| 2003 | 6,549.2 | 6,549.2 |
| 2004 | 332.5 | 332.5 |
| 2005 | 3,042.5 | 332.5 |
| 2006 | 1,017.5 | 3,042.5 |
| 2007 | 4,875.9 | 1,017.5 |
| 2008 | 2,824.9 | 4,543.4 |
| 2009 | 1,043.0 | 2,824.9 |
| 2010 | - | 1,043.0 |
| Total | 33,000.0 | 33,000.0 |

Table 38 displays the composition of total first cost, the present value cost necessary to calculate average annual costs, and lastly, the average annual costs. Overall, average annual costs have increased by approximate $1.9 million for both plans. The increase is a direct result of the increase in first costs.

All costs in Table 38 represent 1996 price levels. Annual costs were calculated using an interest rate of 7.375 percent, a 50-year project life, and a plan specific base year indicated in the table.

**Table 38**
**Cost Summary**
**(1996 $1,000's 7.375 Percent)**

| Item | 900 x 110 x 22 | 1200 x 110 x 36 |
|---|---|---|
| Construction Costs | 410,900 | 479,100 |
| Mitigation Costs | 33,000 | 33,000 |
| Nav Losses During Const | 2,546 | 2,588 |
| Total Costs | 446,453 | 514,695 |

**Table 38 Continued**
**Cost Summary**
**(1996 $1,000's, 7.375 Percent)**

| Item | 900 x 110 x 22 | 1200 x 110 x 36 |
|---|---|---|
| P.V. Const Cost | 616,667 | 755,237 |
| P.V. Mitigation Costs | 51,901 | 54,677 |
| P.V. Nav Losses | 2,735 | 2,780 |
| Total P.V. Costs | 671,313 | 812,694 |

**Table 38 Continued**
**Cost Summary**
**(1996 $1,000's, 7.375 Percent)**

| Item | 900 x 110 x 22 | 1200 x 110 x 36 |
|---|---|---|
| Annual Construction Costs | 46,814 | 57,333 |
| Annual Mitigation Costs | 3,939 | 4,150 |
| Annual Nav Losses | 208 | 211 |
| Annual Perm DD Losses | 477 | 0 |
| Annual O&M Costs | 1,382 | 1,384 |
| Induced Vehicular Losses | 0 | 0 |
| Total Annual Cost | 52,820 | 63,078 |
| Base Year | 2010 | 2011 |

Benefits. Table 39 displays the composition of total average annual benefits. All benefits represent 1996 price levels, an interest rate of 7.375 percent, a 50-year project life, and a plan specific base year indicated in the table. As presented, the benefits are unchanged from those previously reported in Appendix E, Volume 7. One unquantified impact, not related to the change in project features described above, should be noted. Additional investigation has revealed that the operation time of the new permanent bridge at St. Claude Avenue would be faster than that assumed in the previous estimates. As a consequence, the vehicular benefits presented here are slightly understated. The degree of understatement has not been quantified because the magnitude of bridge operation time improvement has not been precisely determined.

**Table 39**
**Annual Benefit Summary**
(1996 $1,000's, 7.375 Percent)

| | 900 x 110 x 22 (w/curfews) | 1200 x 110 x 36 (w/curfews) |
|---|---|---|
| Shallow Draft | 83,982 | 87,448 |
| Deep Draft | 0 | 979 |
| Vehicular | 5,909 | 6,563 |
| Savings to Federal Project Maint Closure | 4,017 | 4,194 |
| Nav Losses Prevented | 10,471 | 11,243 |
| Total Annual Benefits | 104,379 | 110,427 |
| Base Year | 2010 | 2011 |

Economic Justification. Table 40 summarizes the annual costs, annual benefits, net benefits, and benefit to cost ratios. Net benefits reflect a decrease of less than four percent.

Benefit-to-cost ratios reflect a reduction of less than one-tenth of a point for both plans.

**Table 40**
**Recommended Plan Summary Information**
**(1996 $1,000's, 7.375 Percent)**

| | 900 x 110 x 22 (w/curfews) | 1,200 x 110 x 36 (w/curfews) |
|---|---|---|
| Total Annual Cost | 52,820 | 63,078 |
| Total Annual Benefits | 104,379 | 110,427 |
| Net Benefits | 51,559 | 47,349 |
| BCR | 1.98 | 1.75 |
| Base year | 2010 | 2011 |
| Net Benefits Adj. to 2010 | 51,559 | 44,097 |

# PLAN IMPLEMENTATION

## INSTITUTIONAL REQUIREMENTS

Since the recommended plan is a single-purpose navigation project, all costs are attributable to navigation and will be allocated between inland waterway and deep-draft navigation.

The deep-draft feature of the project requires a non-Federal sponsor. The Board of Commissioners for the Port of New Orleans has been designated by the State of Louisiana to serve as sponsor. In accordance with PL 99-662, the inland waterway feature of the project will be cost shared 50-50 between the Inland Waterways Trust Fund and Federal Appropriated Funds. The deep-draft increment, which our analysis demonstrates does not warrant full participation, will be totally paid for by non-Federal interests. Federal participation is limited by the Federal share of the Federally supportable plan, the NED plan.

The locally preferred plan, the deep-draft lock, has outputs similar in kind, and equal to or greater than the outputs of the NED plan and is economically justified on an overall basis.

Table 41 presents a summary breakdown of the First costs for the NED and the recommended plans.

**Table 41**

**Summary Estimate of First Costs for the NED and Recommended Plans***

| Account | Description | NED | TSP |
|---|---|---|---|
| 01 | Lands & Damages | $45,200,000 | $45,200,000 |
| 02 | Relocations | 85,300,000 | 85,500,000 |
| 05 | Locks | 204,500,000 | 257,800,000 |
| 09 | Channels and canals | 16,600,000 | 22,000,000 |
| 11 | Levees and Floodwalls | 11,200,000 | 11,400,000 |
| 18 | Cultural Resources | 600,000 | 600,000 |
| 25 | Mitigation | 33,000,000 | 33,000,000 |
| 30 | Engineering & Design | 50,300,000 | 56,100,000 |
| 31 | Construction Management | 16,400,000 | 19,800,000 |
| | T o t a l | $463,100,000 | $531,400,000 |

* Includes sunk costs

**DIVISION OF PLAN RESPONSIBILITIES**

Since the Federally supportable plan, the NED plan, is a single-purpose inland navigation project, all costs are allocated to commercial navigation. The NED plan is currently estimated to cost $463,100,000. Approximately $23,000,000 in utility relocations have been determined to be non-compensable and therefore will be paid for by the utility owners. Of the remaining $440,100,000, fifty percent, or $220,050,000, would come from Federal appropriated funds and the other fifty percent, $220,050,000, would come from the Inland Waterways Trust Fund. The recommended plan, a locally preferred plan, a deep-draft lock, will cost $531,400,000, or an increase of $68,300,000 over the NED plan. The incremental cost of $68,300,000 between a shallow- and deep-draft project will be borne in full by the Port of New Orleans. The real estate required for the project which is the same for the NED plan and the recommended plan, currently estimated to cost about $45,316,000, will be acquired by the Federal government (Corps of Engineers). The Board of Commissioners of the Port of New Orleans owns almost all of the real estate required for this project and will be given credit for these lands towards their share of the recommended plan. The entire project will be designed and constructed by the Corps of Engineers. Upon completion, the Corps will operate and maintain the project.

**Cost Changes.** The incremental cost difference between the NED Plan and the recommended plan is presently estimated at $68,300,000. Based on the model Project Cooperation Agreement (PCA) for navigation projects, the Port of New Orleans would be required to furnish that amount upon execution of the PCA, which will not occur until funds are appropriated for construction of this project. However, future cost changes, increases or decreases, in the recommended plan need to be accounted for in the process of ensuring this incremental cost difference is as up-to-date as possible when the Port of New Orleans has to provide this incremental cost difference.

The following method will be used to address cost changes in the future.

a. The costs for Lands and Damages, Relocations, Levees and Floodwalls, Community Impact Mitigation, and most of the Engineering and Design and Supervision and Administration are the same for the NED Plan as for the Recommended Plan. The only costs that change between plans are the costs associated with the Lock and Channels/Canal features. Therefore, the appropriate share of the project cost that is attributable to

the incremental cost difference would be calculated using only the costs of the Lock and Channels/Canal feature.

b. The Lock and Channels/Canal costs for the Recommended Plan is now estimated at $279,800,000. The incremental cost difference is now estimated at $68,300,000, and that results in the appropriate share being approximately 22.9 percent.

c. The present incremental cost difference of $68,300,000 would be adjusted by applying this 24.4 percent factor to any future changes in the Lock and Channels/Canal feature costs of the Recommended Plan. For instance, if the Lock and Channels/Canal cost for the Recommended Plan increases by $10,000,000, the incremental cost difference would increase by $2,440,000 (0.244 x $10,000,000) and the Port of New Orleans would be responsible for the additional $2,440,000. Any changes in the cost of the features other than the Lock and Channels/Canal would be considered part of the NED Plan and shared 50-50 between the Corps and the Inland Waterways Trust Fund.