US Army Corps
of Engineers
New Orleans District

CITY OF CARENCRO, LAFAYETTE PARISH, LOUISIANA, CONTINUING AUTHORITIES PROGRAM SECTION 205 FEASIBILITY STUDY

DRAFT FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

MARCH 2012

EXECUTIVE SUMMARY

The City of Carencro, Lafayette Parish, Louisiana, Continuing Authorities Program Section 205 Feasibility Study was conducted pursuant to the Continuing Authorities Program under the authority of Section 205 of the Flood Control Act of 1948, as amended. Section 205 of the 1948 Flood Control Act, as amended, provides the authority to the U.S. Army Corps of Engineers (USACE) to plan and construct small flood damage reduction projects that have not already been specifically authorized by Congress.

The Feasibility Cost Sharing Agreement for this study was executed by the City of Carencro, LA (Non-Federal Sponsor), and the USACE, New Orleans District, on 3 July 2003.

The study was undertaken in response to repeated flooding of Beau Bassin Coulee. Floods have occurred from many different sources, including headwater runoff from the north and heavy localized rainfall, as well as hurricanes and tropical storms.

Planning objectives of the study stem from national, State, and local water and related land-resources-management needs specific to the study area. These objectives were developed through problem analysis and coordination with the Non-Federal Sponsor. The following planning objectives were established in response to the identified problems, needs, and opportunities:

- Reduce flood damage in the study area (Carencro)
- Do not induce flood damage elsewhere in the watershed

The study considered both structural and nonstructural alternatives to reduce flood damage in the study area. Structural alternatives were developed to improve the flow through the study area and to control the upstream flow entering Carencro, while nonstructural alternatives were developed to reduce damage when flooding occurs. Individual measures used to form the structural alternatives include:

- Enlarging the coulee
- Lining the coulee with concrete or gabion
- Storing flood waters in a retention or detention basin
- Clearing, grubbing, and dressing (CG&D) Beau Bassin Coulee to remove accumulated debris and smooth the channel profile

Individual measures used to form the nonstructural alternatives include:

- Acquiring (purchasing) properties and either relocating or demolishing structures and using the land as open space
- Elevating (raising) structures

A total of 11 structural measures and 6 nonstructural measures were developed and evaluated during the initial screening process. The initial screening identified three structural alternatives and one nonstructural alternative to be carried forward for further consideration. The alternatives carried forward were:

- Alternative 3: Combined Gabion and Enlarged Earthen Section

- Alternative 7: Retention Storage in Central Carencro with Channel Clearing
- Alternative 8: Retention Storage in Central Carencro with Channel Clearing and Enlarged Earthen Channel
- Nonstructural Alternative: Elevation of Structures in the 20-Percent-Chance Flood Event Floodplain

The economic feasibility of each with-project alternative was determined by comparing the average annual cost to the average annual benefits. If the benefit-to-cost ratio (BCR) was equal to or greater than 1.0, the alternative was considered to be cost effective (Table ES-1).

Table ES-1: Economic Evaluation of Alternatives

Alternative	Annual Costs	Annual Benefits	Net Benefits	BCR
Alternative 3	$440,200	$676,700	$236,500	1.5
Alterative 7	$265,800	$636,000	$370,200	2.4
Alternative 8	$357,000	$687,400	$330,400	1.9
Nonstructural	$191,600	$277,700	$86,100	1.4

The with-project alternatives meet all of the evaluation criteria by being complete, effective, efficient, and acceptable. Alternative 7 had the greatest net National Economic Development (NED) benefits of the with-project alternatives and would cause the least disruption to the environment. Based on the evaluation, Alternative 7 was identified as the Tentatively Selected Plan (TSP).

Following identification of the TSP, an optimization analysis was conducted to ensure that the characteristics of Alternative 7 provided the greatest NED benefits. During optimization:

- The 1.67-acre retention basin was determined not to be effective at reducing flooding and therefore was removed as a measure of Alternative 7.
- Three flow control options for the remaining 7.38-acre retention basin were evaluated.
- Including a nonstructural measure to Alternative 7 was determined not to be cost effective.

Following the optimization analysis, Alternative 7 was referred to as Alternative 7 (optimized). The estimated cost of Alternative 7 (optimized) is approximately $5,000,000. Following refinements, Alternative 7 (optimized) as the TSP consists of a combination of two measures: CG&D of approximately 12,000 feet of Beau Bassin Coulee from the upstream bridge of the Southern Pacific Railroad to St. Esprit Road, and the construction of a retention basin at the confluence of the Beau Bassin and Gaston Coulees (Figure ES-1). During construction of the features noted above, three laydown areas would be used for staging equipment and materials.

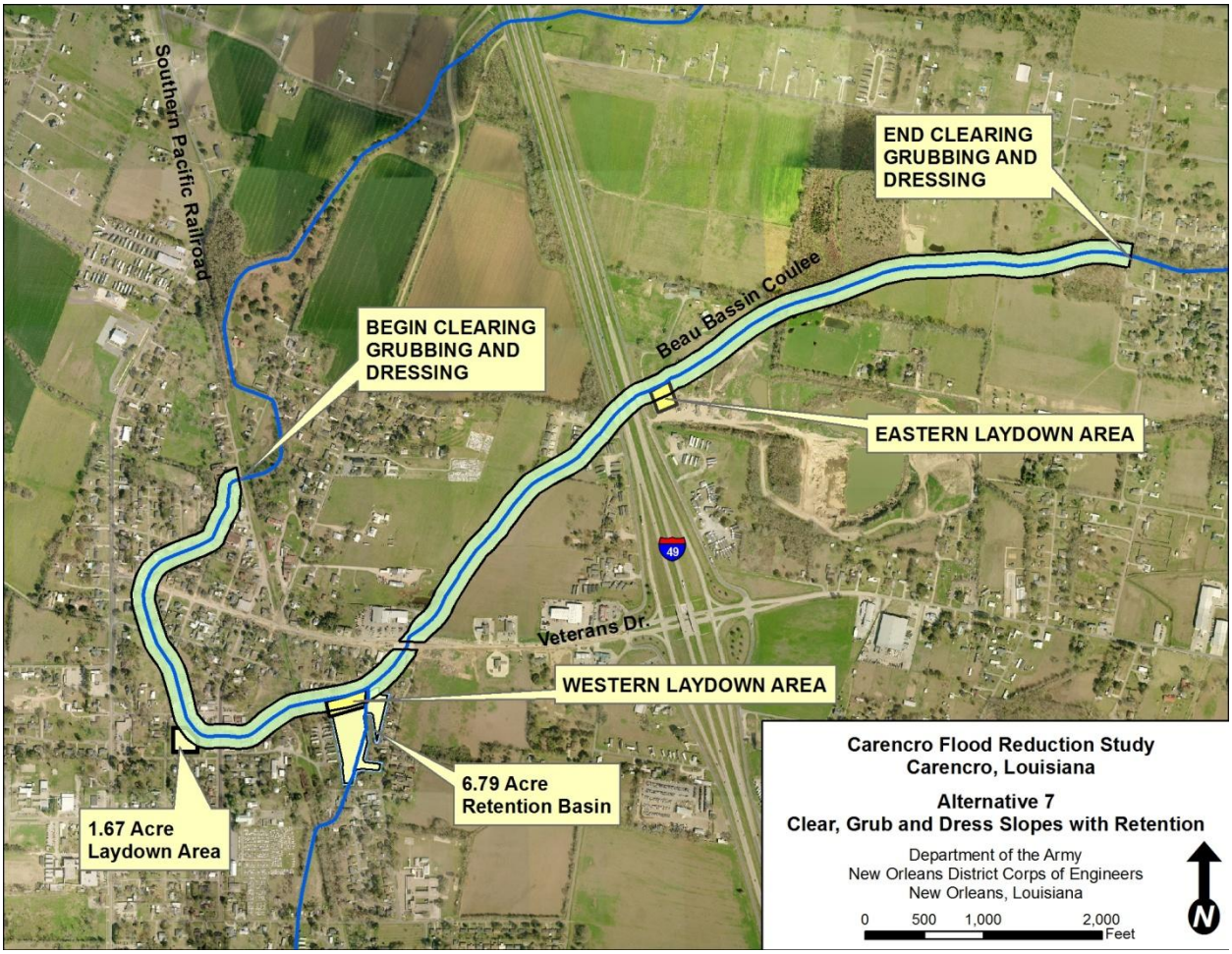

Figure ES-1: Tentatively Selected Plan

The CG&D activities would include clearing and removal of trees, brush, and accumulated snags and other debris. Grubbing and dressing of the channel would remove vegetation roots, stumps, and debris just below the subsurface to smooth the ground surface within the existing channel to further improve the flow of water through the coulee. Laborers and equipment would use 10-foot work areas on each bank of the coulee to clear woody vegetation, trees, logs, and debris in the channel. These work areas, which will be used both during construction and for subsequent operation, maintenance, repair, replacement, and rehabilitation, are located within a state statutory servitude (La. R.S. 38:113) for the maintenance and operation of drainage canals pursuant to the right-of-way claimed by the non-Federal sponsor.

Alternative 7 (optimized) would also provide a 6.79-acre retention basin located near the confluence of Beau Bassin Coulee and Gaston Coulee, with the following features:

- The 6.79-acre retention basin would be approximately 6 feet deep and have a total wetted area of approximately 5.4 acres.
- A 2-foot-deep channel through the middle of the retention basin would allow for flow through the Gaston Coulee during low-flow periods.

- A lateral weir structure would be constructed along Gaston Coulee for overflow into the retention basin during high flows.
- Retention storage would begin at an elevation of 30 feet.
- A 50-foot-wide overflow weir at an elevation of 34.5 feet would connect Beau Bassin Coulee to the retention basin to allow the retention basin to operate as an offline storage area during high-flow events.
- The retention storage volume at an elevation of 34.5 feet would be 22.5 acre-feet.
- The total retention storage capacity at the top of basin—an elevation of 36 feet—would be 30 acre-feet.
- No flow controls would be placed on the retention basin outfall.
- No fencing would be required around the retention basin because of the low slope and the normally dry basin.

During project development, Alternative 7 (optimized) would require three laydown/equipment storage/staging areas: one on the east side of Interstate 49 (I-49) and two on the west side.

Alternative 7 (optimized) would not alter the footprint of the existing coulee, and the work activities would be classified as major maintenance. Therefore, an existing statutory servitude in favor of the non-Federal sponsor along the coulee banks would be used for the implementation and maintenance of Alternative 7 (optimized). The locations of the proposed retention basin and two laydown areas west of I-49 are on land owned by the City of Carencro (Non-Federal Sponsor); no new land would need to be acquired. However, the Non-Federal Sponsor would need to obtain a temporary construction easement for the eastern laydown area.

TABLE OF CONTENTS

ITEM **PAGE**

LIST OF FIGURES

ITEM **PAGE**

LIST OF TABLES

LIST OF PHOTOGRAPHS

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Average Annual Cost
AACE	Association for the Advancement of Cost Engineering
AAD	Average Annual Damage
ACM	Asbestos-Containing Material
ACS	American Community Survey
ASTM	American Society for Testing and Materials
BCR	benefit-to-cost ratio
CAP	Continuing Authorities Program
CEA	Cooperative Endeavor Agreement
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CEMVN	U.S. Army Corps of Engineers, New Orleans District
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
CG&D	Clearing, Grubbing, and Dressing
DDF	Depth-Damage Function
DTM	Digital Terrain Model
EA	Environmental Assessment
ER	Engineering Regulation
ESA	Environmental Site Assessment
FCSA	Feasibility Cost Share Agreement
FEMA	Federal Emergency Management Agency
FFE	First Floor Elevation
FIRM	Flood Insurance Rate Map
GIS	Geographic Information System
H&H	Hydrologic and Hydraulic
HEC-FDA	Hydrologic Engineering Center's Flood Damage Analysis
HEC-HMS	Hydrologic Engineering Center's Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center's River Analysis System
HTRW	Hazardous, Toxic, or Radioactive Waste
I-10	Interstate 10
I-49	Interstate 49
LBP	Lead-Based Paint
LCG	Lafayette Consolidated Government
LDWF	Louisiana Department of Wildlife and Fisheries
LERRD	Lands, Easements, Rights-of-Way, Relocations, and/or Disposal Area
LiDAR	Light Detection and Ranging

MCACES	Micro-Computer-Aided Cost Estimating System
MOP	Method of Planes
NAAQS	National Ambient Air Quality Standards
NAVD 88	North American Vertical Datum of 1988
NED	National Economic Development
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
OMRR&R	Operation, Maintenance, Repair, Replacement, and Rehabilitation
OSE	Other Social Effects
PED	Preconstruction, Engineering and Design
PL	Public Law
PPA	Project Partnership Agreement
RCRA	Resource Conservation and Recovery Act
RED	Regional Economic Development
SPRR	Southern Pacific Railroad
TSP	Tentatively Selected Plan
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USFWS	U.S. Fish and Wildlife Service

CITY OF CARENCRO, LAFAYETTE PARISH, LOUISIANA, CONTINUING AUTHORITIES PROGRAM SECTION 205 FEASIBILITY STUDY

1 INTRODUCTION

1.1 STUDY AUTHORITY

The City of Carencro, Lafayette Parish, Louisiana, Continuing Authorities Program Section 205 Feasibility Study was conducted pursuant to the Continuing Authorities Program (CAP) under the authority of Section 205 of the Flood Control Act of 1948, as amended. Section 205 of the 1948 Flood Control Act, as amended, gives authority to the U.S. Army Corps of Engineers (USACE) to plan and construct small flood damage reduction projects that have not already been specifically authorized by Congress.

1.2 NON-FEDERAL SPONSOR

All CAP Section 205 (flood risk management) projects require a Non-Federal Sponsor to provide 35 percent of the total project costs, including lands, easements, rights-of-way, relocations, and/or disposal areas (LERRDs) with 5 percent of the total project costs to be paid in cash, and to provide 100 percent of all operation, maintenance, repair, replacement, and rehabilitation (OMRR&R).

In addition, feasibility studies such as this study can only be completed with a cost-sharing Non-Federal Sponsor. The roles and responsibilities of the Non-Federal Sponsor and the Government during the study are defined in a Feasibility Cost Share Agreement (FCSA). The FCSA is intended to promote a partnership for the conduct of the feasibility study. The FCSA for this study was executed by the City of Carencro, LA (Carencro), and the USACE, New Orleans District (CEMVN) on 3 July 2003. The FCSA also contains the Project Management Plan, which was negotiated between CEMVN and the City of Carencro. For the remainder of this report, the City of Carencro will be referred to as the Non-Federal Sponsor when discussing items that are related to the duties of the Non-Federal Sponsor.

CEMVN performed the overall study management. The technical analyses were performed by members of the project delivery team, which included staff from the CEMVN and consultants. Representatives from the Non-Federal Sponsor also participated regularly in project coordination meetings and provided assistance throughout the Feasibility Study.

1.3 STUDY HISTORY

The study area has experienced significant flooding from Beau Bassin Coulee. Floods have occurred from many different sources, including headwater runoff from the north and heavy localized rainfall, as well as hurricanes and tropical storms. Photograph 1 illustrates flooding in Carencro.

Photograph 1: 2004 Flooding in Carencro

In 1999, CEMVN began a reconnaissance study of flood risk management alternatives for Beau Bassin Coulee in Carencro. The study identified and quantified flooding problems, identified five potential structural alternatives (Alternatives 1 through 5) to reduce flood risk along the coulee, and conducted initial analyses and refinement of the five alternatives. At the conclusion of the study, four of the structural alternatives (Alternatives 2 through 5) were considered suitable for further analysis. The results of the study were presented in a May 2001 report[1] and formed the basis for the current feasibility study.

In 2003, the City of Carencro (Non-Federal Sponsor) entered into the FCSA with CEMVN and a feasibility study was initiated on Alternatives 2 through 5. Because of incremental funding and delays associated with Hurricanes Katrina and Rita, progress on the study was intermittent between 2003 and 2007. By 2007 sufficient progress had been made for one alternative (Alternative 4 – channel enlargement and diversion channel) to emerge as the tentatively selected plan (TSP).

However, by the time the TSP was reviewed with the Non-Federal Sponsor, public opposition to this alternative had developed and the alternative was not supported by local officials because it conflicted with current and future land uses. Therefore, the Non-Federal Sponsor requested that one or more additional alternatives be considered. Concurrently, a new, refined, unsteady-state hydrologic and hydraulic (H&H) model became available and was used to re-examine flooding in the area.

[1] "Beau Basin Coulee, Carencro, Lafayette Parish, Louisiana, Initial Appraisal of Flood Control Alternatives," May 2001.

In 2008, in light of the Non-Federal Sponsor's request to evaluate additional alternatives, and the availability of an improved H&H model, the Non-Federal Sponsor and CEMVN agreed to conduct additional feasibility analyses on the original alternatives and to evaluate a series of new alternatives. These analyses would be done using the new H&H model to ensure that the best analytical tools available were used and that both the old and new alternatives were evaluated using the same tools/criteria.

Between 2008 and 2009, six new structural alternatives (Alternatives 6 through 11) were formulated and evaluated along with the five original alternatives. By 2010, analysis of the 11 structural alternatives had eliminated eight from further consideration (see Section 5.5).

1.4 STUDY PURPOSE AND SCOPE

The purpose of this feasibility study is to reduce the flood risk and related flood damage in the study area. This study presents the results of feasibility and cost-effectiveness assessments of three structural alternatives and a nonstructural alternative that would result in a reduction of flood damage.

This report provides background data and documentation on the preliminary screening of alternatives to meet the flood risk management objectives; analyzes and compares selected with-project alternatives; identifies the TSP; describes the optimization process; and describes the TSP following optimization. The analyses were based largely, although not exclusively, on the following for each alternative:

- Preliminary design layouts using the latest available mapping of the study area
- Assessment of operations and maintenance features and costs
- Potential for encountering hazardous, toxic, and radioactive waste during construction
- Identification of significant environmental and cultural resources in the study area, and preliminary analysis of potential impacts to these resources
- Real estate and relocations considerations
- Evaluation of costs and benefits

1.5 STUDY AREA

The study area is in the City of Carencro and adjacent unincorporated areas of Lafayette Parish. Carencro is located in south central Louisiana in Lafayette Parish and just to the north of the City of Lafayette (Figure 1). Carencro is near the junction of Interstates 10 (I-10) and 49 (I-49).

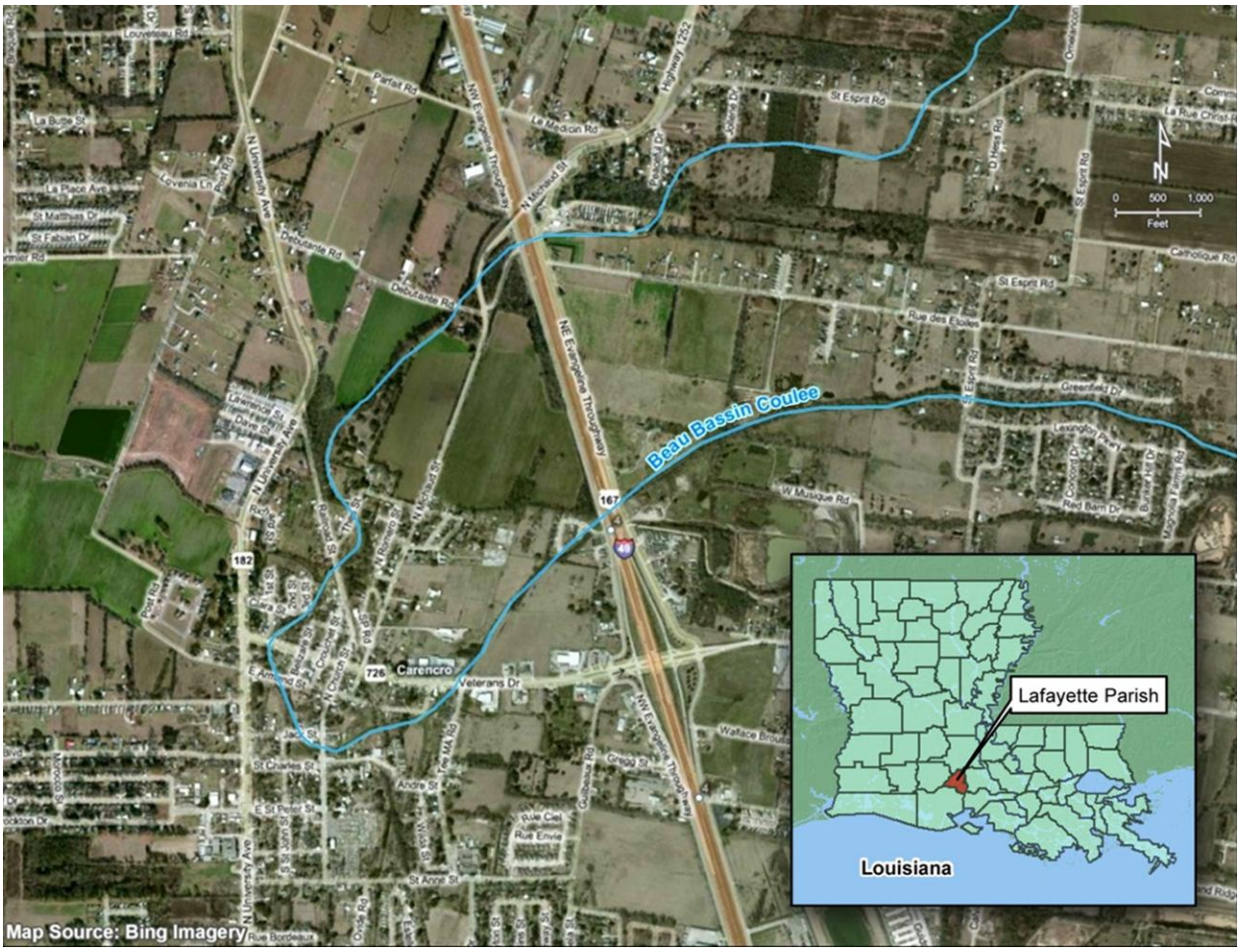

Figure 1: Study Area – Carencro, LA

Of particular interest to the study is Beau Bassin Coulee, the main drainage artery that flows through Carencro. Beau Bassin Coulee flows from the northeastern part of Lafayette Parish in a southwesterly direction to Carencro. Within the city limits, it turns and flows out of town to the northeast. Beyond the limits of Carencro, the coulee continues flowing east to its convergence with the Vermilion River (Figure 2). Photographs 2 and 3 show the coulee in Carencro.

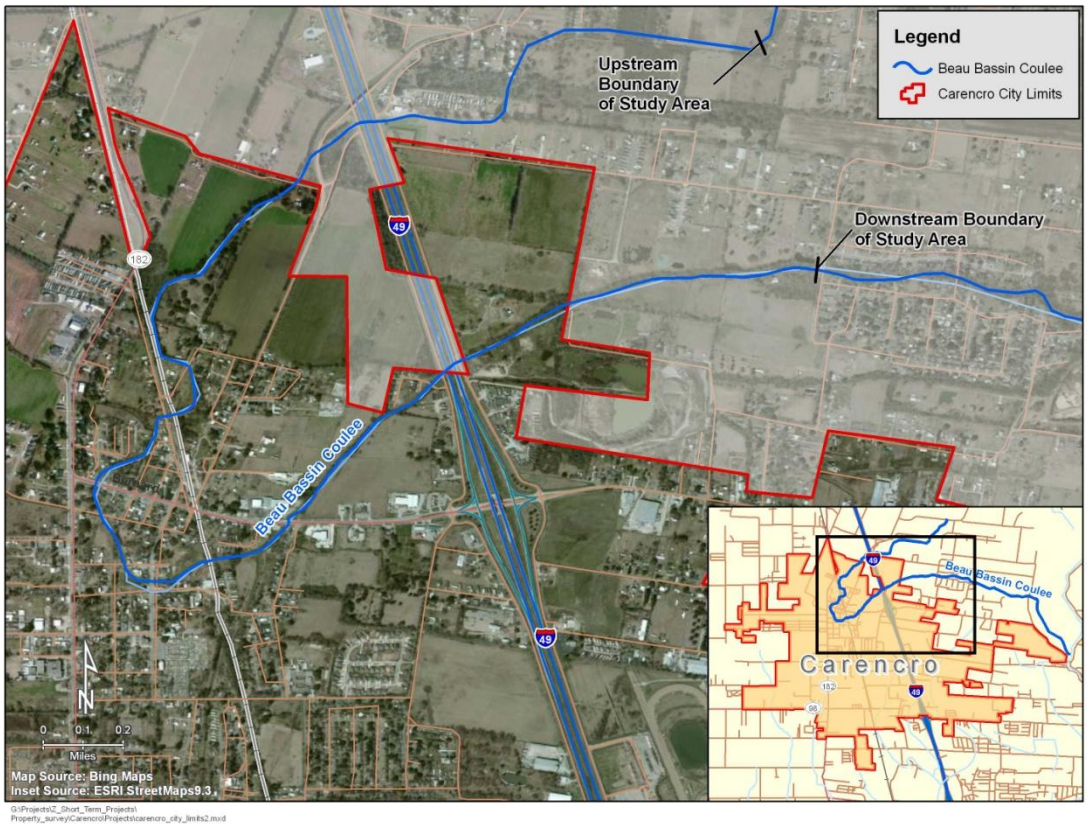

Figure 2: Carencro City Limits Within Study Area

Photograph 2: Beau Bassin Coulee in Carencro

Photograph 3: Beau Bassin Coulee in Carencro

Three watersheds contribute to flooding within the study area. The Beau Bassin Coulee watershed measures approximately 6 square miles. Beau Bassin Coulee has two tributaries: (1) an unnamed tributary and (2) the Gaston Coulee. The unnamed tributary flows into Beau Bassin Coulee near the upstream Southern Pacific Railroad (SPRR) bridge and drains a watershed of approximately 0.72 square mile. The Gaston Coulee, also referred to as the Southern Lateral,

flows into Beau Bassin Coulee just near the downstream SPRR bridge (now removed) and drains a watershed of approximately 0.87 square mile. The study considered the drainage capacity and hydrologic features of the entire watershed of Beau Bassin Coulee and the two tributaries.

Carencro comprises primarily residential and commercial development, but the areas outside of the city are primarily agricultural lands with scattered residential development. Transportation and utility infrastructure, including roads, interstate highways, rail tracks, and utility lines traverse the study area.

1.6 RELATED STUDIES AND PROJECTS

A number of studies and reports on water resources development in the Carencro area have been prepared by Federal, State, and local agencies, research institutes, and individuals. Available information was used to identify historical trends, define existing conditions in the study area, predict future conditions, and assist in identifying problems. The more relevant studies, reports, and projects are summarized in the following sections.

1.6.1 Prior Beau Bassin Coulee Studies 1999–2005

The following documents have been developed for studies of Beau Bassin Coulee since 1999:

CEMVN, Retention/Detention Facility Investigation for Flood Control in Lafayette Parish and Small-Scale Water Catchment and Diversion Systems, November 1999. The study had two objectives: (1) to investigate the feasibility of using available lands for retention/detention facilities in Lafayette Parish to mitigate flooding along the Vermilion River; and (2) to investigate whether small-scale water catchment and diversion systems could help in flood reduction.

CEMVN, *Beau Basin Coulee, Carencro, Lafayette Parish, Louisiana, Initial Appraisal of Flood Control Alternatives*, May 2001. The study determined and quantified flooding problems and identified potential flood risk management alternatives.

CEMVN, *Carencro Flood Study: Carencro, Lafayette Parish, Louisiana Section 205 Feasibility Study – Hydrology and Hydraulics Review*, May 2005. The study used H&H modeling to predict water surface elevation along Beau Bassin Coulee based on various rainfall events.

1.6.2 Vermilion River and Coulee Ile des Cannes Studies 1973–1974

Section 206 of the Flood Control Act of 1960 (Public Law [PL] 86-646), as amended by the 1960 and 1970 Flood Control Acts, the Water Resources Development Act of 1974, and Executive Order 11296 (10 August 1966), authorizes USACE to establish and carry out a floodplain management service program. The objective of the program is comprehensive flood risk management planning that encourages wise use of the floodplain at all levels of government. Under the program, CEMVN prepared two floodplain information reports for the Vermilion River and tributaries and for the Coulee Ile des Cannes and tributaries in September 1973 and September 1974, respectively.

1.6.3 Flood Insurance Studies 1981–2010

The Federal Emergency Management Agency (FEMA) prepares and updates flood insurance studies to map communities throughout the region by risk zones and to determine insurance rates. The studies are conducted under the provisions of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. The program is administered by the Federal Insurance Administration of FEMA. Flood Insurance Rate Maps (FIRMs) were updated in 2010 for selected communities in Lafayette Parish, but the updates did not include Carencro.

1.6.4 Coulee Ile des Canes Flood Protection Study 1983

Domingue, Szabo & Associates, Incorporated, completed a report for the Lafayette Parish Police Jury, "Application for Project Funding through the Louisiana Statewide Flood Control Program," in October 1983. The report addressed flood risk management improvements of Coulee Ile des Canes from the Vermilion River to its upper limits near the Ossun Community, a distance of approximately 15.7 miles. Coulee Ile des Canes is one of the major drainage canals in Lafayette Parish. The frequency of flooding along Coulee Ile des Canes has been similar to that of Beau Bassin Coulee.

1.6.5 Lafayette Parish Flood Protection Study 1981

Domingue, Szabo & Associates, Incorporated, completed a report for the Lafayette Parish Police Jury, "A Report on Drainage Improvements," in July 1981. A preliminary design was completed for 43 drainage canals in Lafayette Parish for the 10-percent-chance (10-year) flood event. The report presents a description of the work required to achieve the needed flood risk management improvements, estimated project costs, a recommended method of financing, and a canal maintenance program. The preliminary findings associated with the Lafayette Parish Flood Protection Study led to the initiation of the flood risk management study along Beau Bassin Coulee in Carencro.

1.6.6 Carencro Flood Evaluation 1990

Professional Engineering and Surveying Company, Incorporated, completed a report for Carencro, "Application for Project Funding Submitted to the Louisiana Statewide Flood Control Program for Beau Bassin Coulee," in November 1990. The study evaluated the flooding problems within Carencro and surrounding areas. Extreme overgrowth of trees and brush within the channel from the I-49 crossings to the Beau Bassin Road crossing severely reduces the conveyance capacity of the coulee, resulting in backwater flooding. The proposed project primarily consisted of improving the downstream portion of the coulee from the I-49 service road to the Beau Bassin Road.

1.6.7 Lafayette Parish Master Drainage Plan 2008

CEMVN and CH2M Hill completed a report for the Lafayette Parish Consolidated Government, "Lafayette Parish Master Drainage Plan," in February 2008. The study evaluated selected coulees within Lafayette Parish using FEMA-approved digital Flood Insurance Rate Map models to study drainage improvements. Beau Bassin Coulee was one of the selected models to be evaluated for drainage improvement alternatives. The study evaluated alternatives considered in previous studies. The models developed were incorporated into this feasibility study.

2 EXISTING CONDITIONS

2.1 CITY OF CARENCRO – BRIEF HISTORY

Original inhabitants of the area included members of the Attakapas and Opelousas tribes. Early settlers to the area came from Nova Scotia, the Canary Islands, France, the British Isles, Germany, and Africa. Known as St. Pierre between 1765 and 1803, most of the settlers in the area were refugees (St. Pierre Genealogical Society Archives n.d.). Land grants issued by the Spanish Government along Bayou Vermillion and Bayou Carencro helped the Acadian refugees settle in this area (City of Carencro 2011). Slaves of African heritage that were freed following the Civil War moved to the area and led to gradual expansion of area settlements. A census conducted in 1803 reported 32 Acadian families, which increased to 50 families by 1810. By the turn of the century, the population had increased to 445 persons.

Early settlers from European countries established a Catholic community and some of the area churches serve as popular tourist destinations today. Tourists also come to Carencro and the surrounding area to enjoy Cajun/Creole culture, cuisine, and music. Outdoor enthusiasts visit the areas bayous, swamps, open prairies, and forests for activities such as hunting, bird-watching, hiking, and boating (City of Carencro 2011).

Sugar, cotton, lumber, and agriculture were the primary sources of employment in Carencro during the nineteenth and early twentieth century. During the twentieth century, construction of I-10 and I-49 provided residents of Carencro easy access to employment opportunities in the City of Lafayette (5 miles to the south) and to the State capitol, Baton Rouge (about 50 miles to the east). The strategic location near major highways as well as proximity to the Lafayette Regional Airport (9 miles to the south) and the ports of Iberia (30 miles to the south), Baton Rouge (50 miles to the east), and Lake Charles (80 miles to the west) have provided opportunities for economic development in Carencro.

2.2 PHYSICAL CONDITIONS

This section presents an overview of key physical conditions of the study area that affect the screening of flood risk management alternatives. Additional information on the physical conditions of the study area can be found in Appendix A and Appendix B.

2.2.1 Climate

South central Louisiana climate is influenced by the proximity of the Gulf of Mexico, which modifies temperatures and, when southerly winds prevail, imparts the characteristics of a maritime climate.

According to National Oceanic and Atmospheric Administration (NOAA) records, the average annual temperature is approximately 68 degrees Fahrenheit (°F) and the normal monthly mean temperature varying from 50°F in January to 82°F in July.

The average annual precipitation in the study area is approximately 60 inches. The heaviest rainfall usually occurs during the month of July, with an average monthly precipitation of 6.5 inches. October is the driest month, with an average monthly precipitation of approximately 4 inches. Snow is rare in the study area, with the last significant snow falling in December 2008.

Wind data collected at Baton Rouge and Lake Charles indicate that the average wind velocity for the region is approximately 8 miles per hour. The prevailing wind flow is southerly during most of the year. Winter storms in the area have produced wind gusts up to 70 mph. The summer is often disturbed by tropical storms and hurricanes, which produce the highest winds in the area (NOAA 2007. Climate at a Glance. www.climvis.ncdc.noaa.gov/cgi-bin/cag3/hr-display.pl.)

2.2.2 Hydrology

As discussed earlier, three watersheds contribute to flooding within the study area: Beau Bassin Coulee, Gaston Coulee, and an unnamed tributary (Figure 3). The Beau Bassin Coulee watershed is approximately 6 square miles in area. The Gaston Coulee drains an area of approximately 0.87 square mile. The unnamed tributary drains a watershed of approximately 0.72 square mile.

Significant floods have occurred in and around the study area several times in recent decades (see Section 3.1). The portion of Beau Bassin Coulee within the study area ranges in depth from 2 to 10 inches and has an average channel width of approximately 10 feet.

2.2.3 Soils and Geology

The U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS) Soil Survey for Lafayette Parish indicates that the soils in the study area consist mainly of Frost silt loam, Frost soils, and Memphis silt loam (NRCS 2011). Frost silt loam is dark gray in color and grades to gray with dark grayish brown mottles in the upper 14 inches. It becomes clayey with dark yellowish mottles to a depth of approximately 4 feet and then returns to gray silt loam to a depth of approximately 5 feet. This soil is located adjacent to, but not within, the stream channel of Beau Bassin Coulee. This soil is considered a prime farmland soil type by NRCS.

The upper 2 feet of Frost soils are dark grayish brown to gray silt loam and become clayey with yellowish brown mottles to a depth of approximately 5 feet. Frost soils are primarily contained within the stream channel of Beau Bassin Coulee and are not considered prime farmland soils.

The upper 6 inches of Memphis silt loam consist of mainly dark grayish and brown silt loam. The deposit becomes more clayey to a depth of approximately 3 feet and then returns to dark brown silt loam to a depth of more than 6 feet. Memphis silt loam is located farther away from the stream channel. This soil is considered a prime farmland soil type by NRCS.

Physiographically, the study area is situated on the terrace upland area of Lafayette Parish. The study area is composed largely of loess-covered alluvial deposits and is generally part of the Prairie Formation. In Lafayette Parish, the Prairie Formation is composed largely of Red River alluvium in the western part. This area has been described as a relict deltaic plain of the Red River characterized by extremely flat topography, several segments of southwest-trending meander belts, and clayey deposits. The Pleistocene Prairie formation is predominantly fluvially deposited clay, silt, and sand that were deposited by the ancestral Red River. The deposits are typically stiff to very stiff and oxidized, and display a range of colors from brown/red to green/gray. The older deposits are similar to the modern-day deposits of the Red River.

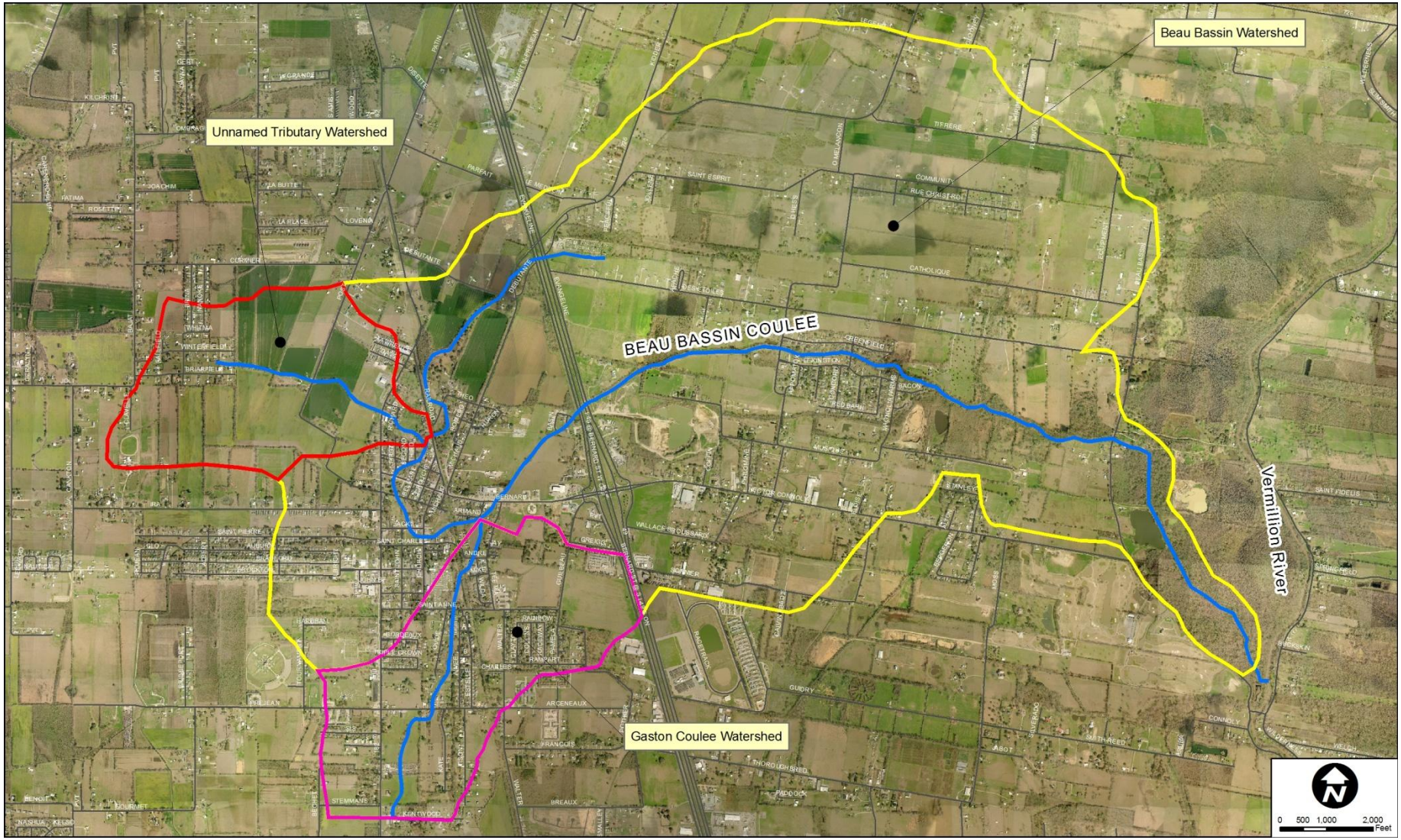

Figure 3: Beau Bassin Coulee Watershed

2.2.4 Land Use

The Beau Bassin Coulee watershed primarily comprises farm land (approximately 87 percent), with some residential areas, particularly within Carencro. The portion of the study area from the upstream SPRR bridge downstream to Veterans Drive/Bernard Street Bridge is classified as residential. Commercial establishments (e.g., gas stations, shopping centers) are scattered throughout this area. The portion of the study area from the Veterans Drive/Bernard Street Bridge to St. Esprit Road is classified as undeveloped.

Although the study area is experiencing residential and commercial development, data since 2007 indicate that the growth is limited. Future development would be subject to City of Carencro and Lafayette Parish requirements to control runoff.

2.3 ENVIRONMENTAL CONDITIONS

This section presents an overview of key environmental conditions of the study area that affect the screening of alternatives. Additional information on the environmental conditions of the study area can be found in Appendix A.

2.3.1 Wetlands

Waters of the United States within the study area are limited to the stream channel of Beau Bassin Coulee. Some slump banks and depressions areas along the coulee contain wetland vegetation, but no jurisdictional wetlands are present. Dominant vegetation includes Johnson grass (*Sorghum halepense*), Vasey grass, Bermuda grass (*Cynodon spp.*), bahia grass, elephant ear, ragweed (*Ambrosia trifida*), Chinese privet (*Ligustrum sinense*), elderberry (*Sambucus canadensis*), blackberry (*Rubus fruticosus*), Japanese honeysuckle (*Lonicera japonica*), and trumpet creeper (*Campsis radicans*).

2.3.2 Vegetation

All banks of Beau Bassin Coulee are non-wetland and all vegetation is common. The overstory vegetation near Beau Bassin Coulee consists primarily of live oak (*Quercus virginiana*), American elm (*Ulmus americana*), magnolia (*Magnolia grandiflora*), pecan (*Carya illinoensis*), eastern cottonwood (*Populus deltoides*), Chinese tallow-tree (*Sapium sebiferum*), chinaberry (*Melia azedarach*), and southern catalpa (*Catalpa bignonioides*). The banks of Beau Bassin Coulee through Carencro have been cleared, and herbaceous vegetation, including elephant ear (*Colocasia sp.*), Vasey grass (*Paspalum urvillei*), and bahia grass (*Paspalum notatum*), dominates the coulee banks.

2.3.3 Wildlife

Fragmentation of the mature bottomland habitat along Beau Bassin Coulee has reduced the abundance and diversity of wildlife in most of the study area. The dominant habitat types in the study area include pastureland and urban/developed areas. These areas support a limited number of wildlife species such as cattle egret (*Bubulcus ibis*), mourning dove (*Columba macroura*), red-tailed hawk (*Buteo jamaicensis*), common crow (*Corvus corax*), eastern kingbird (*Tyrannus tyrannus*), northern mockingbird (*Mimus polyglottos*), European starling (*Sturnus vulgaris*), field sparrow (*Spizella pusilla*), eastern cottontail (*Sylvilagus floridanus*), hispid cotton rat (*Sigmodon hispidus*), and eastern woodrat (*Neotoma floridana*). The Beau Bassin Coulee

stream reach contains various turtles (*Kinosternon sp.*, *Trachemys sp.*) and small fish (*Gambusia affinis*, *Funduls sp.*, and *Lepomis sp.*).

Sections of bottomland hardwoods have the potential to support a variety of wildlife species. These include northern mockingbird (*Mimus polyglottos*), loggerhead shrike (*Lanius ludovicianus*), Carolina wren (*Thryothorus ludovicianus*), American robin (*Turdus migratoruius*), red-bellied woodpecker (*Melanerpes carolinus*), northern flicker (*Colaptes auratus*), blue jay (*Cyanocitta cristata*), yellow-throated warbler (*Geothlypis trichas*), northern cardinal (*Cardinalis cardinalis*), tufted titmouse (*Parus bicolor*), Virginia opossum (*Dipelphis virginiana*), and gray squirrel (*Sciurus carolinensis*).

2.3.4 Threatened and Endangered Species

The U.S. Fish and Wildlife Service currently list no federally protected species with the potential of occurring in Lafayette Parish. Further, no designated critical habitat is located within or adjacent to the study area. The Louisiana Department of Wildlife and Fisheries (LDWF), Louisiana Natural Heritage Program currently lists 13 species within Lafayette Parish with State protection or on the State watch list. However, according to LDWF, no such species have been reported to occur within the study area.

2.3.5 Cultural Resources

Cultural resources are institutionally significant because of the National Historic Preservation Act of 1966, as amended, 16 U.S. Code (U.S.C.) 470; the Native American Graves Protection and Repatriation Act of 1990, 25 U.S.C. 3001; and the Archeological Resources Protection Act of 1979, 20 U.S.C. 2101; as well as other statutes. Cultural resources are significant because of their association or linkage to past events and to historically important persons. Cultural resources are significant to the public, with preservation groups and private individuals supporting their protection, restoration, enhancement, and recovery.

Two archeological sites and one isolated archeological occurrence were identified during field surveys conducted in March 2011. One of the sites consists of a light historic scatter and was considered to be ineligible for nomination to the National Register of Historic Places (NRHP). The other site is an intact, wooden historic bridge that crosses Beau Bassin Coulee east of I-49. The NRHP eligibility of this site is unknown. The isolated occurrence does not constitute a site and lacks research potential; thus, it is not eligible for nomination to the NRHP.

2.3.6 Hazardous, Toxic and Radioactive Wastes

A Phase I Environmental Site Assessment (ESA), completed in October 2008, was conducted for areas along the coulee that could be impacted by potential alternatives. A subsequent Phase I ESA, completed in May 2011, updated the 2008 ESA and investigated the locations of potential retention basins. No areas containing Hazardous, Toxic, and Radioactive Waste (HTRW) were identified.

If HTRW issues are encountered, the Non-Federal Sponsor will be responsible for the cleanup of materials regulated by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601–9675, or by the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901 et seq.

2.3.7 Air Quality

Lafayette Parish is currently classified, as of June 2011, as in compliance with all National Ambient Air Quality Standards (NAAQS). This classification is the result of area-wide air quality modeling studies.

2.4 SOCIAL AND ECONOMIC CONDITIONS

This section presents an overview of key social and economic conditions of the study area that affect the screening of alternatives.

U.S. Census data was primarily used to prepare the social and economic profile of the study area. As income and employment related data from the 2010 U.S. Census data are not available for Carencro, available 2000 U.S. Census and 2009 American Community Survey (ACS) data were used where necessary. To provide a larger scale of reference for the social and economic conditions of Carencro, data were compared to surrounding Lafayette Parish and the State of Louisiana.

2.4.1 Demographics

In 2000, the U.S. Census reported a total population of 6,120 persons for Carencro, while Lafayette Parish had a population of 190,503. In 2010, the reported population for Carencro was 7,526; while Lafayette Parish had a population of 221,578. Between 2000 and 2010, the population of Carencro increased 23 percent and the population of Lafayette Parish increased 16 percent. In 2010, white persons composed 53.5 percent (of which 51 percent are white, non-Hispanic) of the total population and black persons accounted for 42 percent of the population. The remaining ethnic groups or combination of groups comprised the remaining 4.5 percent of the population. Table 1 displays demographic data for Carencro, Lafayette Parish, and the State of Louisiana.

Table 1: Demographic Statistics

Category	Carencro	Lafayette Parish	State of Louisiana
Population (total number)			
2010	7,526	221,578	4,533,372
2000	6,120	190,503	4,468,976
1990	5,431	164,760	4,219,973
Change (2000–2010)	23.0%	16.3%	4.9%
Race (2010)			
White	53.5%	69.4%	62.6%
Black	41.7%	25.8%	32.0%
Am. Indian, Eskimo, or Aleut	0.6%	0.3%	0.7%
Asian or Pacific Islander	0.7%	1.5%	1.5%
Other race	2.4%	1.4%	1.5%
Two or more races	1.1%	1.6%	1.6%

Source: U.S. Census Bureau 2010 Census, 2000 Census, and 1990 Census

2.4.2 Income

Data from the 2000 U.S. Census were used to prepare an income profile of Carencro, Lafayette Parish, and State of Louisiana. Carencro has lower per capita income and a higher

poverty rate than both the Parish and the State. In 2009, the per capita income and median household income for Lafayette Parish was greater than Carencro and Louisiana. Poverty levels reported for parish residents were also lower than those reported within the State. Table 2 displays income data.

Table 2: Income Statistics

Category	Carencro	Lafayette Parish	State of Louisiana
Per Capita Income, 2000	$11,491	$19,371	$16,912
Per Capita Income, 2009	$18,545	$44,598	$37,632
Median Household Income, 2000	$22,716	$36,518	$32,566
Median Household Income, 2009	$26,755	$48,050	$42,492
Poverty Rate, 2000	29.8%	15.7%	19.6%
Poverty Rate. 2009	29%	10.3%	13.3%

Source: U.S. Census Bureau 2000 Census, 2005–2009 ACS

2.4.3 Employment

As the population of Lafayette Parish has grown, the civilian labor force has also grown, increasing 21 percent between 1990 and 2000. In 2009, the unemployment rate within Lafayette Parish was reported to be 5.8 percent of the population (Table 3). In Carencro, the industries that employ the most people are: accommodation and other food services; professional, scientific, and technical services; health care and social assistance; and the retail trade.

Table 3: Employment Statistics

Category	1990	2000	2009
Carencro			
Civilian Work Force	2,279	2,366	3,329
Employed	1,993	2,164	3,106
Percent Unemployed	12.5%	8.5%	6.7%
Lafayette Parish			
Civilian Work Force	78,343	95,151	112,511
Employed	72,243	88,603	105,980
Percent Unemployed	7.8%	6.9%	5.8%
State of Louisiana			
Civilian Work Force	1,816,917	2,016,114	2,176,635
Employed	1,641,614	1,997,995	1,994,133
Percent Unemployed	9.6%	7.3%	8.4%

Source: U.S. Census Bureau 2000 Census, 2005–2009 ACS

Other significant sectors of employment within the Parish in 2009 include professional services (11.4 percent); agriculture, forestry, and mining (11 percent); art, entertainment, recreation, accommodation, and food services (8.0 percent), manufacturing (6.2 percent); construction (5.9 percent); and public administration (4.8 percent).

2.4.4 Households

The 2000 U.S. Census reported a total of 2,857 housing units for Carencro. In terms of households, approximately 3 percent of the households in Lafayette Parish were reported to be

within Carencro. In 2009, Lafayette Parish reported a total of 81,733 households, an increase of 9,628 households between 2000 and 2009. Families made up 62 percent of the households in Lafayette Parish. The number of housing units within Lafayette Parish increased from 78,122 in 2000 to 91,146 in 2009; an increase of 13,024 between the 2000 and 2009. Table 4 provides general housing characteristics for the study area.

Table 4: Housing Statistics

Category	Carencro	Lafayette Parish	State of Louisiana
Median Value of Owner-Occupied Housing Units, 1999	$73,000	$100,500	$85,000
Median Value of Owner-Occupied Housing Units, 2009	$99,000	$143,300	$121,300
Households, 2000	2,237	72,372	1,656,053
Households, 2009	2,900	81,733	1,688,027
Housing Units, 2000	2,401	78,122	1,847,181
Housing Units, 2009	2,857	91,146	1,963,337
Homeownership rate	63.8%	66.0%	67.9%
Persons Per Household, 1999	2.66	2.57	2.62

Source: U.S. Census Bureau 2000 Census, 2005–2009 ACS

2.4.5 Business and Industrial Activity

The proximity of Carencro to interstate highways (I-10 and I-49), airports, and rail is advantageous to local business and helps bolster business and industrial activity in the city and Lafayette Parish. In terms of transportation infrastructure, Carencro is located just 9 miles from the Lafayette Regional Airport, providing quick access to businesses in the city and the region. Union Pacific and Burlington Northern Santa Fe Railways provide freight rail access to business. The Ports of Iberia, Baton Rouge, and Lake Charles are all located within 80 miles of Carencro.

In addition to the transportation infrastructure, the presence of fiber optic networks has attracted companies such as Sprint, Sun America, and Network USA to Carencro and Lafayette Parish. Local businesses are supported by The Enterprise Center of Louisiana, a business incubator that includes a 30,000-square-foot office and production facility. Financing assistance, tax incentives, and training programs to new and existing businesses throughout Louisiana and the Lafayette Economic Development Authority help attract and retain businesses in Carencro and the region.

2.4.6 Public Facilities and Services

The Lafayette Parish School System operates three public schools in Carencro (Carencro City Profile 2011). The Carencro Heights Elementary school enrolls students in grades K–4. The Carencro Middle School enrolls students in grades 5–8, and the Carencro High School enrolls students in grades 9–12. Other educational institutions in Carencro include the Academy of Information Technology, which offers courses in information technology, and the Carencro Catholic School (Pre K–8) operated by the Diocese of Lafayette. The North Regional Library, operated by the Lafayette Public Library System has a large selection of books and other reading materials for local residents.

The Carencro Community Center offers nearly 10,000 square feet of event space for receptions, meetings, and other group events. The largest recreational facility in Carencro is Pelican Park. This multi-million dollar sports complex includes softball and baseball fields, a fishing pond, jogging/running tracks, and a venue for festivals, concerts, and corporate events (http://www.pelicanpark.net/index.html).

Health care in Carencro is offered by several private providers. Lafayette located approximately 5 miles south of Carencro is home to several large hospitals and medical facilities. Law and order in the city is maintained by the Carencro Police Department, which has 23 full time police officers and 5 reserve officers. The Carencro Fire Department, with 2 fire stations, has 2 full-time firemen and 20 reserve firemen.

2.4.7 Tax Revenues and Property Values

Carencro's financial base is a one-cent sales tax passed in 1967 and another one-cent sales tax passed in 1993. These two sales taxes generate approximately $2,850,000 per year (City of Carencro 2010). A Tax Increment Finance district for commercial property along I-49 generates approximately $450,000 per year. A property tax levied by Carencro generates approximately $150,000 per year (Rochon 2011).

In general, new housing in Carencro sells well and the inventory of unsold houses is not large (Rochon 2011). Property values in Carencro for new three-bedroom homes range from $120,000 to $135,000. New homes in other subdivisions are typically valued between $160,000 and $175,000.

2.4.8 Transportation and Traffic

The transportation infrastructure in Beau Bassin Coulee study area includes I-10 and I-49, highway service roads, surface roads, and a railroad. Within the study area, arterial roads (e.g., Veterans Drive, North University Avenue) provide easy access to I-10.

3 PROBLEMS AND OPPORTUNITIES

3.1 PROBLEMS

The City of Carencro, Lafayette Parish, Louisiana, Continuing Authorities Program Section 205 Feasibility Study was undertaken in response to repeated flooding of Beau Bassin Coulee. Significant rainfall floods have occurred in the study area from headwater runoff from the north and heavy localized rainfall. Floods affecting the area and the surrounding parish occurred in 1940, 1953, 1955, 1961, 1967, 1969, 1973, 1977, 1979, 1980, 1982, 1984, 1989, 1991, 1993, 1995, 1997, 1998, and 1999, 2001, 2002, 2003, 2004, 2006, 2008, and 2009.

The recurring flooding has impacted the homes and businesses in Carencro. In July 2004, 22 homes[2] within the city limits were listed as repetitive loss structures by FEMA and were elevated or removed using FEMA grant monies. However, a large number of structures in the study area are still at risk of flood damage. In addition to flooded structures, floodwaters in streets, yards, and fields is not uncommon. Photographs 4, 5, and 6 demonstrate the flooding that occurred in Carencro in 2004. Figure 4 depicts the floodplain for the 1-percent-chance (100-year) flood event as determined from the H&H modeling conducted for this study.

Photograph 4: Carencro, 2004 Flood

Photograph 5: Carencro, 2004 Flood

Photograph 6: Carencro, 2004 Flood

[2] None of the acquired properties are located in areas where the flood risk management measures were being considered for the current study. Therefore, any FEMA-related deed restrictions were not a concern.

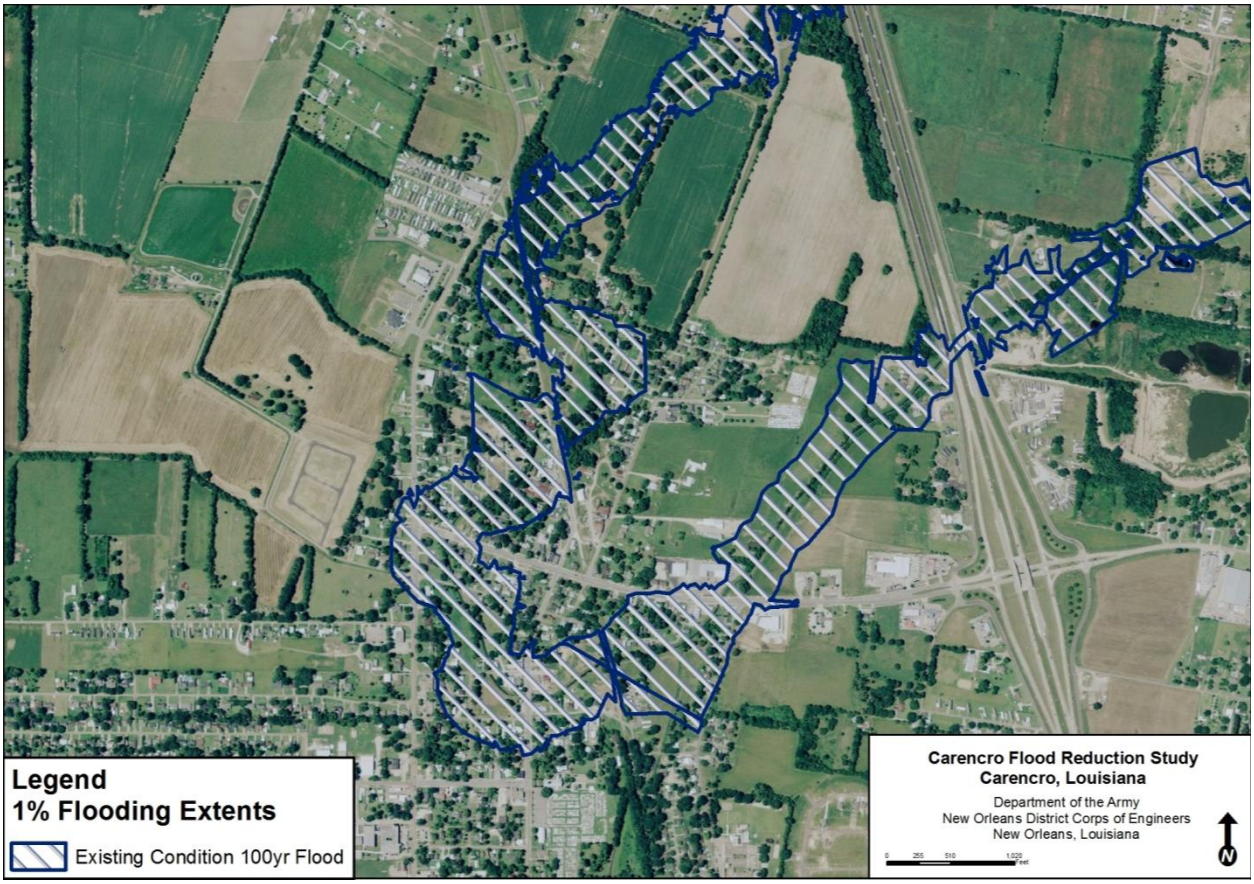

Figure 4: Floodplain for the Existing 1-Percent-Chance Flood Event

The most severe flooding occurred in August 1940, when precipitation occurred throughout the study area from 1 August through 10 August. Total precipitation for this event was recorded as 37.36 inches at Lafayette, LA, and 29.92 inches at Grand Coteau, LA. More than 50 percent of the total rainfall occurred on 9 August.

During a flash flood in July 1989, 10.0 inches of rain were recorded at Grand Coteau and 4.78 inches were recorded at Lafayette. During January 1993, 11.34 inches of rain were recorded at Lafayette between 19 and 20 January. A total of 10.10 inches of rain were recorded on 20 January; this rainfall produced a maximum stage of 12.95 feet National Geodetic Vertical Datum (NGVD) on the Vermilion River at the Lafayette gauge.

Hurricanes affecting the study area include Hurricane Edith in 1971, Hurricane Carmen in 1974, Hurricane Danny in 1985, Hurricane Juan in 1985, and Hurricane Andrew in 1993. Hurricane Juan yielded rainfall totals of 7.09 inches at Lafayette and 9.92 inches at Grand Coteau. The study area did not receive excessive amounts of rain in the more recent hurricanes affecting the Gulf Coast, including Hurricanes Katrina and Rita in 2005 and Hurricane Ike in 2008.

In addition to the rainfall, erosion (and subsequent deposition) and vegetation exacerbate flooding along the stream. Deposition of eroded sediment makes the stream shallower, and increased vegetation contributes debris that clogs the coulee.

3.2 OPPORTUNITIES

Opportunities exist to reduce flood-induced damage through nonstructural and structural measures. Nonstructural measures reduce flood damage without significantly changing flow or stage (flood height) of waterways. Examples of nonstructural measures include:

- Acquiring (purchasing) properties and either relocating or demolishing structures and using the land as open space
- Elevating (raising) or floodproofing structures
- Constructing "ring levees" around individual structures or small groups of structures

Structural measures alter water surface elevations and flows through a waterway to reduce flood stages in designated areas. Examples of structural measures include:

- Widening stream channels
- Reducing constrictions (e.g., bridges, debris) in stream channels
- Constructing levees
- Constructing diversion channels

4 STUDY METHODOLOGY

Development and evaluation of alternative plans is guided by the *Economic and Environmental Principles and Guidelines for Water and Related Land Implementation Studies*, published in March 1983 by the Water Resources Council, and by applicable Department of the Army regulations and other principles and guidelines. The following sections provide an overview of the methodologies used for the specific technical studies.

4.1 ENVIRONMENTAL AND CULTURAL RESOURCE ASSESSMENT

To identify the potential for unintended consequences of alternatives, an environmental assessment (EA) of the area surrounding Beau Bassin Coulee was conducted to determine condition of wetlands and vegetation in the area, to identify wildlife habitat and the potential for any threatened or endangered species, and to establish the existence of any sites with significant cultural or historic value. The EA is included as Appendix A.

The EA was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (Title of the 42 U.S.C. 4321–4347) and the Council on Environmental Quality regulations for implementing NEPA (40 Code of Federal Regulations [CFR] 1500–1508), as well as the USACE's Engineering Regulation (ER) 200-2-2, and other pertinent environmental statutes, regulations, and compliance requirements.

For the purpose of the EA, the project corridor for surveys included 100 feet on either side of the coulee, as well as the footprint of the retention basins and laydown areas. Reconnaissance surveys to ascertain existing site conditions of the study area were conducted on 12 April 2000, 12 October 2000, 8 October 2007, 31 January 2011, and 22 March 2011.

A Phase I cultural resources survey was conducted for areas that would potentially be affected by the alternatives. Professional archeologists conducted the fieldwork, which consisted of a pedestrian survey and systematic shovel testing at 98-foot intervals across the survey area, in compliance with the Louisiana State Historic Preservation Office guidelines.

4.2 HYDROLOGIC AND HYDRAULIC ANALYSIS

A steady-state H&H model was used to conduct a review of peak flows and water surface elevations. A more comprehensive unsteady state model was subsequently used to provide a more refined estimate of peak flows and water surface elevations.

The H&H study examined characteristics of the coulee and water flow at cross-section locations throughout the study area. The locations of representative cross-sections are depicted in Figure 5. The H&H analysis estimated the water surface elevation and flow for eight flood recurrence intervals at each of the cross-sections. The results were incorporated into the economic analysis to estimate inundation levels throughout the study area.

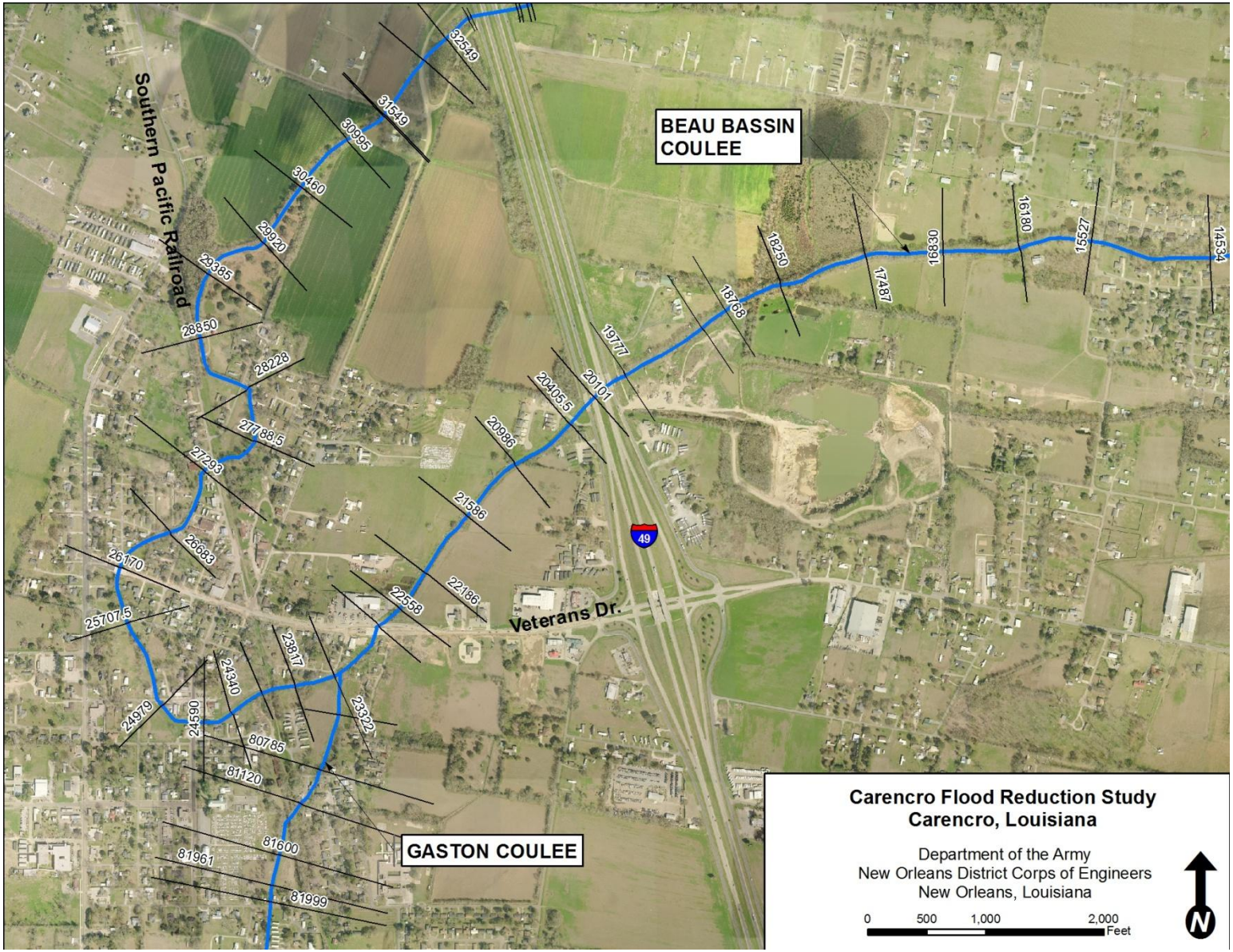

Figure 5: Locations of River Stations

Several assumptions were made about the existing and future conditions of the watershed:

- Based on existing land use patterns and aerial photographs, the current conditions in Beau Bassin Coulee have not changed significantly from 2007 conditions.
- Carencro development ordinances prevent filling the floodplain or otherwise developing the area such that water surface elevation would increase.
- Following Carencro development regulations, future development would incorporate measures to minimize impacts to the overall watershed to less than the current runoff conditions.
- No new environmental changes or other infrastructure would be developed that would affect water levels or flood characteristics of Beau Bassin Coulee.
- Acquisition and demolition projects funded through the FEMA-administered Hazard Mitigation Grant Program and approved by the Carencro City Council in 2008 have not altered the water surface elevations or flood characteristics of Beau Bassin Coulee.
- In accordance with Title 44 of the CFR Part 80, properties acquired through FEMA for open space purposes would be assigned deed restrictions to ensure that these properties remain as open space in perpetuity.

A brief description the H&H analysis is provided below and a more detailed analysis is provided in Appendix B.

4.2.1 Hydrologic Analysis

The NRCS methodology from Technical Report Number 55 (TR-55) using runoff curve numbers, subbasin size, and time of concentration, was used to calculate the discharge. Subbasins were developed from Light Detection and Ranging (LiDAR) data using automated geographic information system (GIS) tools. Runoff Curve Number and Time of Concentration worksheets for all 25 Beau Bassin subbasins were developed for the study. The Muskingum-Cunge Routing algorithm in the USACE's Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) (Version 3.5.0) was used to route discharges through the subbasins.

Peak discharge rates for the 50-percent-chance (2-year), 20-percent-chance (5-year), 10-percent-chance (10-year), 4-percent-chance (25-year), 2-percent-chance (50-year), 1-percent-chance (100-year), 0.4-percent-chance (250-year), and 0.2-percent-chance (500-year) flood events were modeled.

4.2.2 Hydraulic Analysis

Water surface profiles were developed using the Hydrologic Engineering Center's River Analysis System (HEC-RAS), Version 4.1.0. Water surface profiles were calculated for the 50-percent-, 20-percent-, 10-percent-, 4-percent-, 2-percent-, 1-percent-, 0.4-percent-, and 0.2-percent-chance flood events for each of the alternatives. The hydraulic model used the flow results from the HEC-HMS model to obtain water surface elevations. Comparisons were made between the existing water surface profiles and the post-project water surface profiles for each

design event. Hydrologic flow calculations from the HEC-HMS model were used as input for the unsteady flow calculations.

Cross-section information for the channel was collected during a 2003 topographic field survey. Overbank elevations were obtained using LiDAR data with the HEC-GeoRAS extension and ArcGIS software to create a Digital Terrain Model (DTM) and export georeference geometry data. All data was georeferenced and the model was built with the cross-sections looking downstream. The HEC-RAS geometry data was modeled in North American Vertical Datum of 1988 (NAVD88). Generally, contraction coefficients of 0.1 and expansion coefficients of 0.3 were used between cross-sections. Figure 6 displays a representative cross-section.

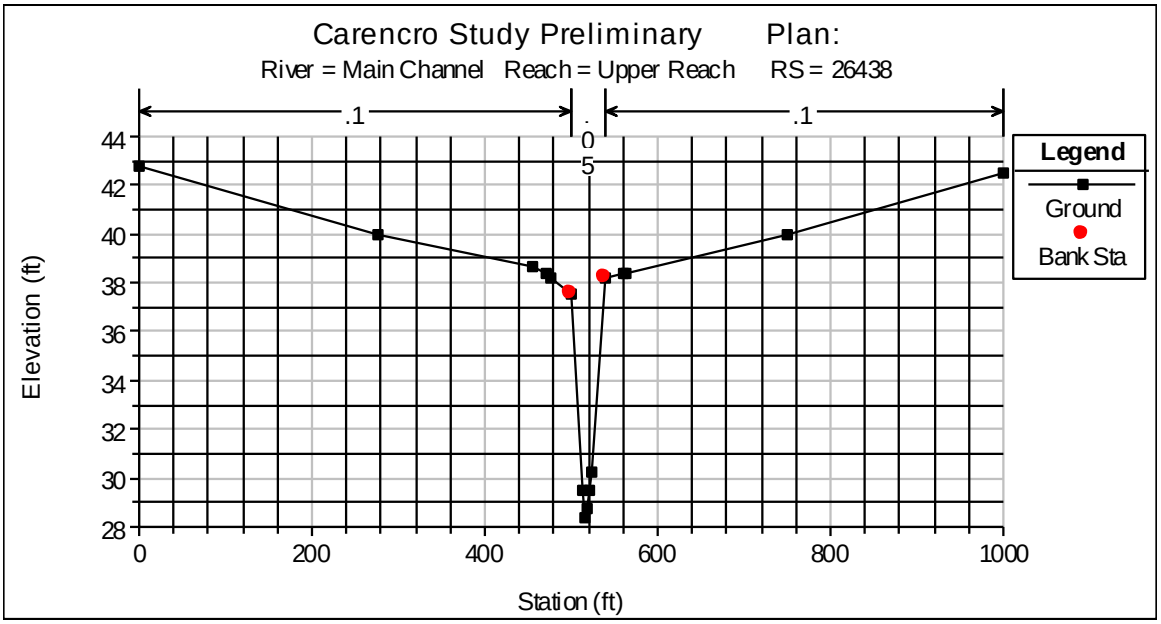

Figure 6: Representative Cross-Section

Nineteen bridges, culverts, and bridge crossings associated with the coulee were identified and incorporated into the model. None of the structures within the study area showed significant impact to the hydraulic capacity of the channel.

Manning's coefficients of roughness were distributed using horizontal variations across the cross-section stations and were used to define the relative roughness of overbanks, main channel, and transition areas. Aerial photographs and field reconnaissance were used to establish roughness characteristics of the channel and floodplain.

The hydraulic model of the existing conditions was developed and calibrated using Tropical Storm Allison of June 2001. Actual Tropical Storm Allison rainfall data was provided by the National Weather Service. Tail water surface elevations were based on gage data in the Vermilion River at the Beau Bassin Coulee as provided by U.S. Geological Survey. Representatives from Carencro provided accounts of flooding areas and high water marks of the June 2001 flood. Calibration of the model by adjusting the Manning's roughness coefficients resulted in a reasonable reproduction of the June 2001 flood event.

4.3 ENGINEERING COST ANALYSIS

The engineering cost estimates were developed for the purpose for comparison of various alternatives at a conceptual-level design, where the preliminary engineering is from 1 percent to 10 percent complete. The preliminary cost estimates are for alternative screening, analysis, technical feasibility, and/or planning-level decision-making. A final total construction cost using Micro-computer Aided Cost Estimating System (MCACES), TRACES MII Version 4.1, was developed for the TSP using costs as of November 2011. The final cost of a project would depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule, and other variable factors.

The engineering cost estimates are composed of three components:

- Construction costs
- Utility relocation
- OMRR&R

An overview of the methodology and major assumptions used to calculate the costs is provided below. Further details are provided in Appendix C.

4.3.1 Construction

The construction cost estimates were prepared in accordance with the guidelines of the Association for the Advancement of Cost Engineering (AACE) International. According to the definitions of AACE, the cost estimates prepared for this study are categorized as a Class 4 Estimate. The expected accuracy range for this class of estimate is –15 percent to –30 percent on the low-range side and +20 percent to +50 percent on the high-range side.

This cost estimate is considered a bottom rolled-up type estimate with detailed cost items and breakdown of labor, materials, and equipment. Some quotations were obtained for various items. The estimate only includes allowance costs for components, items, and situations that are difficult to quantify and develop costs for but that need to be included in the estimate.

The following is a list of the primary cost resources that were used in the development of the cost estimates:

- R.S. Means
- Historical data
- Davis-Bacon Wage Determinations – Labor Rates (40 U.S.C. 276)
- Vendor quotes on equipment and materials where appropriate
- Estimator judgment and construction knowledge

The following markups have been included in the construction cost estimates:

- Mobilization and Demobilization – 5 percent
- Performance Bonds and All-Risk Insurance – 2.5 percent
- Contractor’s Overhead – 10 percent
- Contractor’s Profit – 5 percent

- Contingency – 30 percent
- Engineering Services, Design, Bid Phase, Construction Services, and Inspection – 25 percent

The following primary assumptions were used to develop the cost estimate:

- Work would be done on a competitive bid basis and the contractor would have a reasonable amount of time to complete the work.
- All contractors are equal, with a reasonable project schedule, no overtime, constructed under a single contract, no liquidated damages.
- Fabricated equipment would be shipped from the mainland United States.
- The scalped material would be transported to a landfill disposal site within 4 miles of the project.
- Material transported to the landfill disposal site would require a tipping fee, environmental fee, plus a fuel recovery fee.
- Labor unit prices would reflect a burdened rate, including: workers compensation, unemployment taxes, fringe benefits, and medical insurance.
- No hazardous remediation measures would be required.

4.3.2 Utility Relocation

Utilities are located throughout the study area to provide services to residents and businesses. Additional utility transmission lines pass through the study area. To identify the affected utilities, field visits were conducted in April and May 2011, telephone interviews were conducted with utility representatives, maps were reviewed, and in-person interviews were conducted with City of Carencro staff.

The utilities identified include:

- Fiber optic lines
- Water lines
- Sewer lines
- Gas lines
- Electrical lines and associated power poles
- Sewer force main

The alternatives were evaluated to determine whether the identified utilities would be affected. Any potential impacts were further evaluated to determine if relocation of the utility would be required or if another mitigation measure would be appropriate.

The costs for any relocation actions are based on preliminary unit costs estimates and extent of the required action. A 25-percent contingency was added to the estimates.

4.3.3 Operation, Maintenance, Repair, Replacement, and Rehabilitation

Annual OMRR&R costs were estimated for the construction features of the structural alternatives. The OMRR&R requirements for each alternative are based on the conceptual-level designs, unit costs, and anticipated quantities. The OMRR&R were determined by extrapolation from operational cost histories using industry standard cost data and data from past and projected future cost trends. A 30-percent contingency was added to the estimates.

After completion of construction, the Non-Federal Sponsor would assume all OMRR&R responsibilities associated with the Project.

4.4 NATIONAL ECONOMIC DEVELOPMENT ANALYSIS

The damage reduction associated with each with-project alternative, as compared to the future without-project condition, was used to determine the National Economic Development (NED) benefits. The economic analysis followed guidance set forth in ER 1105-2-100. The economic analysis estimated the flood-related damage and related costs for seven categories:

- Damage to structures and contents
- Damage to automobiles
- Increased travel costs associated with road detours and delays
- Increased emergency response expenditures
- Evacuation and subsistence expenditures
- Reoccupation costs
- Costs for commercial cleanup and restoration

An overview of the methodology used to calculate each damage category is presented below. A more detailed explanation is provided in Appendix D.

4.4.1 Structure and Content Damage

A structure inventory was conducted in 2000, and updated in 2007 and 2011. The study area consists of the residential and nonresidential structures approximately within the floodplain for the 1-percent-chance (100-year) flood event in Carencro (see Figure 4). Flood damage was assessed based on the characteristics of residential and nonresidential structures in the study area, and on the H&H analyses. The structure data were entered into the Marshall & Swift Residential Estimator Program and Commercial Estimator Program to calculate the depreciated replacement values for each structure based on the concepts of effective age, quality, size, and other structural characteristics.

Each structure was assigned a depth-damage function (DDF) that estimates an economic loss as a percentage of the value of the structure or contents based on the depth of flooding. The DDFs used for this study were developed by CEMVN during a previous study. Because Carencro is located in the same region as the previous study, the DDFs were considered appropriate for use in Carencro. Different DDFs were provided for various categories based on the type of structure and the activities performed in the structure (e.g., one-story residential, retail shop, professional business). Separate DDFs were provided to represent damage to the structure and the contents.

The structures were assigned to a stream based on their location in the study area and where the flooding was anticipated to originate. The structures were assigned to one of two streams, Beau Bassin Coulee or Gaston Coulee and were assigned a river station number based on their location along the stream. The station numbers were assigned using GIS and the cross-section data that was developed for the H&H analysis. The station numbers were interpolated for structures falling between the provided cross-sections.

During the 2000 survey, hand levels were used to estimate the first floor elevations (FFEs) of the structures in relation to known elevations obtained from FEMA Flood Insurance Rate Maps. In 2007, a professional land surveyor determined the FFE for a sample set of randomly selected structures. The original FFEs and the sample set were statistically compared. The results were used as part of the uncertainty analysis.

The Hydrologic Engineering Center's Flood Damage Analysis program (HEC-FDA), Version 1.2.4, was used to estimate the damage. Data associated with each structure (DDF, stream, river station, depreciated replacement value, and FFE) were incorporated into the HEC-FDA program along with the results of the H&H analyses. HEC-FDA estimates the level of inundation and damage for each structure for each recurrence interval. HEC-FDA uses a Monte Carlo simulation to quantify uncertainty and derive average annual damage (AAD). This random sampling approach computes successive iterations of each computation for which there is uncertainty, using the assigned uncertainty variables.

4.4.2 Automobile Damage

Automobile damage was calculated similarly to the structure and content damage. Residential households were assumed to have an average of one automobile that would receive damage in a flood event. The elevation of the vehicle was assumed to be the elevation of the ground adjacent to each residential structure, which was determined using GIS. The average value per vehicle was estimated to be $13,100. Automobiles were assigned a DDF. The automobile inventory and associated data were input to HEC-FDA to calculate the damage.

4.4.3 Traffic Impacts

Traffic impacts include costs of increased travel time, road closures, and corresponding re-routing (detours). The traffic data were provided by the Lafayette Consolidated Government and the Louisiana Department of Transportation. The depth and duration of flooding were estimated for each flood recurrence interval based on the H&H analysis.

Traffic impacts for each recurrence interval were estimated in terms of time delays and increased mileage. For each recurrence interval, the number of vehicles delayed as well as the time delay and additional miles traveled were estimated for each vehicle. Traffic impacts by recurrence interval were monetized using Federal government 2011 mileage reimbursement rates and the time value per passenger vehicle using the median household income of Lafayette Parish.

The cost of emergency response officials barricading roads was included in the traffic impact analysis. Representatives from Carencro provided estimates of the cost of barricading roads based on previous flood events. Road flooding for each recurrence interval was incorporated into a regression analysis to determine the duration of the flood, which was then multiplied by average traffic costs. The results were annualized to determine the AAD.

4.4.4 Emergency Response

Emergency response costs include the costs incurred by Federal, State, and local government agencies to provide emergency services during a flood. The calculation of costs of emergency response was based on the actual costs of a combination of flood events in southern Louisiana, including both hurricane and rainfall events. The data were used to estimate the average amount of debris per residential and nonresidential structure, the cost to remove debris, and the average emergency cost per structure flooded. Emergency costs were assumed to be applicable in events higher than or equal to the 10-percent-chance flood event. These estimates were updated to 2011 values using the consumer price index. Results from the HEC-FDA analysis were used to obtain the number of residential and nonresidential structures projected to flood above the FFE. The average emergency response costs were multiplied by the number of structures inundated at each recurrence interval. The results were annualized to determine the AAD.

4.4.5 Evacuation and Subsistence

Large floods may cause the evacuation of residences and the subsequent payment of subsistence to residents who are required to seek shelter. Evacuation and subsistence costs were assumed to begin occurring at and after the 10-percent-chance flood event. The average evacuation and subsistence expenditures per evacuated household were based on government per diem for lodging and subsistence in Baton Rouge, LA, for Fiscal Year 2011. Using data provided by local representatives, the average inundated household is estimated to spend 10 days away from home. The average evacuation and subsistence cost was multiplied by the number of residential structures flooded above the first floor (obtained from HEC-FDA output) at each recurrence interval. The results were annualized to determine the AAD.

4.4.6 Reoccupation

Reoccupation costs include costs to contract, supervise, and inspect repairs and to clean and disinfect homes. Reoccupation costs were based on interviews with contractors following Hurricane Katrina. Average costs of gutting a residential structure and average cleanup hours were updated to 2011 values. Because owners are foregoing other activities, including work time and leisure time, an opportunity cost of time was included in the analysis. The median household income for Carencro was used to determine the opportunity time of work and leisure. Reoccupation costs were assumed to begin after the 10-percent-chance flood event. Results from the HEC-FDA analysis were used to determine the number of structures flooding above the FFE at each recurrence interval, which was multiplied by the average reoccupation cost. The results were annualized to determine the AAD.

4.4.7 Commercial Cleanup and Restoration

Commercial cleanup costs are the expenses that business owners must incur to make their business operational, including the time spent gutting their establishments. Cleanup and restoration costs were based on the actual costs of a combination of flood events in southern Louisiana, including both hurricane and rainfall events. Data from Hurricane Katrina was used to calculate commercial cleanup and restoration costs. Surveys of business owners in Jefferson Parish following a flood event in 1995 were used to estimate average costs of cleanup. Costs were updated to 2011 values using the consumer price index. The number of structures flooding at each recurrence interval was obtained from the results of the HEC-FDA analysis, and then

multiplied by the updated average cleanup and restoration cost. Costs were assumed to begin at the 10-percent-chance flood event. The results were annualized to determine the AAD.

4.5 GEOTECHNICAL INVESTIGATION ANALYSIS

The geotechnical investigation evaluated subsurface conditions in the study area. Geotechnical design criteria were developed based on field investigations, laboratory soil testing, and geotechnical analysis. A brief description the geotechnical investigation is provided below. A more detailed analysis is provided in Appendix E.

4.5.1 Subsurface Investigation

The subsurface investigation consisted of drilling and sampling 11 geotechnical exploratory soil borings from a truck-mounted rotary drill rig. Soil borings were continuously sampled from the ground surface to a depth of 30 feet. Cohesive soils were sampled using thin-walled 3-inch outside-diameter Shelby tubes in accordance with American Society for Testing and Materials (ASTM) standard D 1587. Noncohesive soils were sampled using a 2-inch outside-diameter split-spoon sampler in accordance with ASTM standard D 1586 (Standard Penetration Test). All borings were grouted in accordance with Louisiana Department of Transportation and Development requirements**.**

Selected portions of undisturbed samples were retained in moisture-proof containers for laboratory testing and reference. All samples were transported to a soils laboratory for further visual examination.

4.5.2 Geotechnical Testing and Analysis

Various laboratory tests were conducted on soil samples recovered from the borings to provide soil parameters for channel design and slope stability analysis. The tests included those conducted as part of standard geotechnical testing and conformed to industry standards and parameters.

4.5.3 Geotechnical Analysis

Preliminary slope-stability analyses were performed based upon existing conditions, channel geometry, and estimated construction loads. The following programs were used in the analyses:

- USACE Method of Planes (MOP)
- Geostudios SLOPE/W
- Macra1 2002
- GawacWin 2003

For the slope-stability analysis, estimated channel depths were taken from existing hydraulic survey data, and strength parameters were taken from the laboratory testing. Both undrained condition (short-term) and drained condition (long-term) were considered for stability calculations. Analyses were made with MOP using a block failure and in SLOPE/W using the Spencer Method with circular failure surfaces. SLOPE/W was used as an iterative process to determine the steepest allowable slope under drained conditions. MOP was then used to verify that the channel was stable at each soil layer interface.

The construction-material-type analysis was performed using the same parameters defined for the slope-stability analysis and parameters from the program GawacWin 2003. Based on hydraulic information and the program Macra1 2002, analyses were performed to determine the construction material types suitable for the channel.

4.6 REAL ESTATE ANALYSIS

The real estate costs for land acquisition and easements were estimated in accordance with USACE Engineer Circular 405-1-04, Appraisal, paragraph 4-19, and the nature and extent of the real estate requirements were evaluated pursuant to Chapter 12 of ER 405-1-12, Real Estate Handbook. The analysis of the number of owners affected for each alternative is based on the requirements for each alternative, ownership information from 1955, and aerial photography. The real estate cost estimates developed for each alternative are considered preliminary. A brief list of assumptions used to develop the costs for real estate is provided below. A more detailed analysis is provided in Appendix F.

The following assumptions were used to develop the real estate cost estimates:

- Sufficient ownership documentation was not available to show whether Beau Bassin Coulee is a publically owned waterway.
- The width of Beau Bassin Coulee is 45 feet throughout the study area.
- Any existing buildings and houses in the study area would not be disturbed.
- The Non-Federal Sponsor would obtain and provide all easements and other property rights along the banks of the coulee that are necessary to implement a project and for the Non-Federal Sponsor to perform OMRR&R obligations.

4.7 REGIONAL ECONOMIC DEVELOPMENT

The regional economic development (RED) analysis employs input-output economic analysis, which measures the interdependence among industries and workers in an economy. The analysis used a matrix representation of a region's economy to predict the effect of changes in one industry on others. The greater the interdependence among industry sectors, the larger the multiplier effect on the economy. The RED analysis used the IMPLAN model. IMPLAN was selected due to its ease of use, the availability of data inputs, and its ability to provide results that are consistent with USACE guidelines. IMPLAN is linear and static, showing relationships and impacts at a fixed point in time. Spending impacts are composed of three different effects: direct, indirect, and induced.

Direct effects represent the impacts that new federal expenditures would have on industries associated with the implementation of a project. Labor and construction materials can be considered direct components to the project. Indirect effects represent changes to secondary industries that support the direct industries. Rock quarries used in making cement or fuel for construction equipment could be considered indirect components of the project. Induced effects are changes in consumer spending patterns caused by the change in employment and income within the industries affected by the direct and induced effects.

The inputs for the IMPLAN model were costs that were entered separately as the following: construction, preconstruction, engineering and design (PED), construction management, and utility relocation. The following IMPLAN industry sectors were used for the

model: sector 36, construction of new nonresidential structures; sector 369, engineering services; sector 337, pipeline transport; and sector 381, management of companies and enterprises. The baseline data used by IMPLAN to represent the regional economy of Louisiana are annual averages from the Bureau of the Census, the Bureau of Labor Statistics, and the Bureau of Economic Analysis for the year 2009.

A more detailed analysis is provided in Appendix G.

4.8 OTHER SOCIAL EFFECTS

Recognizing the importance of social vulnerability and resiliency, the Other Social Effects (OSE) analysis considers the potential social ramifications of the alternatives. Based on the existing social conditions within the study area, the OSE analysis evaluates to what degree with-project alternatives are judged as complete, effective, and fair and contribute to the ability of communities to respond to, and recover from, flood events.

A more detailed analysis is provided in Appendix H.

5 PLAN FORMULATION

Pursuant to Section 904 of the Water Resources Development Act of 1986, the following items were considered in the plan formulation and evaluation process: (1) NED; (2) protecting and restoring the quality of the environment; (3) the well-being of the people of the United States; (4) the prevention of loss of life; and (5) the preservation of cultural and historical values. The following sections provide an overview of the plan formulation process that considered these items.

5.1 PLANNING GOALS

The overarching goal of Federal and federally assisted water and related land resources planning is to contribute to NED, consistent with protecting the Nation's environment, applicable Executive Orders, and other Federal planning requirements. A positive contribution to NED requires that the economic benefits attributable to a project exceed the cost.

The goals of this study are to identify an alternative that:

- Reduces the existing and future flood risk and damage to public and private infrastructure and facilities in Carencro
- Optimizes compatibility with current and future land uses
- Limits the impact to existing infrastructure and channel alignments
- Minimizes OMRR&R costs to the Non-Federal Sponsor.

5.2 PLANNING OBJECTIVES

Planning objectives stem from national, State, and local water and related land-resources-management needs specific to the study area. These objectives were developed through problem analysis and coordination with the Non-Federal Sponsor. The following planning objectives were established in response to the identified problems, needs, and opportunities:

- Reduce flood damage in the study area
- Do not induce flood damage elsewhere in the watershed.

5.3 PLANNING CONSTRAINTS

The planning process must take constraints into consideration when developing with-project alternatives. Complying with all applicable environmental laws and regulations was identified as a planning constraint.

5.4 ASSUMPTIONS

The planning process must make assumptions on future conditions and responses when developing with-project alternatives. The following planning assumptions were used:

- Future development will not result in increased water surface elevations and, therefore, increased flooding.
- The existing character and condition of the residential and nonresidential structures will remain the same throughout period of analysis.

5.5 EVALUATION CRITERIA

USACE Planning Guidance Notebook (ER 1105-2-100) states that alternatives must be analyzed with regard to the following four criteria:

- Completeness
- Effectiveness
- Efficiency
- Acceptability

Completeness is the extent to which a given alternative provides and accounts for all necessary investments or other actions needed to ensure the realization of the planned flood risk management objectives. To satisfy this criterion, an alternative should:

- Ensure that the total quantitative and non-quantitative beneficial effects are equal to or exceed the negative (costs) effects
- Be capable of being physically implemented and consideration should be given to the safety, health, and social well-being of the affected communities.

Effectiveness is the extent to which an alternative alleviates the identified problems and primarily achieves the planning objective of flood damage reduction.

Efficiency is a measure of the extent to which an alternative is the most cost-effective means of alleviating the identified problems while realizing the specified objectives, consistent with protecting the environment.

Acceptability is the workability and viability of the alternative with respect to acceptance by Federal and Non-Federal entities and the public, and compatibility with existing laws, regulations, and public policies. Two measures of acceptability are:

- Degree to which an alternative is supported by other Federal and non-Federal agencies, organizations, and the public
- Be feasible from technical, environmental, economic, financial, political, legal, institutional, and social perspectives.

In addition, as required by Section 904 of the Water Resource Development Act of 1986, the Feasibility Report must address the following in the formulation and evaluation of alternatives:

- Enhancement of NED benefits
- Protection and restoration of the quality of the total environment
- Prevention of loss of life
- Preservation of cultural and historical values.

5.6 FUTURE WITHOUT-PROJECT CONDITIONS

The USACE planning process is grounded in the economic and environmental principles and guidelines promulgated by the Water Resources Council's 1983 *Principles and Guidelines* and described in the USACE Planning Guidance Notebook (ER1150-2-10, April 2000).

USACE regulations describe the without-project condition as the features and conditions that would likely occur assuming no future Federal involvement or funding of a project resulting from this study. Forecasts of the future without-project condition take into consideration all other actions, plans, and programs that would be implemented in the future in the study area in the absence of a Federal project.

The without-project condition constitutes the baseline against which the with-project alternatives are evaluated. Any differences between the without-project condition and the with-project alternatives are measured as a cost or a benefit for the with-project alternative. Because the without-project condition provides a basis of comparison, proper definition and forecast of the future without-project condition are critical to the success of the planning process.

5.6.1 Hydrology and Hydraulics

Under the without-project condition, the future hydraulics and/or hydrology of Beau Bassin Coulee through Carencro would not change; the water surface profiles would not be modified and downstream velocities would not be altered. The future vegetative conditions of the coulee would be expected to remain the same as existing conditions, with light to heavy vegetation and Manning "n" values ranging from 0.04 to 0.05. Reference H&H appendix for a full description of Manning "n" values.

Although residential and nonresidential development is anticipated, Carencro has implemented land development regulations that require that any increases in impervious surfaces be mitigated through retention basins and other means. The Lafayette Consolidated Government (LCG) has enacted similar regulations governing the unincorporated portions of the study area. These regulations are assumed to remain in effect and to be enforced for the period of analysis of this study. Therefore, development would not result in an increase in flooding under the future without-project condition. Although no significant increases in runoff are anticipated as a result of development, any limited change would be well within the modeling error.

LCG is planning to conduct vegetation removal and regular maintenance activities along 5,175 feet of Beau Bassin Coulee east of St. Esprit Road, immediately downstream of the study area. This area is highly overgrown and removing the vegetation will reduce water levels in the coulee through this area and the easternmost portion of the study area. However, these water level reductions do not extend significantly upstream of St. Esprit Road. Therefore, the hydraulics and/or hydrology of Beau Bassin Coulee through the developed areas of Carencro where most flood damage occurs would not change significantly and no benefits would be realized. The removal of vegetation and debris and ongoing maintenance in this area is considered to be part of the future without-project condition.

5.6.2 Environmental

Long-term growth and development in the study area would not change the quality of water in the coulee. Potential improvements in water quality could result from a reduction in the amount of agriculture in the area and a reduction in the potential for release of fertilizers into the surface water; however, potential increased development in the area as the population continues to grow could result in an increased number of vehicles in the study area, which would introduce additional petroleum products into the water through storm water runoff. Development in the study area would not affect jurisdictional wetlands, wildlife populations, threatened or

endangered species, or historic properties. Temporary and minor impacts would occur to the region's air quality, ambient noise, and the coulee's water quality.

5.6.3 Flood Damage

Table 5 provides the number of structures that are estimated to receive inundation above the first floor by recurrence interval.

Table 5: Number of Inundated Structures

Coulee	Annual Chance Flood Event							
	50%	20%	10%	4%	2%	1%	0.4%	0.2%
Beau Bassin	4	29	39	48	76	90	108	116
Gaston	0	1	1	2	5	22	35	38
Total	**4**	**30**	**40**	**50**	**81**	**112**	**143**	**154**

The flood damage associated with the without-project condition is the annualized flood damage experienced in Carencro. The flood damage is not expected to increase or decrease over the planning period. The flood related AAD for the without-project condition are estimated as $892,500 (Table 6).

Table 6: AAD for Without-Project Condition

Category	AAD
Structure and Content	$452,700
Automobiles	$334,400
Traffic Impacts	$6,800
Emergency Response	$17,600
Evacuation and Subsistence	$16,600
Reoccupation	$47,300
Commercial Cleanup and Restoration	$17,100
Total	**$892,500**

5.7 ALTERNATIVE PLANS

The USACE's Planning Guidance Notebook (ER-1105-2-100) requires that "various alternative plans be formulated in a systematic manner to ensure that all reasonable alternatives are evaluated."

Measures considered for overbank flood damage reduction include nonstructural and structural measures. Nonstructural and structural measures can be considered independently or in combination with other measures to form an alternative.

Nonstructural measures reduce flood damage without significantly altering the nature or extent of flooding by changing the use of the floodplain. Examples are floodproofing, relocation of structures, installation of flood warning/preparedness systems, and regulation of floodplain use.

Structural measures change the flood levels or the hydraulic characteristics of the streams in question. These measures include dams with reservoirs, dry dams, channelization, levees, walls, diversion channels (including tunnels), and bridge modifications.

5.7.1 Structural Alternatives Considered

Structural alternatives were developed to improve the flow through Carencro and to control the upstream flow entering Carencro. Individual measures used to form the structural alternatives include:

- **Enlarging** the coulee
- **Lining** the coulee with concrete or gabion
- **Storing** flood waters in a retention or detention basin
- **Clearing, grubbing, and dressing** (CG&D) to remove accumulated debris and smooth channel profile
- **Diverting** water away from Carencro.

As alternatives are evaluated through the planning process, specifics of the alternatives may change as additional studies are conducted and additional information becomes available. Therefore, as refinements are made to the alternatives, their descriptions may change slightly. The following sections provide brief descriptions of the 11 structural alternatives that were evaluated during the initial screening to identify the alternatives to carry forward for more detailed analysis.

5.7.1.1 Alternative 1: Enlarged Earthen Section

Alternative 1 would construct an earthen-lined trapezoidal channel with a 10-foot bottom width, 70-foot top width, and 1:3 side slopes through Carencro from the upstream SPRR bridge to St. Esprit Road downstream of I-49.

The initial analysis conducted in 2001 demonstrated that this alternative would be cost-effective, but the increased velocity with which flood water would move through the area caused concerns because it could lead to erosion problems in the earthen section.

5.7.1.2 Alternative 2: Concrete Section

Alternative 2 would construct a concrete-lined trapezoidal channel with a 10-foot bottom width, 40-foot top width, and 1:1.5 side slopes through Carencro from the upstream SPRR bridge to St. Esprit Road downstream of I-49.

Initial analysis indicates that Alternative 2 would lower water levels an average of 2.9 feet for all storm events within the study area.

5.7.1.3 Alternative 3: Enlarged Earthen Section/Gabion Section

Alternative 3 would enlarge the existing channel and provide 7,193 feet of earthen-lined trapezoidal channel with a 10-foot bottom width, 70-foot top width, and 1:3 side slopes from the Veterans Drive/Bernard Street Bridge to St. Esprit Road. Originally, Alternative 3 would also construct a concrete-lined trapezoidal channel with a 10-foot bottom width, 40-foot top width, and 1:1.5 side slopes from the downstream SPRR crossing to Veterans Drive/Bernard Street Bridge.

Initial analysis conducted in 2001 demonstrated that the original design for Alternative 3 would not be cost-effective. Therefore, the alternative was revised.

The revised Alternative 3 no longer includes a concrete section. Rather, Alternative 3 would provide 4,697 feet of gabion-lined trapezoidal channel with a 10-foot bottom width, 40-foot top width, and 1:1.5 side slopes. The gabion-lined channel would extend from the upstream SPRR bridge to the Veterans Drive/Bernard Street Bridge.

Initial analysis of Alternative 3 indicates that it would lower water levels an average of 2.4 feet for all storm events within the study area.

5.7.1.4 Alternative 4: Enlarged Earthen Section with Diversion Channel

Alternative 4 would construct an enlarged earthen-lined trapezoidal channel with a 10-foot bottom width, 70-foot top width, and 1:3 side slopes from the downstream SPRR crossing to St. Esprit Road. Alternative 4 would also construct a new earthen-lined trapezoidal diversion channel with a 10-foot bottom width, 64-foot top width, and 1:3 side slopes from the upstream section of Beau Bassin Coulee on the east side of I-49 to the downstream section of Beau Bassin Coulee on the east side of I-49.

Alternative 4 was revised because development occurred in the proposed alignment of the diversion channel; the original alignment was no longer valid. As revised, Alternative 4 would construct a gabion-lined trapezoidal channel with a 10-foot bottom width, 40-foot top width, and 1:1.5 side slopes from the downstream SPRR crossing to Veterans Driver /Bernard Street Bridge as well as an enlarged earthen channel from Veterans Drive /Bernard Street Bridge to St. Esprit Road. As revised, Alternative 4 would also construct a new earthen-lined diversion channel with a 10-foot bottom width, 64-foot top width, and 1:3 side slopes from the upstream section of Beau Bassin Coulee on the east side of I-49 to the downstream section of Beau Bassin Coulee along the I-49 frontage road on the east side of I-49.

The analysis shows that the revised Alternative 4 would lower water levels an average of 1.85 feet for all storm events within the study area.

5.7.1.5 Alternative 5: Enlarged Earthen Section with Retention Storage

Alternative 5 would construct an earthen-lined trapezoidal channel with a 10-foot bottom width, 70-foot top width, and 1:3 side slopes from the downstream SPRR crossing continuing past the I-49 crossing to St. Esprit Road. Alternative 5 would also construct a 32-acre, 6-foot-deep retention basin upstream of Carencro and north of Debutante Road.

The initial analysis conducted in 2001 showed that this alternative would lower water levels an average of 1.85 feet, but would not be cost effective.

Alternative 5 was revised in 2006. Rather than construct a retention basin north of Debutante Road, the revised alternative considered the construction of a 32-acre, 6-foot-deep retention basin in northeast Carencro.

Analysis of the revised Alternative 5 indicates that it would lower water levels an average of 1.81 feet for all storm events within the study area.

5.7.1.6 Alternative 6: Retention Storage in Central Carencro

Alternative 6 would construct approximately 5 acres of retention basin(s) in central Carencro.

The initial analysis indicates that Alternative 6 would only lower water levels an average of 0.19 feet for all storm events within the study area.

5.7.1.7 Alternative 7: Retention Storage in Central Carencro with Channel Clearing

Alternative 7 would provide CG&D through approximately 12,000 feet of Beau Bassin Coulee from the upstream crossing of the SPRR to St. Esprit Road. The existing channel is approximately 45 feet wide on average at the top. No change to the configuration of the existing channel would occur as a result of the CG&D.

Alternative 7 would also include the construction of retention storage in central Carencro.

Analysis of Alternative 7 indicates that it would lower water levels an average of 1.9 feet for all storm events within the study area.

5.7.1.8 Alternative 8: Retention Storage in Central Carencro with Channel Clearing and Enlarged Earthen Channel

Alternative 8 would provide CG&D through approximately 4,697 feet of the existing Beau Bassin Coulee from the upstream SPRR bridge crossing to the Veterans Drive/Bernard Street Bridge. The existing channel is 45 feet wide on average at the top and no change to the configuration of the existing channel would occur as a result of CG&D.

Alternative 8 would include enlarging a section of the existing channel by providing 7,193 feet of earthen-lined trapezoidal channel with a 10-foot bottom width, 70-foot top width, and 1:3 side slopes from the Veterans Drive/Bernard Street Bridge to St. Esprit Road.

Alternative 8 would also include the construction of retention storage in central Carencro.

The initial analysis of Alternative 8 indicates that it would lower water levels an average of 2.5 feet for all storm events within the study area.

5.7.1.9 Alternative 9: Retention Storage in Central and Northeast Carencro

Alternative 9 would construct three retention basins:

- A 2-acre retention basin in central Carencro
- A 3-acre retention basin in central Carencro
- A 5-acre retention basin in northeast Carencro

Initial analysis indicated that Alternative 9 would lower water levels an average of 0.46 feet for all storm events within the study area.

5.7.1.10 Alternative 10: Retention Storage in Central and Northeast Carencro with Channel Clearing

Alternative 10 would construct three retention basins:

- A 2-acre retention basin in central Carencro
- A 3-acre retention basin in central Carencro
- A 5-acre retention basin in northeast Carencro

Alternative 10 would also provide for CG&D to clear the existing channel of obstructions from the upstream SPRR crossing to St. Esprit Road.

Analysis of Alternative 10 indicates that it would lower water levels an average of 2.56 feet for all storm events within the study area.

5.7.1.11 Alternative 11: Retention Storage in Central and Northeast Carencro with Channel Clearing and Channel Improvements

Alternative 11 would construct three retention basins:

- A 2-acre retention basin in central Carencro
- A 3-acre retention basin in central Carencro
- A 5-acre retention basin near northeast Carencro

Alternative 11 would also include CG&D of the existing channel from the upstream SPRR crossing to the Veterans Drive/Bernard Street Bridge. Alternative 11 would improve the channel and facilitate flow with an earthen-lined trapezoidal channel with a 10-foot bottom width, 64-foot top width, and 1:3 side slope from the Veterans Drive/Bernard Street Bridge to St. Esprit Road.

The initial analysis of Alternative 11 indicates that it would lower water levels an average of 2.81 feet for all storm events within the study area.

5.7.1.12 Additional Alternative Considered but Not Fully Evaluated

The following alternatives were considered but not fully evaluated:

- Use of the Judice Sand Pit as a downstream holding basin was suggested, but preliminary models demonstrated that this would not improve the flow of Beau Bassin Coulee through Carencro. The plan assumed that the flow out of Carencro was limited by the downstream hydraulics of Beau Bassin Coulee. Several models were developed to mimic the effects of a downstream holding basin. Results showed that this type of improvement did not affect the flow through Carencro. The governing factor controlling the backwater profile was the flow capacity of Beau Bassin Coulee through Carencro and not the downstream characteristics of the channel. Because improvements were not produced, the alternative was not considered further. This site is now an active construction debris landfill, which would preclude future use as a retention basin.
- The construction of levees through Carencro was initially considered as a structural alternative. However, because of the substantial disruption to existing land uses/structures and the associated costs, levees were not evaluated as an alternative.
- CG&D did not develop as a standalone alternative in the plan formulation process. Subsequent analysis supports the value of a solution that both provides storage (the retention basins) as well as more efficient hydraulic transport (through CG&D) in balancing the need to move water through Carencro without inducing downstream flooding.

- Hydraulic modeling showed that the bridges crossing Beau Bassin Coulee through Carencro were not a major source of flow constriction. Therefore, no alternative was developed that would involve the replacement of bridges.

5.7.1.13 Initial Evaluation of Structural Alternatives

Table 7 lists the structural alternatives and the results of the initial evaluation, which are based on the planning objectives presented in Section 5.2 and the evaluation criteria presented in Section 5.5. The evaluations determined whether the alternative would be carried forward for further consideration. The period of analysis for the evaluations is 50 years.

Table 7: Initial Evaluation of Structural Alternatives

Alternative	Evaluation	Status of Alternative
Alt. 1: Enlarged Earthen Section	Although Alternative 1 is cost effective, it would cause considerable disruptions to the current land uses; thus, it does not meet the planning goals and is unacceptable to the Non-Federal Sponsor.	No longer under consideration.
Alt. 2: Concrete Section	Because of the high construction costs, Alternative 2 was not cost effective; thus, it does not meet the evaluation criteria.	No longer under consideration.
Alt. 3: Gabion-Lined Section and Enlarged Earthen Section	Initial analysis indicates Alternative 3 meets the planning objective and evaluation criteria.	Carried forward for further consideration.
Alt. 4: Enlarged Earthen Section, Gabion-Lined Section, and Diversion Channel	Although Alternative 4 is cost effective, it would cause considerable disruptions to the current and future land uses; thus, it does not meet the planning goals and is unacceptable to the Non-Federal Sponsor.	No longer under consideration.
Alt. 5: Enlarged Earthen Section with Retention Storage	Because of the high construction costs, Alternative 5 is not cost effective; thus, it does not meet the evaluation criteria.	No longer under consideration.
Alt. 6: Retention Storage in Central Carencro	Because of the minimal reduction in water surface elevations, Alternative 6 is not complete or cost effective; thus, it does not meet the evaluation criteria.	No longer under consideration.
Alt. 7: Retention Storage in Central Carencro with Channel Clearing	Initial analysis indicates Alternative 7 meets the planning objective and evaluation criteria.	Carried forward for further consideration.
Alt. 8: Retention Storage in Central Carencro, with Channel Clearing and Enlarged Earthen Channel	Initial analysis indicates Alternative 8 meets the planning objective and evaluation criteria.	Carried forward for further consideration.
Alt. 9: Retention Storage in Central and Northeast Carencro	Because of the minimal reduction in water surface elevations, Alternative 9 is not complete or cost effective; thus, it does not meet the evaluation criteria.	No longer under consideration.
Alt. 10: Retention Storage in Central and Northeast Carencro with Channel Clearing	Alternative 10 would cost approximately 65 percent more than Alternative 7, but would only provide an additional 0.35-foot reduction of water levels. Thus, Alternative 10 is not cost effective when compared to Alternative 7.	No longer under consideration.
Alt. 11: Retention Storage in Central and Northeast Carencro, with Channel Clearing and Enlarged Earthen Channel	Alternative 11 would cost approximately 60 percent more than Alternative 8, but would only provide an additional 0.6-foot reduction of water levels. Thus, Alternative 11 is not cost effective when compared to Alternative 8.	No longer under consideration.

5.7.2 Nonstructural Alternatives Considered

Section 73 of the Water Resources Development Act of 1974 (PL 93-251) requires Federal agencies to give consideration to nonstructural alternatives to reduce or prevent flood damage. Nonstructural alternatives considered include the acquisition and demolition of structures in Beau Bassin Coulee floodplain or elevation of structures in the floodplain. Structures receiving flooding above the FFE at the 20-percent, 10-percent, and 4-percent-chance flood events form the basis of the nonstructural alternatives (incorporating nonstructural measures on structures outside of the 4-percent-chance flood event is generally not cost effective). HEC-FDA output was used to determine which structures would flood above the first floor at the three flood events. At the 20-percent-chance flood event, 30 structures receive flooding; at the 10-percent-chance flood event, 40 structures receive flooding; and at the 4-percent-chance flood event, 50 structures receive flooding. For the acquisition alternatives, the structures flooding at each event were assumed to be removed from the study area completely. Automobiles associated with an acquired residential structure were assumed to be removed from the area as well. For the elevation alternatives, the structures flooding at each event were assumed to be elevated 1 foot above the 1-percent-chance flood event. Automobiles associated with an elevated structure were assumed to remain at the same ground elevation as the future without-project condition.

Analyses of the nonstructural alternatives indicate that all are cost effective except the acquisition of structures at both the 4-percent-chance flood event and the 10-percent-chance flood event. The elevation of structures at the 20-percent-chance flood event was determined to be the alternative with the greatest net benefits and was, therefore, carried forward for further consideration.

5.7.3 Alternatives Carried Forward

The initial evaluation of alternatives identified a nonstructural alternative and three structural alternatives (Alternative 3, Alternative 7, and Alternative 8) to carry forward for further consideration and analysis.

Following the initial evaluation, features of these alternatives were revised based on further analysis and the availability of land for the retention basins. The features (e.g., placement of retention basins) took into consideration the planning constraints presented in Section 5.3.

As alternatives are evaluated through the planning process, specifics of the alternatives may change as additional studies are conducted and additional information becomes available. Therefore, as refinements are made to the alternatives, their descriptions may change slightly. The following sections provide descriptions of the alternatives that were evaluated to identify the TSP. As described in Section 6, the TSP was further refined during the optimization analysis and the description was updated.

5.7.3.1 Alternative 3: Combined Gabion and Enlarged Earthen Section

Description of Features

Alternative 3 would provide a gabion-lined channel that would extend from the upstream SPRR bridge to the Veterans Drive/Bernard Street Bridge and an earthen-lined trapezoidal channel from the Veterans Drive/Bernard Street Bridge to St. Esprit Road (Figure 7).

The gabion-lined trapezoidal channel would be 4,697 feet long with a 10-foot bottom width, 40-foot top width, and 1:1.5 side slopes (Figure 8).

Alternative 3 would enlarge the existing channel and provide 7,193 feet of earthen-lined trapezoidal channel with a 10-foot bottom width, 70-foot top width, and 1:3 side slopes (Figure 9).

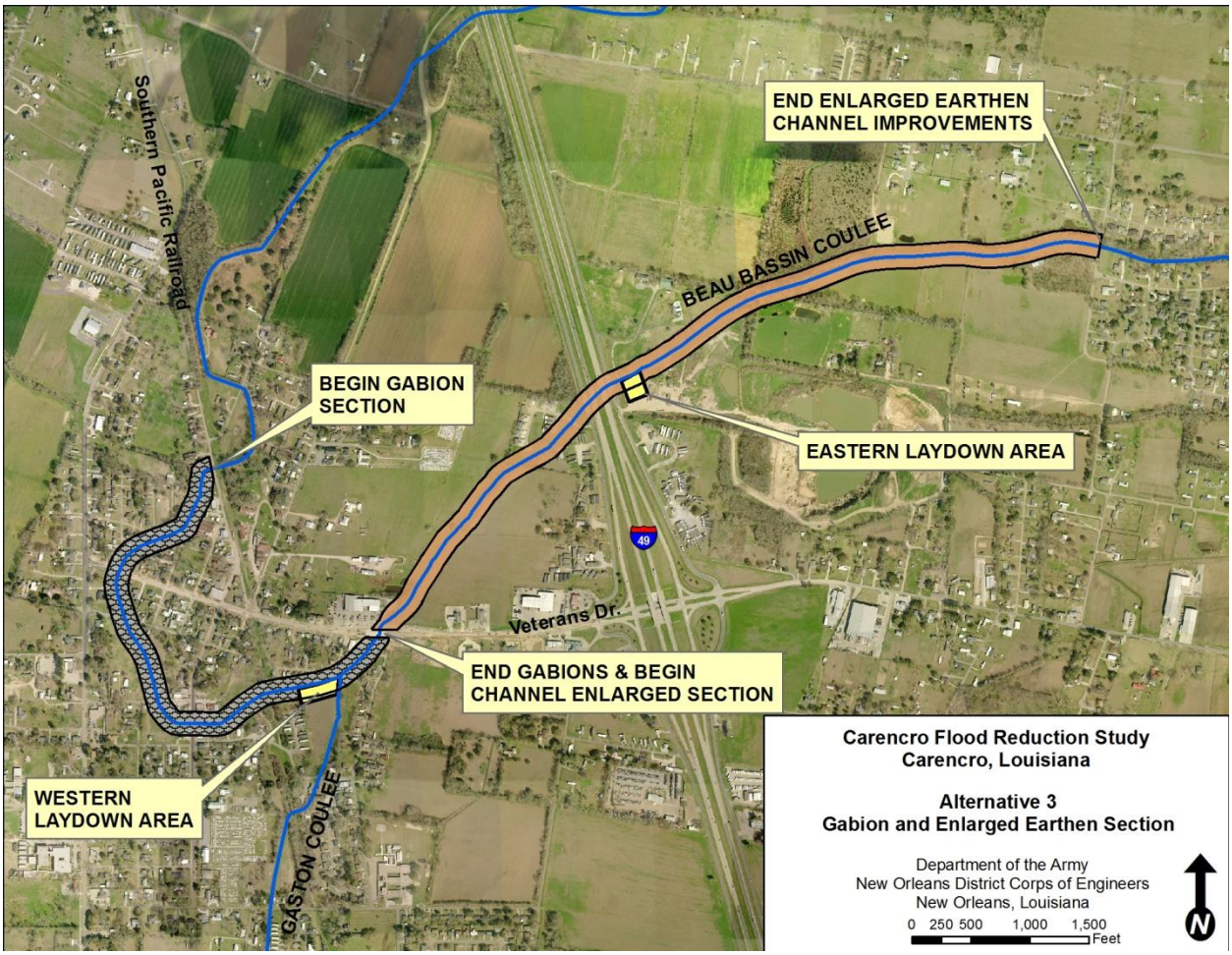

Figure 7: Features of Alternative 3

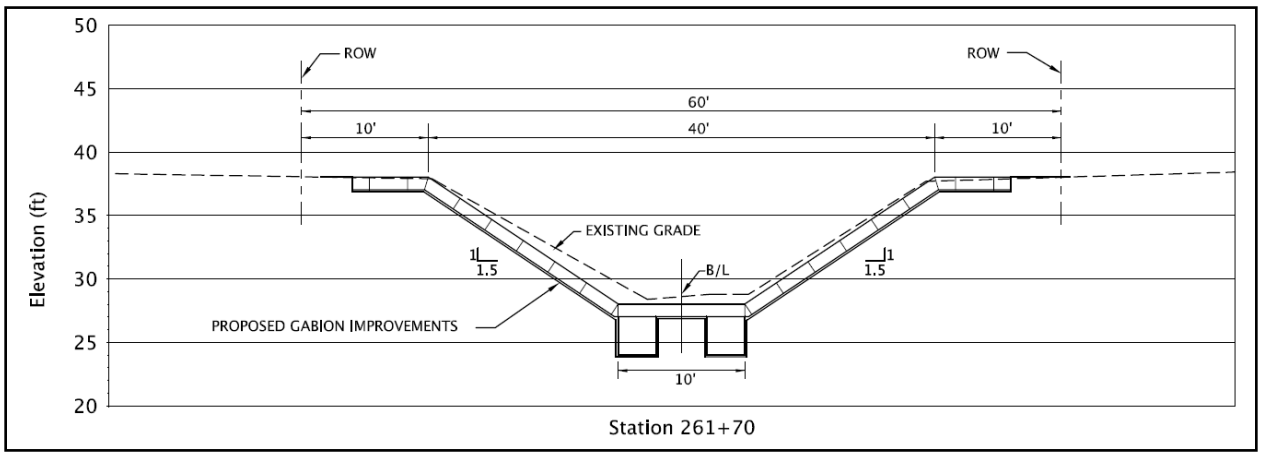

Figure 8: Cross-section of Gabion-Lined Channel

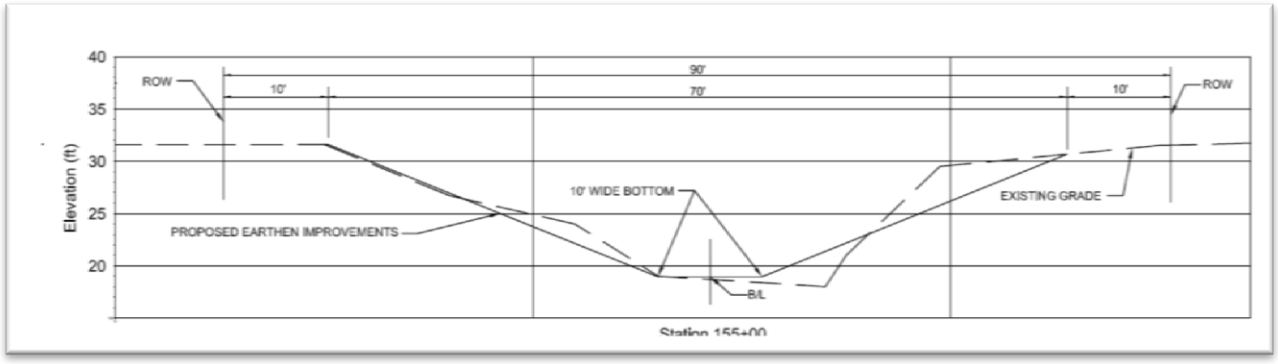

Figure 9: Cross-section of Enlarged Earthen-Lined Channel

Lands, Easements, Rights-of-Way, Relocations, and/or Disposal Areas

During construction, two 1-acre laydown/equipment storage/staging areas would be used. The eastern laydown area would be east of I-49 on privately owned land; the western laydown area would be west of I-49 on city-owned land. The eastern laydown area and access route are located on property currently being used to excavate soil. The western laydown area and access route are located on vacant property currently owned by the Non-Federal Sponsor. Detailed maps of these individual sites, including proposed access roads, are shown on Figures 10 and 11. These two sites would be the points of access to the east and west sides of the project area during construction; additional access roads to the coulee would be provided from public roadways adjacent to bridges that cross the coulee.

The hydraulic model showed that the bridges were not a major source of flow constriction to warrant bridge replacement; therefore, none of the bridges in the study area were considered for replacement.

Relocations cost for this Alternative is $199,000. This cost was derived for relocating the 6 inch diameter sewer force main from adjacent to the Coulee.

Alternative 3 would require expanding the footprint of the existing coulee. In the gabion-lined section of the channel, the average width would increase from of 45 feet to 60 feet. In the enlarged earthen-lined section of the channel, the average channel width would increase from 45

feet to 70 feet. Consequently, to construct Alternative 3, the Non-Federal Sponsor would be required to obtain a Perpetual Channel Improvement Easement over approximately 5 acres along both banks of the coulee. The western laydown area is on land owned by the City of Carencro (Non-Federal Sponsor) and no additional land rights would be required. However, the Non-Federal Sponsor would need to obtain a temporary construction easement over the 1 acres comprising the eastern laydown area. Disposal fees for excavated soil and debris are classified as a LERRD.

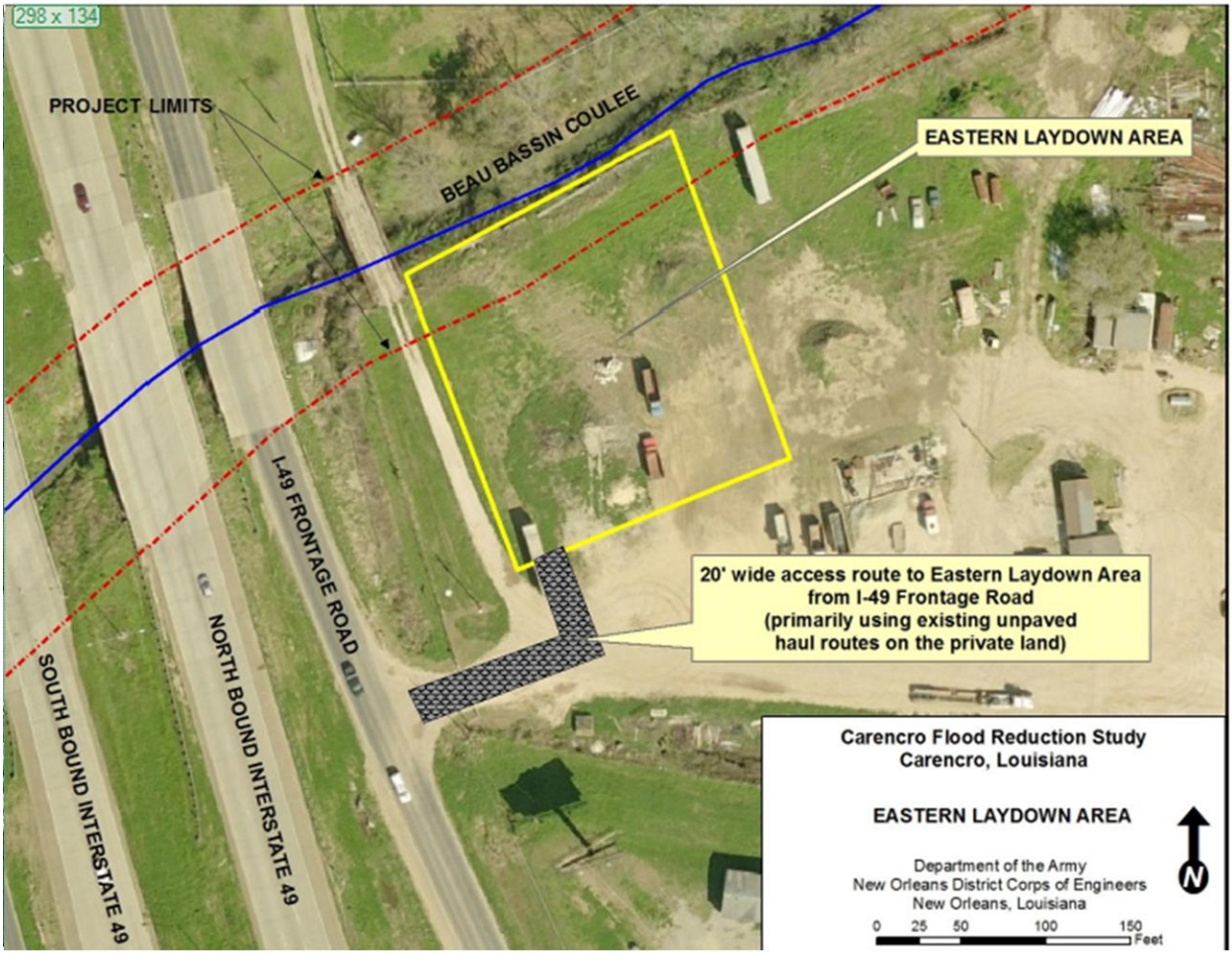

Figure 10: Eastern Laydown Area

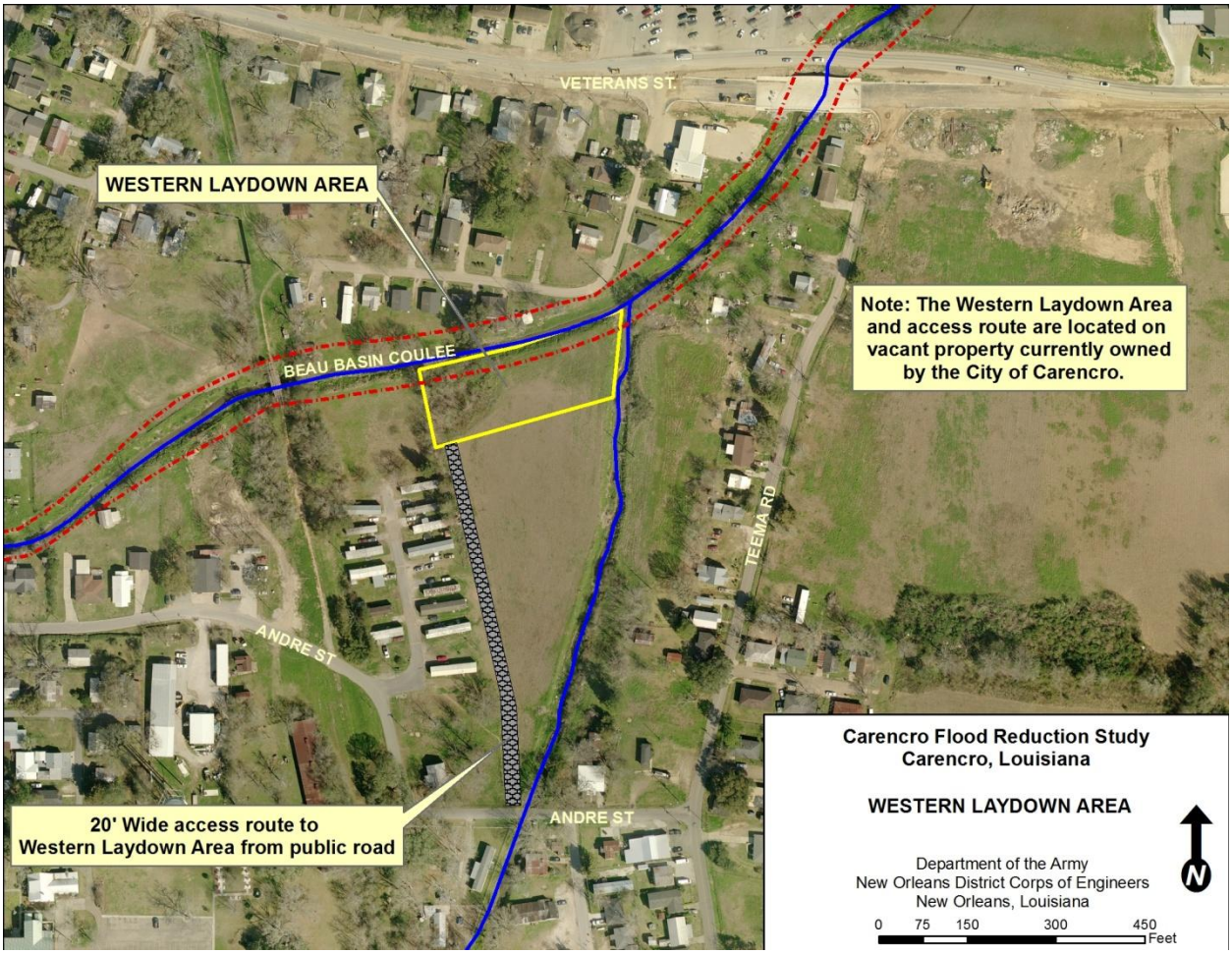

Figure 11: Western Laydown Area

5.7.3.2 Alternative 7: Retention Storage in Central Carencro with Channel Clearing

Description of Features

Alternative 7 would provide CG&D through approximately 12,000 feet of Beau Bassin Coulee from the upstream bridge crossing of the SPRR to St. Esprit Road. The existing channel is an average of 45 feet wide at the top. During CG&D, surficial vegetation and subsurface root masses would be removed, larger embedded obstructions would be removed, and the channel profile would be smoothed (Figure 12). Although, no there will be no change to the configuration of the existing coulee as a result of CG&D, the Manning "n" values would drop to 0.025. A drop in the Manning "n" values signifies a reduction in the obstruction of the movement of water within the Coulee.

Alternative 7 would also provide two retention basins (Figure 13):

- A 7.38-acre retention basin located near the confluence of Gaston Coulee and Beau Bassin Coulee (Figure 14). The land is currently owned or being acquired by the Non-Federal Sponsor. The retention basin would have a wetted area of 5.7-acre and would be approximately 6 feet deep.

- A 1.67-acre retention basin located south of Beau Bassin Coulee at the southwestern edge of Beau Bassin Coulee on land currently owned or being acquired by the Non-Federal Sponsor (Figures 15). The retention basin would have a wetted area of 1.0-acre and would be approximately 6 feet deep.

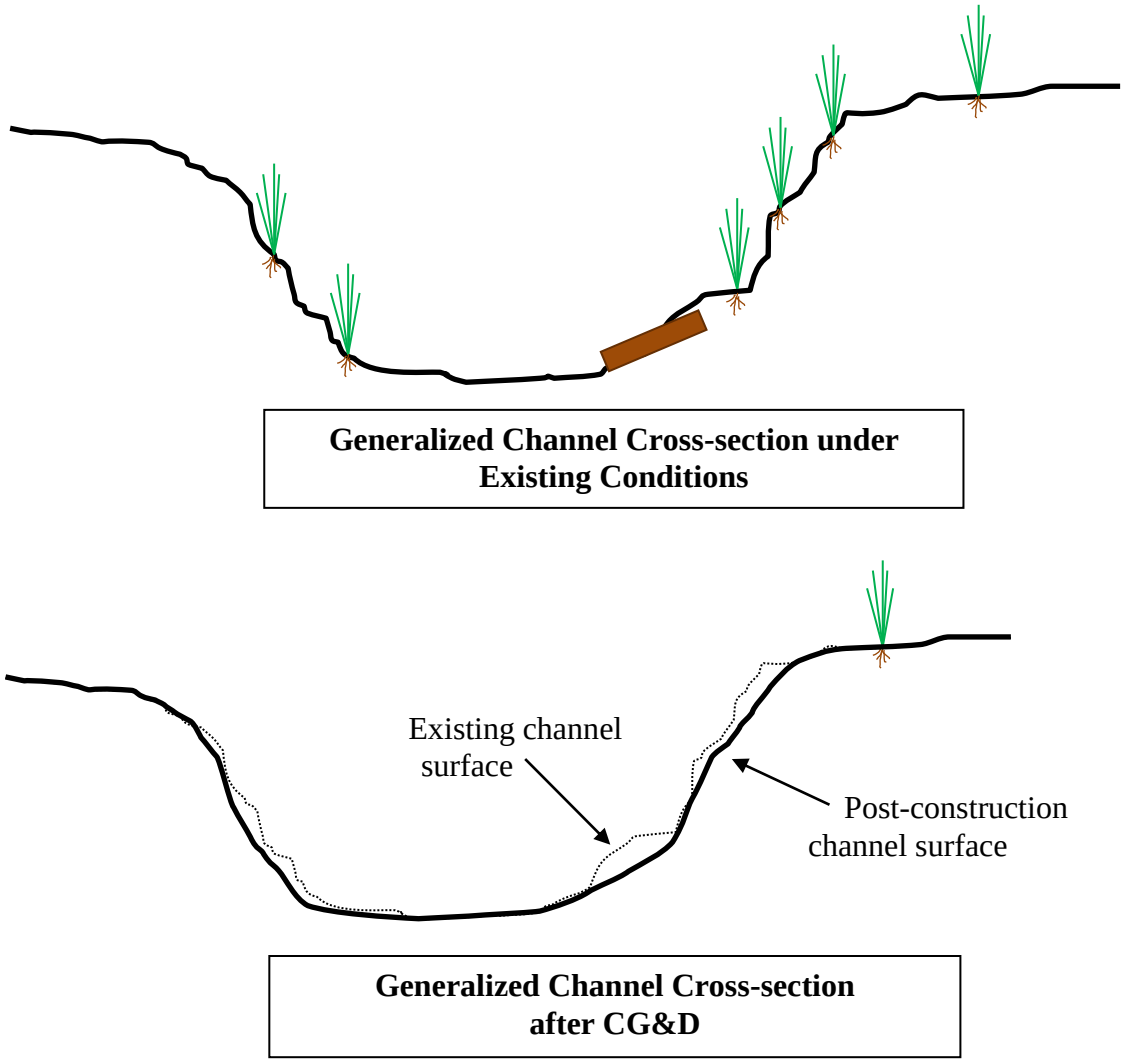

Figure 12: Schematic of CG&D

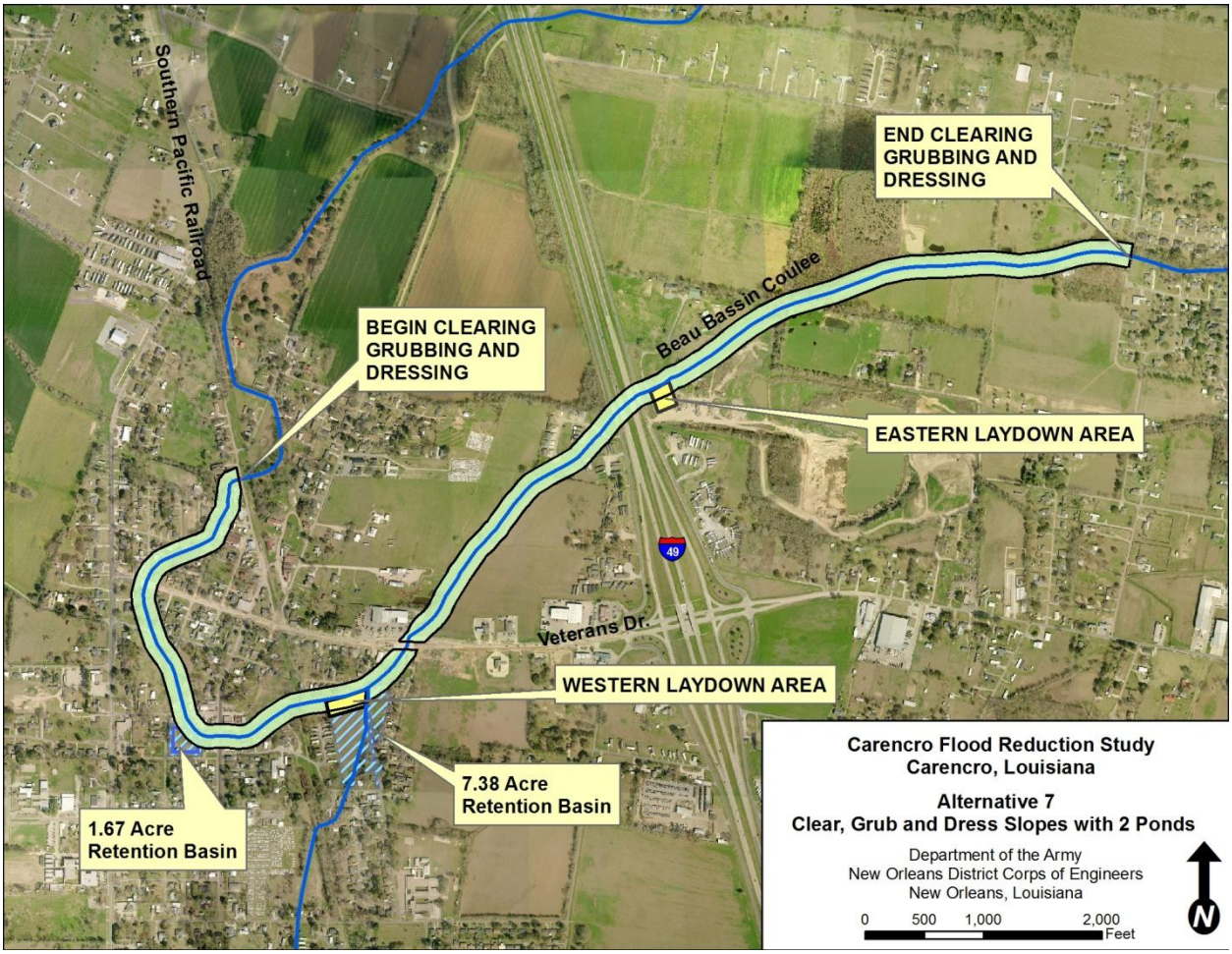

Figure 13: Alternative 7

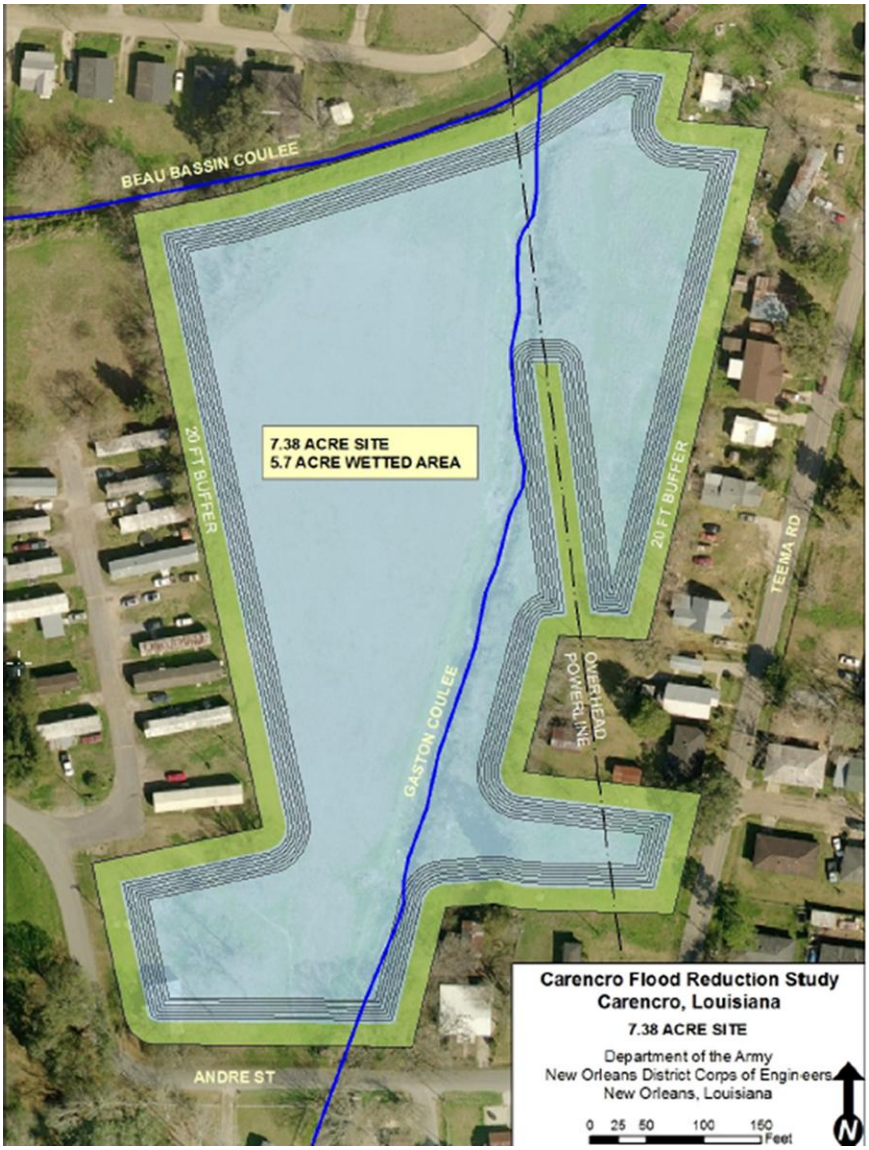

Figure 14: Boundaries of 7.38-Acre Retention Basin

Figure 15: Boundaries of 1.67-Acre Retention Basin

Lands, Easements, Rights-of-Way, Relocations, and/or Disposal Areas

During project development, Alternative 7 would require two laydown/equipment storage/staging areas—one area on each side of I-49 during construction. On the east side, the eastern laydown area and associated access route, as shown in Figure 10, would be used. The laydown area for the western side would be the same as described in Alternative 3, as shown in Figure 11. The laydown area would be within the footprint of the 7.38-acre retention basin.

Alternative 7 would not alter the footprint of the existing coulee, and the project work activities would be classified as major maintenance. Therefore, an existing statutory right-of-way along the coulee would be used for implementation and maintenance. The locations of the two retention basins and the western laydown area are on land owned by the City of Carencro (Non-Federal Sponsor); no new land would need to be acquired to construct them. However, the Non-Federal Sponsor would need to obtain a temporary construction easement for the eastern laydown area. Disposal fees for excavated soil and debris are classified as a LERRD.

Relocations cost for this alternative would be $54,000. This cost was derived for re-installing a portion of the sewer force main at a deeper elevation.

5.7.3.3 Alternative 8: Retention Storage in Central Carencro with Channel Clearing and Enlarged Earthen Channel

Description of Features

Alternative 8 would provide CG&D through approximately 4,697 feet of the existing Beau Bassin Coulee from the upstream SPRR crossing to the Veterans Drive/Bernard Street Bridge. During CG&D, surficial vegetation and subsurface root masses would be removed, larger embedded obstructions would be removed, and the channel profile would be smoothed (Figure 11). Although, no change to the configuration of the existing coulee would occur as a result of CG&D, the Manning "n" values would drop to 0.025.

Alternative 8 would include enlarging a section of the existing coulee by providing 7,193 feet of earthen-lined trapezoidal channel with a 10-foot bottom width, 70-foot top width, and 1:3 side slopes from the Veterans Drive/Bernard Street Bridge to St. Esprit Road (Figure 16). A generalized cross-section of the enlarged earthen section is provided in Figure 9.

Alternative 8 would include development of two retention basins:

- A 7.38-acre retention basin located near the confluence of Gaston Coulee and Beau Bassin Coulee (Figure 14). The land is currently owned or being acquired by the Non-Federal Sponsor. The retention basin would have a wetted area of 5.7-acre and would be approximately 6 feet deep.
- A 1.67-acre retention basin located south of Beau Bassin Coulee at the southwestern edge of Beau Bassin Coulee on land currently owned or being acquired by the Non-Federal Sponsor (Figures 15). The retention basin would have a wetted area of 1.0-acre and would be approximately 6 feet deep.

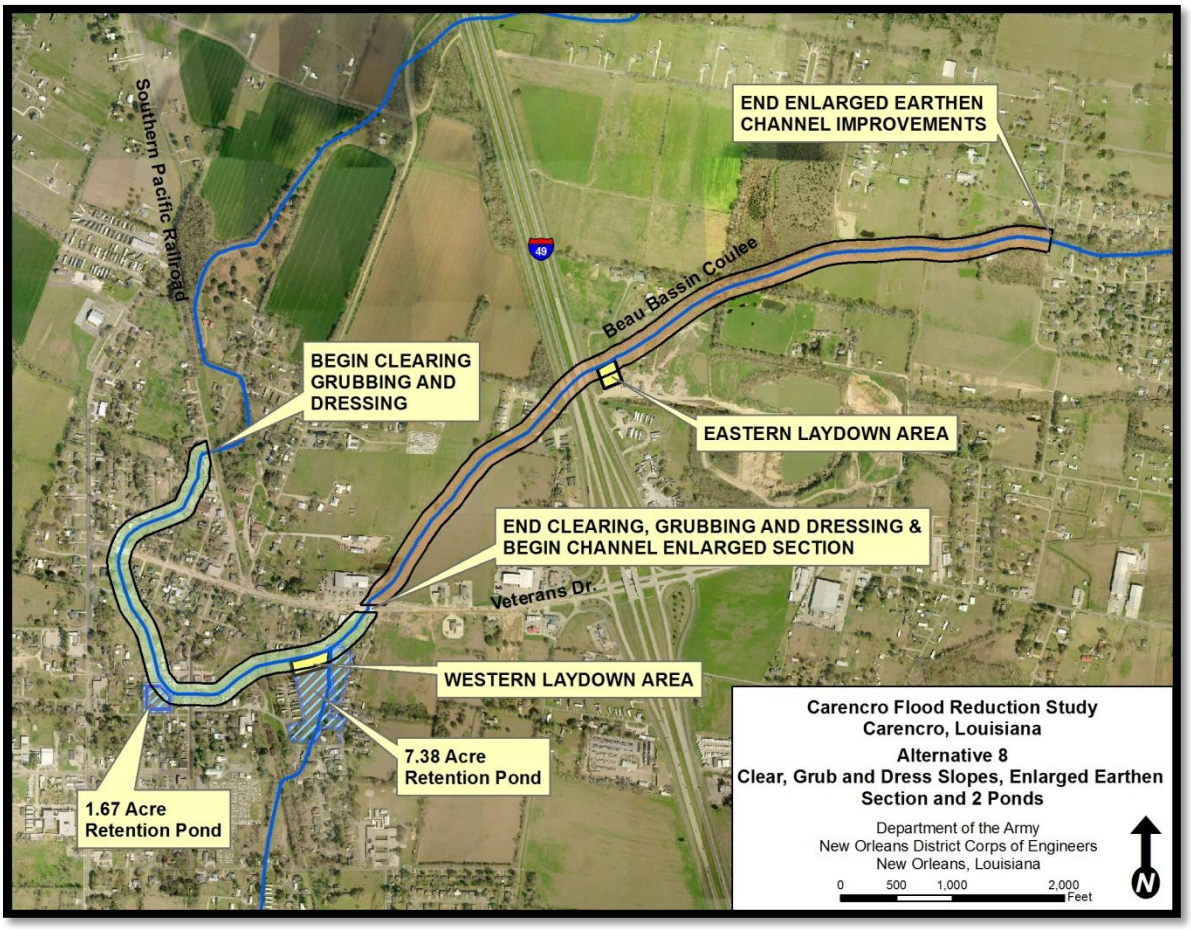

Figure 16: Alternative 8

Lands, Easements, Rights-of-Way, Relocations, and/or Disposal Areas

Alternative 8 would require laydown/equipment storage/staging areas on each side of I-49 during construction. On the east side, the eastern laydown area and associated access route, as shown in Figure 10, would be used. The laydown area for the western side would be the same as described in Alternative 3, as shown in Figure 11. The laydown area would be within the footprint of the 7.38-acre retention basin.

Alternative 8 would not alter the footprint of the existing coulee upstream of the Veterans Drive/Bernard Street Bridge. Therefore, the work activities in this reach would be classified as major maintenance and an existing statutory right-of-way along the coulee would be used for implementation and maintenance. In the enlarged earthen-lined portion of the channel downstream of the Veterans Drive/Bernard Street Bridge, the average width would increase from of 45 feet to 70 feet. Consequently, to construct this section, the Non-Federal Sponsor would be required to obtain a Perpetual Channel Improvement Easement over approximately 5 acres on each side of the coulee. The locations of the two proposed retention basins and the western laydown area are on land owned by the City of Carencro (Non-Federal Sponsor); therefore, no new land would need to be acquired. However, the Non-Federal Sponsor would need to obtain a temporary construction easement over 1 acre of private property for the eastern laydown area. Disposal fees for excavated soil and debris are classified as a LERRD.

Relocations cost for this alternative would be $54,000. This cost was derived for re-installing a portion of the sewer force main at a deeper elevation.

5.7.3.4 Nonstructural Alternative

Description of Features

The elevation of structures at the 20-percent-chance flood event was determined to be the nonstructural plan with the greatest net benefits, and was therefore carried forward. The alternative would elevate 30 structures in the study area that are at the highest risk of flood damage (Figure 17). The alternative involves elevating the structures so that the FFE is 1 foot above the 1-percent-chance flood event.

Figure 17: Nonstructural Alternative

Lands, Easements, Rights-of-Way, Relocations, and/or Disposal Areas

The nonstructural alternative would require elevation of 30 structures. The elevation of the structures would be coordinated with individual property owners and remain in the control of the property owners throughout the process; therefore, no easements or rights-of-way would be required. The structures being elevated would not be usable during the construction process, so the occupants would have to temporarily vacate the structures. However, the occupants would not be permanently relocated from the structures.

5.8 EVALUATION OF ALTERNATIVES

The with-project alternatives were evaluated with regards to the planning objectives and evaluation criteria stated in Sections 5.2 and 5.5, respectively. Overviews of the environmental, H&H, and economic analyses completed for each alternative are presented below. The

information from these analyses was used to determine how the planning objectives and evaluation criteria are met by each of the with-project alternatives.

5.8.1 Environmental

The environmental impacts of the alternatives were assessed. Construction related activities are anticipated to result in temporary impacts to the human environment, while some resources are anticipated to experience long term and permanent impacts. Table 8 summarizes the impacts of the alternatives on environmental resource areas. Further details on the nature of impacts and affected resources are provided in the Environmental Assessment, Appendix A.

Table 8: Summary of Environmental Impacts

Resource	Alternative 3	Alternative 7	Alternative 8	Nonstructural
Land Use	Approximately 9.6 acres of the study area would be permanently converted to floodway system, including the future OMRR&R corridor.	Approximately 12.3 acres of the study area would be permanently converted to floodway system, including the future OMRR&R corridor.	Approximately 17.4 acres of the study area would be permanently converted to floodway system, including the future OMRR&R corridor.	Thirty structures would be elevated.
Soils	Approximately 4.1 acres of prime farmland soils would be impacted No prime farmland soils would be impacted due to retention basin and channel enlargement construction. Temporary impacts would total 9.1 additional acres.	Approximately 6.8 acres of prime farmland soils would be impacted. Construction related impacts would affect 9.1 additional acres.	Approximately 11.9 acres of prime farmland soils would be impacted. Construction related impacts would affect 7.5 additional acres.	Temporary impacts to soil during construction activities.
Water Resources	Temporary impacts to water quality; hydrology would be changed by increased velocities. Temporary impacts on waters of the U.S. anticipated.	Temporary impacts to water quality; hydrology would be changed by increased velocities. Temporary impacts on waters of the U.S. anticipated.	Temporary impacts to water quality; hydrology would be changed by increased velocities. Temporary impacts on waters of the U.S. anticipated.	No impacts anticipated.
Vegetative Habitat	Minor impacts on disturbed habitats anticipated.	Minor impacts on disturbed habitats anticipated; up to 6.7 acres of urban grassland removed at retention basin sites.	Minor impacts on disturbed habitats anticipated; up to 6.7 acres of urban grassland removed at retention basin sites.	No adverse impacts anticipated.
Fish and Wildlife Resources	Construction-related impacts anticipated.	Construction-related impacts anticipated.	Construction-related impacts anticipated.	Construction-related impacts anticipated.

Resource	Alternative 3	Alternative 7	Alternative 8	Nonstructural
Protected Species and Critical Habitat	No impacts anticipated as no federally protected species or Critical Habitat identified within study area.	No impacts anticipated as no federally protected species or Critical Habitat identified within study area.	No impacts anticipated as no federally protected species or Critical Habitat identified within study area.	No impacts anticipated as no federally protected species or Critical Habitat identified within study area.
Cultural Resources	No impacts anticipated as no cultural resources were identified within construction footprint.	No impacts anticipated as no cultural resources were identified within construction footprint.	No impacts anticipated as no cultural resources were identified within construction footprint.	No impacts anticipated; however, additional evaluation of the structures to be elevated would need to be conducted to determine their historic significance.
Air Quality	Temporary impacts during construction are anticipated.	Temporary impacts during construction are anticipated.	Temporary impacts during construction are anticipated.	Temporary impacts during construction are anticipated; asbestos-containing material (ACM) and lead-based paint (LBP) could be emitted unless proper precautions are implemented.
Noise	Temporary impacts during construction are anticipated.	Temporary impacts during construction are anticipated.	Temporary impacts during construction are anticipated.	Temporary impacts during construction are anticipated.
Aesthetics and Visual Resources	No adverse impacts to aesthetics and visual resources are expected.	No adverse impacts to aesthetics and visual resources are expected.	No adverse impacts to aesthetics and visual resources are expected.	No adverse impacts to aesthetics and visual resources are expected.
Hazardous Materials	Temporary impacts during construction are anticipated.	Temporary impacts during construction are anticipated.	Temporary impacts during construction are anticipated.	Temporary impacts during construction are anticipated; facility condition assessments would need to be conducted to determine presence of ACM, LBP, or other recognized environmental conditions.
Socioeconomics	Construction-related jobs would benefit persons within the study area leading to increases in local employment rates and incomes.	Construction-related jobs would benefit persons within the study area leading to increases in local employment rates and incomes.	Construction-related jobs would benefit persons within the study area leading to increases in local employment rates and incomes.	Construction-related jobs would benefit persons within the study area leading to increases in local employment rates and incomes.
Environmental Justice and Protection of Children	No impacts anticipated.	No impacts anticipated.	No impacts anticipated.	No impacts anticipated.

5.8.2 Hydrology and Hydraulics

The improvements associated with each of the three structural alternatives would increase the efficiency of the flow of water through portions of the coulee located in the study area, resulting in reduced water surface elevations. Greater detail of the results of the H&H analysis can be found in Appendix B.

Table 9 compares water flow and water surface elevation for the 1-percent-chance flood event at two locations along the coulee. See Figure 5 for location of river stations.

Table 9: Water Flow and Elevation Comparison (1-percent-chance flood event)

Alternative	River Station 25239.5		River Station 19015	
	Water Flow (cfs)[a]	Water Surface Elevation (feet)	Water Flow (cfs)[a]	Water Surface Elevation (feet)
Without-Project	1,397.1	40.2	2,063.9	36.0
Alternative 3	1,594.2	38.2	2,964.5	34.3
Alternative 7	1,525.7	38.3	2,655.2	34.8
Alternative 8	1,741.8	38.0	2,749.2	33.9
Nonstructural	1,397.1	40.2	2,063.9	36.0

[a] cfs=cubic feet per second

Each of the three alternatives would result in an increased velocity of water flowing through Carencro in Beau Bassin Coulee. Table 10 displays estimated water velocities for the 1-percent-chance flood event at two locations along the coulee.

Table 10: Water Velocity Comparisons (1-percent-chance flood event)

Alternative	River Station 25239.5	River Station 19015
	Velocity (feet per second)	Velocity (feet per second)
Without-Project	2.3	3.8
Alternative 3	4.8	4.5
Alternative 7	4.1	5.7
Alternative 8	4.4	4.4
Nonstructural	2.3	3.8

The initial hydraulic modeling for the study was conducted using current conditions in the study area and vicinity. This modeling showed that implementing any of the structural alternatives could induce flooding in the residential area downstream of St. Esprit Road, which is outside of the study area. The portion of the coulee located in this residential area is covered with heavy vegetative growth, which restricts the flow of floodwater. The modeling showed that this restriction could result in increased flooding at some residences by over 1 foot for the 1-percent-chance flood event if one of the structural alternatives proposed in this report were implemented. However, as described in Section 5.6.1, the future without-project condition of the coulee is that vegetation and debris will be removed and regular maintenance performed by LCG to provide efficient water flow through the area. Subsequent hydraulic modeling demonstrated that under this future condition there is no induced flooding downstream of St. Esprit Road as a result of the structural alternatives. Table 11 shows the velocity and flow of the coulee at the downstream boundary of the study area for the 1-percent-chance flood event.

Table 11: Velocity and Flow Comparisons at Boundary (1-percent-chance Flood Event)

Alternative	River Station 15482	
	Water Velocity (feet per second)	Water Flow (cubic feet per second)
Without-Project	3.5	2,092
Alternative 3	3.7	3,008
Alternative 7	4.1	2,746
Alternative 8	3.6	2,788
Nonstructural	3.5	2,092

5.8.3 Engineering Costs

The following section presents a summary of the engineering costs that were developed for the structural alternatives. The costs were based on preliminary unit cost estimates and contingencies (Table 12). Greater detail on the cost estimate can be found in Appendix C.

Table 12: Engineering Cost Estimate

CW WBS	Description	Alternative 3	Alternative 7	Alternative 8
09 01 01	Clearing and snagging of exiting channel (Sta 274+33 to 154+80)	$34,364	$10,281	$24,708
09 01 01	Clearing and scalping of Retention Basin areas		$18,460	$18,460
09 01 15 02 01	Load Retention Basin scalped material for hauling		$5,655	$5,655
09 01 15 02 01	Load clear and snag excavated material for hauling	$10,527	$3,149	$7,569
09 01 15 02 01	Hauling of scalped material to landfill disposal site	$67,239	$36,274	$36,274
09 01 15 02 01	Tipping Fee's at landfill disposal site for scalped material	$64,856	$34,840	$34,840
09 01 15 02 01	Tipping Fee's at landfill disposal site for clear and snag material		$19,403	$46,632
09 01 30 02 01	Channel Excavation	$327,180	$59,850	$225,150
09 01 15 02 01	Load channel excavated material for hauling	$49,938	$9,135	$34,365
09 01 15 02 01	Hauling of clean material to disposal site	$318,499	$663,096	$878,527
09 01 15 02 01	Hauling of clear and snag material to landfill disposal site		$20,349	$48,660
09 01 30 02 03	Retention Basin Weir, Imported Fill Material w/Placement & Compaction		$6,202	$6,202
09 01 30 02 01	Retention Basin Excavation plus Connecting Channel		$477,000	$477,000
19 00 18 15 01	Retention Basin Weir Pipe 12" HDPE		$2,364	$2,364
09 01 30 02 07	Gabion Construction - Channel Sta. 274+33 to 227+36	$1,472,400		
09 01 15 02 01	Load Retention Basin excavated material for hauling		$73,140	$73,140
09 01 30 02 06	Install Rip-Rap at Various Locations	$52,400	$1,886	$1,886
19 00 18 15 01	Incidental Drainage Retention Pond Modification	$13,484		
09 01 15 02 01	Additional Costs for Bridge Crossing Interference's	$10,000		
09 01 30 02 12	Erosion Control Planting, After Construction	$163,068	$10,999	$10,999
09 01 99 03 01	Channel Slide Slope Protection w/6" Liner (Wide)		$318,499	$318,499
09 01 99 03 01	Channel Slide Slope Protection w/6" Liner at Retention Pond Weir Location		$53,083	$53,083
09 01 01	Mobilization and Demobilization	$176,000	$138,000	$162,000
	Sub-total Direct Costs for Alternative	2,760,000	1,962,000	2,466,000
31 23 11 01	Contingency	$828,000	$589,000	$740,000
	Sub-total Direct Costs with Contingency	3,588,000	2,551,000	3,206,000
31 23 11 01	Contractors Overheads	$359,000	$255,000	$321,000
31 23 11 01	Contractors Profit	$197,000	$140,000	$176,000
31 23 11 01	Performance Bonds & All-Risk insurance	$104,000	$74,000	$93,000
	Estimated Construction Cost for Alternative, July 2011	4,248,000	3,020,000	3,796,000
30 19 09	Planning	$212,000	$151,000	$190,000
30 23 01	Engineering and Design	$510,000	$362,000	$456,000
31 23 11	Construction Management	$340,000	$242,000	$304,000
	Estimated Project Cost for Alternative, July 2011	5,310,000	3,775,000	4,746,000

5.8.4 National Economic Development

The following section presents the results of the NED economic analysis, which considered the costs and the benefits of each of the alternatives. The costs and benefits were estimated using a 50-year period of analysis and a discount rate of 4 percent. Greater detail on the NED analysis can be found in Appendix D.

Costs

The first costs and average annual costs (AACs) for Alternatives 3, 7, 8, and the nonstructural alternative were estimated for each of the cost categories presented in Sections 4.3 and 4.6. The costs are predominately for excavation of the channel, retention areas, and LERRDs (Table 13). The construction period of the alternatives is anticipated to be less than 1 year; therefore, interest during construction was not included in the estimates.

Table 13: First Costs and Average Annual Costs (in 2011 dollars)

Costs	Alternative 3	Alternative 7	Alternative 8	Nonstructural
Construction	$5,310,000	$3,775,000	$4,746,000	$4,115,800
Real Estate	$1,220,000	$700,000	$1,688,000	$0
Relocation of Utilities	$199,000	$54,000	$54,000	$0
Total First Costs	***$6,729,000***	***$4,529,000***	***$6,488,000***	***$4,115,800***
First Cost – AAC	$313,200	$210,800	$302,000	$191,600
OMRR&R – AAC	$127,000	$55,000	$55,000	$0
Total AAC	***$440,200***	***$265,800***	***$357,000***	***$191,600***

Benefits

The reduction in the water surface elevations of the structural alternatives results in reduced flooding and damage to residential and nonresidential structures. The results show a large reduction in the number of structures damaged when compared to the without-project condition (Table 14). Although it would not lead to a reduction in water surface elevations, the nonstructural alternative would result in 30 structures being permanently elevated out of the 1-percent-chance event floodplain.

Table 14: Structures Damaged with Alternatives Implemented

Chance Flood Event	Number of Structures Inundated				
	WO	Alternative 3	Alternative 7	Alternative 8	Nonstructural
50%	4	0	0	0	0
20%	30	0	1	0	0
10%	40	1	1	1	10
4%	50	4	8	5	20
2%	81	22	31	20	51
1%	112	37	45	33	82
0.4%	143	69	78	55	113
0.2%	154	81	92	77	132

The reduction in the number of structures flooded correlates to a reduction in damage. Table 15 presents the AAD for the with-project alternatives compared to the without-project condition. The damage associated with the with-project alternatives represent the residual risk of flooding in the study area.

Table 15: Average Annual Damage by Category and Alternative

Category	WO	Alternative 3	Alternative 7	Alternative 8	Nonstructural
Structure, Content, and Automobile	$787,100	$201,200	$235,700	$191,200	$565,500
Transportation	$6,800	$600	$900	$500	$6,800
Emergency Response	$17,600	$2,600	$3,900	$2,700	$8,000
Evacuation and Subsistence	$16,600	$2,400	$3,000	$2,200	$7,100
Reoccupation	$47,300	$7,000	$8,900	$6,300	$20,600
Commercial Cleanup and Restoration	$17,100	$2,000	$4,100	$2,200	$6,800
Total	**$892,500**	**$215,800**	**$256,500**	**$205,100**	**$614,800**

Notes: Average annual damage calculated using a 50-year period of analysis and a discount rate of 4 percent. Values are in 2011 dollars.

The economic benefits of an alternative are the reduction in damage when compared to the without-project condition (Table 16).

Table 16: Average Annual Benefits of the Alternatives

Category	Alternative 3	Alternative 7	Alternative 8	Nonstructural
Structure, Content, and Automobile	$585,900	$551,400	$595,900	$221,600
Emergency Response	$15,000	$13,700	$14,900	$9,600
Evacuation and Subsistence	$14,200	$13,600	$14,400	$9,500
Reoccupation	$40,300	$38,400	$41,000	$26,700
Traffic	$6,200	$5,900	$6,300	$0
Commercial Restoration	$15,100	$13,000	$14,900	$10,300
Total	**$676,700**	**$636,000**	**$687,400**	**$277,700**

Notes: Average annual benefits calculated using a 50-year period of analysis and a discount rate of 4 percent. Values are in 2011 dollars.

The economic feasibility of each with-project alternative was determined by comparing the average annual cost to the average annual benefits. If the benefit-to-cost ratio (BCR) was equal to or greater than 1.0, the alternative was considered to be cost effective (Table 17). The economic analysis indicates that all of the with-project alternatives are cost effective.

Table 17: Economic Evaluation of Alternatives

Alternative	Annual Costs	Annual Benefits	Net Benefits	BCR
Alternative 3	$440,200	$676,700	$236,500	1.5
Alternative 7	$265,800	$636,000	$370,200	2.4
Alternative 8	$357,000	$687,400	$330,400	1.9
Nonstructural	$191,600	$277,700	$86,100	1.4

5.8.5 Regional Economic Development

The RED analysis was based on IMPLAN, which used the construction costs presented in Table 13 as inputs to the model. The results of the RED analysis are presented in Table 18, which describes the impacts separately for Lafayette Parish and remaining parishes in Louisiana. The follow information was developed for the RED analysis:

- Employment – estimated worker-years of labor required to build the project
- Labor Income – includes all forms of employment income, including employee compensation (wages and benefits) and proprietor income
- Output – sum total of transactions that take place as a result of the construction project
- Gross Regional Product (GRP) – value-added output of the region, which captures all final goods and services produced in the study area
- Tax Revenue – includes the following state and local taxes and fees: social insurance taxes, corporate profit taxes, dividends taxes, sales taxes, income taxes, fees for motor vehicle licenses, and fees for fishing and hunting licenses, severance taxes, fees for business licenses, documentary and stamp taxes, rents and royalties, special assessments, fines, settlements, and donations

Table 18: Results of RED Analysis

Alternative	Employment	Labor Income	Output	GRP	Tax Revenue
Lafayette Parish					
Alternative 3	80	$3,655,200	$9,691,900	$4,860,000	$304,800
Alternative 7	55	$2,540,600	$6,740,200	$3,376,800	$211,600
Alternative 8	70	$3,185,100	$8,450,100	$4,233,100	$265,200
Nonstructural	60	$2,532,700	$6,802,000	$3,547,400	$240,100
Remaining Parishes in Louisiana					
Alternative 3	10	$324,800	$1,103,800	$567,900	$57,100
Alternative 7	5	$225,900	$767,500	$395,000	$39,700
Alternative 8	7	$283,200	$962,100	$495,200	$49,700
Nonstructural	6	$245,100	$854,800	$424,600	$41,200

Greater detail on the RED analysis can be found in Appendix G.

5.8.6 Other Social Effects

This section presents the results of the OSE analysis, which considered the impacts to the residents and community in the study area resulting from implementation of the alternatives. The three structural with-project alternatives would all result in a reduced potential for flooding in the study area, leading to:

- Risks associated with damage to housing units and other public and commercial structures would be reduced.
- Property values would be at a reduced risk of flood-related depreciation.
- Carencro would be at a lower risk of experiencing reduced tax revenues as a result of continued flooding.
- The social vulnerability of the community would be reduced.
- Carencro's potential for long-term growth and sustainability would be enhanced.
- Carencro would be at a reduced risk of incurring the costs associated with clean-up, debris removal, and building and infrastructure repair as a result of flood events.

Greater detail on the OSE analysis can be found in Appendix H.

5.8.7 Risk and Uncertainty Analysis

Three areas of risk and uncertainty relative to performance, costs, and benefits were reviewed and are described below. Knowing the risks and uncertainties provides an understanding of the degree of reliability that the with-project alternatives would provide.

Planning Assumptions

Several general planning assumptions were made for the without-project and with-project alternatives and for future conditions. The following discussion summarizes the uncertainties associated with these assumptions:

- The Non-Federal Sponsor would perform the proper maintenance activities. Although uncertainty is always associated with future maintenance activities, the Non-Federal Sponsor has a history of performing regular maintenance on portions of the coulee through Carencro. These activities are not anticipated to decrease in the future.
- The Non-Federal Sponsor and LCG would enter into a Cooperative Endeavour Agreement (CEA) that would ensure jurisdictional issues are addressed for project areas outside the boundaries of the City of Carencro and, if required, any statutory land rights are shared between the Non-Federal Sponsor and LCG. Both the Non-Federal Sponsor and LCG have expressed their intent to support one another to implement the project and perform the required maintenance in the study area. Therefore, the uncertainty associated with this assumption is limited.
- LCG would perform the proper maintenance activities downstream of St. Esprit Road. Although uncertainty is always associated with future maintenance activities, LCG has historically conducted an active drainage maintenance program throughout Lafayette Parish in accordance with the parish-wide Master Drainage Plan, and LCG has committed in writing to conduct maintenance in the portion of the coulee downstream of the study area. If the maintenance activities are not performed, the residents downstream of St. Esprit Road would experience increased flooding; however, the study area would not be affected.
- The Non-Federal Sponsor and LCG will enforce existing development regulations. The Non-Federal Sponsor and LCG have implemented land development regulations that require that any increases in impervious surfaces be mitigated through retention basins and other means.

Cost Analysis

The uncertainties in the engineering cost estimates were addressed by the inclusion of contingencies in the final estimates. The contingencies are considered conservative and they are anticipated to be reduced following a detailed analysis. Reducing the contingencies would reduce the overall costs and increase the net benefits.

In compliance with ER 1110-2-1302, Civil Works Cost Engineering, a cost and schedule risk assessment is anticipated to be performed on the TSP during subsequent phases of this study. The purpose of the assessment would be to establish an overall project contingency by

identifying and measuring the cost and schedule impact of project uncertainties with respect to the estimated total project cost.

Benefit Analysis

As part of the economic analysis, an uncertainty analysis was conducted in HEC-FDA for structure, content, and automobile damage. The uncertainty analysis indicates the probability that the net benefits and BCR for each structural alternative would exceed the indicated values at the 75-, 50-, and 25-percent probability of exceedance (Table 19). Greater detail on the specific uncertainties can be found in Appendix D.

Table 19: Uncertainty Analysis

Alternative	Probability of Exceedance					
	Net Benefits			BCR		
	0.75	0.5	0.25	0.75	0.5	0.25
Alternative 3	$128,500	$226,000	$336,900	1.3	1.5	1.8
Alternative 7	$272,200	$361,200	$461,900	2.0	2.4	2.7
Alternative 8	$220,700	$319,700	$432,000	1.6	1.9	2.2

6 TENTATIVELY SELECTED PLAN

The following section discusses selection of the TSP and considerations critical to the decision-making process.

6.1 SELECTION OF THE TENTATIVELY SELECTED PLAN

All of the with-project alternatives (Alternatives 3, 7, and 8, and the nonstructural alternative) would provide a considerable reduction in flood damage in the study area by either reducing the flood levels or elevating at-risk structures. The alternatives would be implemented with relatively little impact to the environment and have no long-term impacts on land uses and infrastructure. Therefore, the alternatives would meet the planning objectives of the study. The with-project alternatives also meet all of the evaluation criteria by being complete, effective, efficient, and acceptable.

Although Alternative 7 did not provide the greatest level of flood damage reduction, it had the greatest net NED benefits of the with-project alternatives. Of the structural alternatives, Alternative 7 would cause the least disruption to the environment. Because Alternative 7 met the objectives and evaluation criteria, and had the greatest net NED benefits, it was identified as the TSP.

6.2 OPTIMIZATION OF THE TENTATIVELY SELECTED PLAN

An optimization analysis was conducted to ensure that the characteristics of Alternative 7 provided the greatest NED benefits. The following summarizes the results of the analysis.

6.2.1 Hydrology and Hydraulics

During the H&H optimization analysis, the following alternative features were evaluated and revised:

- The 7.38-acre retention basin was reduced to 6.79 acres to avoid impacting existing structures and an overhead high-voltage transmission line, resulting in a total wetted retention basin area of approximately 5.4 acres (reduced from 5.7 acres).
- Three options for flow control at the confluence of the Beau Bassin and Gaston Coulees were developed and analyzed for optimum retention;
  - Option 1: No flow control.
  - Option 2: Two 8-foot by 5-foot box culverts and a 50-foot-wide overflow spillway at elevation 34.
  - Option 3: Two 7-foot by 4-foot box culverts and a 70-foot-wide overflow spillway at elevation 33.

  Although the hydraulic analysis showed that additional retention times would be better with a flow control at the outfall, a flow control would have a negative effect upstream of the basin along Gaston Coulee.
- The 1.67-acre retention basin would not significantly reduce water levels in the Beau Bassin Coulee because of the small storage area. Therefore, the 1.67-acre retention basin was removed as a measure of Alternative 7. Removing the retention basin under

the optimized Alternative 7 eliminated the need for a relocation of the sewer force main.

6.2.2 Engineering Costs

The three flow options evaluated in the H&H analysis above would only change the flow control at the outfall. The options are not significantly different from each other from an engineering perspective; therefore, the construction cost for the three outflow options were considered to be the same. The cost estimates presented in Section 5.8.3 and Table 13 were used for the optimization analysis. Although removing of the1.67-acre retention basin from consideration would change the overall cost of Alternative 7, it would impact all of the options equally. Therefore, not accounting for a change in the cost estimates would not change the results for identifying the option with the greatest NED benefits.

6.2.3 National Economic Development

The three flow control options for Alternative 7 were evaluated in HEC-FDA. Flood damage and costs considered in the economic analysis include damage to structures and contents, damage to automobiles, increased travel costs associated with road flooding, increased emergency response expenditures, evacuation and subsistence expenditures, reoccupation costs, and costs for commercial cleanup and restoration. The analysis found that Option 1 has the highest annual net NED benefits. The results are shown in Table 20.

Table 20: Summary of Economic Evaluation for Alternative 7

Alternative	Average Annual Costs	Average Annual Benefits	Annual Net NED Benefits	BCR
Option 1	$265,800	$643,300	$377,500	2.4
Option 2	$265,800	$628,400	$362,600	2.4
Option 3	$265,800	$628,000	$362,200	2.4

Six nonstructural components were evaluated in combination with Option 1 to see if adding a nonstructural measure to the TSP would increase net NED benefits. The nonstructural components included either acquisition and demolition or elevation of flood-prone structures in the study area. HEC-FDA output for the three flow control options was used to determine which structures would be flooded above the first floor at the 20-percent, 10-percent, and 4-percent-chance flood event. For the acquisition alternatives, the structures with flooding at each event were assumed to be removed from the study area completely. Automobiles associated with an acquired residential structure were assumed to be removed from the area as well. For the elevation nonstructural alternatives, the structures with flooding at each event were assumed to be raised 1 foot above the 1-percent-chance flood event. However, including a nonstructural measure was found not to be cost effective.

Because the nonstructural measure did not increase net NED benefits, Option 1 of Alternative 7 is considered the optimized TSP.

6.3 DESCRIPTION OF THE TENTATIVELY SELECTED PLAN

Refinements were made to Alternative 7 during the optimization process. The following is the final description of Alternative 7 as the TSP. Alternative 7 will be referred to as Alternative 7 (optimized) for the remainder of this document.

6.3.1 Description of Features

Alternative 7 (optimized) consists of a combination of two measures: CG&D of approximately 12,000 feet of Beau Bassin Coulee from the upstream crossing of the SPRR to St. Esprit Road, and the construction of a retention basin at the confluence of the Beau Bassin and Gaston Coulees (Figure 18).

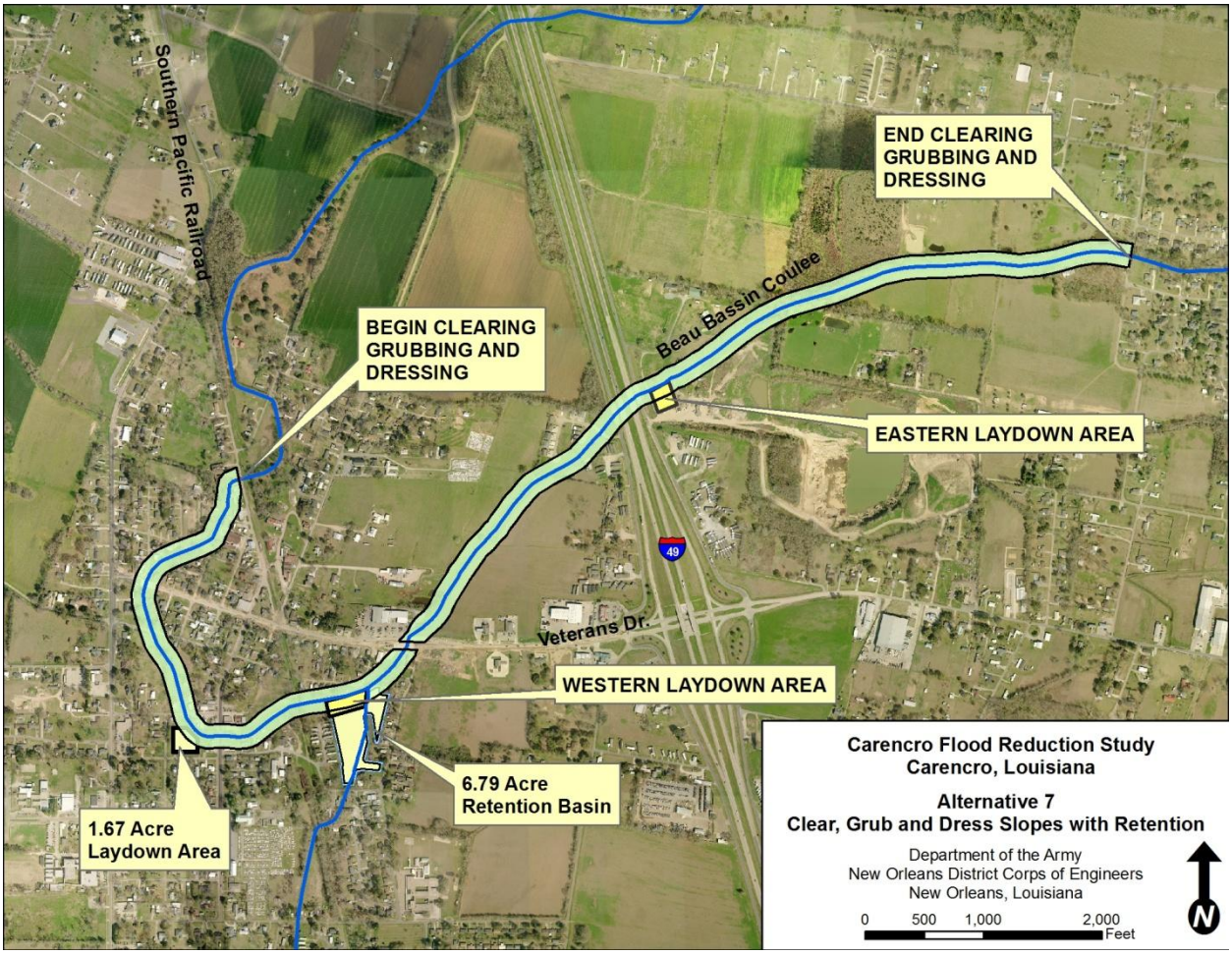

Figure 18: Tentatively Selected Plan

The CG&D activities would include clearing and removal of trees, brush, and accumulated snags and other debris. Grubbing and dressing of the channel would remove vegetation roots, stumps, and debris just below the subsurface to smooth the ground surface within the existing channel to further improve the flow of water through the coulee. The 10-foot easements on the bank would be used by laborers to clear woody vegetation, trees, logs, and debris in the channel. A small to medium excavator would also be used from the bank for

grubbing larger trees, roots, stumps, and debris. The materials collected from clearing and grubbing would be hauled to a nearby landfill for disposal. Figure 12 illustrates the results of the CG&D activities. The configuration of the existing coulee would not significantly change as a result of CG&D.

Alternative 7 (optimized) would also provide a retention basin near the confluence of Beau Bassin Coulee and Gaston Coulee (Figure 19), with the following features:

- The 6.79-acre retention basin would be approximately 6 feet deep and have a total wetted area of approximately 5.4 acres.
- A 2-foot-deep channel through the middle of the retention basin would allow for flow through the Gaston Coulee during low-flow periods.
- A lateral weir structure would be constructed along Gaston Coulee for overflow into the retention basin during high flows.
- Retention storage would begin at an elevation of 30 feet.
- A 50-foot-wide overflow weir at an elevation of 34.5 feet would connect Beau Bassin Coulee to the retention basin to allow the retention basin to operate as an offline storage area during high-flow events.
- The retention storage volume at an elevation of 34.5 feet would be 22.5 acre-feet.
- The total storage capacity at the top of retention basin—an elevation of 36 feet—would be 30 acre-feet.
- No flow controls would be placed on the retention basin outfall.
- No fencing would be required around the retention basin because of the low slope and the normally dry basin.

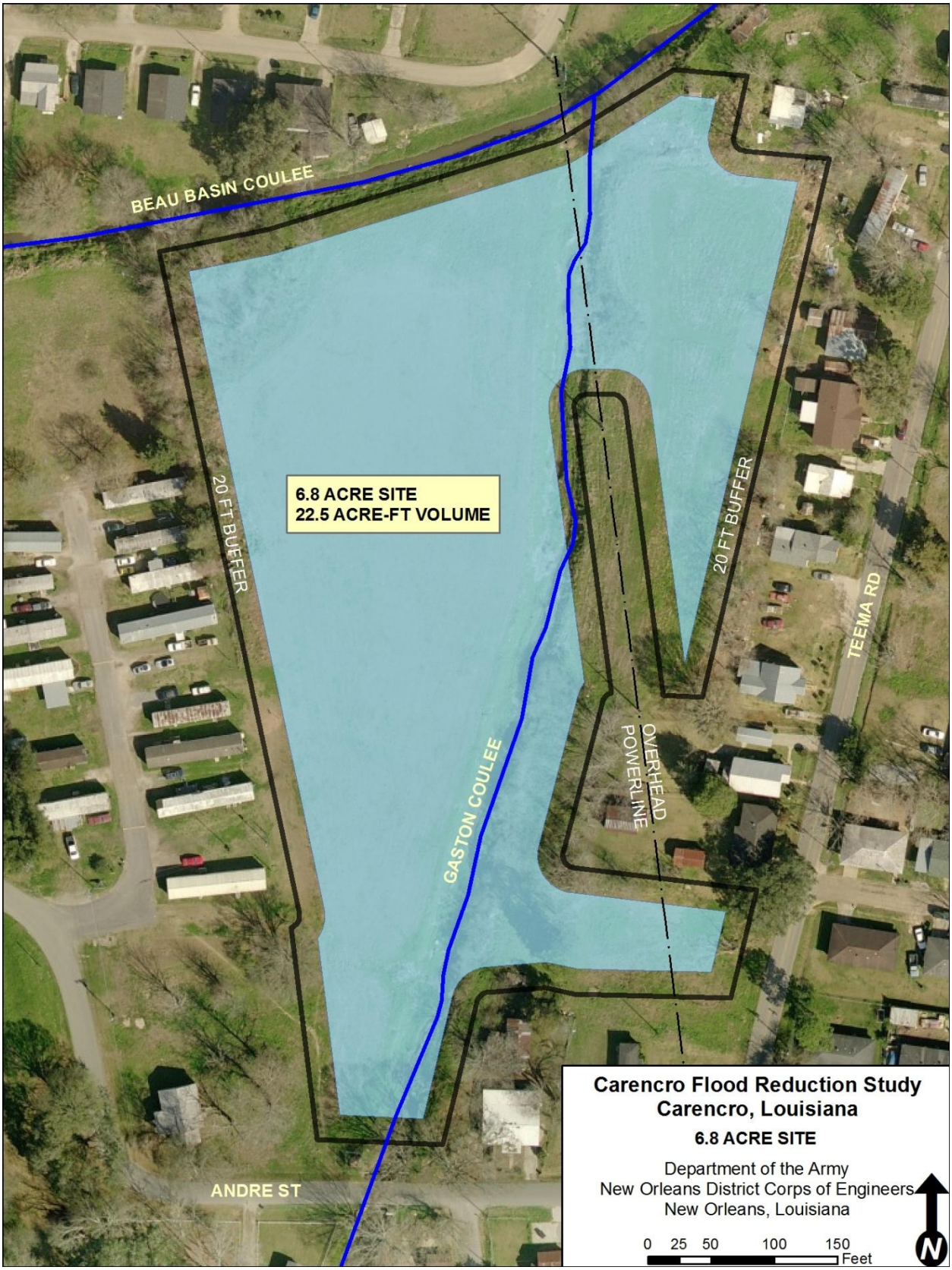

Figure 19: Boundaries of 6.79-Acre Retention Basin

6.3.2 Lands, Easements, Rights-of-Way, Relocations, and/or Disposal Areas

During project development, Alternative 7 (optimized) would require three laydown/equipment storage/staging areas—one area on the east side of I-49 and two on the west side. On the east side, a laydown area and associated access route as shown in Figure 10 would be used. One of the laydown areas on the western side of I-49 would be located at the confluence of the Beau Bassin Coulee and Gaston Coulee (Figure 11) and be within the boundaries of the 6.79-acre retention basin. The other laydown area (Figure 20) on the west side of I-49 would be on the land previously identified for the 1.67-acre retention basin. This site would be accessed directly from St. Charles Street.

Figure 20: 1.67-Acre Laydown Area

Alternative 7 (optimized) would not alter the footprint of the existing coulee and the work activities would be classified as major maintenance. Therefore, an existing statutory right-of-way along the coulee would be used for implementation and maintenance. The locations of the proposed retention basin and two laydown areas west of I-49 are on land owned by the City of Carencro (Non-Federal Sponsor); no new land would need to be acquired. However, the Non-Federal Sponsor would need to obtain a temporary construction easement for the eastern laydown area. Disposal fees for excavated soil and debris are classified as a LERRD.

6.3.3 Operation, Maintenance, Repair, Replacement, and Rehabilitation

The OMRR&R of Beau Bassin Coulee and the retention basin would require the Non-Federal Sponsor to conduct annual inspections and make necessary repairs and/or replacement of project features in addition to the routine channel maintenance of removing vegetation and debris from the coulee. The estimated annual repairs, replacement and rehabilitation may consist of installing side slope protection such as: rip-rap, geotextile fabric, and hydroseeding as a result of erosion. The average annual cost for OMRR&R is estimated to be $55,000. The following summarizes the OMRR&R items:

- Repair/replace 2,500 square feet of flexible channel side slope protection liner
- Repair/replace 73 square yards of geotextile fabric for riprap
- Repair/replace 11 cubic yards of bedding sand for riprap
- Repair/replace 55 cubic yards of riprap
- Repair/replace 10,000 square feet of hydroseeding
- Herbicide application
- Mowing retention basin
- Remove channel debris as needed

6.3.4 Hydrology and Hydraulics

Alternative 7 (optimized) would provide significant water level reductions within the study area. This reduction in water levels is especially evident for the more frequent events, such as the 4-percent-chance flood event (Figure 21). However, the water level reductions would not be as evident for the less frequent events, such as the 1-percent-chance flood event (Figure 22).

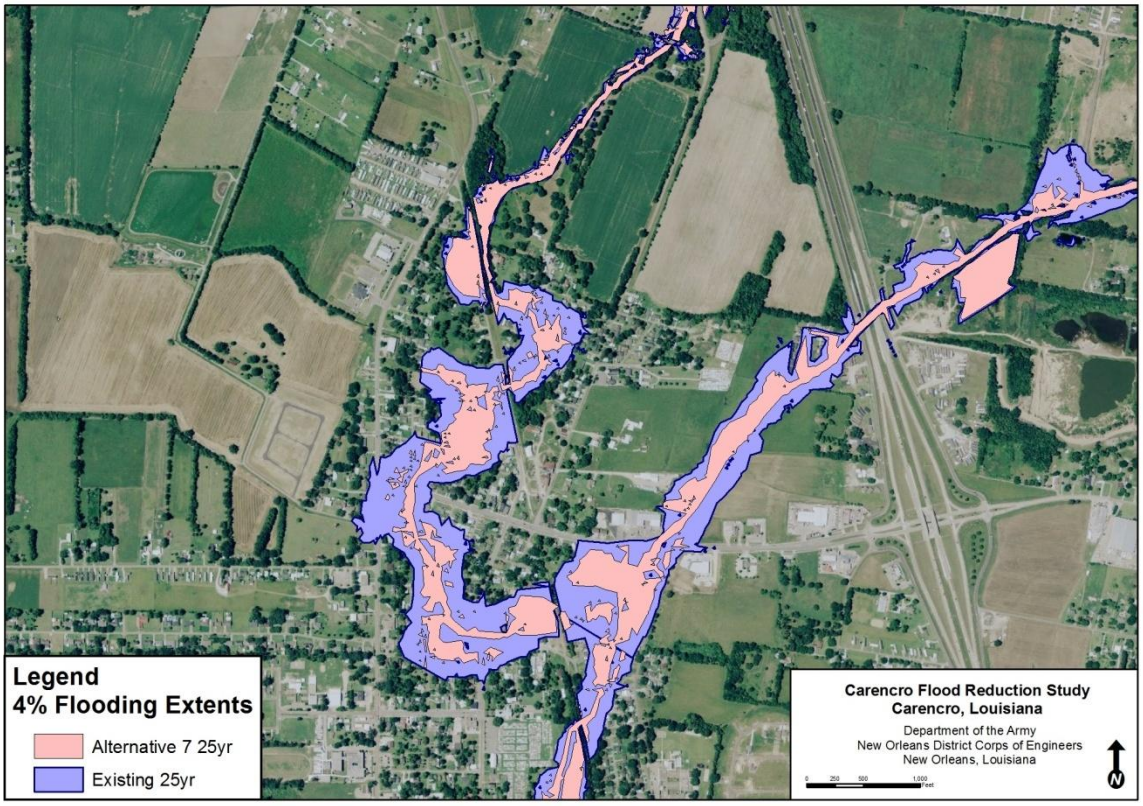

Figure 21: Impact of Alternative 7 for the 4-Percent-Chance Flood Event

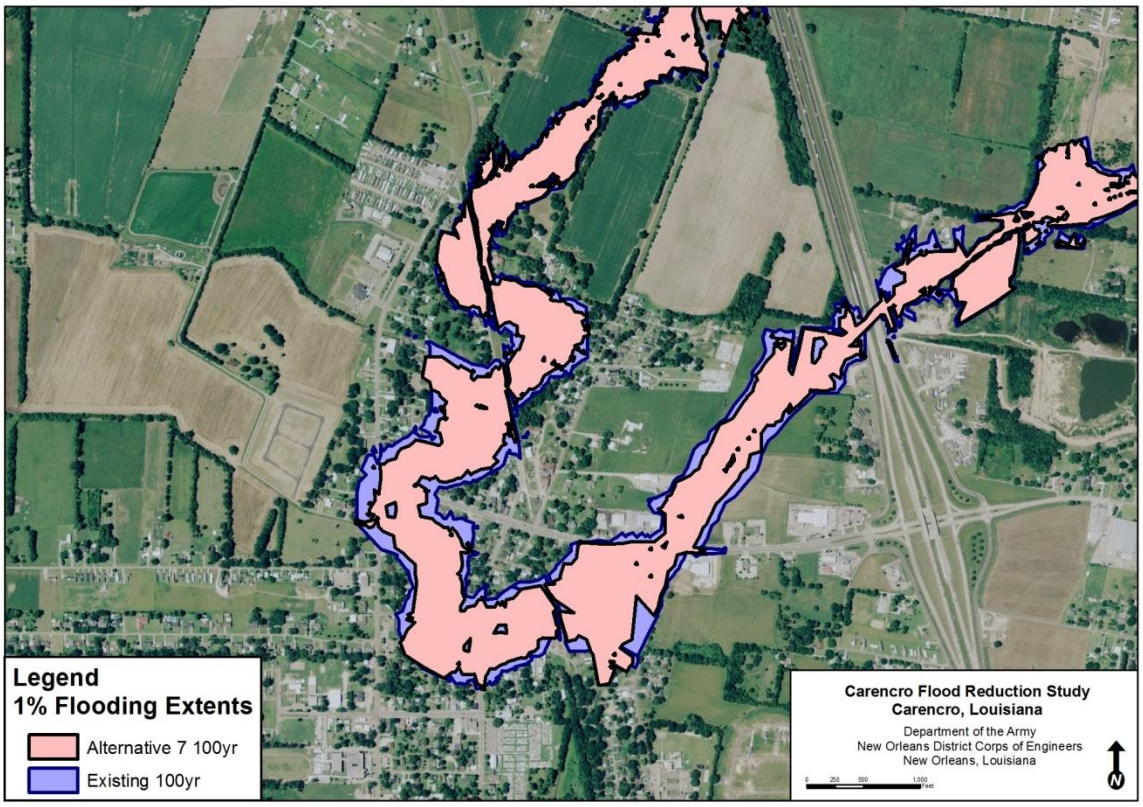

Figure 22: Impact of Alternative 7 for the 1-Percent-Chance Flood Event

6.3.5 Environmental

The environmental impacts of Alternative 7 (optimized) are anticipated to be similar to those presented in Section 5.8.1. Additional details can be found in Appendix A.

6.3.6 Engineering Costs

A construction cost was developed for the TSP using MCACES, TRACES MII Version 4.1. The construction cost estimate for Alternative 7 (optimized) is $3,213,128. The total cost of Alternative 7 (optimized) would be approximately $5,000,000 when PED and construction management are included. The level of detail for the cost estimates is consistent with the level of design. The costs take into consideration revised contingencies, which are based on a risk-based analysis. Table 21 summarizes the results of the analysis. Detailed information regarding the cost estimate can be found in Appendix C.

Table 21: Engineering Cost Estimate

Description	Alternative 7 (optimized)
Mobilization and Demobilization	$13,000
Clear, Snag and Dress Channel	$1,066,000
Retention Basin	$778,000
Bank Stabilization	$235,000
Sub-total Direct Costs for Alternative	**$2,092,000**
Contingency	$789,000
Sub-total Direct Costs with Contingency	**$2,881,000**
LERRDs	$670,000
PED	$1,080,000
Construction Management	$369,000
Estimated Project Cost for Alternative, July 2011	**$5,000,000**

Note: Values rounded
LERRDs = lands, easements, rights-of-way, relocation, and disposal areas

6.3.7 National Economic Development

The NED analysis was updated using the revised cost estimate for Alternative 7 (optimized). The analysis took into consideration damage to structures and contents, damage to automobiles, increased travel costs associated with road flooding, increased emergency response expenditures, evacuation and subsistence expenditures, reoccupation costs, and costs for commercial cleanup and restoration. The results are shown in Table 22.

Table 22: Summary of Economic Evaluation for Alternative 7 (Optimized)

Alternative	Average Annual Costs	Average Annual Benefits	Annual Net NED Benefits	BCR
Alternative 7 (Optimized)	$287,800	$643,300	$355,600	2.2

Table 23 shows the number of structures damaged at each frequency flood event for Alternative 7 (optimized). The numbers of structures damaged were determined using HEC-FDA output and include the number of the structures with flooding above the FFE.

Table 23: Structures Damaged at Each Frequency Flood Event for Alternative 7 (Optimized)

Chance Flood Event	Number of Structures Damaged
50%	0
20%	0
10%	3
4%	8
2%	29
1%	44
0.40%	66
0.20%	82

6.3.8 Regional Economic Development

A detailed RED analysis was not conducted for the TSP, although it is expected that the impacts of Alternative 7 (optimized) would be slightly greater than those presented for Alternative 7 in Table 18. Greater detail on the RED analysis can be found in Section 5.8.5 and Appendix G.

6.3.9 Other Social Effects

The OSE impacts to the residents and communities in the study area for Alternative 7 (optimized) would be the same as those presented in Section 5.8.6. Alternative 7 (optimized) would result in a reduced potential for flooding in the study area, leading to:

- The risks associated with damage to housing units and other public and commercial structures would be reduced.
- Property values would be at a reduced risk of flood-related depreciation.
- Carencro would be at a lower risk of experiencing reduced tax revenues as a result of continued flooding.
- The social vulnerability of the community would be reduced.
- Carencro's potential for long-term growth and sustainability would be enhanced.
- Carencro would be at a reduced risk of incurring the costs associated with cleanup, debris removal, and building and infrastructure repair as a result of flood events.

More detail on the OSE analysis can be found in Appendix H.

6.4 COST APPORTIONMENT

The cost of implementing a project is restricted by the limits of the Continuing Authorities Program. Section 205 of the Flood Control Act of 1948 places a limit on Federal funding for a project at $7 million. Under the Continuing Authorities Program, the Non-Federal Sponsor share of project implementation cost is a minimum of 35 percent up to a maximum of 50 percent, with a required 5-percent cash contribution. The implementation costs include LERRDs provided by the Non-Federal Sponsor, the cost of which is creditable against the non-Federal share. The Non-Federal Sponsor is responsible for all OMRR&R costs associated with an implemented project.

The cost for Alternative 7 (optimized) is less than the total allowable project cost under the Continuing Authority Program and is eligible for funding under the program. The construction of Alternative 7 (optimized) is estimated to cost $5,000,000, with a LERRDs cost of $670,000, and an annual OMRR&R cost of $55,000 (Table 24). The Non-Federal Sponsor would be responsible the for the OMRR&R costs.

Table 24: Cost Apportionment for the Tentatively Selected Plan

Category	Federal Share	Non-Federal Share
Construction	$2,263,150	$617,850
PED	$702,000	$378,000
Construction Management	$239,850	$129,150
LERRDs	$0	$670,000
Total First Costs	$3,250,000	$1,750,000*
Effective Percentage Share	65%	35%

LERRDs = lands, easements, rights-of-way, relocation, and disposal areas
* Includes a required 5 percent cash contribution of $250,000
Note: Costs are presented in 2011 dollars, 4% discount rate.

6.5 COOPERATIVE ENDEAVOUR AGREEMENT

Certain portions of the project extend beyond the limits of the City of Carencro. Consequently, as the City intends to act as the sole Non-Federal Sponsor, the City and LCG would need to enter into a Cooperative Endeavor Agreement (CEA) for purposes of jurisdiction for the project areas which are located outside of the municipal boundaries of the City of Carencro, and to ensure that the City has the servitudes in and along the banks of the coulee which are required for the implementation and performance of the project and also for the subsequent operation, maintenance, repair, replacement, and rehabilitation of the project. In a memo dated 26 August 2011, LCG acknowledged that it plans to perform maintenance clearing and snagging on portions of the channel downstream of St. Esprit Road. Furthermore, LCG acknowledges that this work will be performed independently of the City of Carencro, Lafayette Parish, Louisiana, Continuing Authorities Program Section 205 Feasibility Study. The City of Carencro and LCG are both aware that project construction cannot commence until downstream maintenance has occurred.

The terms of the CEA must not violate the provisions of Article 7, Section 14 of the Louisiana Constitution of 1974, which prohibits political subdivisions of the State from using donating, granting, or pledging its funds to pay for improvements to property that is outside of its corporate limits unless certain conditions are met. Louisiana law requires that, when expending City funds for a flood risk management project beyond its corporate limits, the City of Carencro must demonstrate that: (1) the expenditure is for a legitimate public purpose of the City of Carencro; (2) the transaction is looked at as a whole and does not appear to be gratuitous on its face; (3) the use of the funds by the City of Carencro is mandated by a legal obligation or duty and can be accomplished by legal means; (4) the City of Carencro has a reasonable expectation of receiving and would receive a substantial and direct benefit in return and the benefit is equivalent to the value of the funds expended; (5) the City of Carencro's expectations of receiving the benefit are evidenced by contractual obligations imposed on the recipient of the funds; and (6) that the City of Carencro's use of the funds is not a violation of the restriction against the donation of funds under the State constitution.

6.6 PUBLIC REVIEW OF DRAFT DOCUMENT

The Draft Feasibility Report is available to public, local, State, and Federal agencies, local interests, as well as other interested parties to review for 30 days. The report is available at the public library in Carencro, and on the USACE New Orleans District Web site. A public meeting will be held in Carencro to obtain public input during the comment period. The following agencies, as well as other interested parties, have received copies of the Draft Feasibility Report:

- City of Carencro
- LCG
- U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS)
- U.S. Environmental Protection Agency, Region VI
- NRCS, State Conservationist
- Advisory Council on Historic Preservation
- LDWF
- Louisiana Department of Environmental Quality
- Louisiana State Historical Preservation Office
- Louisiana Department of Transportation and Development

6.7 AGENCY COORDINATION

The formulation of the project was coordinated with the USFWS as well as other interested local, State, and Federal agencies. A letter requesting any comments on the project will be sent to all interested agencies. The letter, as well as other letters from various resource agencies supporting the project, is included in the EA.

Interested Federal agencies and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

6.8 PROJECT PARTNERSHIP AGREEMENT AND ITEMS OF NON-FEDERAL RESPONSIBILITY

Prior to commencement of construction, the Non-Federal Sponsor must enter into a binding agreement, the Project Partnership Agreement (PPA), with the Government to provide a commitment of its cooperation. The PPA is an agreement setting forth the obligations of each party. The Non-Federal Sponsor (City of Carencro) for this Project is in basic agreement with the Continuing Authorities Program 205 Model PPA requirements. Local interests must agree to meet the requirements for non-Federal responsibilities, as summarized below and in future legal documents:

- Comply with Section 221 of PL 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, PL 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the

Non-Federal Sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element.

- Provide the non-Federal share of the costs equal to 35 percent of the total project costs (cost to conduct the study, prepare plans and specifications, and construct the modification) during the design and implementation period. The Non-Federal Sponsor has provided a Self-Certification of Financial Capability.
- Do not use funds from other Federal programs, including any non-Federal contribution required as a matching share, to meet the non-Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that the expenditure of such funds for such purpose is authorized.
- Participate in the Project Coordination Team.
- Provide all lands, easements, right-of-way, relocations, and suitable borrow and dredged or excavated material disposal areas required for the project modification.
- Provide 100 percent of all design and construction costs associated with project betterments.
- Operate, maintain, repair, replace, and rehabilitate the project after completion in accordance with procedures prescribed by the USACE.
- Give the Government a right to enter, at reasonable times and in a reasonable manner, property that the local sponsor owns or controls for access to the project for the purpose of inspecting, completing, operating, maintaining, repairing, replacing, or rehabilitating the project.
- Hold and save the United States free from all damages arising for the construction and OMRR&R of the project and any project-related betterments, except for damages due to the fault or negligence of the United States or its contractors.
- Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, PL 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (PL 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way and performing relocations for construction, operation, and maintenance of the project; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.
- Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under CERCLA that may exist in, on, or under lands, easements or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the Non-Federal Sponsor with prior specific written direction, in which case the Non-Federal Sponsor shall perform such investigations in accordance with such written direction. The Non-Federal Sponsor shall be responsibility for all necessary cleanup and response costs of any CERCLA-regulated materials located in, on, or

under lands, easements, or rights-of-way that the Government determines necessary for the construction, operation, or maintenance of the project.

- Agree, as between the Federal Government and the Non-Federal Sponsor, that the Non-Federal Sponsor shall be considered the operator of the project for the purpose of CERCLA liability and, to the maximum extent practicable, agree to operate, maintain, repair, replace, and rehabilitate the project and otherwise perform its obligations in a manner that will not cause liability to arise under CERCLA.
- Comply with all applicable Federal and State laws and regulations, including Section 601 of the Civil Rights Act of 1964, PL 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."
- Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence is required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 CFR Section 33.20.
- Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might interfere with the proper functioning of the project, hinder operation and maintenance, or reduce the benefits of the project.

6.9 SCHEDULE

The tentative schedule for project completion is as follows:

Report Approval	Spring 2012
Start of Engineering & Design	Fall 2012
Construction Start	Spring 2013
Construction Complete	Winter 2013

This schedule is dependent on the availability of additional Federal and non-Federal funds and is subject to change.

6.10 VIEWS OF THE NON-FEDERAL SPONSOR

The Non-Federal Sponsor, the City of Carencro, supports the project, has signed a Letter of Intent dated 15 November 2011 (see Appendix I), and has expressed its intent to sign a Section 205 model PPA to proceed with the project. The Non-Federal Sponsor has also provided a Self-Certification of Financial Capability.

6.11 CONCURRENCE WITH ENVIRONMENTAL OPERATING PRINCIPLES

In 2002, the USACE reaffirmed its long-standing commitment to environmental conservation by formalizing a set of Environmental Operating Principles applicable to decision-making in all programs. The principles are consistent with NEPA; the Department of the Army's Environmental Strategy with its four pillars of prevention, compliance, restoration, and conservation; other environmental statutes; and the Water Resources Development Act, which all govern USACE activities. The Environmental Operating Principles inform the plan formulation process and are integrated into all proposed program and project management processes.

The Environmental Operating Principles are as follows:

1. Strive to achieve environmental sustainability, and recognize that an environment maintained in a healthy, diverse, and sustainable condition is necessary to support life.
2. Recognize the interdependence of life and the physical environment, and proactively consider environmental consequences of USACE programs and act accordingly in all appropriate circumstances.
3. Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another.
4. Continue to accept corporate responsibility and accountability under the law for activities and decisions under our control that impact human health and welfare and the continued viability of natural systems.
5. Seek ways and means to assess and mitigate cumulative impacts to the environment and bring systems approaches to the full lifecycle of our processes and work.
6. Build and share an integrated scientific, economic, and social knowledge base that supports a greater understanding of the environment and impacts of our work.
7. Respect the views of individuals and groups interested in USACE activities, listen to them actively, and learn from their perspective in the search to find innovative win-win solutions to the Nation's problems that also protect and enhance the environment.

Ecosystem sustainability and diversity have been incorporated throughout the study and have guided the plan development, evaluation, and selection processes (Principle 1). Recognizing that there could be potential impacts from an action to reduce flood damage in Carencro, an EA was completed as part of this study (Principle 2). No significant concerns were identified for Alternative 7, as described in the EA (Appendix A).

Alternative 7 balances both the needs of the human activities and the natural system by minimizing impacts to the environment, such as by conducting activities on previously disturbed lands and causing no long-term impacts to the environment (Principle 3). Although some environmental alterations to the existing stream would be required, the impacts would be kept small and would not affect the long-term functioning of the environmental systems that currently exist (Principle 4). Because of the efforts to reduce the environmental impacts, the cumulative impacts of implementing Alternative 7 would be minimal and would not require mitigation activities (Principle 5). The knowledge gained by the activities conducted for this study is presented throughout this report and associated appendices (Principle 6).

Throughout the study, the Non-Federal Sponsor has been actively involved in the collection of data, the formulation of alternatives, and the preparation of this report. The views of the local sponsor were given considerable weight in the plan formulation and alternative evaluation process, leading to a solution that meets all of the planning objectives (Principle 7).

6.12 CONTRIBUTION TO THE USACE CAMPAIGN PLAN

The USACE has developed a Campaign Plan with a mission to "provide vital public engineering services in peace and war to strengthen our Nation's security, energize the economy, and reduce risk from disasters." This Campaign Plan is shaping USACE command priorities, focusing transformation initiatives, measuring and guiding progress, and helping the USACE adapt to the needs of the future.

The following summarizes the 2011 USACE Campaign Plan goals and objectives:

- Goal 1: Deliver USACE support to combat, stability, and disaster operations through forward-deployed and reach-back capabilities.
  - Objective 1a: USACE is ready, responsive, and reliable in delivering high-performance, all-hazard, contingency mission execution in a worldwide theater of operations.
  - Objective 1b: Prepare Theater Engineer Commands to support Combatant Commanders throughout the spectrum of operations.
  - Objective 1c: Establish human resources and family support programs that promote readiness and quality of life.
  - Objective 1d: Institutionalize USACE capabilities in interagency policy and doctrine.
- Goal 2: Deliver enduring and essential water resource solutions through collaboration with partners and stakeholders.
  - Objective 2a: Deliver integrated, sustainable, water resources solutions.
  - Objective 2b: Implement collaborative approaches to effectively solve water resource problems.
  - Objective 2c: Implement streamlined and transparent regulatory processes to sustain aquatic resources.
  - Objective 2d: Enable Gulf Coast recovery.
- Goal 3: Deliver innovative, resilient, sustainable solutions to the Armed Forces and the Nation.
  - Objective 3a: Deliver sustainable infrastructure via consistent and effective military construction and real estate support to customers.
  - Objective 3b: Improve resilience and lifecycle investment in critical infrastructure.
  - Objective 3c: Deliver reliable infrastructure using a risk-informed asset management strategy.

- Objective 3d: Develop and apply innovative approaches to delivering quality infrastructure.

- Goal 4: Build and cultivate a competent, disciplined, and resilient team equipped to deliver high-quality solutions.
  - Objective 4a: Identify, develop, maintain, and strengthen technical competencies in selected Communities of Practice.
  - Objective 4b: Communicate strategically and transparently.
  - Objective 4c: Standardize business processes.
  - Objective 4d: Establish tools and systems to get the right people in the right jobs, then develop and retain this highly skilled workforce.

Implementation of Alternative 7 would address two goals of the 2011 USACE Campaign Plan. The second goal of the USACE Campaign Plan would be met by providing integrated water resources solutions for flood risk management through a collaborative process with the local stakeholder. This project also addresses the third goal through the application of the planning process to formulate, analyze, and evaluate alternative designs in pursuit of a sustainable and cost-effective flood risk management alternative.

APPENDIX A

ENVIRONMENTAL ASSESSMENT
CITY OF CARENCRO, LAFAYETTE PARISH, LOUISIANA
CONTINUING AUTHORITIES PROGRAM
SECTION 205 FEASIBILITY STUDY

US Army Corps of Engineers®

Prepared for:
U.S. Army Corps of Engineers
New Orleans District
New Orleans, Louisiana

DRAFT FINDING OF NO SIGNIFICANT IMPACT
CITY OF CARENCRO, LAFAYETTE PARISH, LOUISIANA
CONTINUING AUTHORITIES PROGRAM
SECTION 205 FEASIBILITY STUDY

Pursuant to the Council on Environmental Quality (CEQ) Regulations (40 CPR Parts 1500-1508) for implementing the procedural provisions of the National Environmental Policy Act (NEPA) 42 U.S.C.4 321 et seq. and U.S. Army Corps of Engineers (USACE) Engineer Regulation(ER) 200-2-2 (33 CFR 230 et seq.), the USACE New Orleans District (CEMVN) conducted an environmental assessment (EA) of the potential environmental, socioeconomic, and cultural resource effects of proposed flood risk reduction measures along the Beau Bassin Coulee in Carencro, Lafayette Parish, Louisiana. The purpose of the TSP is to reduce the flood risk and related flood damages within the City of Carencro. The need for the TSP is to provide sufficient flood conveyance within Beau Bassin Coulee within the City of Carencro.

Tentatively Selected Plan: The Tentatively Selected Plan (TSP) consists of clearing, grubbing, and dressing approximately 12,000 feet of Beau Bassin Coulee and installing a retention basin on a 7-acre site owned by the City of Carencro. No change to the configuration of the existing channel would occur as a result of the clearing, grubbing, and dressing. A 10-foot-wide work area would be used on each side of the channel during clearing, grubbing, and dressing and for future operation, maintenance, repair, replacement, and rehabilitation (OMRR&R). The retention basin would provide a total storage capacity of approximately 22.5 acre-feet. It would encompass about 5.47 wetted acres and be approximately 6 feet deep. The proposed retention basin would be located on an upland parcel that is currently maintained grassland.

Three laydown areas would be used for equipment storage and staging of materials during construction. The first laydown area is east of Interstate 49 (I-49) on privately owned land and will require the City of Carencro to obtain a temporary work easement. The second laydown yard is west of I-49 and is located on the 7-acre area owned by the City of Carencro that will be used to construct the retention basin. The third area would be located on a 1.67-acre site west of the proposed retention basin. This site is a previously disturbed, upland parcel owned by the City of Carencro. These three sites would be points of access to the east and west sides of the project area during construction. No additional access roads to the coulee would be necessary; public roads will be used to access the coulee at various locations, however. This alternative would reduce the flood water level by an average of 1.9 feet and would cost approximately $5,000,000.

Alternatives: Three other action alternatives, in addition to the No Action Alternative, were carried forward for analysis in the EA.

The No Action Alternative would not satisfy the purpose and need, but was evaluated as required by CEQ and formed the baseline for comparison purposes of the action alternatives. Under the No Action Alternative, CEMVN would not participate in any measures to improve the flood conveyance along the Beau Bassin Coulee and reduce the flood risks to the City of Carencro. The City of Carencro and Lafayette Parish, however, would continue to maintain the channel, including reaches downstream of the TSP, as funding becomes available.

Alternative 3 consists of two different types of channel improvements: stream bank stabilization using gabion baskets, and earthen channel enlargements. Stream bank stabilization would extend for a length of approximately 4,697 feet of gabion-lined trapezoidal canal. The channel width in this section would be 10 feet at the bottom of the channel, sloping upward at a 1.5:1 slope, to an average 40 feet wide at the top of the channel. The enlarged earthen channel section would extend for approximately 7,193 feet long. The enlarged earthen channel width would be 10 feet at the bottom of the channel, sloping upward at a 1:3 slope, to 70 feet wide at the top of the channel. A 10-foot-wide permanent easement would be necessary on each side of the channel for construction and post-construction OMRR&R along the entire construction corridor. The three laydown yards described for the TSP would be used under this alternative as well. This alternative would reduce the flood water level by an average of 2.4 feet and would cost approximately $6.73 million.

Alternative 8 would involve a variety of measures, including clearing, grubbing, and dressing, channel enlargement, and two retention basins. Clearing, grubbing, and dressing would extend for approximately 4,697 feet, and the channel enlargement would extend for 7,193 feet. The clearing, grubbing, and dressing would not change the configuration of the stream channel. The enlarged earthen channel section would be the same as discussed in Alternative 3. In addition, this alternative would include two retention basins, one located as described for the TSP and a second smaller retention basin constructed on the 1.67-acre westernmost laydown area. The other two laydown areas and the 10-foot-wide construction/OMRR&R easement under this alternative would be the same as the TSP. This alternative would reduce the flood water level by an average of 2.5 feet and would cost approximately $6.49 million.

The Nonstructural Alternative includes the elevation of approximately 30 houses, buildings, and other structures within the 20-percent-chance floodplain of the project area. These measures would not influence the hydraulics or hydrology of the area and would not reduce the frequency or depth of flooding along the stream; however, it would reduce total value of damages during significant flood events.

Environmental Consequences: Under the TSP, approximately 6.8 acres of soils would be permanently impacted due to the construction of the retention basin. Up to an additional 9.1 acres of soils would be temporarily impacted along the 10-foot-wide construction corridor and the three laydown areas. These impacts would occur sporadically over the life of the project due to OMRR&R activities. Impacts on wildlife populations and habitats would be minor due to the low quality of native habitats and the urban/developed conditions along the coulee. Impacts on fisheries and water quality would be short-term and minor, since the majority of the clearing, grubbing, and dressing activities would occur along the banks and the aquatic habitat that is present is of very low quality. Likewise, temporary impacts on waters of the U.S. would occur during the clearing, grubbing, and dressing activities; no jurisdictional wetlands would be impacted, however. Temporary impacts would occur on ambient noise levels and air quality during the construction activities and any future OMRR&R activities. Traffic in the Carencro area would be indirectly and temporarily affected by the additional traffic on local streets and state highways due to construction workers and construction vehicles. No impacts on cultural resources, recreational opportunities, or aesthetics would occur, and no hazardous waste sites would be expected to be encountered during the implementation of the TSP.

Socioeconomic conditions would be benefited in the long term by reduced flood risks, which could increase property values and taxes. Short-term benefits would be incurred due to local expenditures and possibly increased employment during the construction period. The effects under the TSP would equally affect all population groups in the project area and, therefore, would not result in a disproportionately high adverse impact on low-income or minority populations in the area.

Minor cumulative impacts could occur on some resources (e.g., wildlife habitat, water quality, air quality, and transportation) if other construction projects planned for the project area are implemented concurrently with the TSP.

Mitigation: No impacts have been identified under the TSP that would require compensatory mitigation. Although there would be short-term and minor adverse impacts on water quality, fish populations, and waters of the U.S., the existing conditions of the stream provide very low-quality habitat and wetland functions. In addition, removal of the trash and debris from the channel would provide long-term benefits to the water quality and, synergistically, to the aquatic ecosystem and the species it supports.

Conclusion: Based on the EA, which is herewith incorporated by reference, it has been determined that implementation of any of the alternatives, including the TSP, would have no significant direct, indirect, or cumulative impacts on the quality of the natural or human environment. Because no significant impacts would result from implementation of the TSP, an environmental impact statement is not warranted and will not be prepared.

_____ _____

Edward R. Fleming
Colonel, U.S. Army
District Commander

Date

DRAFT

ENVIRONMENTAL ASSESSMENT
(EA # 457)

CITY OF CARENCRO, LAFAYETTE PARISH, LOUISIANA
CONTINUING AUTHORITIES PROGRAM
SECTION 205 FEASIBILITY STUDY

Prepared by:

U.S. Army Corps of Engineers
New Orleans District
New Orleans, Louisiana

March 2012

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PHOTOGRAPHS

LIST OF APPENDICES

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SECTION 1.0
PURPOSE, NEED, AND SCOPE

1.0 PURPOSE, NEED, AND SCOPE

1.1 INTRODUCTION

The City of Carencro has a population of approximately 6,500 and is located approximately 5 miles north of Lafayette, Louisiana (Figure 1-1). Carencro experiences periodic floods along the Beau Bassin Coulee, which winds through the town and eventually drains into the Vermilion River. The area along the Beau Bassin Coulee is developed, with little or no natural floodplain remaining. The proposed improvements would reduce the risk of flooding and flood-related damages along Beau Bassin Coulee. This Environmental Assessment (EA) identifies the purpose and need, Tentatively Selected Plan (TSP), and alternatives for the proposed flood risk management project located in Carencro, Louisiana. This project is being conducted under the Continuing Authorities Program (CAP), Section 205 Program. This EA has been prepared by the U.S. Army Corps of Engineers (USACE), New Orleans District (CEMVN) in accordance with the National Environmental Policy Act (NEPA) of 1969 and the Council on Environmental Quality's (CEQ) Regulations (40 Code of Federal Regulations [CFR] 1500-1508), and USACE Engineering Regulation (ER) 200-2-2 (33 CFR 230 et seq.).

1.2 PURPOSE AND NEED

Significant floods along the Beau Bassin Coulee have occurred in and around the City of Carencro (Figure 1-2). The floodwaters have been derived from many different sources, including headwater runoff from the north, heavy localized rainfall, hurricanes, and tropical storms. Major floods affecting the area and the surrounding parish occurred in 1940, 1953, 1955, 1966, 1971, 1973, 1977, 1980, 1982, 1989, 1993, 2004, 2006, 2008, and 2009. The purpose of the proposed improvements is to reduce the flood risk and related flood damages within the City of Carencro.

The proposed flood risk reduction actions are needed to provide sufficient flood conveyance within Beau Bassin Coulee within the City of Carencro. The stream reaches are overgrown with trees and brush impairing the flow. Stream banks have also eroded and slumped into the channel. These conditions have severely reduced the conveyance capacity of the coulee, resulting in flooding throughout the developed areas of Carencro.

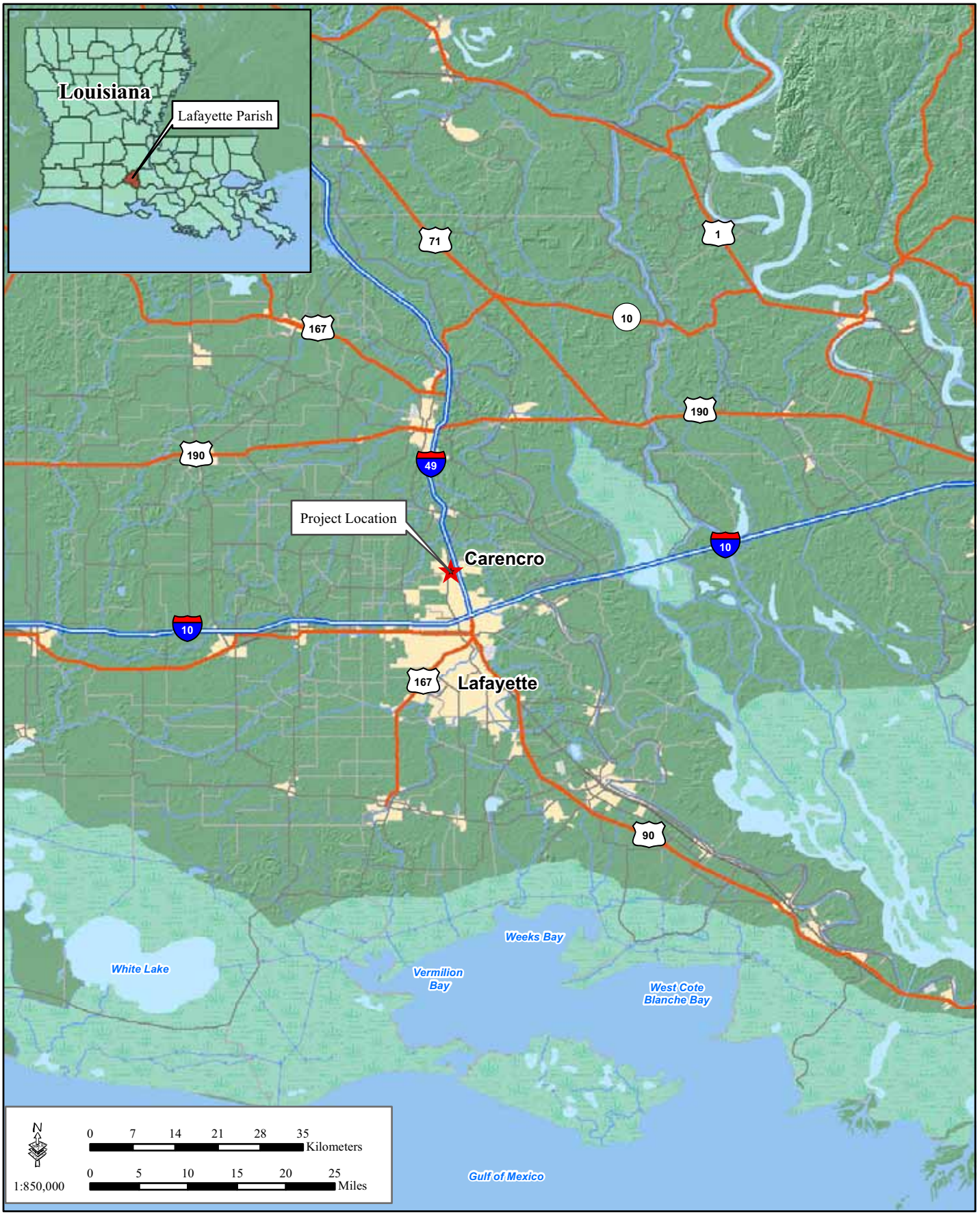

Figure 1-1: Vicinity Map

GSRC

January 2012

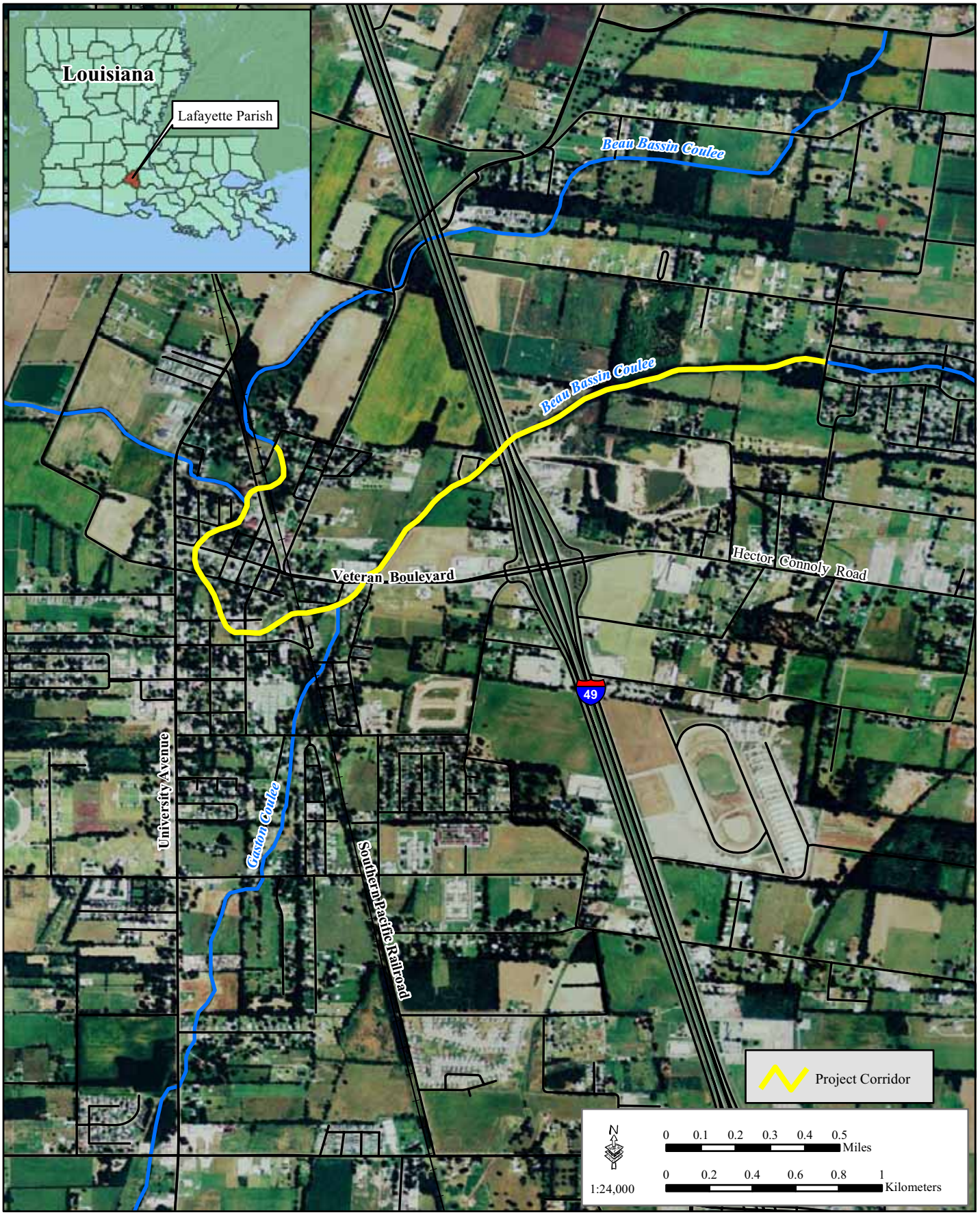

Figure 1-2: Project Area in Carencro along Beau Bassin Coulee

GSRC

January 2012

1.3 AUTHORITY FOR THE PROPOSED ACTION

This study was conducted pursuant to the CAP under the authority of Section 205 of the Flood Control Act of 1948, as amended. Section 205 of the 1948 Flood Control Act, as amended, provides authority to the USACE to plan and construct small flood damage reduction projects that have not already been specifically constructed by Congress.

1.4 PRIOR REPORTS

A number of studies and reports on water resources development in the Carencro area have been prepared by Federal, state, and local agencies, research institutes, and individuals. Available information was used to identify historical trends, define existing conditions in the study area, predict future conditions, and assist in identifying problems. The more relevant studies, reports, and projects are summarized in the following sections.

1.4.1 Prior Beau Bassin Coulee Studies (1995-2005)

The following documents have been developed for studies of Beau Bassin Coulee since 1999:

- CEMVN, *Retention/Detention Facility Investigation for Flood Control in Lafayette Parish and Small-Scale Water Catchment and Diversion Systems*, November 1999. The study had two objectives: (1) to investigate the feasibility of using available lands for retention/detention facilities in Lafayette Parish to mitigate flooding along the Vermilion River; and (2) to investigate whether small-scale water catchment and diversion systems could help in flood reduction.

- CEMVN, *Beau Bassin Coulee, Carencro, Lafayette Parish, Louisiana, Initial Appraisal of Flood Control Alternatives*, May 2001. The study determined and quantified flooding problems and identified alternatives that might be effective in reducing the flooding.

- CEMVN*, Carencro Flood Study: Carencro, Lafayette Parish, Louisiana Section 205 Feasibility Study – Hydrology and Hydraulics Review,* May 2005. The study used hydrologic and hydraulic (H&H) modeling to predict water surface elevation along Beau Bassin Coulee based on various rainfall events.

1.4.2 Vermilion River and Coulee Ile Des Cannes Studies (1973-1974)

Section 206 of the Flood Control Act of 1960 (Public Law 86-646), as amended by the 1960 and 1970 Flood Control Acts, the Water Resources Development Act of 1974, and Executive Order (EO) 11296 (10 August 1966), authorizes USACE to establish and carry out a floodplain management service program. The objective of the program is comprehensive flood risk management planning that encourages wise use of the floodplain at all levels of government. Under the program, CEMVN prepared two floodplain information reports for the Vermilion River and tributaries and for the Coulee Ile Des Cannes and tributaries in September 1973 and September 1974, respectively.

1.4.3 Federal Emergency Management Agency Flood Insurance Study

Federal Emergency Management Agency (FEMA) prepares and updates flood insurance studies to map communities throughout the region by risk zones and to determine insurance rates. The studies are conducted under the provisions of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. The program is administered by the Federal Insurance Administration of FEMA. Flood Insurance Rate Maps were updated in 2010 for selected communities in Lafayette Parish, but the updates did not include Carencro.

1.4.4 Coulee Ile des Cannes Flood Protection Study (1983)

Domingue, Szabo & Associates, Incorporated, completed a report for the Lafayette Parish Police Jury, "Application for Project Funding through the Louisiana Statewide Flood Control Program," in October 1983. The application addressed flood risk management improvements of Coulee Ile des Cannes from the Vermilion River to its upper limits near the Ossun community, a distance of approximately 15.7 miles. Coulee Ile des Cannes is one of the major drainage canals in Lafayette Parish. The frequency of flooding along Coulee Ile Des Cannes has been similar to that of the Beau Bassin Coulee.

1.4.5 Lafayette Parish Flood Protection Study (1981)

Domingue, Szabo & Associates, Incorporated, completed a report for the Lafayette Parish Police Jury, "A Report on Drainage Improvements," in July 1981. A preliminary design was completed for 43 drainage canals in Lafayette Parish for the 10-percent-chance (10-year) event. The report presents a description of the work required to achieve the needed flood risk management improvements, estimated project costs, a recommended method of financing, and a canal maintenance program. The preliminary findings associated with the Lafayette Parish Flood Protection Study led to the initiation of the study of flood risk management along Beau Bassin Coulee in Carencro.

1.4.6 Carencro Flood Evaluation (1990)

Professional Engineering and Surveying Company, Incorporated, completed a report for the City of Carencro, Lafayette Parish, LA, "Application for Project Funding submitted to the Louisiana Statewide Flood Control Program for Beau Bassin Coulee," in November 1990. The purpose of the study was to evaluate the flooding within the City of Carencro and surrounding area that drains into Beau Bassin Coulee. Extreme overgrowth of trees and brush within the canal from the I-49 crossings to the Beau Bassin Road crossing severely reduces the conveyance capacity of the coulee, resulting in backwater flooding. The proposed project primarily consisted of improving the downstream portion of the coulee from the Interstate 49 (I-49) service road (west) crossing to the Beau Bassin Road crossing, thereby providing relief to residents upstream of that location.

1.4.7 Lafayette Parish Master Drainage Plan (2008)

CEMVN and CH2M Hill completed a report for the Lafayette Parish Consolidated Government, "Lafayette Parish Master Drainage Plan," in February 2008. The study evaluated selected coulees within Lafayette Parish using FEMA-approved digital Flood Insurance Rate Map models to study drainage improvements. Beau Bassin Coulee was one of the selected models to be evaluated for drainage improvement alternatives. The study evaluated alternatives considered in previous studies. The models developed were incorporated into this feasibility study.

1.5 PUBLIC CONCERNS

The people of Carencro and surrounding areas are concerned about being provided with protection from flood damage for businesses and residences and providing for public safety during major storm events. A public meeting was conducted in February 2008 regarding the various flood risk management scenarios being considered. The public will be afforded the opportunity to review and comment on the Draft EA and draft Finding of No Significant Impact (FONSI). Interagency coordination has also been conducted during the preparation of the EA, as discussed later. Throughout the NEPA process, the public may obtain information on the status and progress of the proposed measures and the EA through CEMVN's Project Manager, Mr. Durund Elzey, USACE, New Orleans District, at 504-862-1674.

SECTION 2.0
DESCRIPTION OF THE PROPOSED ACTION

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 DEVELOPMENT OF ALTERNATIVES

In May 2001, CEMVN completed initial analyses of flood risk management alternatives for Beau Bassin Coulee. The study identified and quantified flooding problems and evaluated five alternatives to reduce the problems. The initial analyses were refined and updated between 2001 and 2004, when the feasibility study was initiated. During that time, three of the original five alternatives were removed from consideration due to cost-effectiveness and local support issues. Because of funding constraints and real estate access issues, the study experienced a number of starts and stops between 2004 and 2007. One alternative (channel enlargement and diversion channel) emerged as the Tentatively Selected Plan (TSP) and the other alternatives were removed from consideration. The cost effectiveness of the TSP was marginal throughout the study process. However, in 2007 a new, improved unsteady-state H&H model became available. The refined analysis performed with this model resulted in an increase in the net benefits of the TSP.

In 2008, the non-Federal sponsor rejected the TSP because of public controversy and land rights issues. The study team quickly developed and evaluated another alternative to determine whether a feasible solution was available. The new alternative was demonstrated to be cost-effective. As a result of the changes in the H&H models and the inclusion of another alternative, CEMVN determined that all of the alternatives should be reevaluated using the same criteria.

The improvement measures evaluated included clearing, grubbing, and dressing the channel; widening the stream channel; stabilizing the stream banks; and constructing floodwater retention basins. Three structural alternatives, which are considered viable for implementation, have been developed during the plan formulation process. These three action alternatives (Alternatives 3, 7, and 8) consist of various combinations of the improvement measures, as described in the following subsections. A Nonstructural Alternative has also been developed and is carried forward as a viable alternative. As required by CEQ, the No Action Alternative (also called Future Without Project) has been carried forward for analysis. This alternative represents the current and future conditions of the Beau Bassin Coulee in and around the City of Carencro, and will form the basis for comparison of the action alternatives.

As indicated above, numerous other alternatives were considered during the planning stages but were eliminated from further considerations for various reasons. These alternatives, and the reasons they were eliminated, are briefly discussed in the paragraphs following the description of the No Action Alternative.

2.2 NO ACTION ALTERNATIVE

The CEQ's regulations require that a No Action Alternative be evaluated. Under the No Action Alternative, no channel improvements on Beau Bassin Coulee would occur. Thus, no physically altered flow in the main channel of the coulee would result. No Federal action would be taken; however, current maintenance practices by Lafayette Parish or the City of Carencro would continue at existing levels. The No Action Alternative will be carried forward for analysis, however, and will form the baseline against which other action alternatives will be assessed.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED

Numerous alternatives to achieve the desired goal of flood protection were considered during the planning stages of this project. However, these alternatives were eliminated as viable alternatives to be addressed in the EA for various reasons. These alternatives and the reasons they were eliminated are briefly discussed below.

2.3.1 Alternative 1. Enlarged Earthen Section

This alternative involved enlarging the entire stream channel from upstream of the Southern Pacific Railroad Bridge to the lower end of the project at St. Esprit Road. The finished channel would be an earthen-lined, trapezoidal canal with a 10-foot bottom width, 70-foot top width, and 3:1 (horizontal: vertical) side slopes. This required width would likely have resulted in several displacements/relocations of residents or, at the very least, additional private property being affected. The initial appraisal conducted in 2001 demonstrated that this alternative would be cost-effective, but there were concerns that the increased velocity at which floodwater would move through the area may lead to erosion problems in the earthen section. This alternative was also found to be unacceptable to local officials and the public due to the extensive impacts on current land uses. As a result of these socioeconomic and potential operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) issues, this alternative was eliminated from further consideration.

2.3.2 Alternative 2. Concrete Section

This alternative involved constructing a concrete-lined trapezoidal channel with a 10-foot bottom width, 40-foot top width, and 1.5:1 side slopes through Carencro from the upstream Southern Pacific Railroad Bridge to St. Esprit Road downstream of I-49. The initial evaluation of this alternative indicated that it would lower floodwater levels an average of 2.9 feet for all storm events within the study area; however, the cost for this alternative was estimated to be $12 million. The initial appraisal determined that this design would not be cost-effective and, thus, it was eliminated from further consideration.

2.3.3 Original Alternative 3. Enlarged Earthen Section / Concrete Section

This alternative consisted of measures similar to those discussed above for Alternatives 1 and 2 and was the initial concept for Alternative 3. The project would be an earthen-lined, trapezoidal channel with 10-foot bottom width, 70-foot top width, and 3:1 side slopes from the upstream Southern Pacific Railroad Bridge to the downstream crossing of the Southern Pacific Railroad tracks. A concrete-lined trapezoidal canal with a 10-foot bottom width, 40-foot top width, and 1.5:1 side slopes would be constructed from the downstream Southern Pacific Railroad crossing to the end of the project at St. Esprit Road. The concrete section again resulted in costs that would make this alternative cost-prohibitive. Consequently, this combination of earthen and concrete channel was eliminated from further consideration. However, this alternative was subsequently modified to remove the concrete section and is now considered a viable alternative as Alternative 3 (Section 2.4.2).

2.3.4 Alternative 4. Earthen Channel and Diversion Channel

This alternative consisted of the construction of a high water diversion channel (2,500 feet long) that would connect the upstream and downstream sections of Beau Bassin Coulee on the east side of I-49 (Figure 2-1). The diversion canal would divert water, during high flow conditions, from flowing through the City of Carencro. The diversion canal would create a shortcut, managed by a system of weirs that would prevent flood flow from encountering the Gaston Coulee and an unnamed tributary where, in the past, the floodwaters would meet and often rise above the banks to create flood conditions in the City of Carencro. The diversion canal would be a concrete-lined, trapezoidal channel with a 10-foot bottom width, 64-foot top width, and 3:1 side slopes.

Other components of this alternative included constructing approximately 8,465 feet of trapezoidal earthen channel with a 10-foot bottom width, 70-foot top width, and 3:1 side slopes. The earthen channel construction corridor would start from the Theo Street Bridge and continue downstream through Carencro to the St. Esprit Street Bridge (Figure 2-1). The shoreline of the earthen channel would be stabilized with

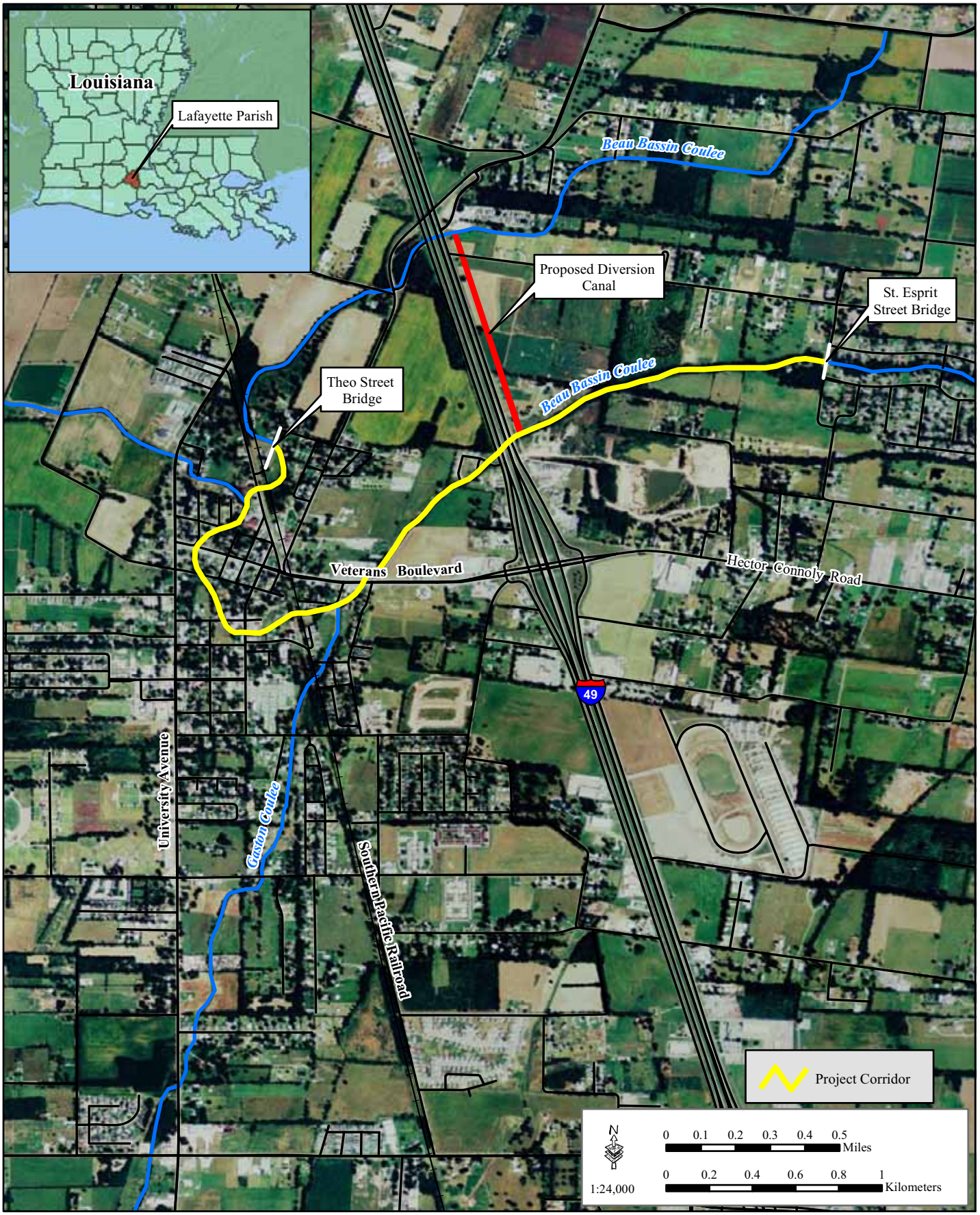

Figure 2-1: Diversion Canal Alternative

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January 2012

riprap. This alternative would remove approximately 2.4 acres of mature bottomland hardwoods along the downstream sections, east of I-49.

This alternative would require the acquisition, most likely through condemnation, of approximately 3 acres of land to construct the diversion canal. Several bridges across the diversion would be required, which would increase the construction costs. While this alternative would provide substantial reduction in flood risks, the benefit-to-cost ratio for these measures was below 1.0 and, thus, it was eliminated from further consideration.

This alternative was modified to line a section of the earthen channel with gabions to reduce flow velocity and protect the stream bank from erosion. A trapezoidal channel with 10-foot bottom width, 40-foot top width, and 1.5:1 side slopes would be lined with gabion baskets from the downstream Southern Pacific Railroad crossing to Veterans Boulevard Bridge. Downstream from this bridge to St. Esprit Road, the channel would be enlarged and the diversion channel would be constructed as described in Section 2.3.4. Although the initial evaluation indicated that this alternative would lower flood water levels an average of 1.85 feet and was considered cost-effective, it was eliminated from further consideration because this alternative was unacceptable to local officials and the public due to the extensive impacts on current and future land uses.

2.3.5 Alternative 5. Enlarged Earthen Section with Retention Basin

The original Alternative 5 consisted of an earthen-lined, trapezoidal channel as described under the original Alternative 4 (Section 2.3.4), but also included a 32-acre, 6-foot-deep retention basin upstream of Carencro in the vicinity of Debutante Road. This design was estimated to lower the flood water level an average of 1.85 feet at a cost of $4.4 million; this alternative was not cost-effective and, therefore, was eliminated from further consideration.

This alternative was revised to relocate the retention basin in the vicinity of Rue Des Etoiles. This alternative was estimated to cost about the same as the original Alternative 5, but would essentially have the same effect in lowering flood water levels (i.e., 1.81 feet versus 1.85 feet). Consequently, this alternative was also deemed to be not cost-effective and was eliminated from further consideration.

2.3.6 Alternative 6. Retention Storage in Central Carencro

Two retention basins, one encompassing 2 acres and the other encompassing 3 acres, were evaluated under this alternative. The 2-acre basin would be located in the central portion of Carencro, in the general

vicinity of the former southern crossing of Southern Pacific Railroad, on land currently owned or that could be acquired by the City of Carencro. The other would be located in central Carencro, but further downstream in the general vicinity of the confluence of an unnamed southwestern tributary and Beau Bassin Coulee, on land currently owned or that could be acquired by the City of Carencro. This alternative would only lower floodwater levels by about 0.19 foot and was not considered to be cost-effective. Consequently, it was eliminated from further evaluation.

2.3.7 Alternative 9. Retention Storage in Central and Northern Carencro

In addition to the 2-acre and 3-acre retention basins described above, this alternative would include construction of a 5-acre retention basin east of the Southern Pacific Railroad line in the northern part of Carencro. The addition of this third retention basin would allow a total decrease in flood water levels of about 0.46 foot. The initial appraisal demonstrated that this alternative would not be cost-effective and, thus, it was eliminated from further consideration.

2.3.8 Alternative 10. Three Retention Basins with Channel Clearing

This alternative included the three retention basins described above, along with channel clearing, grubbing, and dressing the existing Beau Bassin Coulee channel from the upstream Southern Pacific Railroad crossing to St. Esprit Road. The initial appraisal indicated that this alternative would lower water levels an average of 2.56 feet. This is a greater reduction in water levels compared to Alternative 7 (TSP, which is described later), but it would also cost an additional $2.9 million. This additional cost to provide an additional 0.35 foot in reduction of water levels was determined to be not cost-effective. Thus, it was eliminated from further consideration.

2.3.9 Alternative 11. Three Retention Basins with Channel Clearing and Channel Improvements

This alternative was a combination of several alternatives, and included all three retention basins described previously (i.e., 2-acre, 3-acre, and 5-acre retention basins). In addition, channel clearing (i.e., clear and snag) would occur within the existing channel from the upstream Southern Pacific Railroad crossing to Veterans Boulevard Bridge. Below this bridge, the channel would be improved to an earthen-lined, trapezoidal canal with a 10-foot bottom width, 64-foot top width, and 3:1 side slopes. This design was determined to reduce flood water levels an average of 2.81 feet. Compared to Alternative 8 (described later in Section 2.4.3), this would provide an additional 0.6-foot reduction in water levels, but it would also cost an additional $3.4 million. Thus, this alternative was not cost-effective and was eliminated from further consideration.

2.3.10 Nonstructural Alternatives

Nonstructural alternatives were considered for structures located in the 20-percent-chance, 10-percent-chance, and 4-percent-chance events floodplains. H&H modeling was used to determine which structures flooded above the first floor at the three flood events. At the 20-percent-chance event, 30 structures receive flooding; at the 10-percent-chance event, 40 structures receive flooding; and at the 4-percent-chance event, 50 structures receive flooding. In addition, measures to raise these structures to an elevation of 1 foot above the 100-year floodplain (1 percent chance event) were also evaluated.

Analyses of the nonstructural alternatives indicate that all are cost-effective except the acquisition of structures at the 4-percent-chance flood event and the acquisition of structures at the 10-percent-chance flood event. The elevation of structures at the 20-percent-chance flood event was determined to be the alternative with the greatest net benefits and will be carried forward for analysis. Elevation or removal of the structures under other scenarios would have similar effects on the natural and human environment but at higher benefit-to-cost ratios; thus, the other non-structural alternatives were not carried forward for analysis.

2.4 PROPOSED ACTION AND ALTERNATIVES

2.4.1 Alternative 7 (TSP)

The TSP consists of clearing, grubbing, and dressing approximately 12,000 feet of Beau Bassin Coulee and installing a retention basin at a location within the developed portion of the City of Carencro. Clearing, grubbing, and dressing would extend from the upstream Southern Pacific Railroad Bridge to St. Esprit Road, at the downstream project limits on the east side of I-49 (Figure 2-2). Upon completion, the bank surfaces would be dressed with a biodegradable mesh and then reseeded to inhibit erosion and slumping. A 10-foot-wide work area would be used on one or both sides of the channel during clearing, grubbing, and dressing and for future OMRR&R. The footprint for the clearing, grubbing, and dressing would be 65 feet wide, including the 45 feet between the tops of the channel banks.

The retention basin would be located on land currently owned by the City of Carencro, as shown in Figure 2-2. This parcel comprises 7 acres and is situated in a disturbed, upland area that is maintained grassland, as shown in Photograph 2-1. The site is bisected by the Gaston Coulee, a tributary to the Beau Bassin Coulee. The retention basin would encompass approximately 6.8 acres of the parcel and be

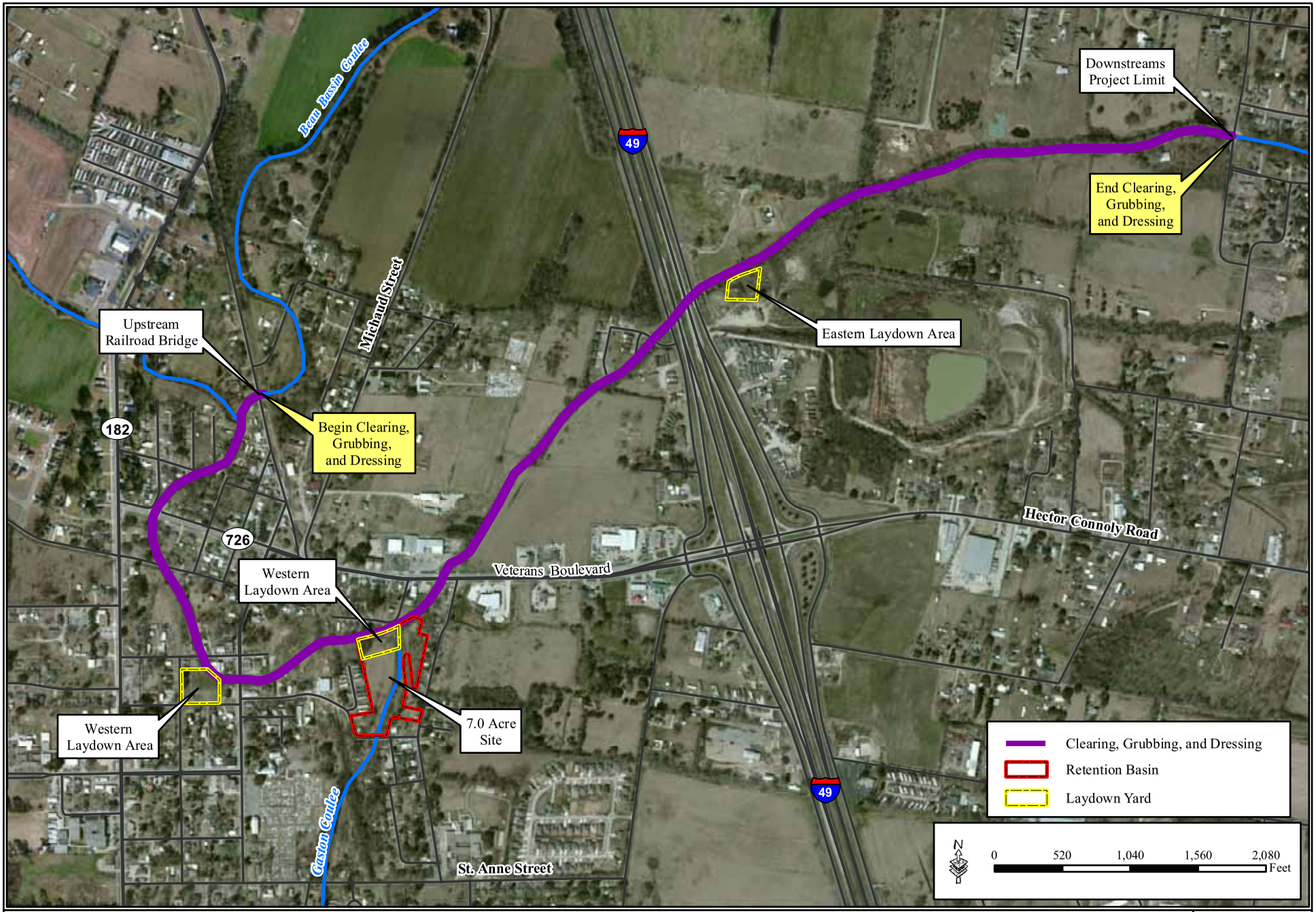

Figure 2-2: Alternative 7

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January 2012

approximately 6 feet deep, providing nearly 22.5 acre-feet of storage capacity and 5.4 wetted acres. In the early stages of development of this alternative, another retention basin was also evaluated. However, during optimization evaluation of the design, it was determined that the small size of the second retention basin (1 acre) would provide negligible benefits to flood risk reduction and, thus, it was eliminated from this alternative. However, the parcel of land where the retention basin was considered will be used as a laydown yard, as described in the following paragraphs.

Photograph 2-1. 7-Acre Retention Basin Site (looking north)

During construction, three laydown areas would be used for equipment storage and staging of materials. The first laydown area is east of I-49 on privately owned land and will require the City of Carencro to obtain a temporary work easement. The other laydown yards are west of I-49 and are located on City-owned, open land. These sites are shown on Figure 2-2. One of the western laydown areas is situated within the northwestern portion of the retention basin site and is maintained grassland, as described previously. The other western laydown area is a 1.67-acre parcel of land, which was a former residential area. The residences were primarily rental properties and have all been removed over the past 10 years. This site is now maintained grassland, as shown in Photograph 2-2. The eastern laydown area is located within the maintenance/storage yard of an existing sand and gravel mining facility (Photograph 2-3). These three sites would be points of access to the east and west sides of the project area during construction. No additional access roads to the coulee would be necessary; public roads will be used to access the coulee at various

Photograph 2-2. Western (1.67-Acre) Laydown Site (looking southeast)

Photograph 2-3. View of the Eastern Laydown Area (looking south)

locations, however. This alternative would reduce the flood water level by an average of 1.9 feet and would cost approximately $5,000,000.

2.4.2 Alternative 3

Alternative 3 consists of two different types of channel improvements: stream bank stabilization using gabion baskets and earthen channel enlargements (Figure 2-3). The reach proposed under Alternative 3 for stabilization would extend from the upstream Southern Pacific Railroad Bridge to the Veterans Boulevard Bridge, for a length of approximately 4,697 feet. The channel width in this section would be 10 feet at the bottom of the channel, sloping upward at a 1.5:1 slope, to an average 40 feet wide at the top of the channel. A 10-foot-wide permanent easement would be necessary on each side of the channel for construction and post-construction OMRR&R.

The enlarged earthen channel section would extend from the Veterans Boulevard Bridge on the west side of I-49 to the downstream project limits on the east side of I-49. This reach is approximately 7,193 feet long. The enlarged earthen channel width would be 10 feet at the bottom of the channel, sloping upward at a 3:1 slope, to 70 feet wide at the top of the channel. The three laydown yards that would be used are the same as proposed in Alternative 7. This alternative would reduce the flood water level by an average of 2.4 feet and would cost approximately $6.73 million.

2.4.3 Alternative 8

Alternative 8 would involve a variety of measures, including clearing, grubbing and dressing, channel enlargement, and two retention basins (Figure 2-4). One basin would be the same location/design as described under Alternative 7; the other retention basin would be located on the 1.67-acre parcel that would be used as a laydown area under Alternative 7. Clearing, grubbing, and dressing would extend for approximately 4,697 feet, from the upstream Southern Pacific Railroad Bridge to the Veterans Boulevard Bridge. The top bank width in this reach would be 45 feet. Channel enlargement would occur from the Veterans Boulevard Bridge to the end of the project reach at St. Esprit Road, a total length of 7,193 feet.

The enlarged earthen channel section would be the same as discussed in Alternative 3. A 10-foot-wide permanent easement would be necessary on each side of the channel during clearing, grubbing, and dressing and for future OMRR&R. Therefore, the footprint for the clearing, grubbing and dressing in this reach would be 90 feet wide. Only two laydown yards would be used under this alternative; the westernmost laydown yard would be developed into a 1-acre retention basin, as described above, and thus would not be used for staging. The other two laydown yards would be the same as proposed in

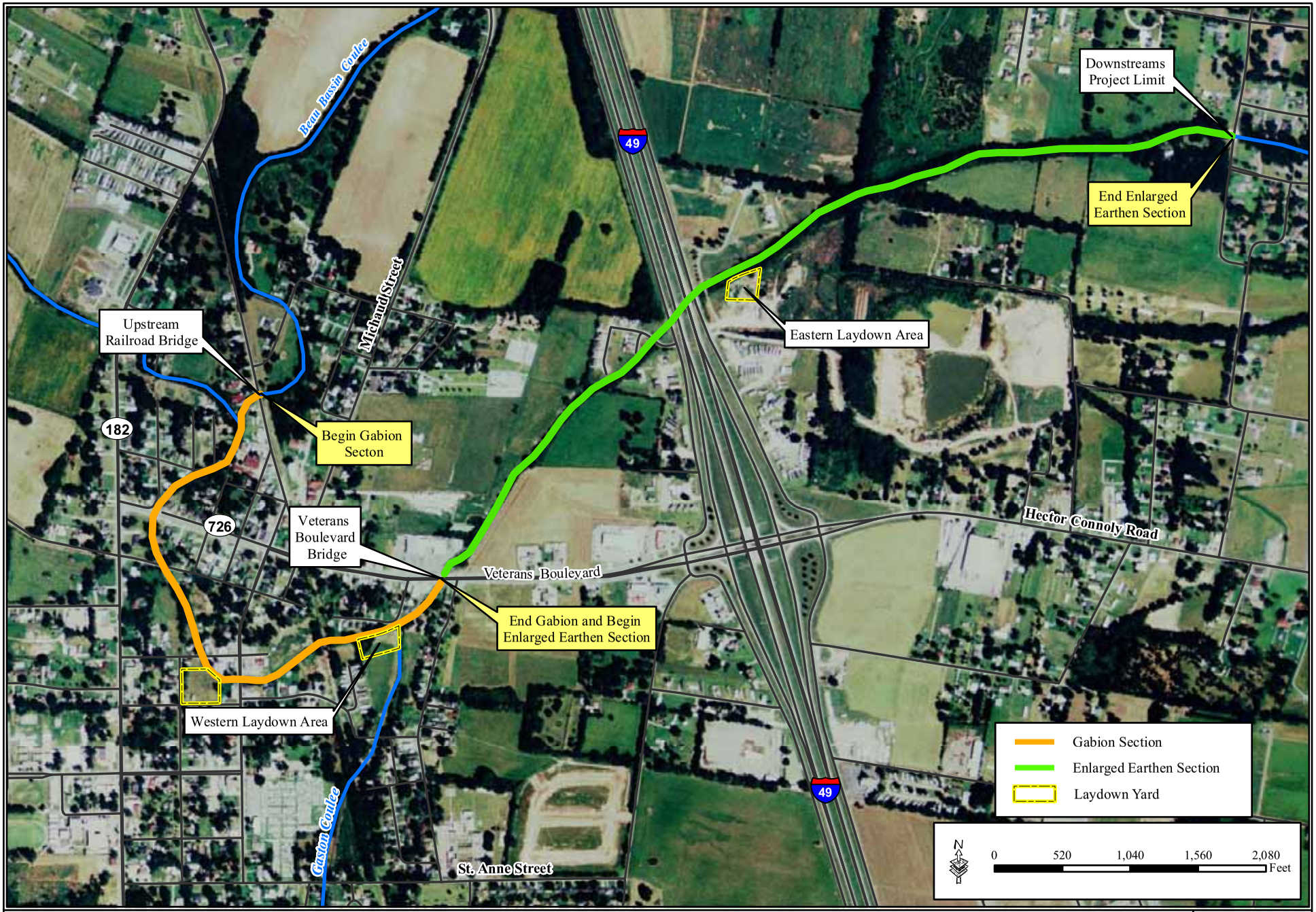

Figure 2-3: Alternative 3

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January 2012

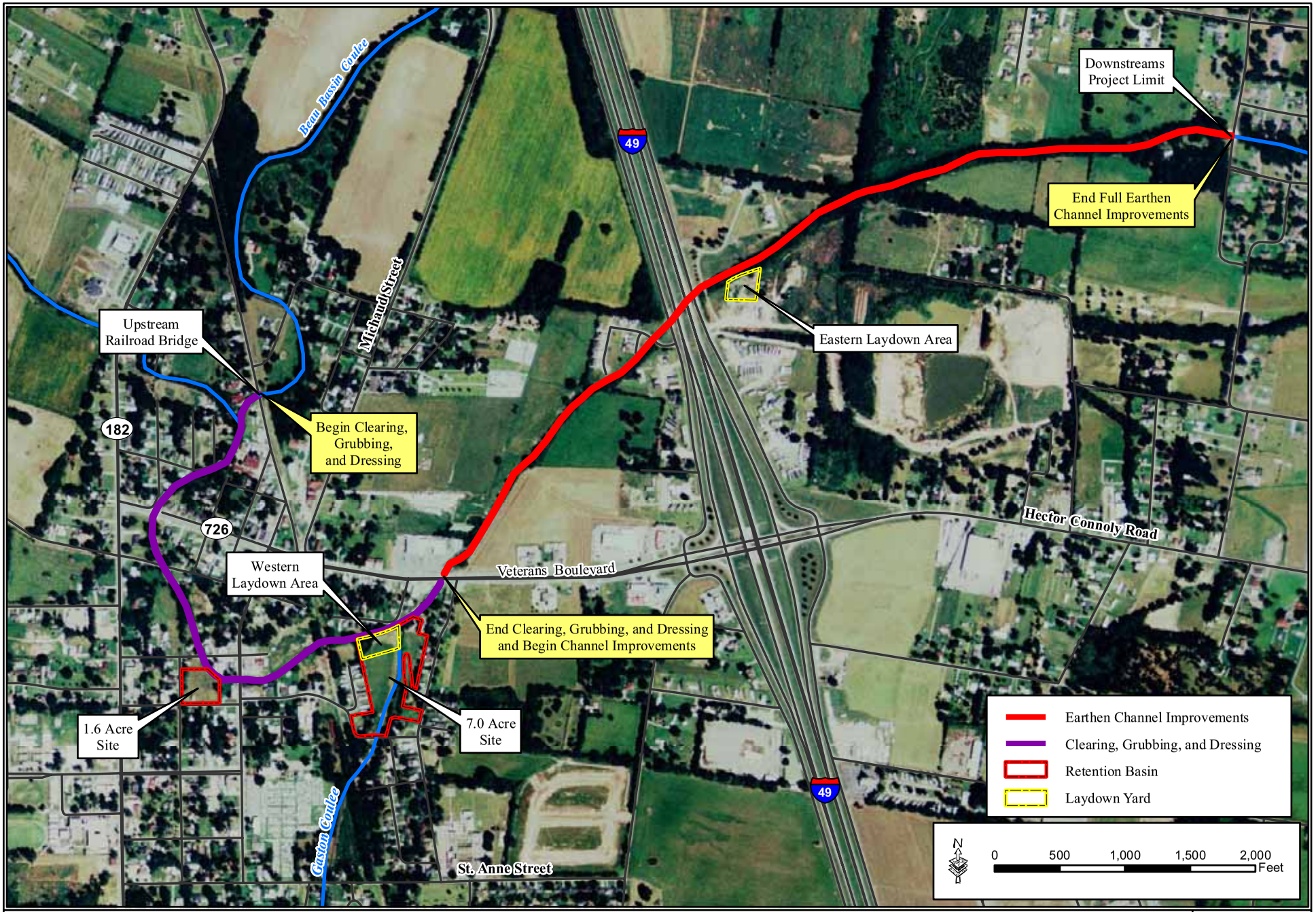

Figure 2-4: Alternative 8

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January 2012

Alternative 7. This alternative would reduce the flood water level by an average of 2.5 feet and would cost approximately $6.49 million.

2.4.4 Nonstructural Alternative

The Nonstructural Alternative includes the elevation of house, buildings, and other structures at the 20-percent-chance floodplain of the project area. The alternative would elevate 30 structures (26 residences and four commercial buildings) in the study area that are at the highest risk of flood damages. These measures would not influence the hydraulics or hydrology of the area and would not reduce the frequency or depth of flooding along the stream; however, it would reduce total value of damages during significant flood events.

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SECTION 3.0
EXISTING CONDITIONS

3.0 EXISTING CONDITIONS

3.1 ENVIRONMENTAL SETTING

3.1.1 General

Carencro is bisected north to south by I-49 and east to west by Hector Connoly Road/Veterans Boulevard (State Highway 726). For the purpose of this EA, the project area extends along both banks of the Beau Bassin Coulee from the east side of I-49 north of Carencro, downstream to the St. Esprit Street Bridge (see Figure 1-2), and includes the two retention basins and the eastern laydown area (the western laydown area is encompassed by the larger retention basin). Biological and cultural resources surveys were conducted within 100 feet on both sides of the Beau Bassin Coulee, the retention basin sites, and the eastern laydown site. The project vicinity and the region of influence are defined as Lafayette Parish.

Surveys to ascertain existing site conditions for the project area were conducted on April 12, 2000; October 12, 2000; October 8, 2007; January 31, 2011; and March 22, 2011. Overall, no significant environmental issues were evident. No potential jurisdictional wetlands adjacent to or connected to the Beau Bassin Coulee were observed, and all vegetation is common. The riparian vegetation near Beau Bassin Coulee occurs in small and narrow patches and consists primarily of live oak (*Quercus virginiana*), American elm (*Ulmus americana*), magnolia (*Magnolia grandiflora*), pecan (*Carya illinoensis*), eastern cottonwood (*Populus deltoides*), Chinese tallow-tree (*Triadica sebifera*), chinaberry (*Melia azedarach*), and southern catalpa (*Catalpa bignonioides*).

The banks of Beau Bassin Coulee in this area have been cleared, and herbaceous vegetation, including elephant ear (*Colocasia sp.*), giant ragweed (*Ambrosia trifida*), Vasey grass (*Paspalum urvillei*), and bahia grass (*Paspalum notatum*), dominates the coulee banks. The Beau Bassin Coulee stream reach contains various turtles (*Kinosternon* sp., *Trachemys* sp.) and small fish (*Gambusia affinis, Funduls* sp., and *Lepomis* sp.).

3.1.2 Climate

The climate of south central Louisiana is influenced by the proximity of the Gulf of Mexico, which modifies temperature conditions by decreasing the range between extremes. These effects increase when southerly winds prevail, imparting the characteristics of a maritime climate. The average annual temperature is approximately 68 degrees Fahrenheit (°F), with the normal monthly mean temperature varying from 50°F in January to 82°F in July. The average normal annual precipitation for the study area

is approximately 60 inches. The heaviest rainfall usually occurs during the month of July, with an average monthly normal of 6.5 inches. October is the driest month, averaging approximately 4 inches. Snow is rare in the study area with the last significant snow falling in December 2008. Wind data collected at Baton Rouge and Lake Charles indicate that the average wind velocity for the region is approximately 8 miles per hour (mph). The prevailing wind flow is southerly during most of the year. Winter storms in the area have produced wind gusts up to 70 mph. The summer can be disturbed by tropical storms and hurricanes, which produce the highest winds in the area (National Oceanic and Atmospheric Administration [NOAA] 2007).

3.1.3 Geology

The study area is situated on the terrace upland area of Lafayette Parish. The elevations of the upland terraces in this area approach 55 feet National Geodetic Vertical Datum. Much of this area has been described as an upper deltaic plain or lower alluvial plain of the Mississippi River. These extensive alluvial deposits are not exposed at the surface in the area. The surface of the entire area consists mostly of loess-covered deposits that range to 20 feet or more in thickness. Generally, the loess deposits are calcareous, tan, eolian deposits composed predominantly of silt and they typically contain less than 5 percent sand.

These silty loess deposits are essentially uniform in texture and lack interstratified sand and clay lenses. They are generally part of the Prairie Formation, which was deposited during late Pleistocene time, and is comprised largely of Red River alluvium. The sediments in the lower Prairie Formation have varying textures and appreciably higher sand content than the overlying loess.

3.1.4 Land Use

The land use within the Beau Bassin Coulee watershed is primarily farm land (approximately 87 percent), with some residential areas, particularly within the City of Carencro. The portion of the study area from the Railroad Street Bridge downstream to Veterans Bridge on Bernard Street is classified as residential. Commercial establishments (e.g., gas stations and shopping centers) are scattered throughout this area. The portion of the study area from the Veterans Boulevard Bridge to the downstream terminus of the project corridor is classified as undeveloped. There are two exceptions in this portion of the study area: a landfill (formerly a sand and gravel operation) just east of I-49 and a small housing development just west of I-49. Approximately 167 residential structures are located within the study area along or immediately adjacent to the banks of Beau Bassin Coulee.

3.2 IMPORTANT RESOURCES

This section contains a description of important resources that could potentially be impacted. The resources described in this section are those recognized by laws, Executive Orders, regulations, and other standards of Federal, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public.

The important resources discussed in this section are soils, water bodies, water quality, fisheries, wildlife, endangered or threatened species, cultural resources, recreational resources, aesthetics, noise, air quality, socioeconomics, wetlands, and hazardous, toxic, and radioactive waste. Resources that are not discussed include Essential Fish Habitat (EFH), Coastal Zone, and Wild and Scenic Streams, because the project area does not fall within the boundaries of, and would not affect any of, these resources.

3.2.1 Soils

Soil resources are institutionally important because of the Food Security Act of 1985, as amended; the Farmland Protection Policy Act of 1981; the Resource Conservation and Recovery Act of 1976, as amended; and the Comprehensive Environmental Response, Compensation, Liability Act of 1980, as amended. Soil resources are technically important because of the provision or potential for provision of forest products, and human and livestock food products. Soil resources are publicly important because of their present economic value or potential for future economic value.

3.2.1.1 Existing Conditions

The U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) Soil Survey for Lafayette Parish, indicates that the study area consists mainly of Frost silt loam, Frost soils, and Memphis silt loam (NRCS 2011). The upper 2 feet of Frost soils is dark grayish brown to gray silt loam, becoming clayey with yellowish brown mottles to a depth of approximately 5 feet. Frost soils are primarily contained within the stream channel of Beau Bassin Coulee and are not considered Prime Farmland soils.

Frost silt loam is dark gray in color and grades to gray with dark grayish brown mottles in the upper 14 inches. It becomes clayey with dark yellowish mottles to a depth of approximately 4 feet and then returns to gray silt loam to a depth of approximately 5 feet. This soil is located adjacent to, but not within, the stream channel of the Beau Bassin Coulee. This soil is considered a Prime Farmland Soil type by NRCS. The upper 6 inches of Memphis silt loam consist of mainly dark grayish and brown silt loam. The deposit becomes more clayey to a depth of approximately 3 feet and then returns to dark brown silt loam to a

depth of more than 6 feet. Memphis silt loam is located farther away from the stream channel. This soil is considered a Prime Farmland Soil type by NRCS.

3.2.1.2 Environmental Consequences

3.2.1.2.1 No Action Alternative

Under the No Action Alternative, soils within and adjacent to the Beau Bassin Coulee would not directly be impacted or disturbed by construction. Indirect effects on soils would include the continued erosion of the stream bank and downstream sedimentation (Photograph 3-1). It is likely that private citizens would continue to place various forms of erosion control measures along the bank in efforts to protect their own property, as shown in Photograph 3-2.

Photograph 3-1. Erosion along Beau Bassin Coulee

Photograph 3-2. Private Erosion Control

Cumulative impacts on soils and other important resources are discussed in a separate section later in this document (Section 4.0).

3.2.1.2.2 Alternative 7 (TSP)

This alternative would result in approximately 6.8 acres of direct permanent impacts on soils, most of which would be considered Prime Farmland soils, due to the construction of the retention basins. None of the soils are currently in agricultural production. Clearing, grubbing, and dressing would result in minor direct impacts on soils as trees, stumps, snags, and other debris are removed from the stream bottom and sides. An additional 9.1 acres of soils would be temporarily impacted along the 10-foot-wide construction corridor and the three laydown areas. These impacts would occur sporadically over the life of the project for OMRR&R activities.

Short-term, indirect impacts on soils would occur within the stream channel immediately after the clearing, grubbing, and dressing operations. The stream bottom would be expected to stabilize within less than a year. Some streambank erosion and downstream sedimentation would continue, and perhaps increase, due to the higher flow velocities, until herbaceous vegetation becomes established along the banks.

3.2.1.2.3 Alternative 3

Alternative 3 would result in direct, permanent impacts on 4.1 acres of Prime Farmland soils due to the channel improvements. The temporary and indirect impacts would be similar to those discussed for Alternative 7.

3.2.1.2.4 Alternative 8

Alternative 8 would result in approximately 11.9 acres of permanent impacts on Prime Farmland soils due to the construction of the two retention basins and the channel improvements along the lower reach of Beau Bassin Coulee. The temporary and indirect impacts would be similar to those discussed for Alternative 7.

3.2.1.2.5 Nonstructural Alternative

Under this alternative, there would be direct disturbance to soils when the 30 structures are elevated. Indirect adverse effects on soils would include the continued erosion of the stream bank and downstream sedimentation.

3.2.2 Waters of the U.S. and Wetlands

This resource is institutionally important because of the Clean Water Act (CWA) of 1977, Section 404 (33 United States Code [USC] 1341 et seq.). Wetland resources are technically important because they serve as floodwater storage, enhance water quality, provide habitat for wildlife, and provide habitat for fishes and other aquatic species. Wetland resources are publicly important because of the high priority that the public places on their aesthetic, recreational, and floodwater storage value.

3.2.2.1 Existing Conditions

Waters of the U.S. within the study area are limited to the stream channel of Beau Bassin Coulee. Some slump banks and depressions areas along the coulee contain wetland vegetation, but no jurisdictional wetlands are present. Dominant vegetation includes non-native and invasive species such as Johnson grass (*Sorghum halepense*), Vasey grass, Bermuda grass (*Cynodon* spp.), bahia grass, elephant ear,

ragweed, Chinese privet (*Ligustrum sinense*), elderberry (*Sambucus canadensis*), blackberry (*Rubus fruticosus*), Japanese honeysuckle (*Lonicera japonica*), and trumpet creeper (*Campsis radicans*). The coulee contains a lot of trash and debris (e.g., batteries, tires and wheels, wooden pallets), which has degraded the quality and function of the stream as a waters of the U.S.

3.2.2.2 Environmental Consequences

3.2.2.2.1 No Action Alternative

Under the No Action Alternative, no direct effect on waters of the U.S. would occur. Indirect effects would include alteration of channel flow, since it is likely that stream bank erosion and downstream sedimentation would continue. This erosion and sedimentation could result in synergistic losses of downstream wetlands and wetland functions.

3.2.2.2.2 Alternative 7 (TSP)

Alternative 7 would directly impact 2.3 miles of waters of the U.S. due to clearing, grubbing, and dressing activities. However, long-term functions of the drainage would not be affected by this alternative since herbaceous vegetation would be expected to naturally return along the bank within 2 years. Removal of the debris and trash would enhance the water quality of the stream. No indirect impacts on waters of the U.S. would be expected from the clearing, grubbing, and dressing operations. Construction of the retention basin would have no direct or indirect effect on waters of the U.S., as the basin is situated in upland areas. Because the long-term functions of the stream would not be adversely affected, and given the current low quality of the stream, no mitigation of the short-term impacts would be expected.

3.2.2.2.3 Alternative 3

Channel improvements proposed under Alternative 3 would adversely affect 2.3 miles of waters of the U.S. Some functions within the stabilized reach would be lost or modified due to the placement of the gabion baskets. The impacts in the lower, enlarged reach would be temporary and the functions of the channel should return to pre-project conditions within 2 years after completion of the project, when herbaceous vegetation would become established.

3.2.2.2.4 Alternative 8

Waters of the U.S. would be directly, but temporarily, impacted along the upper 4,697 feet of the Beau Bassin Coulee due to clearing, grubbing, and dressing operations. Short-term impacts on waters of the U.S. would be expected along the lower 7,193 feet where the channel would be enlarged. Wetland

functions of providing habitat and improving water quality would be expected to return to both reaches within less than 2 years when herbaceous communities become reestablished.

No indirect effects on waters of the U.S. would be expected from the proposed channel modifications. Construction of the two retention basins would have no direct or indirect effect on waters of the U.S., as both basins are located in upland areas.

3.2.2.2.5 Nonstructural Alternative

The Nonstructural Alternative would have no direct impact on waters of the U.S. Indirect effects under the Nonstructural Alternative would be the same as those described for the No Action Alternative.

3.2.3 Hydrology

Surface water bodies are institutionally important because of the Flood Control Act of 1948, CWA of 1977, and Fish and Wildlife Coordination Act of 1958. Surface water bodies are technically important because they are a critical element of many valuable aquatic habitats, they are an indicator of the health of various aquatic habitats, and many aquatic species are important commercial resources. Water bodies are publicly important because of the high priority that the public places on their aesthetic, recreational, and commercial value.

3.2.3.1 Existing Conditions

Beau Bassin Coulee within the study area is considered as waters of the U.S. This waterway is the main drainage artery for the City of Carencro and is a tributary of the Vermilion River. The channel width of Beau Bassin Coulee is estimated at approximately 10 feet during normal flow, with depths ranging from a few inches to about 2 feet. Beau Bassin Coulee is a natural waterway, although evidence of channelization exists within the urban portions of the study area. Vermilion River is the major waterway in the region. It meanders its way south through Lafayette Parish, and many of Lafayette Parish's other smaller water bodies, such as Bayou Carencro, Coulee Mine, and Coulee Francois, drain into the river.

3.2.3.2 Environmental Consequences

3.2.3.2.1 No Action Alternative

Without the TSP, there would be no direct impact on water bodies. Lafayette Parish or the City of Carencro would continue to maintain the coulee and drainage ditches that enter the coulee, as funding is available. However, indirect impacts on hydrology would result as stream bank erosion and downstream sedimentation would continue to occur; these conditions could cause indirect, adverse effects on water

quality, hydrology, and aquatic habitats in the lower portions of the Beau Bassin Coulee and the Vermilion River.

3.2.3.2.2 Alternative 7 (TSP)

Direct benefits would occur from the clearing, grubbing, and dressing of the Beau Bassin Coulee and the installation of the retention basin. The clearing, grubbing, and dressing of the stream would increase the conveyance capacity of the stream during flood events, and the installation of the retention basin would increase the flood protection for nearby residential homes during flood events. The flow velocities during a 100-year flood event would be increased from 3.8 cubic feet per second (cfs) to 5.3 cfs through the downstream reaches; this increased flow velocity would be only sporadic and temporary. Normal velocities would return as flood waters subside. No indirect adverse impacts on hydrology are anticipated.

3.2.3.2.3 Alternative 3

Direct benefits would occur from the installation of gabions and the construction of an enlarged earthen channel. The use of gabions would reduce erosion and slumping of the stream bank. The enlarged earthen channel would increase the conveyance capacity and flow velocity (3.8 cfs versus 3.9 cfs) within the downstream reach of the project during 100-year flood events. However, reduction of erosion and slumping of the stream bank through the installation of gabions would potentially reduce erosion and sedimentation, thus having an indirect beneficial effect on water quality. There would be no indirect adverse impacts on hydrology anticipated.

3.2.3.2.4 Alternative 8

Impacts under Alternative 8 would be similar to those for Alternative 7.

3.2.3.2.5 Nonstructural Alternative

The Nonstructural Alternative would have no direct effect on hydrology. Indirect effects would be the same as those described for the No Action Alternative.

3.2.4 Water Quality

Water quality is institutionally important because of the CWA of 1977. Water quality is technically important because of the status of watershed water quality in relation to the Total Maximum Daily Loads of pollutants. It is publicly important because of the desire for clean water expressed by virtually all citizens.

3.2.4.1 Existing Conditions

The Beau Bassin Coulee project corridor is situated within the Louisiana Department of Environmental Quality (LDEQ) Vermilion River watershed subsegment 060801. This subsegment occupies land from Opelousas in St. Landry Parish to central Lafayette Parish. The Vermilion River flows east of Carencro and south through Lafayette. The New Flanders Bridge (State Highway 3073) marks the southern boundary of subsegment 060801. The total amount of land is estimated to be 320 square miles (205,038 acres) within St. Landry, St. Martin, and Lafayette parishes. It is listed as impaired on the LDEQ's 2006 State of Louisiana Water Quality Management Plan Water Quality Inventory Integrated Report (Section 305(b) and 303(d) Reports) for high fecal coliform counts, elevated nutrient concentrations, low dissolved oxygen (DO), and high levels of sulfates (LDEQ 2006). The 060801 subwatershed does not meet LDEQ criteria for primary contact recreation use and fish and wildlife propagation standards. Suspected sources of fecal coliform pollution include sanitary sewage overflows (LDEQ 2006). LDEQ does not list the sources of oxygen demand substances and nutrients; however, common causes of low DO and high nutrient levels are urban and agricultural runoff.

3.2.4.2 Environmental Consequences

3.2.4.2.1 No Action Alternative

No direct impacts on water quality would occur under the No Action Alternative since no construction would be conducted. However, The Beau Bassin Coulee would continue to experience stream bank erosion and sedimentation, which would indirectly result in adverse impacts on water quality. These indirect adverse effects would include increased turbidity and temperatures, and lower DO.

3.2.4.2.2 Alternative 7 (TSP)

Clearing, grubbing, and dressing activities would directly disturb stream bottoms and temporarily degrade water quality. Increased turbidity and temperatures, decreased oxygen levels, and resuspension of contaminants within the sediments would have minor to moderate impacts on water quality during the construction activities. Ambient conditions would be expected to return within 1 year after completion of the construction activities. The Section 401 Water Quality Certification (WQC) has been submitted to LDEQ and was released for public review in November 2011; upon completion of the public review period, LDEQ approved the Section 401 WQC on December 15, 2011. A copy of LDEQ's approval letter is included in Appendix A of this EA.

Indirectly, clearing and grubbing within the construction right-of-way, as well as excavation of soils at the retention basin site, would disturb soils and increase the potential for erosion and sedimentation during

construction activities. Sediment-laden stormwater would enter the stream reaches. Sediment-laden water would increase sedimentation and turbidity in these water bodies, thus affecting water quality. Also, construction operations could potentially create miscellaneous operational pollution, such as oil leaks, mud spatters, and discards from human activities. Because soil disturbances associated with Alternative 7 would be greater than 1 acre, a National Pollutant Discharge Elimination System (NPDES) Stormwater Construction Permit would be required. A Stormwater Pollution Prevention Plan (SWPPP), subject to approval by LDEQ, would be prepared as part of the NPDES permit. The SWPPP would include stormwater management controls. Implementation of the SWPPP and Best Management Practices (BMP) (e.g., seeding exposed soils with grass seed and installation of silt fences) would reduce any indirect impacts on water quality from suspended contaminants or sediments from construction activities. In addition, to prevent the impact of accidental spills, the contractors would employ BMPs during construction to reduce the potential for soils, anti-freeze, fuels, oils, lubricants, and construction debris to migrate through the local watersheds. Negligible long-term indirect effects on water quality would occur from erosion and sedimentation since the stream banks would be revegetated immediately upon completion of the project.

3.2.4.2.3 Alternative 3

The short-term and indirect impacts on water quality associated with Alternative 3 would be similar to those described in Alternative 7. The increased flow velocity and lack of earthen (vegetated) banks along the upper reach where gabions would be installed would contribute to long-term degradation of the water quality in the downstream reaches. Due to the relatively short length of this reach, however, the magnitude of any reduction in water quality would be expected to be minor.

3.2.4.2.4 Alternative 8

The impacts on water quality associated with Alternative 8 would be similar to those described in Alternative 3.

3.2.4.2.5 Nonstructural Alternative

No direct impacts on water quality would occur under the Nonstructural Alternative. Indirect effects under this alternative would be similar to the No Action Alternative.

3.2.5 Fisheries

This resource is institutionally important because of the Fish and Wildlife Coordination Act of 1958, as amended. Fisheries resources are technically important because they are a critical element of many

valuable aquatic terrestrial habitats, they are an indicator of the health of various aquatic habitats, and many species are important commercial resources. Fisheries resources are publicly important because of the high priority that the public places on their aesthetic, recreational, and commercial value. Since the project area is not tidally influenced, there is no designated EFH.

3.2.5.1 Existing Conditions

The portion of the Beau Bassin Coulee within the study area ranges in depth from a few inches to a couple of feet and has an average channel width of approximately 10 feet. The current condition of the study area limits its ability to support recreational opportunities and provides no commercial fishing opportunities. Based on past field reconnaissance, common fish assemblages potentially occurring within the project area include tadpole madtom (*Noturus gyrinus*), mosquitofish (*Gambusia affinis*), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), mud darter (*Etheostoma asprigene*), gar (*Lepisosteus sp.*), and bowfin (*Amia calva*). None of these species are defined as commercially important; however, several are considered recreationally important.

Although no water quality samples were collected as part of this EA, it can be presumed that temperatures are very high in the summer within concomitant low DO levels due to the shallow depths (few inches in many reaches), sluggish flows, high turbidity levels, and trash (including metal pipes, batteries, etc.). The low water quality, combined with low diversity of habitat, has likely resulted in very low diversity and number of fish and other aquatic species. Most of the clearing, grubbing, and dressing would involve removal of woody vegetation along the coulee's bank and logs that block the channel above the normal water surface elevations. Such woody debris does not provide structure within the aquatic ecosystem. Examples of some of the reaches along Beau Bassin Coulee are presented in Photographs 3-3 through 3-5.

Photograph 3-3. Example of Logs/Snags Spanning Beau Bassin Coulee

Photograph 3-4. Example of Stream Channel Bottom

Photograph 3-5. Example of Trash and Debris Occurring within Beau Bassin Coulee

3.2.5.2 Environmental Consequences

3.2.5.2.1 No Action Alternative

No direct impact on fisheries would be anticipated without the TSP because there would be no disturbance of the water body or the stream bank. However, stream bank erosion and sedimentation would continue, and would likely have indirect effects on fishes due to increased turbidity, decreased egg buoyancy, and clogged gills.

3.2.5.2.2 Alternative 7 (TSP)

Direct impacts under Alternative 7 would include temporary impacts on fishes that inhabit the Beau Bassin Coulee during the construction activities by reducing water quality and disturbing aquatic habitat. The duration of the impact would depend upon the direction (upstream or downstream) in which the construction contractor would work. Some individual fishes would be killed within the construction sites.

Indirectly, downstream adverse effects would include increased turbidity and temperature, lower DO, and possible resuspension of stream bottom contaminants. The increased turbidity can affect foraging success, decrease egg buoyancy, clog the fishes' gills, and keep contaminants in suspension. The construction contractor would be expected to use silt curtains to contain the sediments and minimize the downstream effects.

Construction of the retention basin would have no direct or indirect long-term effects (beneficial or adverse) on the fish populations. The basin would contain water only during and shortly after flood events. Some fish could be trapped in the retention basin and would likely be eaten by wading birds or mammals. These minor losses would not affect the long-term viability of fish population in the Beau Bassin Coulee.

3.2.5.2.3 Alternative 3

Alternative 3 would have direct, adverse effects on fish populations similar to those of Alternative 7, although the duration of the construction activities would likely be much longer. The required time to reestablish fish populations would be protracted, since the stream bottom and banks would be shaped and gabion baskets would be installed under this alternative.

Long-term, indirect beneficial effects could be realized in the upper reach, where the banks would be stabilized with gabions. The gabions would prevent or substantially reduce the potential for future erosion/sedimentation and provide structure that could improve in-stream habitat.

3.2.5.2.4 Alternative 8

Impacts on fish populations as a result of implementing Alternative 8 would be similar to those of Alternative 7.

3.2.5.2.5 Nonstructural Alternative

No direct impacts on fish populations would occur under the Nonstructural Alternative. Indirect effects under this alternative would be similar to the No Action Alternative.

3.2.6 Wildlife

This resource is institutionally important because of the Fish and Wildlife Coordination Act of 1958, as amended, and the Migratory Bird Treaty Act of 1918. Wildlife resources are technically important because they are a critical element of many valuable aquatic and terrestrial habitats, they are an indicator of the health of various aquatic and terrestrial habitats, and many species are important commercial resources. Wildlife resources are publicly important because of the high priority that the public places on their aesthetic, recreational, and commercial value.

3.2.6.1 Existing Conditions

Fragmentation of the mature bottomland habitat along the Beau Bassin Coulee has reduced the abundance and diversity of wildlife in most of the study area. The dominant (over 95 percent) habitat types in the study area now include pastureland and urban/developed areas. Wildlife habitat along the coulee consists of a very narrow (less than 20 feet) riparian corridor containing low-quality native and non-native species. Because of the sporadic placement, juxtaposition within urban/developed lands, and narrow width of these patches of vegetation, the value of this habitat is extremely limited (as indicated in Photographs 3-1 through 3-5, shown previously). Common species observed or expected within these areas include cattle

egret (*Bubulcus ibis*), mourning dove (*Zenaida macroura*), red-tailed hawk (*Buteo jamaicensis*), common crow (*Corvus corax*), eastern kingbird (*Tyrannus tyrannus*), northern mockingbird (*Mimus polyglottos*), European starling (*Sturnus vulgaris*), field sparrow (*Spizella pusilla*), eastern cottontail (*Sylvilagus floridanus*), hispid cotton rat (*Sigmodon hispidus*), and eastern woodrat (*Neotoma floridana*).

The riparian hardwoods downstream of the eastern laydown site has the potential to support a variety of wildlife species. These include northern mockingbird, loggerhead shrike (*Lanius ludovicianus*), Carolina wren (*Thryothorus ludovicianus*), American robin (*Turdus migratoruius*), red-bellied woodpecker (*Melanerpes carolinus*), northern flicker (*Colaptes auratus*), blue jay (*Cyanocitta cristata*), yellow-throated warbler (*Geothlypis trichas*), northern cardinal (*Cardinalis cardinalis*), tufted titmouse (*Parus bicolor*), Virginia opossum (*Dipelphis virginiana*), and gray squirrel (*Sciurus carolinensis*).

3.2.6.2 Environmental Consequences

3.2.6.2.1 No Action Alternative

Without the TSP, there would likely be no direct impacts on wildlife populations. The Beau Bassin Coulee project area lies within or adjacent to the developed areas of the City of Carencro, so there are limited wildlife populations that use the stream and adjacent residential properties.

No indirect impacts on wildlife populations would be expected under the No Action Alternative.

3.2.6.2.2 Alternative 7 (TSP)

The clearing, grubbing, and dressing operations would not directly impact any important wildlife habitat in the area. The additional easement needed for construction and post-construction OMRR&R would directly impact the very narrow riparian corridor, primarily downstream of I-49 to St. Esprit Road. However, the limited vegetation communities present are common and provide low-quality habitat for terrestrial wildlife species. Some losses of individual wildlife specimens, particularly sedentary species, might occur as a result of direct contact with excavation or construction equipment and vehicles. However, all of the species potentially impacted by construction activities are locally and regionally common. Thus, no long-term adverse effects on wildlife populations would occur.

No nighttime construction work is expected to be required, since the construction corridor is entirely within urban/developed areas; therefore, potential effects on wildlife from portable lights would be eliminated. Noise from construction equipment would have minimal and intermittent impacts on the surrounding wildlife communities. Continuous noise in this area would likely disturb some individuals of

wildlife species in the immediate vicinity of the project area; however, the local population would acclimate to the noise disturbance or avoid the immediate area. Ambient noise conditions would return when construction activities are complete.

Construction of the retention basin would remove grassland habitat that could be used by rabbits, mice, and some ground-nesting birds, such as killdeer (*Charadrius vociferus*) or eastern meadowlark (*Sturnella magna*). Use of this basin would directly eliminate up to 6.8 acres of urban grassland/old field habitat.

Conversely, indirect impacts from the construction of the retention basin would include additional potential habitat for semi-aquatic, terrestrial, and waterfowl species. The amount and quality of this habitat would depend on the frequency and duration of flood water storage.

3.2.6.2.3 Alternative 3

The bank stabilization and the enlargement of the earthen channel would directly remove approximately 4.1 acres of low-quality habitat and would temporarily disturb approximately 9.1 acres. Post-construction OMRR&R permanent impacts would be similar to those described under Alternative 7.

3.2.6.2.4 Alternative 8

The impacts under this alternative would be similar to those described in Alternative 3. This alternative would also convert approximately 7.8 acres of upland grasslands to the retention basins.

3.2.6.2.5 Nonstructural Alternative

No direct or indirect impacts on wildlife populations would occur under the Nonstructural Alternative.

3.2.7 Endangered or Threatened Species

This resource is institutionally important because of the Endangered Species Act (ESA) of 1973, as amended, the Marine Mammal Protection Act of 1972, and the Bald Eagle Protection Act of 1940. Endangered or threatened species are technically important because the status of such species provides an indication of the overall health of an ecosystem. These species are publicly important because of the desire of the public to protect them and their habitats.

3.2.7.1 Existing Conditions

The U.S. Fish and Wildlife Service (USFWS) currently lists no Federally protected species with the potential for occurring in Lafayette Parish. Further, no designated Critical Habitat is located within or

adjacent to the project area. The Louisiana Department of Wildlife and Fisheries (LDWF), Louisiana Natural Heritage Program currently lists 13 species within Lafayette Parish with state protection or that are on the state watch list. A list of state threatened and endangered species potentially occurring in Lafayette Parish is presented in Table 3-1. However, LDWF has reported that no such species have been reported within the project area (EA Appendix B).

Table 3-1. State-Protected Species of Potential Occurrence in Lafayette Parish

Common Name Scientific Name	State Status	Habitat Requirements
Eastern harvest mouse *Reithrodontomys humulis*	S3,S4	Abandoned fields, marshes, and wet meadows.
Ringtail *Bassariscus astutus*	SNR	Rocky hills and cliffs near water.
Alligator snapping turtle *Macroclemys temmincki*	S3	Large rivers, canals, lakes, and oxbows.
Old prairie crawfish *Fallicambarus macneesei*	S2	Freshwater streams and lakes.
Evening rainlily *Cooperia drummundii*	S2	Black soils around Caddo Lake and on the prairies of Lake Charles.
Powdery thalia *Thalia dealbata*	S2,S3	Water of ditches, margins of swamps, edges of ponds and in marshes.
Cypress-knee sedge *Carex decomposita*	S3	Grows on floating or partially submerged rotting logs or stumps.
Flatsedge *Cyperus Cephalanthus*	S2	Outer reaches of depressions in upland or marsh coastal prairie and where marsh meets prairie.
Water-purslane *Didiplis diandra*	S2	Shallow water and muddy shores of Mississippi River sloughs, and sandy-peaty shores of reservoir ponds.
South bedstraw *Galium virgatum*	S2	Moist disturbed areas, roadside ditches.
Long-sepaled false dragon-head *Physostegia longisepala*	S2,S3	Bottomland hardwood forests along small to mid-size streams, interior fresh marshes in flat terrain, disturbed wet areas, and in roadside ditches.
Three-lobed coneflower *Rudbeckia triloba*	S3	Rich soils of calcareous forests, salt dome hardwood forests, and natural levees.
Broad-leaved spiderwort *Tradescantia subaspera*	S2	Rich soils of salt dome hardwood forests.

Legend: S2 – Imperiled in Louisiana because of rarity (6 to 20 known populations), S3 – Rare and local throughout the state (21 to 100 populations), S4 – Apparently secure in Louisiana with many occurrences (100 to 1000 known extant populations). SNR – species not ranked by LA Department of Wildlife and Fisheries
Source: USFWS 2000, LDWF 2011, NatureServe 2011.

Based on current habitat requirements, potential habitat for six state-protected species exists in the project vicinity. Pastureland and abandoned fields located throughout the study area could provide potential habitat for the eastern harvest mouse, and the banks of Beau Bassin Coulee provide potential habitat for powdery thalia, long-sepaled false dragon-head, cypress-knee sedge, and south bedstraw. However, no protected species were observed during field surveys conducted within the project corridor.

3.2.7.2 Environmental Consequences

3.2.7.2.1 No Action Alternative

Since there are no Federally protected species that occur within or near the project area, there would be no direct impacts on such species whether or not the TSP is implemented. Impacts on state-listed species, if such species are present, would not occur since construction would not be implemented. However, any local maintenance or development could indirectly affect these species if surveys are not performed and avoidance or mitigation measures are not incorporated.

3.2.7.2.2 Alternative 7 (TSP)

There would be no impacts on Federally listed species since there are none in the project area. No impacts on any state-listed species are anticipated; if any such species are identified during construction, CEMVN would coordinate with LDWF to determine the measures to avoid or offset impacts on any specimen.

No indirect impacts would be expected to occur as a result of implementation of Alternative 7.

3.2.7.2.3 Alternative 3

Impacts under Alternative 3 would be the same as described for Alternative 7.

3.2.7.2.4 Alternative 8

Impacts under Alternative 8 would be the same as described for Alternative 7.

3.2.7.2.5 Nonstructural Alternative

Impacts on threatened or endangered species under the Nonstructural Alternative would be the same as those described for Alternative 7.

3.2.8 Cultural Resources

This resource is institutionally significant because of the National Historic Preservation Act (NHPA) of 1966, as amended, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, and the Archeological Resources Protection Act of 1979, as well as other statutes. Cultural resources are technically significant because of their association or linkage to past events, to historically important persons, and to design and/or construction values, as well as for their ability to yield important information about prehistory and history. Cultural resources are publicly significant because preservation groups and private individuals support their protection, restoration, enhancement, or recovery.

3.2.8.1 Existing Conditions

New South Associates and Earth Search Inc. were contracted in 2008 and 2011, respectively, to conduct Phase I cultural resources surveys of the project corridor and associated construction zones. The 2011 survey also included the two proposed retention basins. Professional archaeologists conducted the fieldwork, which consisted of a pedestrian survey and systematic shovel testing at 98-foot intervals across the survey area, in compliance with the State Historic Preservation Officer (SHPO) guidelines. New South reported the documentation of two archaeological occurrences (AOs) and six archaeological sites. Additionally, a single previously recorded archaeological site (16LY102) was revisited during the current survey, but no artifacts associated with the site were identified within the survey corridor.

Of these six sites and two AOs, only one resource was identified as potentially eligible for the National Register of Historic Places (NRHP). Site 16LY127 consisted of the rail grade associated with the Louisiana and Texas Railroad (now known as the Southern Pacific Railroad), which was constructed in the 1880s. This railroad played a significant role in the development of Carencro after the Civil War. The Beau Bassin Coulee crossing at Railroad Street, which is the upper end of the project corridor, features an intact railroad trestle. Despite an overall lack of artifacts in excavated shovel test pits and the rail bed's loss of ties and rails, the grade remains a prominent feature in Carencro's cultural landscape, speaking to the railroad's historic role in the local development of the town. Therefore, site 16LY127, which includes the railroad trestle, is recommended potentially eligible for the NRHP under Criterion A and Criterion C as an engineered structure. However, more research is needed to establish the overall eligibility of this large linear resource.

Two newly discovered archaeological sites and one isolated AO were identified during the 2011 Earth Search survey. One of the sites (16LY135) consisted of a light historic scatter and was considered to be ineligible for nomination to the NRHP. The AO does not constitute a site and lacks research potential; thus, it, too, is not eligible for nomination to the NRHP. The other site (16LY136) was an intact, wooden historic bridge that crossed the Beau Bassin Coulee east of I-49. The NRHP eligibility of this site is unknown; however, since it is outside the direct area of potential effect, no additional research was recommended at this time. The cultural resources survey reports have been submitted to the Louisiana SHPO, in compliance with Section 106 of the NHPA. Concurrence with CEMVN's determination of no adverse effect has been received from the Louisiana SHPO (see EA Appendix B).

3.2.8.2 Environmental Consequences

3.2.8.2.1 No Action Alternative

Under the No Action Alternative, no direct or indirect effects on the newly recorded sites, known sites, or unknown sites would occur, as no construction activities would be implemented.

3.2.8.2.2 Alternative 7 (TSP)

No direct adverse effect on significant historic properties would occur if Alternative 7 were implemented. The proposed clearing, grubbing, and dressing would not adversely affect the overall preservation and potential eligibility of the rail corridor since it spans a broad area, encompassing Lafayette Parish and beyond. Additionally, the clearing, grubbing, and dressing would not affect the associated railroad trestle, since no work is planned at or above the trestle. Likewise, the proposed clearing, grubbing, and dressing would not affect the wooden bridge on the east side of I-49. Since Site 16LY127 and Site 16LY136 would be avoided, no direct impacts on those sites would occur.

No indirect impacts on cultural resources sites would be anticipated under Alternative 7.

3.2.8.2.3 Alternative 3

Impacts under Alternative 3 would be the same as those described for Alternative 7.

3.2.8.2.4 Alternative 8

Impacts under Alternative 8 would be the same as those described for Alternative 7.

3.2.8.2.5 Nonstructural Alternative

Under the Nonstructural Alternative, direct and indirect effects would be similar to those described for Alternative 7.

3.2.9 Recreational Resources

This resource is institutionally significant because of the Federal Water Project Recreation Act of 1965, as amended, and the Land and Water Conservation Fund Act of 1965, as amended. Recreational resources are technically significant because of the high economic value of recreational activities and their contribution to local, state, and national economies. Recreational resources are publicly significant because of the high value that the public places on fishing, hunting, and boating, as measured by the large number of fishing and hunting licenses sold in Louisiana, as well as the large per capita number of recreational boat registrations in Louisiana.

3.2.9.1 Existing Conditions

Lafayette Parish and the Parks and Recreation Commission of Carencro provide several recreational resources to residents and tourists. Softball players come from all over the U.S. to play ball in Carencro's Pelican Park. The facility is one of a few in the country outfitted with artificial turf infields. More than 3,000 games are played annually on Pelican Park's four ball fields. In the off season, the 32-acre park is host to a number of social events. The Carencro Area Youth Sports Initiative is a volunteer organization that coordinates a program for youth in baseball, basketball, and football, of which more than 1,000 children take part each year. Youth soccer is offered through the Lafayette Parish Parks and Recreation Department. Approximately 200 children benefit from the Carencro Summer Recreation Program. Youth participate in seven weeks of organized team sports, recreational games, and special activities such as softball, kickball, flag football, soccer, volleyball, basketball, swimming, horseshoes, ping-pong, checkers, and other quiet games. Children also learn environmental awareness by taking part in Trash Bash, a community cleanup day (City of Carencro 2009).

The nearby Atchafalaya Basin Swamp, the nation's largest swamp wilderness, provides recreational fishing, boating, and hunting. The bayous, swamps, prairies, and forests in the area provide landscape for naturalists and outdoor enthusiasts. Acadian Village is a folk life museum located approximately 7 miles south of Carencro and offers an authentic glimpse of Acadian society in south Louisiana during the 19th century. Located approximately 7 miles south of Carencro is the Jean Lafitte National Historical Park and Preserve - Acadian Cultural, a unit of the National Park Service (NPS). The park depicts the story of the Acadians, who settled the prairies, bayous, and marshes of southern Louisiana, through displays, talks, and exhibits. Vermilionville, a Cajun/Creole heritage and folk life park, is located approximately 10 miles from Carencro. The park recreates life in the Acadiana area from 1765 to 1890. The park features tours, costumed craftspeople, a cooking school, a restaurant, and a special events facility. The Lafayette Science Museum and Planetarium, the official tourism site of Louisiana 2011, is located approximately 8 miles south of Carencro and features hands-on science exhibits, shows, and activities.

No recreation is currently occurring within the Beau Bassin Coulee, as the water and terrain do not support fishing or boating.

3.2.9.2 Environmental Consequences

3.2.9.2.1 No Action Alternative

The conditions within the recreational environment would continue as they have in the past under the No Action Alternative, as no direct impacts on these resources would occur. The recreational conditions and

opportunities would be dictated by the natural land use patterns and processes that have dominated the area in the past.

Indirectly, recreational infrastructure such as parks would remain vulnerable to floods.

3.2.9.2.2 Alternative 7 (TSP)

No recreational facilities or opportunities would be directly affected by the proposed construction activities under Alternative 7, as none are located along the Beau Bassin Coulee. Implementation of Alternative 7 would reduce the risk of floods to recreational infrastructure, such as parks and recreation facilities.

No indirect adverse impacts on these facilities would occur under Alternative 7.

3.2.9.2.3 Alternative 3

Impacts under Alternative 3 would be similar to those described for Alternative 7.

3.2.9.2.4 Alternative 8

Impacts under Alternative 8 would be the same as those described for Alternative 7.

3.2.9.2.5 Nonstructural Alternative

No direct or indirect impacts on recreational facilities or opportunities would occur under the Nonstructural Alternative.

3.2.10 Aesthetics (Visual Resources)

This resource's institutional significance is derived from laws and policies that affect visual resources, most notably NEPA, the Coastal Barrier Resources Act of 1990, and National and Local Scenic Byway Programs. Aesthetic resources are technically significant because of visual accessibility to unique combinations of geological, botanical, and cultural features that may be an asset to an area. Public significance is based on expressed public perceptions and professional evaluation.

3.2.10.1 Existing Conditions

The project area follows the meandering Beau Bassin Coulee primarily extending east and west through the City of Carencro. Visually, the project area is marked primarily by flat land adjacent to the Beau Bassin Coulee with vegetation along the edges helping to define parcels of land. Low-density, rural

development along road frontages and at the various crossroads is common to the project area. Additionally, the project area contains small retail facilities, including restaurants and food stores. Viewsheds are limited by the interspersed pockets of forest vegetation.

3.2.10.2 Environmental Consequences

3.2.10.2.1 No Action Alternative

Under the No Action Alternative, no foreseen direct or indirect impacts on visual resources would occur at the proposed project areas. The project area's scenic character has not been recognized by national or state designations. There may be visual resources of local significance not identified in the project's surrounding area. However, these resources were not acknowledged in the project's stakeholder meetings.

3.2.10.2.2 Alternative 7 (TSP)

Alternative 7 would result in impacts similar to those of the No Action Alternative. However, some individuals would likely consider the removal of a natural vegetation screening as an unnatural and negative impact.

3.2.10.2.3 Alternative 3

Alternative 3 would result in impacts similar to those of Alternative 7.

3.2.10.2.4 Alternative 8

Impacts under Alternative 8 would be similar to those of Alternative 7.

3.2.10.2.5 Nonstructural Alternative

Impacts under the Nonstructural Alternative would be similar to those of the No Action Alternative.

3.2.11 Noise

This resource is institutionally important because of the Noise Control Act of 1972. Compliance with surface carrier noise emissions is technically important. Exposure of persons to noise levels in excess of applicable standards is publicly significant.

3.2.11.1 Existing Conditions

Noise is generally described as unwanted sound, which can be based either on objective effects (i.e., hearing loss, damage to structures, etc.) or subjective judgments (e.g., community annoyance). Sound is

usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as sound level. The threshold of human hearing is approximately 3 dB, and the threshold of discomfort or pain is around 120 dB. Noise levels occurring at night generally produce a greater annoyance than do the same levels occurring during the day. It is generally agreed that people perceive intrusive noise at night as being 10 A-weighted decibels (dBA) (a dBA is a measure of noise at a given, maximum level or constant state level) louder than the same level of intrusive noise during the day, at least in terms of its potential for causing community annoyance. This perception is largely because background environmental sound levels at night in most areas are also about 10 dBA lower than those during the day. Acceptable noise levels have been established by the U.S. Department of Housing and Urban Development (HUD) for construction activities in residential areas, and are generally considered to be 65 dB (HUD 1984).

3.2.11.2 Environmental Consequences

3.2.11.2.1 No Action Alternative

Under the No Action Alternative, no direct or indirect effects on the ambient noise levels within the City of Carencro would occur, as no construction would occur.

3.2.11.2.2 Alternative 7 (TSP)

The clearing, grubbing, and dressing would require the use of common heavy construction equipment. Table 3-2 describes noise emission levels for construction equipment, which range from 76 dBA to 84 dBA at a distance of 50 feet (Federal Highway Administration [FHWA] 2007).

Table 3-2. dBA Sound Levels of Construction Equipment and Modeled Attenuation at Various Distances[1]

Noise Source	50 feet	100 feet	200 feet	500 feet	1000 feet
Backhoe	78	72	68	58	52
Crane	81	75	69	61	55
Dump truck	76	70	64	56	50
Excavator	81	75	69	61	55
Concrete mixer truck	79	73	67	59	53
Pneumatic tools	81	75	69	61	55
Bulldozer	84	78	72	64	58
Front-end loader	81	75	69	61	55

Source: FHWA 2007 and GSRC
The dBA at 50 feet is a measured noise emission (FHWA 2007). The 100- to 1,000-foot results are modeled estimates.

Assuming the worst case scenario of 84 dBA, the noise model projected that noise levels of 84 dBA from a point source (i.e., bulldozer) would have to travel 450 feet before the noise would be attenuated to an acceptable level of 65 dBA. To achieve an attenuation of 84 dBA to a normally unacceptable level of 75 dBA, the distance from the noise source to the receptor is 140 feet.

Assuming the construction activities are contained within the 10-foot construction corridor, several sensitive receptors may be exposed to noise emissions that are unacceptable and normally unacceptable. Table 3-3 contains the number of sensitive noise receptors located within the 75 dBA and 65 dBA noise contours created by the construction equipment.

Table 3-3. Number of Sensitive Noise Receptors within the 65 dBA and 75 dBA Noise Contours

Noise Receptor	Exposure to Noise Greater than 65 dBA	Exposure to Noise Greater than 75 dBA
Residential Homes	167	60
Churches	1	1

Source: Google Earth 2011 and GSRC 2011

Approximately 167 residential receptors and one church may experience temporary noise intrusion equal to or greater than 65 dBA from construction equipment. Approximately 60 residential receptors and one church may experience temporary noise intrusion equal to or greater than 75 dBA from construction equipment. To minimize these noise impacts, construction activities, when operating near residential neighborhoods, should be limited to daylight hours during the workweek, between 8:00 am and 5:00 pm on Monday through Friday. Noise impacts would be within regulatory limits if these timing restrictions are implemented in residential neighborhoods. Noise generated by the construction activities would be intermittent and last for approximately 3 months, after which noise levels would return to ambient levels. Figure 3-1 illustrates the 65 dBA and 75 dBA noise contours from construction equipment associated with the implementation of Alternative 7.

No indirect impacts on ambient noise levels would be expected as a result of this alternative.

3.2.11.2.3 Alternative 3

The direct impacts associated with Alternative 3 would be slightly more than those described in Alternative 7 because there would be more heavy-duty construction equipment involved in channel enlargement and placement of gabion baskets within the stream channel. It would also require more time to complete the project. Still, the construction noise impacts would be intermittent and short-term, and if construction timing restrictions are implemented within residential neighborhoods, impacts on the noise

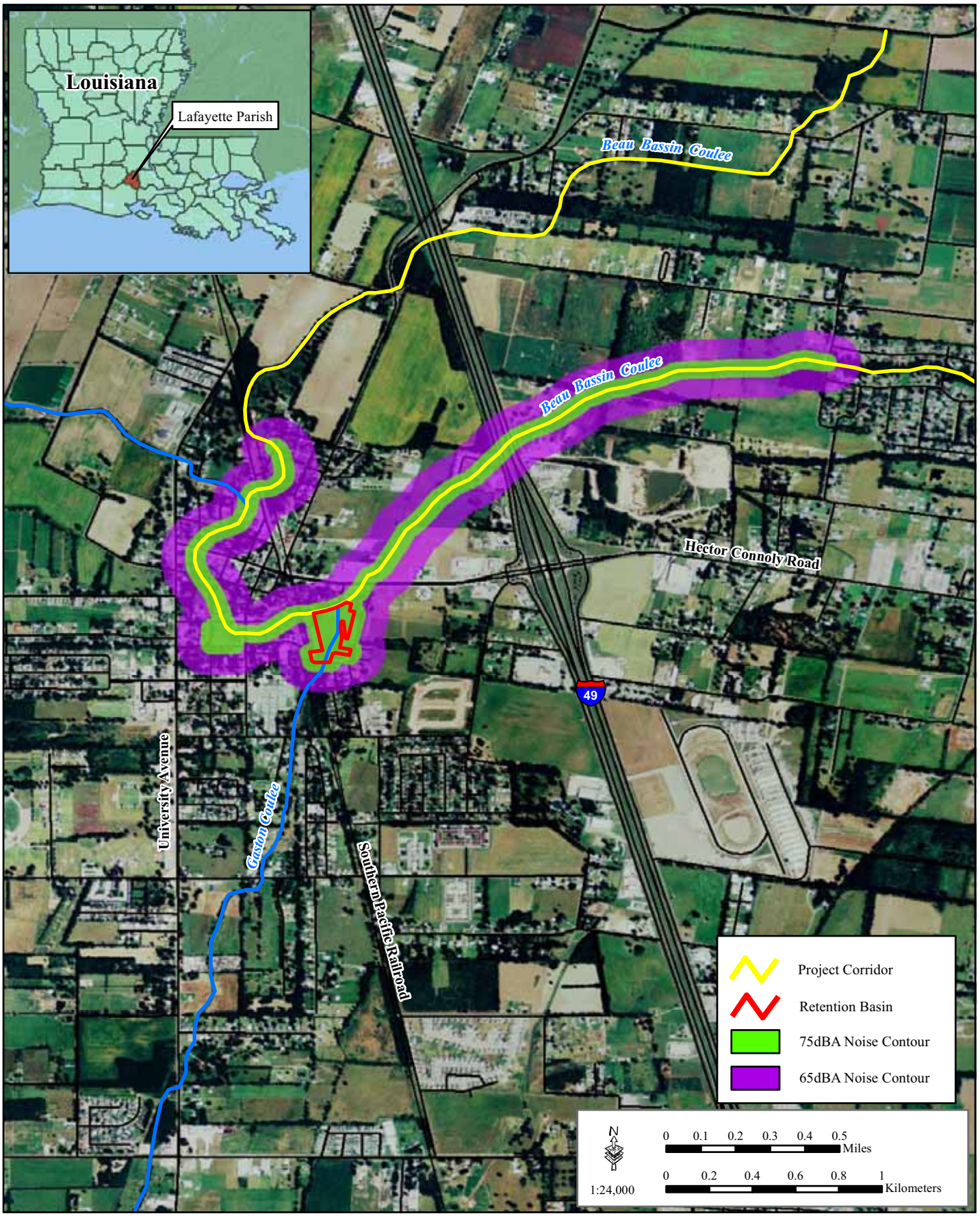

Figure 3-1: Construction Noise Contours of 75 dBA and 65 dBA

GSRC

January 2012

environment resulting from the implementation of Alternative 3 would be minor. Ambient noise conditions would return as construction activities are completed within each reach.

No indirect impacts on ambient noise levels would be expected as a result of this alternative.

3.2.11.2.4 Alternative 8

The impacts associated with Alternative 8 would be similar to those described in Alternative 7. The construction noise impacts would be intermittent and short-term, and if construction timing restrictions are implemented within residential neighborhoods, impacts on the noise environment resulting from the implementation of Alternative 8 would be minor. Ambient noise conditions would return as construction activities are completed within each reach.

No indirect impacts on ambient noise levels would be expected as a result of this alternative.

3.2.11.2.5 Nonstructural Alternative

Impacts on ambient noise levels under the Nonstructural Alternative would be similar to those described for Alternative 7. Increases in noise would occur during the elevation of the 30 structures; however, ambient conditions would return immediately after cessation of the demolition activities. No indirect impacts are anticipated under this alternative.

3.2.12 Air Quality

This resource is considered institutionally important because of the Louisiana Environmental Quality Act of 1983, as amended, and the Clean Air Act of 1963, as amended. Air quality is technically important because of the status of regional ambient air quality in relation to the National Ambient Air Quality Standards (NAAQS). It is publicly important because of the desire for clean air expressed by virtually all citizens.

3.2.12.1 Existing Conditions

The U.S. Environmental Protection Agency (USEPA) established NAAQS for specific pollutants determined to be of concern with respect to the health and welfare of the general public. The major pollutants of concern, or criteria pollutants, are carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide, ozone, particulate matter less than 10 microns (PM-10), particulate matter less than 2.5 microns (PM-2.5), and lead. NAAQS represent the maximum levels of background pollution that are considered safe, with an adequate margin of safety, to protect the public health and welfare.

Areas that do not meet these NAAQS are called non-attainment areas; areas that meet both primary and secondary standards are known as attainment areas. The Federal Conformity Final Rule (40 CFR Parts 51 and 93) specifies criteria or requirements for conformity determinations for Federal projects. The Federal Conformity Rule was first promulgated in 1993 by the USEPA, following the passage of Amendments to the Clean Air Act in 1990. The rule mandates that a conformity analysis must be performed when a Federal action generates air pollutants in a region that has been designated a non-attainment or maintenance area for one or more NAAQS.

A conformity analysis is the process used to determine whether a Federal action meets the requirements of the General Conformity Rule. It requires the responsible Federal agency to evaluate the nature of a TSP and associated air pollutant emissions and calculate emissions as a result of the TSP. If the emissions exceed established limits, known as *de minimis* thresholds, the proponent is required to implement appropriate mitigation measures. Lafayette Parish is in attainment for all NAAQS, and the TSP, and therefore, does not require a conformity analysis (USEPA 2010a).

3.2.12.2.1 Executive Order 13514

EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance,* signed on October 5, 2009, directs Federal agencies to reduce Green House Gases (GHG) emissions and address climate change in NEPA analysis. It expands upon the energy reduction and environmental performance requirements of EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*. It identifies numerous energy goals in several areas, including GHG management, management of sustainable buildings and communities, and fleet and transportation management. In response to this and other Federal acts, USEPA issued the final rule in 2009, which requires large sources that emit 27,557 tons or more per year of GHG emissions to report GHG emissions in the U.S., collect accurate and timely emissions data to inform future policy decisions, and submit annual GHG reports to the USEPA.

3.2.12.2 Environmental Consequences

3.2.12.2.1 No Action Alternative

Under the No Action Alternative, the airshed within Lafayette Parish would not be directly impacted and would remain in its current condition. Maintenance activities along the coulee would likely occur as Lafayette Parish or the City of Carencro are able to obtain funding; these activities would indirectly result in minor, temporary emissions, which would be anticipated to be far less than the *de minimis* thresholds.

3.2.12.2.2 Alternative 7 (TSP)

Direct, temporary increases in air pollution would occur from the use of construction equipment (combustion emissions) and the disturbance of soils (fugitive dust) during construction activities along the coulee. USEPA's NONROAD Model (USEPA 2005a) was used to calculate emissions from construction equipment. Combustion emission calculations were made for standard construction equipment, such as front-end loaders, backhoes, bulldozers, and cement trucks. Assumptions were made regarding the total number of days each piece of equipment would be used and the number of hours per day each type of equipment would be used.

Indirectly, construction workers would temporarily increase the combustion emissions in the airshed during their commute to and from the project area. Emissions from delivery trucks would also indirectly contribute to the overall air emission budget.

The total air quality emissions were calculated for the construction activities, including the delivery and construction worker vehicle trips, are presented in Table 3-4. Details of the analyses are presented in EA Appendix C.

Table 3-4. Total Air Emissions (tons/year) from Alternative 7 Construction Activities versus the *de minimis* Threshold Levels[1]

Pollutant	Total	*de minimis* Thresholds
CO	29.50	100
VOCs	5.87	100
Nitrous oxide	48.65	100
PM-10	23.53	100
PM-2.5	5.98	100
SO_2	6.71	100
GHG (carbon dioxide equivalent)	20,422	27,557

Source: 40 CFR 51.853 and Gulf South Research Corporation model projections.
[1] Note that Lafayette Parish is in attainment for all NAAQS (USEPA 2010b).

As can be seen from the tables above, the proposed construction activities do not exceed Federal *de minimis* thresholds; thus, construction activities under Alternative 7 would not require a Conformity Determination even if Lafayette Parish were to be classified as non-attainment. As there are no violations of air quality standards and no conflicts with the state implementation plan, the direct impacts on air quality from the implementation of Alternative 7 would be negligible to minor.

No indirect impacts would be anticipated under Alternative 7.

3.2.12.2.3 Alternative 3

Impacts on air quality under Alternative 3 would be similar to those described in Alternative 7.

3.12.2.2.4 Alternative 8

Under Alternative 8, the impacts on air quality in the region would be similar to those described in Alternative 7.

3.2.12.2.5 Nonstructural Alternative

Direct and temporary impacts on air quality would occur under the Nonstructural Alternative while the structures are being elevated. The emissions generated by this activity would be minor to moderate. Moderate effects could occur if the structures that are elevated have asbestos-containing materials (ACM) or lead-based paint (LBP), and those materials could be released into the air. A facility condition assessment would need to be conducted for each structure prior to elevating the structure to determine if ACM or LBP were present. If such materials are indeed present, abatement measures would be implemented to avoid or minimize the release of these materials into the air. No indirect effects would be expected to occur under this alternative.

3.2.13 Social and Economic Resources

Social and economic resources are important in considering NEPA's mandate to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and to fulfill the social, economic, and other requirements of present and future generations of Americans by weighing the economic and social impacts of the proposed project against the proposed project's adverse impacts on the physical environment in order to attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.

3.2.13.1 Existing Conditions

3.2.13.1.1 Population and Demographics

According to the U.S. Census Bureau, the population of Carencro in 1990 was 5,429. The population increased to 6,120 by 2000 and to 7,526 by 2010. This shows a population increase of 12.7 percent from the year 1990 to 2000 and a population increase of 23.0 percent from the year 2000 to 2010 (U.S. Census Bureau 2010). According to the 2010 Census, the racial mix of Carencro was 51 percent White, non-Hispanic, "42 percent Black or African American", and less than one percent each American Indian and

Alaskan native, Asian and other races (2010 Census). The population of the project area for 1990, 2000, and 2009 is outlined in Table 3-5.

Table 3-5. Census Population of the Project Area, 1990 through 2009

Location	2010	2000	1990	1990-2000 % Change	2000-2009 % Change
Carencro	7,526	6,120	5,429	12.7	23.0
% of Louisiana	0.17	0.14	0.13	-	-
Louisiana Total	4,533,372	4,468,976	4,219,973	5.9	4.9

Source: U.S. Census Bureau, 2009 Population Estimates, Census 2000, 1990 Census

3.2.13.1.2 Economics

In 2009, the total number of persons in the labor force was 3,329. This represents approximately 50 percent of the population living in Carencro (U.S. Census Bureau 2009c). In 2009, Lafayette Parish had a per capita personal income (PCPI) of $44,598. This PCPI ranked 2nd in the state and was 119 percent of the state average, $37,632, and 113 percent of the national average, $39,635. The 2009 PCPI reflected a decrease of 3.0 percent from 2008. The 2008-2009 state change was -1.3 percent and the national change was -2.6 percent. In 1999, the PCPI of Lafayette Parish was $25,685 and ranked 4th in the state. The 1999-2009 average annual growth rate of PCPI was 5.7 percent. The average annual growth rate for the state was 5.3 percent and for the nation was 3.4 percent.

Total personal income (TPI) includes net earnings by place of residence, dividends, interest, rent, and personal current transfer receipts received by the residents of Lafayette Parish. In 2009, Lafayette Parish had a TPI of $9,408,022. This TPI ranked 6th in the state and accounted for 5.6 percent of the state total. In 1999, the TPI of Lafayette Parish was $4,881,499 and ranked 6th in the state (Bureau of Economic Analysis 2011).

3.2.13.1.3 Housing

The City of Carencro had a total of 2,401 occupied housing units in 2000 (Table 3-6). The occupied housing units slightly increased between the year 2005 and 2009 to 2,857 units (U.S. Census Bureau 2009d).

Table 3-6. Housing Units in Project Area, 2000, and 2005 through 2009

Location	2005 - 2009	2000	2000 through 2005 to 2009 % Change
Carencro	2,857	2,401	19
% of Louisiana	.17	.13	-
Louisiana Total	1,644,094	1,847,181	-11

Source: U.S. Census Bureau, 2000, and 2005 - 2009 Housing Units Estimates

3.2.13.1.4 Business and Industrial Activity

Business and industrial activity is an important component of socioeconomic resources. The support of existing businesses and industry and their future expansion provides an economic base for communities and is part of the community's long-term economic stability. In Carencro, the industries that employ the greatest number of people include retail trade; professional, scientific, and technical services; health care; and accommodation and other food services (Table 3-7).

Table 3-7. Number of Establishments and Employees in Carencro, Louisiana by Industry

Industry	Number of Establishments	Number of Employees
Retail trade	31	242
Information	3	N/A
Real estate; renting and leasing	11	41
Professional, scientific, and technical services	18	401
Administrative and support, waste management and remediation services	7	46
Educational services	2	N/A
Health care and social assistance	24	298
Art, entertainment and recreation	63	82
Accommodation and food services	14	868
Other services	14	89

Source: U.S. Census Bureau 2007

3.2.13.1.5 Public Facilities and Services

This socioeconomic resource provides needed services for health and safety of the general public.

Police and Fire Protection

Carencro is serviced by a full-time force of police officers, detectives, and support staff, in addition to 10 reserve volunteer police officers. The Carencro Fire Department includes 25 volunteer and two full-time firefighters. The fire department responds to over 450 calls per year, including structure fires, vehicle

fires, grass fires, hazardous material incidents, vehicle crashes, and public service calls. They also respond to emergencies on the Vermilion River and Bayou Carencro with the department's rescue boat.

Schools

The Lafayette Parish School System operates three public schools in Carencro, Louisiana: Carencro Heights Elementary, Carencro Middle School, and Carencro High School. Carencro Heights Elementary enrolls students in grades Kindergarten through grade 4, Carencro Middle School enrolls students in grades 5 through 8, and Carencro High School enrolls students in grades 9 through 12 (City of Carencro 2010). Carencro High School offers advanced placement classes and honors classes, in addition to traditional academic classes, and offers numerous clubs, extracurricular activities, and female and male athletic programs. It is also the home of the Academy of Information Technology, which introduces students to career opportunities in today's digital workforce. In addition, there is one private school (Pre-Kindergarten through grade 8) that is operated by the Diocese of Lafayette, named Carencro Catholic School. There are also two higher education facilities located nearby, specifically, the University of Louisiana at Lafayette (UL Lafayette), and the Louisiana Technical College-Lafayette Campus. UL Lafayette is the second largest university in the state and enrolls approximately 16,000 students.

Health Care

No hospitals are located directly in Carencro, Louisiana, but several are located in close proximity to the nearby town of Lafayette. However, there is a health clinic within the city limits and several individual doctors' offices.

Other Facilities

There are four churches located in Carencro, Louisiana: First Baptist Church, Our Lady of the Assumption Catholic Church, Temple Baptist Church, and St. Peter Roman Catholic Church. The North Regional Library, part of the Lafayette Public Library System, is also located adjacent to the Carencro Community Center.

3.2.13.1.6 Community and Regional Growth

Generally desirable community and regional growth is considered to be growth supported by local and regional institutions through economic developments, social programs, and the human environment supported by neighborhoods and metropolitan areas as reflected by employment, income, and population trends. In Carencro, the civilian labor force, median household income, and population increased between 2000 and 2009, indicating a positive community growth (Table 3-8). The City of Carencro

experienced a population increase of 23 percent between 2000 and 2010. The unemployment rate in 2009 for Carencro (5.38 percent) is less than the unemployment rate for the State of Louisiana in 2009 (8.4 percent) (U.S. Census Bureau 2009).

Table 3-8. Indicators of Community Growth in Carencro, Louisiana

	2000	2010
Percent of population (16+) in labor force	54.2%	66.4%
Median household income	$22,716	$26,755
Population (in people)	6,120	7,526

Source: U.S. Census Bureau 2000, 2009.

In addition, Carencro has an active economic development plan and business association. Easy transportation access via two major interstate highways and close proximity to Lafayette make the area ideal for economic development. In addition, several digital communications have chosen to include Carencro and Lafayette Parish in their fiber routes (e.g., Sprint, Sun America, Network USA), allowing for sophisticated digital infrastructure. Based on current trends, it is likely that Carencro will continue to grow and prosper.

3.2.13.1.7 Community Cohesion

Community cohesion is the unifying force of conditions that provide commonality within a group. It has also been used to describe patterns of social networking within a community. Community cohesion refers to the common vision and sense of belonging within a community that is created and sustained by the extensive development of individual relationships that are social, economic, cultural, and historical in nature. The degree to which these relationships are facilitated and made effective is contingent upon the spatial configuration of the community itself; the functionality of the community owes much to the physical landscape within which it is set. The viability of community cohesion is compromised to the extent to which these physical features are exposed to interference from outside sources.

3.2.13.1.8 Tax Revenues and Property Values

The collection of business, sales, and property taxes in support of community services and infrastructure is an important socioeconomic resource. The City of Carencro generated $2,853,049 in 2010 from property taxes, sales and use taxes, franchise taxes, grants and contributions, interest and investment earnings (Table 3-9). As shown in Table 3-10, the average value of owner-occupied housing units in Carencro, Louisiana, was $99,000 between 2005 and 2009, compared to $73,000 in 2000 (U.S. Census

Bureau 2009, U.S. Census Bureau 2000). In addition, the number of owner-occupied homes has increased from 1,078 in 2000 to 1,799 in 2009 (U.S. Census Bureau 2000, U.S. Census Bureau 2009).

Table 3-9. Revenues in 2010 for the City of Carencro, Louisiana

General Revenues	Total Revenue and Changes in Net Assets
Property taxes, levied for general purposes	$135,709
Sales and use taxes, levied for general purposes	$2,591,021
Franchise taxes	$375,127
Grants and contributions (not restricted to specific programs): State Sources	$15,275
Interests and investment earnings	$51,726
Miscellaneous	$15,447
Total general revenues and transfers	**$2,853,049**

Source: City of Carencro 2010b.

Table 3-10. 2000 and 2009 Median Value of Specified Owner-occupied Housing Units in Carencro, Lafayette Parish, and the State of Louisiana

Location	Median Value	
	2000	2009
Carencro, Louisiana	$73,000	$99,000
Lafayette Parish	$100,500	$143,300
Louisiana	$85,000	$121,300

U.S. Census Bureau 2009, 2000.

3.2.13.2 Environmental Consequences

3.2.13.2.1 No Action Alternative

Without the TSP, no improvements, modifications, or additional flood reduction structures would be built. Therefore, there is a high potential for flooding to continue in the City of Carencro, as well as the associated costs in damage to housing units and other public and commercial structures.

According to the U.S. Census Bureau, the State of Louisiana's population is projected to increase by 2.8 percent from 2010 to 2015. The population of Lafayette Parish is projected to increase to 213,040 individuals by the year 2015 (State of Louisiana 2007). This future growth would be limited to the few areas where developable land still exists, such as the area surrounding the City of Carencro. As the population increases, so would the local economy, which in turn may increase the need for housing and jobs. Still, the No Action Alternative condition would be similar to existing conditions. Minority and low-income populations in the project area would also remain similar to existing conditions, but could be impacted by future flooding events, which would result in the loss of or damage to belongings and

housing. The potential for disproportionate impacts on low-income and minority populations is discussed later.

Indirectly, subsequent flooding events could degrade the canal, causing more flooding in the vicinity of the canal and erosion of the canal banks. Recurring flooding events could lead to a drop in the property values in Carencro. The lack of improvement to structures, land, or sites damaged by flooding would decrease the property values, which in turn would lead to less tax revenues for the City of Carencro.

3.2.13.2.2 Alternative 7 (TSP)

Under Alternative 7, there would be activities involving construction and modifications to the Beau Bassin Coulee channel. The equipment, supplies, and personnel used during construction or modification to the structure would likely come from the surrounding area, providing a direct, short-term beneficial impact from construction-related jobs.

In the long term, the potential for flooding would be reduced and, thus, the potential for flood damage to homes would decrease. Persons living in the City of Carencro would have reduced risk of flooding and flood-related damages. Minor long-term economic development could indirectly result from additional personnel relocating from other areas to Carencro. Overall, beneficial impacts would occur as a result of implementing Alternative 3. Additionally, the proposed construction activities would not have adverse impacts on children in the area. These activities would not create emissions or release toxic materials that would impact children in the area.

Due to better flood protection, property values would continue to increase and the potential for economic and community growth would increase, generating indirect benefits for the region. Both home owners and business owners would be more likely to build in the area with the reduced flood risk and would expand into areas that may have been previously undevelopable due to flooding. With an increased flood risk reduction system, community cohesion would be increased by the ability to maintain established neighborhoods.

3.2.13.2.3 Alternative 3

Under this alternative, the direct and indirect impacts would be similar to those of Alternative 7.

3.2.13.2.4 Alternative 8

Under this alternative, the direct and indirect impacts would be similar to those of Alternative 7.

3.2.13.2.5 Nonstructural Alternative

Under the Nonstructural Alternative, temporary relocation of residents or business owners would directly disrupt community cohesion of the neighborhoods along the Beau Bassin Coulee during the time the structures were being elevated.

Indirect effects would include increased property values, since these 30 structures would now be protected against 20 percent flood events.

3.2.14 Environmental Justice (EJ)

EJ is institutionally significant because of EO 12898 of 1994 and the Department of Defense's Strategy on EJ of 1995, which direct Federal agencies to identify and address any disproportionately high adverse human health or environmental effects of Federal actions on minority and/or low-income populations. Minority populations are those persons who identify themselves as Black, Hispanic, Asian American, American Indian/Alaskan Native, or Pacific Islander. This resource is technically significant because the social and economic welfare of minority and low-income populations may be positively or disproportionately impacted by the TSP. This resource is publicly significant because of public concerns about the fair and equitable treatment (fair treatment and meaningful involvement) of all people with respect to environmental and human health consequences of Federal laws, regulations, policies, and actions.

3.2.14.1 Historic Conditions

The concept of "environmental justice" is rooted in Title VI of the Civil Rights Act of 1964, which prohibited discrimination based on race, color, and national origin, and other nondiscrimination statutes, as well as other statutes including NEPA of 1969, the Uniform Relocations Assistance and Real Property Acquisition Policies Act of 1970, and 23 U.S.C Section 109 (h). In 1971, the CEQ annual report acknowledged that racial discrimination adversely affects the environment of the urban poor. During the next 10 years, activists maintained that toxic waste sites were disproportionately located in low-income and areas populated by "people of color." By the early 1980s, the EJ movement had increased its visibility and broadened its support base (Commission for Environmental Equality 2009).

This led to the United Church of Christ (UCC) undertaking a nationwide study and publishing Toxic Waste and Race in the United States (UCC 1987). This eventually gained the attention of the Federal Government, and in 1992, the USEPA's Office of Environmental Equity was established. In 1994, EJ was institutionalized within the Federal Government through EO 12898 (EPA 1995a), which focused

Federal attention on human-health and environmental conditions in minority and low-income communities (EPA 1995a, 1995b, 1995c, 1995d). EO 12898 requires greater public participation and access to environmental information in affected communities. The results of early efforts and research (UCC 1987) into EJ suggested that environmental amenities and toxic waste sites were not uniformly distributed among income groups, classes, or ethnic communities. Disparities of this nature may have been and continue to be the result of historical circumstances, lack of community participation, or simply inadequate or inappropriate oversight. Consequently, dialogue with some community groups was not conducted and their concerns not considered in the decision-making process of local or Federal actions.

A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population. Low-income populations as of 2010 are those whose income are $22,050 for a family of four and are identified using the Census Bureau's statistical poverty threshold. The Census Bureau defines a "poverty area" as a Census tract with 20 percent or more of its residents below the poverty threshold and an "extreme poverty area" as one with 40 percent or more below the poverty level.

A potential disproportionate impact may occur when the percent minority in the study area exceeds 50 percent and/or the percent low-income exceeds 20 percent of the population. Additionally, a disproportionate impact may occur when the percent minority and/or low-income in the study area are meaningfully greater than those in the reference community. For purposes of this analysis, all Census Block Groups within a 1-mile radius of the project footprint are defined as the EJ study area. The City of Carencro project is located in Lafayette Parish, which is considered the reference community of comparison.

The methodology, consistent with E.O. 12898, to accomplish this EJ analysis includes identifying low-income and minority populations within the Beau Bassin Coulee study area using up-to-date economic statistics, aerial photographs, 2010 U.S. Census records, the 2005-2009 U.S. Census Bureau's American Community Survey (ACS) estimates, as well as conducting community outreach activities such as public meetings.

The 2010 U.S. decennial census data was used in the current analysis as the primary deciding variable to determine whether the study area exceeds the minority threshold and, therefore, potentially disproportionately impacts minority population groups. The U.S. Census Bureau is now only providing population (including minority status) and housing characteristics in the decennial censuses. Other social

characteristics (e.g., low-income) will now be provided in the U.S. Census Bureau's ACS. The ACS provides estimates of social characteristics based on data collected over 5 years. The 2005-2009 estimates represent the average characteristics over the 5-year period of time. For this reason, the current analysis uses the 2005-2009 ACS data to determine whether the study area exceeds the low-income threshold and, therefore, potentially disproportionately impacts low-income populations.

3.2.14.2 Existing Conditions

The proposed flood risk management study area is located in Lafayette Parish in the City of Carencro. The 2010 Census records indicate that the minority population in Lafayette Parish was 32.8 percent and the 2005-2009 ACS data indicate that, during this period (as stated previously, the 2005-2009 estimates represent the average characteristics over the 5-year period of time), the low-income population was 15.5 percent. Within Lafayette Parish, the proposed project area is located in Census Tract 21.03. According to the 2010 decennial Census, Census Tract 21.03 had a minority population of 48.9 percent and, according to the 2005-2009 ACS, had a low-income population of 30.8 percent.

Analyses of the above information show that the minority population in Census Tract 21.03 does not exceed 50 percent of the total population. However, the low-income population in Census Tract 21.03 does exceed the 20 percent threshold and, therefore, must be examined further to determine whether a disproportionate impact will occur on low-income populations as a result of the TSP.

3.2.14.3 Environmental Consequences

3.2.14.3.1 No Action Alternative

No minority or low-income communities would be adversely impacted, directly or indirectly, by the No Action Alternative. Therefore, no disproportionately high or adverse human health or environmental effects on minority or low-income populations would occur.

3.2.14.3.2 Alternative 7 (TSP)

Within Census Tract 21.03, the Beau Bassin Coulee runs through low-income areas west of I-49 from the upstream Southern Pacific Railroad Bridge to the Veterans Boulevard Bridge. Under this alternative, both privately owned and city-owned property would be directly affected.

This area is sparsely populated with no residences or businesses located directly within the project footprint. This alternative would result in temporary, direct effects due to construction activities. These

temporary effects would equally affect all population groups in the project area and, therefore, would not result in a disproportionately high adverse impact on low-income populations in the area.

Under this alternative, no disproportionately high adverse indirect impacts on human health or environmental effects within the study area would occur. The completion of the project would result in positive impacts on the area in the form of improved drainage that would benefit all residents equally.

3.2.14.3.3 Alternative 3

Impacts under Alternative 3 would be similar to those described for Alternative 7, and no disproportionately high adverse direct or indirect impacts on human health or environmental effects within the study area would occur.

3.2.14.3.4 Alternative 8

Impacts under Alternative 8 would be similar to those described for Alternative 7, and no disproportionately high adverse direct or indirect impacts on human health or environmental effects within the study area would occur.

3.2.14.2.5 Nonstructural Alternative

Under the Nonstructural Alternative, approximately 30 structures and houses in the area would be elevated. Temporary relocation of residents and business owners would occur during the elevation process, and would equally affect all population groups in the project area. Therefore, no disproportionately high adverse impact would occur on low-income populations in the area. Indirect impacts under this alternative would be similar to those described for Alternative 7.

3.2.15 Hazardous, Toxic, and Radioactive Waste

3.2.15.1 Existing Conditions

CEMVN contracted for the preparation of a Phase I Environmental Site Assessment (PIESA) in 2008 and again in 2011 to identify any Recognized Environmental Conditions (REC), in accordance with American Standards and Testing Material "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process" (E 1527-05), as well as USEPA's requirements for "All Appropriate Inquiry." The PIESA was conducted along the entire project corridor, the two retention basins, and the laydown areas. In 2008, a leaking Underground Storage Tank was reported at the C&M Food Mart. The 2011 PIESA reported that the C&M Food Mart was issued a Conveyance Notification proclaiming that contaminant levels are acceptable for industrial and commercial use under LDEQ's Risk

Evaluation/Corrective Action Program. A No Further Action was requested, but is still (November 2011) pending from LDEQ. Trash and debris were recorded at various locations along the coulee, but no RECs were reported.

3.2.15.2 Environmental Consequences

3.2.15.2.1 No Action Alternative

Since there were no RECs reported from the project corridor and no construction would occur under the No Action Alternative, there would be no direct or indirect impacts associated with hazardous materials or waste.

3.2.15.2.2 Alternative 7 (TSP)

No direct impacts on hazardous waste sites would result from construction activities associated with Alternative 7, since no RECs were observed within the project corridor. All hazardous and regulated wastes and substances generated during the proposed construction activities would be collected, characterized, labeled, stored, transported, and disposed of in accordance with all Federal, state, and local regulations, including proper waste manifesting procedures. All other hazardous and regulated materials or substances would be handled according to materials safety data sheet instructions and would not affect water, soils, vegetation, wildlife, or the safety of USACE and contractor staff or the general public.

Some indirect impacts could occur during construction due to accidental spills. The potential impacts of the handling and disposal of hazardous and regulated materials and substances (e.g., fuel, oils and lubricants) during construction would be minimized by the implementation of BMPs.

3.2.15.2.3 Alternative 3

Impacts under Alternative 3 would be the same as described for Alternative 7.

3.2.15.2.4 Alternative 8

Impacts under Alternative 8 would be the same as described for Alternative 7.

3.2.15.2.5 Nonstructural Alternative

Under the Nonstructural Alternative, approximately 30 structures and houses in the area would be elevated. A facilities condition assessment of these structures has not been completed as yet; consequently, it is not known if RECs are present within or underneath these structures. Given the age of some of the structures along Beau Bassin Coulee (i.e., pre-1976), it is likely that there is ACM or LBP

present within some of the structures. These materials would be abated or removed and disposed of in accordance with LDEQ regulations. No indirect impacts would be anticipated under this alternative.

3.2.16 Transportation

This resource is institutionally significant because of the FHWA. Transportation is technically significant because of the high economic value of transportation systems and their contribution to local, state, and national economies. Transportation resources are publicly significant because of the high value that the public places on transportation systems and traffic loads and capacity.

3.2.16.1 Existing Conditions

Carencro is part of the Lafayette Metropolitan Area which includes Lafayette Parish and portions of Acadia, Vermilion, Iberia, and St. Martin parishes. Numerous modes of transportation are available to serve the Carencro area, including air, rail, and highway access. The Lafayette Regional Airport is a commercial aviation airport located approximately 10 miles south of Carencro, and provides flights to major domestic destinations and connecting service to points around the country (Lafayette Regional Airport 2011). The Southern Pacific Railroad, located along I-49 in Carencro, provides freight service in the area. The Southern Pacific Railroad crosses the western end of the project area. Amtrak provides passenger rail service on the *Sunset Limited* route, which travels westbound from New Orleans to Los Angeles, via the Lafayette station, approximately 6 miles southeast of Carencro. The Lafayette Transit provides public transit bus service near Carencro, with the nearest route running every 60 minutes from 6:30 am to 6:30 pm, Monday through Saturday (Lafayette Consolidated Government 2011a). The primary transportation routes associated with access to the proposed site are I-49 (also known as Evangeline Throughway), Louisiana Highway (LA) 726 (Veterans Boulevard), LA 182 (University Avenue), and Hector Connoly Road.

According to the Louisiana Department of Transportation and Development (LADOTD), 2009 annual average daily traffic (AADT) on I-49 is approximately 52,129 vehicles per day (vpd). The AADT for LA 726 and LA 182 in the project area is 11,823 vpd and 5,198 vpd, respectively (LADOTD 2009). The 2007 AADT for Hector Connoly Road near the project area is 5,948 vpd (Lafayette Consolidated Government 2011b). Some local roads could also be used for access during construction, including Railroad Street, Michaud Street, East Armand Street, Crouchet Street, North Church Street, Jack Street, Fado Street, Pyreness Road, Clara Street, First Street, Second Street, Third Street, St. Esprit Road, Rue Des Etoiles, Rue Coupe Civique Road, and Musique Road. The 2009 AADT for St. Esprit Road is 2,881

vpd (Lafayette Consolidated Government 2011b). Traffic volume data are not available for the other local roads listed above, but traffic is expected to be low since they are considered local, residential roads.

3.2.16.2 Environmental Consequences

3.2.16.2.1 No Action Alternative

Under the No Action Alternative, the conditions within the transportation environment would continue as they have in the past. There would be no direct or indirect effect on vehicle traffic at or around the alternative sites. However, transportation infrastructure, such as roads and bridges, would remain vulnerable to floods.

3.2.16.2.2 Alternative 7 (TSP)

Under Alternative 7, no road closures or road improvements would be required; thus, there would be no direct impacts on transportation within or near Carencro.

Indirect impacts from vehicle traffic associated with the construction activities under Alternative 7 would occur, however. An increase of approximately 44 vpd would occur during the construction period, primarily along I-49, LA 726, LA 182, and Hector Connoly Road. This increase in daily traffic volume would consist of four heavy-duty delivery trucks and approximately 40 construction personnel passenger vehicles. Activities associated with project construction could cause a minimal increase in traffic along I-49, LA 726, LA 182, and Hector Connoly Road as a result of ingress and egress by equipment and the delivery of construction materials.

The addition of 44 construction vpd represents a less than 1 percent addition to the traffic volume on I-49, LA 726, LA 182, and Hector Connoly Road in this area. Increases in construction-related traffic could also occur on the local roads in the area. Although additional construction traffic could impair traffic flow on these roadways, these impacts would be intermittent and temporary and, therefore, would be considered minor indirect impacts. Upon completion of the flood risk reduction measures, any damages to road surfaces would be repaired and the roads returned to pre-project conditions.

3.2.16.2.3 Alternative 3

Impacts under Alternative 3 would be similar to those described for Alternative 7.

3.2.16.2.4 Alternative 8

Impacts under Alternative 8 would be similar to those described for Alternative 7.

3.2.16.2.5 Nonstructural Alternative

No direct impacts on transportation would occur under the Nonstructural Alternative.

The 30 structures that would be elevated under this alternative would require heavy equipment, including bulldozers, cranes, and dump trucks. Local traffic would be impacted during these activities similar to that described under Alternative 7. The magnitude of the impact would depend on the duration of the elevation efforts, although it would not be expected that all 30 structures would be elevated concurrently. Still, these impacts would be temporary.

Long-term traffic patterns would be not be affected and no indirect effects on traffic would be expected once the 30 structures are elevated.

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SECTION 4.0
CUMULATIVE IMPACTS

4.0 CUMULATIVE IMPACTS

NEPA requires a Federal agency to consider not only direct and indirect impacts of a TSP, but also cumulative impacts of the action. Cumulative impacts are defined as the "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7)." Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. Cumulative effects are considered in light of temporal and spatial relationships.

Lafayette Parish currently has numerous projects either ongoing or planned for construction in the near future. Most of these projects are located within or south of the City of Lafayette. These projects include 35 new commercial structures, 162 additions or renovations to commercial structures, four new apartment buildings, and 12 additions to apartment complexes. In addition, a new hospital and a University of Phoenix campus are being planned for construction. A major addition to the Lafayette Airport is also currently underway (Larcade 2011).

Within the City of Carencro, several public and private/commercial projects are planned or ongoing. Public projects include construction of a traffic circle on Hector Connoly Road to ease traffic congestion and a sidewalk along Prejean Road. Private and commercial projects include construction of a retail store, a 75-unit residential complex near Veterans Boulevard, and development of an elderly complex on University Avenue (Rochon 2011).

In addition, the Lafayette Parish Consolidated Government (LCG) is planning to conduct vegetation removal along 5,175 feet of Beau Bassin Coulee east of St. Esprit Road, immediately downstream of the project limits. The City of Carencro and LCG are coordinating the timing of this activity such that it would occur prior to constructing the project recommended in the CAP 205 Feasibility Report.

Each of these projects could generate additional, incremental adverse impacts on the region's resources depending upon the timing, scale, and proximity of the projects relative to the proposed flood risk reduction projects along the Beau Bassin Coulee. Each of these projects would generate additional air emissions during construction, disturb/remove soil and terrestrial habitats from long-term production, create traffic congestion, temporarily increase noise levels, and disturb or destroy unknown cultural resources.

4.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, cumulative impacts would continue to occur, as the construction and development projects described above would proceed as planned and maintenance of the coulee would be provided by Lafayette Parish or the City of Carencro when funding becomes available. Construction and development projects would produce additional air and noise emissions, remove additional soils from biological production, and could reduce wildlife habitat and affect unknown cultural resources. Stormwater runoff during construction, as well as post-construction runoff, would produce adverse cumulative effects on local streams' water quality.

The LCG's clearing activities along the Beau Bassin Coulee east of St. Esprit Road would remove an estimated 4.75 acres of habitat (assuming 20 feet of width on each side of the coulee). This activity would also create short-term impacts on soils and water quality within the downstream reaches of Beau Bassin Coulee. Turbidity and sedimentation would not be expected to affect the Vermilion River, due to the distance (approximately 0.6 mile) between the downstream extent of the vegetation clearing and the Vermilion River, and the extensive vegetation that would remain along this reach. The construction equipment to be used for the clearing would also generate additional air emissions; however, the emissions would be expected to be far less than *de minimis* thresholds and ambient conditions would immediately return upon completion of the vegetation clearing.

No residence or business would be relocated and no disproportionate adverse impacts on low-income or minority populations would be expected. Property values could increase, as flood risks would be reduced. Residents would be annoyed by the noise generated during the clearing activities, as many of the houses are located within 200 feet of the coulee.

Transportation within and near Carencro would be cumulatively affected by the proposed developments in Carencro and Lafayette. The two residential complexes in Carencro would cumulatively affect traffic on Veterans Boulevard and other local streets if construction were to occur concurrently; long-term traffic would also be cumulatively impacted by the increase of residents living along Veterans Boulevard. The socioeconomic conditions of the City of Carencro and surrounding areas would be expected to be beneficially affected, cumulatively, from implementation of these and past projects, all of which would enhance the quality of life.

No cumulative impacts on threatened or endangered species or waters of the U.S. would be expected, as these projects are proposed within urban/developed areas, and regulatory requirements would prohibit significant effects on these resources. No cumulative impacts on aesthetics, recreational opportunities, or hazardous materials would be expected.

4.2 ALTERNATIVE 7 (TSP)

Minor to moderate, adverse cumulative impacts on wildlife habitat, cultural resources, air quality, and ambient noise levels would occur upon implementation of Alternative 7, depending upon the location and extent of the other planned projects and timing of those projects relative to the clearing, grubbing, and dressing activities proposed for the Beau Bassin Coulee. The vegetation removal by LCG along the Beau Bassin Coulee east of St. Esprit Road would remove an estimated additional 4.75 acres of habitat (assuming 20- feet width on each side of the coulee). Minor cumulative impacts on water quality and waters of the U.S. would be expected, depending upon the project designs and timing of the other projects, and any BMPs implemented. Water quality would be affected in the short term by the LCG's vegetation removal due to the erosion of disturbed soils and stormwater runoff. Since this project would be scheduled prior to implementation of the CAP 205 project, there would be cumulative adverse impacts on water quality for a longer duration and over a longer reach of the coulee. Downstream effects would be of greater magnitude as well.

The LCG's vegetation removal combined with the construction activities associated with the TSP would generate cumulative air emissions within the airshed; however, as demonstrated previously (Table 3-4), the construction activities would generate emissions at levels far below the *de minimis* thresholds. In addition, these air emissions would be short-term and no long-term cumulative impact would occur.

Noise effects would be cumulative only if the construction activities are conducted concurrently and in the same general location. However, these effects would be temporary and ambient noise levels would be expected to return upon completion of the construction projects.

Cumulative impacts on transportation would occur, particularly if the residential complexes, traffic circle at Hector Connoly Road, and the clearing, grubbing, and dressing activities were constructed concurrently or with overlapping schedules. Socioeconomic conditions would be expected to incur beneficial cumulative impacts from increased employment, income, tax revenues, and flood protection, as well as reduced health and safety risks. There would be no adverse cumulative impacts on minority and/or low-

income communities within the study area per the requirements of E.O. 12898. Rather, this alternative will contribute toward achieving and sustaining a drainage system that would support and protect the environment, local economy, and culture of the area.

No cumulative impacts on threatened or endangered species, recreational opportunities, aesthetics, or hazardous materials would be expected.

4.3 ALTERNAVIVE 3

Cumulative impacts under Alternative 3 would be similar to those of Alternative 7.

4.4 ALTERNATIVE 8

Cumulative impacts under Alternative 8 would be similar to those of Alternative 7.

4.5 NONSTRUCTURAL ALTERNATIVE

Cumulative impacts on various resources under the Nonstructural Alternative would be similar to Alternative 7, except for socioeconomic conditions and transportation. Housing would be cumulatively affected since 26 families could be affected by the Nonstructural Alternative; these effects could be reduced, depending upon the timing of the construction of the housing complexes in Carencro and Lafayette and if these facilities would be sufficient for those families who are temporarily displaced. Some loss of property and sales taxes and reduction in population would occur if the affected residents were to choose to relocate outside of Carencro instead of elevating their home; these situations would cause adverse cumulative impacts on the continuing OMRR&R of city facilities and properties. Traffic volume and patterns would be cumulatively impacted by other development projects planned for Carencro, but the elevation of 30 structures would not be expected to add to these cumulative effects.

SECTION 5.0
COORDINATION

5.0 COORDINATION

Preparation of this EA and a draft FONSI has been coordinated with appropriate Congressional, Federal, state, and local interests, as well as environmental groups and other interested parties. The following agencies, as well as other interested parties, are receiving copies of this EA and draft FONSI:

- U.S. Department of the Interior, USFWS
- USEPA, Region VI
- NRCS, State Conservationist
- Advisory Council on Historic Preservation (ACHP)
- LDWF
- LDEQ
- Louisiana SHPO
- LADOTD

In addition, informal communication with USFWS, LDWF, and National Marine Fisheries Service was conducted during the preparation of the EA to confirm the presence or absence of sensitive resources, specifically threatened or endangered species, state protected species, and EFH, respectively. Each agency confirmed that no such resources were known to occur within the project area. The cultural resources reports prepared as part of the EA were submitted to the Louisiana SHPO, in accordance with Section 106 of the NHPA. Concurrence with the report's finding of no adverse effect on historic properties has been received (see EA Appendix B).

A letter report has been received from the USFWS, as authorized under the Fish and Wildlife Coordination Act (see EA Appendix B). USFWS concurred with CEMVN's determination of minimal effects, but also provided recommendations to further minimize potential impacts. These conservation recommendations include:

1. The work should consist of only the cleanup of the designated channel area consisting of the removal and disposal of items (e.g., trees, logs, stumps, brush, rubbish, debris, etc.) within the coulee that inhibit the drainage of storm water.
2. The Contractor shall take reasonable precautions to prevent damage to the riparian corridor, including channel banks, fishery resources, and living trees.

3. Equipment that will minimize damage to in-stream and riparian habitat should be used to the maximum extent practicable.
4. No grading for equipment to work or benching of the channel sides should be permitted.
5. Washing, fueling, or servicing of equipment should be avoided where spillage or wash water can enter the channel.
6. Access routes for equipment should be selected to minimize floodplain disturbance (e.g., utilize bridge rights-of-way, powerline crossings, least forested bank, etc.). If top-bank access is needed for a single-location removal, only one top bank should be used for access. If top banks are forested, the top bank utilized should be the highest elevation and least forested. If those conditions are equal, top-bank access should be from the north or east bank.
7. The number of channel crossings should be kept to a minimum. Materials used to form channel crossings should be removed once the work in that area is completed. All crossings should be immediately replanted/restored (e.g., seeded, sprigged, fertilized, mulched, stabilized, etc.) to reduce subsequent erosion.
8. Flow obstructions should be removed by methods including, but not limited to, sawing, cabling, winching, lifting, or dragging. All saw cuts shall be made parallel to and as close to ground level as the cutting tools will permit.
9. No excavation for floatation or any other reasons will be allowed.
10. Only debris accumulations that are contributing to unacceptable flow problems or are likely to cause problems in the near future should be removed. Isolated or single logs should not be disturbed if they are embedded, lodged, or rooted in the channel and are not causing flow problems; however, they may be cut off as close to the ground as possible.
11. Undermined or leaning damaged trees within or outside the banks which are still standing but likely to fall into the stream (i.e., those which are leaning over the channel) should be removed by cutting them off at the ground line and leaving the root mass in place unless 50 percent or less of the root mass is not in direct contact with the soil. If 50 percent or less of the root mat is not in direct contact with the soil, then the root mass should be removed.
12. If any debris to be removed has the potential to release hydrocarbons, a spill boom to contain those hydrocarbons should be placed across the channel downstream of the work area. Upon completion of work, any hydrocarbons contained at the boom should be removed prior to removing the boom and disposed of according to LDEQ regulations.
13. Any hazardous material encountered, such as batteries, used motor oil, scrap tires, white goods, or any item which could contain chlorofluorocarbons, etc., should be loaded and hauled to a LDEQ-approved waste disposal site.

14. All other non-vegetative debris removed from within the work limits should be disposed of by loading and hauling to the nearest approved landfill or disposal site.
15. Temporary stockpiles and off-loading areas should have appropriate runoff measures to prevent possible contaminated mud or water from returning to adjacent water bodies.

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SECTION 6.0
MITIGATION

6.0 MITIGATION

No impacts have been identified under Alternative 7 (TSP) that would require compensatory mitigation. Although there would be short-term and minor adverse impacts on water quality, fish populations, and waters of the U.S., the existing conditions of the stream provide very low-quality habitat and wetland functions. As shown previously in Photographs 3-3 through 3-5, much of the clearing, grubbing, and dressing would remove woody vegetation along the stream banks and logs/snags that span the channel above the normal water surface levels and, thus, do not provide structure within the aquatic habitat. In addition, removal of the trash and debris from the channel would provide long-term benefits to the water quality and, synergistically, to the aquatic ecosystem and the species it supports.

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SECTION 7.0
COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

7.0 COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

This EA was prepared by CEMVN in accordance with the NEPA of 1969 (42 USC 4321-4347) and the CEQ regulations for implementing NEPA (40 CFR 1500-1508), as well as the USACE's ER 200-2-2 and 1105-2-100, and other pertinent environmental statutes, regulations, and compliance requirements, as summarized in Table 7-1. This list is not intended to be all-inclusive of the Federal regulations and laws that were considered during the preparation of this EA.

The TSP will require permits and coordination from various regulatory agencies. Impacts on potential jurisdictional waters of the U.S. along the Beau Bassin Coulee are subject to the CWA Section 404/401 permitting. USACE is required to evaluate any discharges into waters of the U.S. per Section 404 of the CWA, but is not required to obtain a Section 404 permit as described in 33 CFR Part 323. However, a Section 401 WQC application was submitted by CEMVN to LDEQ and it has been approved. A copy of the Section 401 WQC is included in Appendix A of the EA.

In addition, since the site is greater than 1 acre, an NPDES Stormwater Discharge permit will be required prior to construction. This permit will require that a SWPPP and Notice of Intent be prepared and filed with the LDEQ. Compliance with Section 106 of the NHPA has been coordinated through CEMVN with the Louisiana SHPO and concurrence has been received.

Table 7-1. Relevant Policy Documents, Invoking Actions, Regulatory Requirements, and Status of Compliance*

Policy Document	Administrative Authority	Invoking Action	Requirements for Compliance	Status of Compliance
NHPA of 1966 16 USC § 470 et seq.	ACHP and SHPO	Any undertaking by Federal agency which could result in the disturbance of historic properties. 36 CFR 800.3	Assessment of effects through consultation with the ACHP.	Section 106 consultation has been completed.
Archaeological Resources Protection Act of 1979 16 USC § 470 et seq.	Department of the Interior	Excavation, removal, damage, or other alteration or defacing; or attempt to excavate, remove, damage, or otherwise alter or deface any archaeological resource located on public lands. 43 CFR 7.4	Because activities are exclusive for purposes other than the excavation and/or removal of archaeological resources, even though those activities might incidentally result in the disturbance of archaeological resources, no permit shall be required.	Surveys completed and Section 106 process is complete.
NAGPRA as amended	NPS	Excavation, removal, damage, or other alteration of Native American human remains.	Coordination directly with tribes claiming cultural affinity to project areas.	Will be invoked if remains are discovered.
American Indian Religious Freedom Act	NPS	Federal actions that affect current or historically used cultural properties.	Coordination directly with tribes claiming cultural affinity to project areas.	Full compliance.
Clean Air Act of 1963 16 USC § 470 et seq.	USEPA	Any Federal action where the total of direct and indirect emissions in a non-attainment area would equal or exceed the provided rates. 40 CFR 51	Project emission levels were determined to be less than *de minimis* thresholds even though Lafayette Parish is in attainment; therefore, a determination of conformity with applicable implementation plan is not required.	Emissions are below *de minimis*; no conformity analysis required.
Comprehensive Environmental Response, Compensation and Liability Act of 1980 42 USC § 9601 et seq.	USEPA	Release or threatened release of a hazardous substance. 40 CFR 302	Development of emergency response plans, notification, and cleanup.	To be completed by CEMVN during design and implementation.
ESA of 1973 16 USC § 1531 et seq.	USFWS	All actions in which there is discretionary Federal involvement or control. 50 CFR 402.03	Determination of no jeopardy to listed species or adverse modification of critical habitat through consultation with the USFWS.	There are no effects on protected species.
Farmland Protection Policy Act of 1981 7 USC § 9601 et seq.	NRCS	Any Federal action that removes Prime or Unique soils from production. 7 CFR 658	Identify and take into account the adverse effects on the protection of farmland.	NRCS has indicated that project is exempt since the site is within an urban/developed area.

Table 7-1, continued

Policy Document	Administrative Authority	Invoking Action	Requirements for Compliance	Status of Compliance
Federal Water Pollution Control Act of 1977 (also known as Clean Water Act or CWA) 33 USC § 1251 et seq.	USEPA	Not applicable		
		Discharge of pollutants. 40 CFR 122	Obtain a general NPDES Permit. Implement BMPs.	To be completed by CEMVN or CEMVN's contractor.
Migratory Bird Treaty Act of 1918 16 USC § 703	USFWS	Any Federal action resulting in the take of any migratory bird, or the parts, nests, or eggs of such bird. 50 CFR 21.11	Avoidance of take or application for permit.	Surveys prior to any construction beginning during nesting season.
Occupational Health and Safety Act of 1970 29 USC § 651 et seq.	Occupational Safety and Health Administration, Department of Labor	Employees performing in a workplace. 29 CFR 1910.5 (a)	Adherence to occupational health and safety standards.	To be completed by CEMVN's contractor during construction planning and execution.
Coastal Zone Management Act of 1972 16 USC § 1451 et seq.	NOAA	Development and other actions occurring within designated coastal zones. 15 CFR 923	Submittal of Coastal Consistency Determination and concurrence from the affected state's coastal commission.	Project corridor is outside of the Louisiana Coastal Zone.
Executive Order (EO) 11988: Floodplain Management 42 Federal Register (FR) 26,951 (May 24, 1997)	Water Resources Council, Federal Emergency Management Agency, CEQ	Acquisition and management of Federal lands; Federally undertaken, financed, or assisted construction; conducting Federal activities affecting land use.	Determine whether the proposed action will occur in a floodplain, and then evaluate potential effects of any action in a floodplain.	Project cannot avoid floodplain.
EO 11990: Protection of Wetlands 42 FR 26,691 (May 24, 1977)	USACE, USEPA	Acquisition and management of Federal lands; Federally undertaken, financed, or assisted construction; conducting Federal activities affecting land use.	Take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.	Waters of the U.S. cannot be avoided, but will only be temporarily impacted.
EO 12898: Federal Actions to Address EJ in Minority Populations and Low-Income Populations 59 FR 7629 (February 11, 1994)	USEPA	All programs or activities receiving Federal financial assistance that affect human health or the environment.	Analyze the environmental effects, including human health, economic, and social effects of Federal actions, including effects on minority communities and low-income communities.	No disproportionate adverse effects on minority or low-income families.

Table 7-1, continued

Policy Document	Administrative Authority	Invoking Action	Requirements for Compliance	Status of Compliance
EO 13045: Protection of Children from Environmental Health Risks and Safety Risks 62 FR 19883 (April 23, 1997)	USEPA	Any Federal action which could harm children less than 18 years old.	Identify and assess environmental health risks and safety risks that may disproportionately affect children.	No adverse effects on children anticipated. Construction zones will be clearly demarcated and controlled.
EO 13175: Consultation and Coordination with Indian Tribal Governments	Bureau of Indian Affairs	Federal actions that affect current or historically used cultural properties.	Coordinate directly with Tribes claiming cultural affinity to project areas.	Full compliance.

*Not All Inclusive

SECTION 8.0
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8.0 REFERENCES

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SECTION 9.0
ABBREVIATIONS AND ACRONYMS

9.0 ABBREVIATIONS AND ACRONYMS

AADT	Annual Average Daily Traffic
ACHP	Advisory Council on Historic Preservation
ACM	asbestos-containing materials
ACS	American Community Survey
AO	archaeological occurrences
BMP	Best Management Practice
CAP	Continuing Authorities Program
CEMVN	New Orleans District
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
DO	dissolved oxygen
EA	Environmental Assessment
EFH	Essential Fish Habitat
EJ	Environmental Justice
EO	Executive Order
ER	Engineering Regulation
ESA	Endangered Species Act
°F	Fahrenheit
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
GHG	Green House Gases
H&H	hydrologic and hydraulic
HUD	U.S. Department of Housing and Urban Development
I-49	Interstate 49
LA	Louisiana Highway
LADOTD	Louisiana Department of Transportation and Development
LBP	lead-based paint
LCG	Lafayette Parish Consolidated Government
LDEQ	Louisiana Department of Environmental Quality
LDWF	Louisiana Department of Wildlife and Fisheries
mph	miles per hour
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection & Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
OMRR&R	operation, maintenance, repair, replacement, and rehabilitation
PCPI	per capita personal income
PIESA	Phase I Environmental Site Assessment
PM-2.5	particulate matter less than 2.5 microns in size
PM-10	particulate matter less than 10 microns in size

RECAP	Risk Evaluation/Corrective Action Program
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SWPPP	Stormwater Pollution Prevention Plan
TPI	total personal income
TSP	tentatively selected plan
UCC	United Church of Christ
UL Lafayette	University of Louisiana at Lafayette
USACE	U.S. Army Corps of Engineers
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VPD	vehicles per day
WQC	Water Quality Certification

SECTION 10.0
LIST OF PREPARERS

10.0 LIST OF PREPARERS

The people who made major contributions to the preparation of this EA are presented below.

EA Task	Team Member	Years Experience
Project Manager	Durund Elzey, CEMVN	10
USACE EA Manager	Christopher Brown, Ph.D. CEMVN	20
Technical Review/404(b)(1) Analysis	William Klein, Ph.D. CEMVN	17
Project Management; T&E species	Chris Ingram, GSRC	33
Geology and Soils; Technical Review	Steve Oivanki, GSRC	20
Air, Noise, and Aquatic Resources	Steve Kolian, GSRC	10
Wildlife and Vegetation Communities	Missy Singleton, GSRC	8
Recreational Resources	Debbie Wright, CEMVN	18
Visual/Aesthetics	Richard Radford	10
Socioeconomics	Carl Welch, GSRC	10
Hazardous Waste	George Bacuta, CEMVN	20
Geographic Information Systems	Sharon Newman, GSRC	14
Technical Review	Dennis Peters, GSRC	25

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EA APPENDIX A
SECTION 401 WATER QUALITY CERTIFICATION

BOBBY JINDAL
GOVERNOR

PEGGY M. HATCH
SECRETARY

State of Louisiana

DEPARTMENT OF ENVIRONMENTAL QUALITY
ENVIRONMENTAL SERVICES

DEC 15 2011

U.S. Army Corps of Engineers- New Orleans District
P.O. Box 60267
New Orleans, LA 70160-0267

Attention: Christopher Brown

RE: Water Quality Certification (WQC 111102-03/AI 101235/CER 20110009)
Carencro Flood Damage Reduction Project
Lafayette Parish

Dear Mr. Brown:

The Louisiana Department of Environmental Quality (the Department) has reviewed your application to excavate for municipal drainage improvements, along Beau Bassin Coulee in Carencro, Louisiana.

Based on the information provided in the application, the Department made a determination that the requirements for a Water Quality Certification have been met and concludes that the placement of the fill material will not violate water quality standards of Louisiana as provided for in LAC 33:IX.Chapter 11. Therefore, the Department hereby issues a Water Quality Certification to the U.S. Army Corps of Engineers- New Orleans District.

If you have any questions, please call Jamie Phillippe at 225-219-3225.

Sincerely,

Melvin C. Mitchell, Sr.
Administrator
Water Permits Division

MCM/jjp

EA APPENDIX B
CORRESPONDENCE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506

October 24, 2011

Colonel Edward R. Fleming
District Commander
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel Fleming:

The U.S. Fish and Wildlife Service (Service) is providing this draft report on the Feasibility Study for the proposed flood risk reduction measures along the Beau Basin Coulee in Carencro, Lafayette Parish, Louisiana, for which the U.S. Army Corps of Engineers (Corps) is preparing an Environmental Assessment (EA). The proposed project would involve clearing and snagging approximately 12,000 linear feet of Beau Basin Coulee and installing two retention basins on previously disturbed parcels of land owned by the City of Carencro. The proposed project would be authorized by the Corps' Continuing Authorities Program under Section 205 of the 1948 Flood Control Act. This draft report does not constitute the final report of the Secretary of the Interior on this project, as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). A copy of this draft report has been provided to the Louisiana Department of Wildlife and Fisheries (LDWF); their comments, if any, will be incorporated into our final report.

DESCRIPTION OF STUDY AREA

The proposed project would be located within the City of Carencro, in northern Lafayette Parish, Louisiana. Historically, the habitat surrounding the project area consisted of prairie grasslands occasionally intersected by riparian corridors along small natural drainages and Carencro Bayou. Today, much of the area is rural and consists of pasture lands, agricultural lands, residential developments, and commercial development within the city limits. The Beau Basin Coulee is the main drainage for the city's storm water runoff and intersects Interstate 49 (I-49) to the north of the city and Veterans Boulevard in the center of the city. It is bordered by maintained grasslands and residential and commercial developments. A remnant riparian corridor exists along approximately 5,564 linear feet of the coulee beginning just west of I-49 and extending east of I-49 to St. Esprit Road.

FISH AND WILDLIFE RESOURCES OF CONCERN

Approximately 2.5 acres of riparian forest habitat borders the Beau Basin Coulee along approximately 1,307 feet west of I-49 and 4,257 feet east of I-49 (a total of 5,564 linear feet). Within the project area, mature live and water oaks are the dominant canopy species. Bitter

pecan and sycamore are also present. Chinese tallow and Chinese privet dominate the midstory, while various native grasses provide some amount of ground cover.

Riparian habitat serves as a natural filter of sedimentation into a waterbody and helps prevent stream bank erosion by stabilizing the soil and dissipating stream flow energy. Riparian vegetation also provides shading effects for aquatic habitat which helps to mitigate changes in water temperature. Riparian habitat is used by various native and migratory bird species, small mammals, reptiles, and amphibians for foraging, roosting, and travel corridors, while the waterbody provides a water source. Riparian habitat is rare in the project area; therefore, any remaining riparian habitat should be avoided to the maximum extent practicable.

Federally Listed Threatened and Endangered Species

Currently, there are no known occurrences of federally listed threatened or endangered within the proposed project area or its vicinity. No further ESA consultation with the Service would be required for the proposed action, unless there are changes in the scope or location of the proposed project that has not been considered during this project review or the project has not been initiated one year from the date of this letter.

PROJECT ALTERNATIVES UNDER CONSIDERATION

The goal of the proposed project is to reduce the flood risk and related flood damages within the City of Carencro by providing sufficient flood-water conveyance within the Beau Basin Coulee. Five alternatives are being considered for analysis in the Corps' forthcoming EA.

1. The No Action Alternative would result in no channels improvements and would not satisfy the purpose and need of the proposed action.

2. The Tentatively Selected Plan (TSP) would involve clearing and snagging approximately 12,000 linear feet of the coulee and constructing two retention basins to reduce the flood water level by an average of 1.9 feet. A 10-foot-wide work area would be used on each side of the coulee during clearing and snagging and for future operation and maintenance (O&M) activities. No change to the configuration of the existing channel would occur. The retention basins (5.03 acres and 1.67 acres) would be excavated to a depth of 6 feet to provide a total storage capacity of approximately 6.7 acres; they would be located on upland parcels that are owned and maintained (i.e., mowed) by the City of Carencro. Two, 1-acre storage areas would be used for equipment parking, staging of materials, and points of access during construction. One storage area would be located adjacent to the 5.03-acre retention basin west of Interstate 49 (I-49), and the other storage area would be located on private property east of I-49. Public roads would be used to access the coulee at various locations; thus, no additional access roads would be required. This alternative would reduce the flood water level by an average of 1.9 feet and would cost approximately 3.77 million dollars. No forested or emergent wetlands would be affected; however, approximately 2.5 acres of riparian habitat may be temporarily affected by the TSP.

3. Alternative 3 consists of two different types of channel improvements: stream bank stabilization using gabion baskets and channel enlargements. Stream bank stabilization using gabion baskets would be installed along approximately 4,697 feet of the coulee. The channel width in that section would be 10 feet at the bottom of the channel, sloping upward at a 1.5:1 slope, to an average top width of 45 feet. Channel enlargements would be constructed along the remaining 7,193 feet of the coulee. That section of channel width would be 10 feet at the bottom of the channel, sloping upward at a 3:1 slope, to a top width of 70 feet. An additional 10-foot-wide easement would be necessary on each side of the channel for construction and post-construction O&M along the entire construction corridor. The two storage areas described for the TSP Alternative would be used under this alternative as well. This alternative would reduce the flood water level by an average of 2.4 feet and would cost approximately $5.31 million. No forested or emergent wetlands would be affected; however, approximately 2.5 acres of riparian habitat would be removed by this alternative.

4. Alternative 8 would involve a variety of measures, including clearing and snagging, channel enlargement, and retention basins. Clearing and snagging would be conducted along approximately 4,697 feet and channel enlargements would be conducted along the remaining 7,193 feet. The clearing and snagging would not change the configuration of the stream channel. The enlarged earthen channel section would be the same as discussed in Alternative 3. The two retention basins, two storage areas, and the construction/O&M corridor under this alternative would be the same as the TSP Alternative. This alternative would reduce the flood water level by an average of 2.5 feet and would cost approximately $4.75 million. No forested or emergent wetlands would be affected by the TSP; however, approximately 2.5 acres of riparian habitat would be either temporarily affected or removed by this alternative.

5. The Nonstructural Alternative includes the acquisition and removal of approximately 50 houses, buildings, and other structures within the 25-year floodplain of the project area. Affected residences would be purchased at fair market values and residents would be relocated to other areas outside the floodplain. These measures would not influence the hydraulics or hydrology of the area and would not reduce the frequency or depth of flooding along the stream; however, it would reduce total value of damages during significant flood events. No forested or emergent wetlands or riparian habitat would be affected by this alternative.

DESCRIPTION OF PROJECT-RELATED IMPACTS

Direct impacts of implementing the TSP alternative would result in permanent disturbance to 6.7 acres of grassland due to construction of the retention basins and temporary disturbance to 7.5 acres of grassland due to the 10-foot-wide construction corridor and two temporary storage areas. Indirect impacts of implementing the TSP would result in temporary disturbance to 2.5 acres of riparian habitat. Sporadic temporary impacts along the 10-foot-wide construction corridor, within the two temporary storage areas, and to the 2.5 acres of riparian habitat would also occur during O&M activities over the life of the project. Implementation of the TSP alternative would

also result in positive benefits to area wildlife and water quality by removing human refuse from the coulee.

SERVICE POSITION AND RECOMMENDATIONS

In an electronic mail dated October 12, 2011, the Corps indicated that implementation of the TSP alternative is not likely to result in the removal of living trees unless it is unavoidable for clearing the channel. The TSP alternative would result in temporary disturbance in the form of noise and human presence along 2.5 acres of riparian corridor during construction and sporadically during O&M activities over the project life. Alternatives 3 and 8 would likely result in the removal of the remaining riparian corridor; therefore, the Service does not support further evaluation of those alternatives.

The Service does not object to the proposed TSP alternative provided that the following recommendations are incorporated, to the maximum extent practicable, to ensure that fish and wildlife resource conservation receives equal consideration during project implementation:

1. The work should consist of only the cleanup of the designated channel area consisting of the removal and disposal of items (e.g., trees, logs, stumps, brush, rubbish, debris, etc.) within the coulee that inhibit the drainage of storm water.
2. The Contractor shall take reasonable precautions to prevent damage to the riparian corridor, including channel banks, fishery resources, and living trees.
3. Equipment that will minimize damage to in-stream and riparian habitat should be used to the maximum extent practicable.
4. No grading for equipment to work or benching of the channel sides should be permitted.
5. Washing, fueling, or servicing of equipment should be avoided where spillage or wash water can enter the channel.
6. Access routes for equipment should be selected to minimize floodplain disturbance (e.g., utilize bridge rights-of-way, powerline crossings, least forested bank, etc.). If top-bank access is needed for a single-location removal, only one top bank should be used for access. If top banks are forested, the top bank utilized should be the highest elevation and least forested. If those conditions are equal, top-bank access should be from the north or east bank.
7. The number of channel crossings should be kept to a minimum. Materials used to form channel crossings should be removed once the work in that area is completed. All crossings should be immediately replanted/restored (e.g., seeded, sprigged, fertilized, mulched, stabilized, etc.) to reduce subsequent erosion.
8. Flow obstructions should be removed by methods including, but not limited to, sawing, cabling, winching, lifting, or dragging. All saw cuts shall be made parallel to and as close to ground level as the cutting tools will permit.
9. No excavation for floatation or any other reasons will be allowed.
10. Only debris accumulations that are contributing to unacceptable flow problems, or are likely to cause problems in the near future, should be removed. Isolated or single logs should not be disturbed if they are embedded, lodged, or rooted in the channel and are not causing flow problems; however, they may be cut off as close to the ground as possible.

11. Undermined or leaning damaged trees within or outside the banks which are still standing but likely to fall into the stream (i.e., those which are leaning over the channel) should be removed by cutting them off at the ground line and leaving the root mass in place unless 50 percent or less of the root mass is not in direct contact with the soil. If 50 percent or less of the root mat is not in direct contact with the soil, then the root mass should be removed unless the removal of such root mass would cause a potentially erosive condition.
12. If any debris to be removed has the potential to release hydrocarbons, a spill boom to contain those hydrocarbons should be placed across the channel downstream of the work area. Upon completion of work, any hydrocarbons contained at the boom should be removed prior to removing the boom and disposed of according to Louisiana Department of Environmental Quality (LDEQ) regulations.
13. Any hazardous material encountered, such as batteries, used motor oil, scrap tires, white goods, or any item which could contain chlorofluorocarbons (CFCs), etc., should be loaded and hauled to a LDEQ-approved waste disposal site.
14. All other non-vegetative debris removed from within the work limits should be disposed of by loading and hauling to the nearest approved landfill or disposal site.
15. Temporary stockpiles and off-loading areas should have appropriate run-off measures to prevent possible contaminated mud or water from returning to adjacent waterbodies.

We appreciate the opportunity to review the proposed project and to provide these recommendations. If you or your staff requires further assistance in this matter, please contact Ms. Brigette Firmin (337/291-3108) of this office.

Sincerely,

Brad S. Rieck
Acting Supervisor
Louisiana Ecological Services Office

cc: EPA, Dallas, TX
LDWF, Coastal & Nongame Division, Baton Rouge, LA (Attn: Kyle Balkum)

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
3737 Government Street
Alexandria, LA 71302

(318) 473-7751
Fax: (318) 473-7626

November 17, 2011

J. Christopher Brown, Ph.D.
US Army Corps of Engineers, New Orleans District
Environmental Compliance Branch
USACE-MVN-PDC-CEC, Room 363
P.O. Box 60267
New Orleans, Louisiana 70160-0267

RE: Lafayette Parish - Carencro CAP 205 Study - Flood Control-Clearing Channel_(USACE)

Dear Dr. Brown,

I have reviewed the above referenced project for potential requirements of the Farmland Protection Policy Act (FPPA) and potential impact to Natural Resource Conservation Service projects in the immediate vicinity.

Projects are subject to FPPA requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a federal agency or with assistance from a federal agency. For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements can be forest land, pastureland, cropland, or other land, but not water or urban built-up land.

The project map submitted with your request indicates that the proposed construction areas are within urban areas and therefore is exempt from the rules and regulations of the Farmland Protection Policy Act (FPPA)—Subtitle I of Title XV, Section 1539-1549. Attached is a CPA-106 form with our agencies sections completed.

For specific information about the soils found in the project area, please visit our Web Soil Survey at the following location:

http://websoilsurvey.nrcs.usda.gov/

Please direct all future correspondence to me at the address shown above.

W. Britt Paul
Acting State Conservationist

Attachment

U.S. DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service

NRCS-CPA-106
(Rev. 1-91)

FARMLAND CONVERSION IMPACT RATING
FOR CORRIDOR TYPE PROJECTS

PART I *(To be completed by Federal Agency)*	3. Date of Land Evaluation Request 11/14/11	4. Sheet 1 of 4
1. Name of Project Carencro CAP 205 Study	5. Federal Agency Involved US Army Corps of Engineers	
2. Type of Project Flood Control - Clearing Channel	6. County and State Lafayette Parish, Louisiana	
PART II *(To be completed by NRCS)*	1. Date Request Received by NRCS 11-17-11	2. Person Completing Form Michael Lindsey
3. Does the corridor contain prime, unique statewide or local important farmland? (If no, the FPPA does not apply - Do not complete additional parts of this form)	YES ☐ NO ☒	4. Acres Irrigated / Average Farm Size
5. Major Crop(s)	6. Farmable Land in Government Jurisdiction: Acres: %	7. Amount of Farmland As Defined in FPPA: Acres: %
8. Name Of Land Evaluation System Used	9. Name of Local Site Assessment System	10. Date Land Evaluation Returned by NRCS 11-17-11

PART III *(To be completed by Federal Agency)*	Alternative Corridor For Segment			
	Corridor A	Corridor B	Corridor C	Corridor D
A. Total Acres To Be Converted Directly	5			
B. Total Acres To Be Converted Indirectly, Or To Receive Services				
C. Total Acres In Corridor	5	0	0	0
PART IV *(To be completed by NRCS) Land Evaluation Information*				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by NRCS) Land Evaluation Information Criterion Relative value of Farmland to Be Serviced or Converted (Scale of 0 - 100 Points)*				
PART VI *(To be completed by Federal Agency) Corridor Assessment Criteria (These criteria are explained in 7 CFR 658.5(c))*	Maximum Points			
1. Area In Nonurban Use	15			
2. Perimeter In Nonurban Use	10			
3. Percent Of Corridor Being Farmed	20			
4. Protection Provided By State And Local Government	20			
5. Size of Present Farm Unit Compared To Average	10			
6. Creation Of Nonfarmable Farmland	25			
7. Availability Of Farm Support Services	5			
8. On-Farm Investments	20			
9. Effects Of Conversion On Farm Support Services	25			
10. Compatibility With Existing Agricultural Use	10			
TOTAL CORRIDOR ASSESSMENT POINTS	160	0	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland (From Part V)	100				
Total Corridor Assessment (From Part VI above or a local site assessment)	160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	0	0	0	0

1. Corridor Selected:	2. Total Acres of Farmlands to be Converted by Project:	3. Date Of Selection:	4. Was A Local Site Assessment Used?
			YES ☐ NO ☐

5. Reason For Selection:

Signature of Person Completing this Part: J. Christopher Brown DATE 14 Nov. 2011

NOTE: Complete a form for each segment with more than one Alternate Corridor

JAY DARDENNE
LIEUTENANT GOVERNOR

State of Louisiana

OFFICE OF THE LIEUTENANT GOVERNOR
DEPARTMENT OF CULTURE, RECREATION & TOURISM
OFFICE OF CULTURAL DEVELOPMENT

CHARLES R. DAVIS
DEPUTY SECRETARY

PAM BREAUX
ASSISTANT SECRETARY

16 June 2011

Joan Exnicios
Chief, NO Environmental Branch
New Orleans District
Corps of Engineers
PO Box 60267
New Orleans, La 70160-0267

Re: Draft Report
La Division of Archaeology Report No. 22-3791
Phase I Cultural Resources Survey of Two Proposed Holding Ponds and One Layover Area in Carencro, Lafayette Parish, Louisiana

Dear Mrs. Exnicios:

We acknowledge receipt of your letter dated 19 May 2011 and two copies of the above referenced report. We have completed our review of this report and have only a minor comment to offer.

In the Abstract, please mention the architectural survey conducted for this project and its results.

We concur that 16LY135 is not eligible for nomination to the National Register of Historic Places, and that 16LY136 is undetermined with respect to its eligibility for the National Register. As 16LY136 lies outside the project area, we concur that no historic properties will be impacted by this project.

If you have any questions, please contact Chip McGimsey in the Division of Archaeology by email at cmcgimsey@crt.state.la.us or by phone at 225-219-4600.

Sincerely,

Pam Breaux

Pam Breaux
State Historic Preservation Officer

PB:crm

BOBBY JINDAL
GOVERNOR

State of Louisiana
DEPARTMENT OF WILDLIFE AND FISHERIES
OFFICE OF WILDLIFE

ROBERT J. BARHAM
SECRETARY
JIMMY L. ANTHONY
ASSISTANT SECRETARY

Date	July 8, 2011
Name	Chris Ingram
Company	Gulf South Research Corporation
Street Address	
City, State, Zip	
Project	Beau Basin Coulee Project
Project ID	0
Invoice Number	11070815

Personnel of the Habitat Section of the Coastal & Non-Game Resources Division have reviewed the preliminary data for the captioned project. After careful review of our database, no impacts to rare, threatened, or endangered species or critical habitats are anticipated for the proposed project. No state or federal parks, wildlife refuges, scenic streams, or wildlife management areas are known at the specified site within Louisiana's boundaries.

The Louisiana Natural Heritage Program (LNHP) has compiled data on rare, endangered, or otherwise significant plant and animal species, plant communities, and other natural features throughout the state of Louisiana. Heritage reports summarize the existing information known at the time of the request regarding the location in question. The quantity and quality of data collected by the LNHP are dependent on the research and observations of many individuals. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in Louisiana have not been surveyed. This report does not address the occurrence of wetlands at the site in question. Heritage reports should not be considered final statements on the biological elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. LNHP requires that this office be acknowledged in all reports as the source of all data provided here. If at any time Heritage tracked species are encountered within the project area, please contact the LNHP Data Manager at 225-765-2643. If you have any questions, or need additional information, please call 225-765-2357.

Sincerely,

for Amity Bass, Coordinator
Natural Heritage Program

EA APPENDIX C
AIR QUALITY CALCULATIONS

CALCULATION SHEET-COMBUSTION EMISSIONS-CONSTRUCTION-ALTERNATIVE 3

Assumptions for Combustion Emissions					
Type of Construction Equipment	Num. of Units	HP Rated	Hrs/day	Days/yr	Total hp-hrs
Water Truck	1	300	8	240	576000
Diesel Road Compactors	0	100	8	240	0
Diesel Dump Truck	4	300	8	240	2304000
Diesel Excavator	2	300	8	240	1152000
Diesel Hole Trenchers	0	175	8	240	0
Diesel Bore/Drill Rigs	0	300	8	240	0
Diesel Cement & Mortar Mixers	0	300	8	120	0
Diesel Cranes	1	175	8	120	168000
Diesel Graders	1	300	8	240	576000
Diesel Tractors/Loaders/Backhoes	2	100	8	240	384000
Diesel Bull Dozers	2	300	8	240	1152000
Diesel Front-End Loaders	2	300	8	240	1152000
Diesel Fork Lifts	2	100	8	240	384000
Diesel Generator Set	2	40	8	240	153600

Emission Factors							
Type of Construction Equipment	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	PM-10 g/hp-hr	PM-2.5 g/hp-hr	SO2 g/hp-hr	CO2 g/hp-hr
Water Truck	0.440	2.070	5.490	0.410	0.400	0.740	536.000
Diesel Road Compactors	0.370	1.480	4.900	0.340	0.330	0.740	536.200
Diesel Dump Truck	0.440	2.070	5.490	0.410	0.400	0.740	536.000
Diesel Excavator	0.340	1.300	4.600	0.320	0.310	0.740	536.300
Diesel Trenchers	0.510	2.440	5.810	0.460	0.440	0.740	535.800
Diesel Bore/Drill Rigs	0.600	2.290	7.150	0.500	0.490	0.730	529.700
Diesel Cement & Mortar Mixers	0.610	2.320	7.280	0.480	0.470	0.730	529.700
Diesel Cranes	0.440	1.300	5.720	0.340	0.330	0.730	530.200
Diesel Graders	0.350	1.360	4.730	0.330	0.320	0.740	536.300
Diesel Tractors/Loaders/Backhoes	1.850	8.210	7.220	1.370	1.330	0.950	691.100
Diesel Bull Dozers	0.360	1.380	4.760	0.330	0.320	0.740	536.300
Diesel Front-End Loaders	0.380	1.550	5.000	0.350	0.340	0.740	536.200
Diesel Fork Lifts	1.980	7.760	8.560	1.390	1.350	0.950	690.800
Diesel Generator Set	1.210	3.760	5.970	0.730	0.710	0.810	587.300

CALCULATION SHEET-COMBUSTION EMISSIONS-CONSTRUCTION-ALTERNATIVE 3

Emission factors (EF) were generated from the NONROAD2005 model for the 2006 calendar year. The VOC EFs includes exhaust and evaporative emissions. The VOC evaporative components included in the NONROAD2005 model are diurnal, hotsoak, running loss, tank permeation, hose permeation, displacement, and spillage. The construction equipment age distribution in the NONROAD2005 model is based on the population in U.S. for the 2006 calendar year.

Emission Calculations							
Type of Construction Equipment	VOC tons/yr	CO tons/yr	NOx tons/yr	PM-10 tons/yr	PM-2.5 tons/yr	SO2 tons/yr	CO2 tons/yr
Water Truck	0.279	1.314	3.485	0.260	0.254	0.470	340.227
Diesel Road Paver	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel Dump Truck	1.117	5.256	13.939	1.041	1.016	1.879	1360.908
Diesel Excavator	0.432	1.650	5.840	0.406	0.394	0.939	680.835
Diesel Hole Cleaners\Trenchers	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel Bore/Drill Rigs	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel Cement & Mortar Mixers	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel Cranes	0.081	0.241	1.059	0.063	0.061	0.135	98.159
Diesel Graders	0.222	0.863	3.002	0.209	0.203	0.470	340.417
Diesel Tractors/Loaders/Backhoes	0.783	3.474	3.055	0.580	0.563	0.402	292.451
Diesel Bull Dozers	0.457	1.752	6.043	0.419	0.406	0.939	680.835
Diesel Front-End Loaders	0.482	1.968	6.348	0.444	0.432	0.939	680.708
Diesel Aerial Lifts	0.838	3.284	3.622	0.588	0.571	0.402	292.324
Diesel Generator Set	0.205	0.636	1.011	0.124	0.120	0.137	99.411
Total Emissions	**4.897**	**20.438**	**47.403**	**4.135**	**4.019**	**6.713**	**4866.276**

Conversion factors	
Grams to tons	1.102E-06

CALCULATION SHEET-TRANSPORTATION COMBUSTION EMISSIONS-CONSTRUCTION-ALTERNATIVE 3

Construction Worker Personal Vehicle Commuting to Construction Site-Passenger and Light Duty Trucks									
	Emission Factors		Assumptions				Results by Pollutant		
Pollutants	Passenger Cars g/mile	Pick-up Trucks, SUVs g/mile	Mile/day	Day/yr	Number of cars	Number of trucks	Total Emissions Cars tns/yr	Total Emissions Trucks tns/yr	Total tns/yr
VOCs	1.36	1.61	60	240	20	20	0.43	0.51	0.94
CO	12.4	15.7	60	240	20	20	3.94	4.98	8.92
NOx	0.95	1.22	60	240	20	20	0.30	0.39	0.69
PM-10	0.0052	0.0065	60	240	20	20	0.00	0.00	0.00
PM 2.5	0.0049	0.006	60	240	20	20	0.00	0.00	0.00
CO2	369	511	60	240	20	20	117.11	162.18	279.29

Heavy Duty Trucks Delivery Supply Trucks to Construction Site									
	Emission Factors		Assumptions				Results by Pollutant		
Pollutants	10,000-19,500 lb Delivery Truck	33,000-60,000 lb semi trailer rig	Mile/day	Day/yr	Number of trucks	Number of trucks	Total Emissions Cars tns/yr	Total Emissions Trucks tns/yr	Total tns/yr
VOCs	0.29	0.55	60	240	2	2	0.01	0.02	0.03
CO	1.32	3.21	60	240	2	2	0.04	0.10	0.14
NOx	4.97	12.6	60	240	2	2	0.16	0.40	0.56
PM-10	0.12	0.33	60	240	2	2	0.00	0.01	0.01
PM 2.5	0.13	0.36	60	240	2	2	0.00	0.01	0.02
CO2	536	536	60	240	2	2	17.01	17.01	34.02
Daily Commute New Staff Associated with Proposed Action									
	Emission Factors		Assumptions				Results by Pollutant		
Pollutants	Passenger Cars g/mile	Pick-up Trucks, SUVs g/mile	Mile/day	Day/yr	Number of Cars	Number of trucks	Total Emissions cars tns/yr	Total Emissions Trucks tns/yr	Total tns/yr
VOCs	1.36	1.61	40				-	0.00	-
CO	12.4	15.7	40				-	0.00	-
NOx	0.95	1.22	40				-	0.00	-
PM-10	0.0052	0.0065	40				-	0.00	-
PM 2.5	0.0049	0.006	40				-	0.00	-
CO2	369	511	40				-	0.00	-

Truck Emission Factor Source: MOBILE6.2 USEPA 2005 Emission Facts: Average annual emissions and fuel consumption for gasoline-fueled passenger cars and light trucks. EPA 420-F-05-022 August 2005. Emission rates were generated using MOBILE.6 highway.

CALCULATION SHEET-TRANSPORTATION COMBUSTION EMISSIONS-CONSTRUCTION-ALTERNATIVE 3

Conversion factor:	gms to tons
	0.000001102

Carbon Equivalents	Conversion Factor
N2O or NOx	311
Methane or VOCs	25

Source: EPA 2010 Reference, Tables and Conversions, Inventory of U.S. Greenhouse Gas Emissions and Sinks; http://www.epa.gov/climatechange/emissions/usinventoryreport.html

CARBON EQUIVALENTS

Construction Commuters	Conversion	Emissions CO2 tons/yr	Total CO2
VOCs	25	23.57	
NOx	311	0.69	
Total		24.25	303.54

Delivery Trucks	Conversion	Emissions CO2 tons/yr	Total CO2
VOCs	25	0.67	
NOx	311	173.42	
Total		174.09	208.11

Kirtland AFB staff and Students	Conversion	Emissions CO2 tons/yr	Total CO2
VOCs	25	-	
NOx	311	-	
Total		-	-

CALCULATION SHEET-FUGITIVE DUST-CONSTRUCTION-ALTERNATIVE 3

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
General Construction Activities	0.19	ton PM10/acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM10/acre-month	MRI 1996; EPA 2001; EPA 2006

PM2.5 Emissions

PM2.5 Multiplier	0.10	(10% of PM10 emissions assumed to be PM2.5)	EPA 2001; EPA 2006
Control Efficiency	0.50	(assume 50% control efficiency for PM10 and PM2.5 emissions)	EPA 2001; EPA 2006

Project Assumptions

Construction Area (0.19 ton PM10/acre-month)

Duration of Construction Project	12	months
Length	1	miles
Length (converted)	5280	feet
Width	24	feet
Area	16.00	acres

Conversion Factors

0.000022957	acres per feet
5280	feet per mile

Staging Areas

Duration of Construction Project	12	months
Length		miles
Length (converted)		feet
Width		feet
Area	12.00	acres

	Project Emissions (tons/year)			
	PM10 uncontrolled	PM10 controlled	PM2.5 uncontrolled	PM2.5 controlled
Construction Area (0.19 ton PM10/ac	36.48	18.24	3.65	1.82
Staging Areas	2.28	1.14	0.23	0.11
Total	**38.76**	**19.38**	**3.88**	**1.94**

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999.* EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants.* Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1).* Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM10/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM10/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM10/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions from Construction Operations, calculated the 0.19 ton PM10/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM10/acre-month) and 75% of the average emission factor (0.11 ton PM10/acre-month).

The 0.19 ton PM10/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM10/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particle (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District and the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM10 and PM2.5 in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM10/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM10/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM10/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM2.5 Multiplier **0.10**

PM2.5 emissions are estimated by applying a particle size multiplier of 0.10 to PM10 emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM10 and PM2.5 **0.50**

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM10 and PM2.5 in PM nonattainment areas. Wetting controls will be applied during project construction (EPA 2006).

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999.* EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants.* Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1).* Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

CALCULATION SHEET-SUMMARY OF EMISSIONS-ALTERNATIVE 3

Alternative 1 Construction Emissions for Criteria Pollutants (tons per year)									
Emission Source	VOC	CO	NOx	PM-10	PM-2.5	SO2	CO2	CO2 Equivalents	Total CO2
Combustion Emissions	4.90	20.44	47.40	4.13	4.02	6.71	4866.28	14864.90	19731.18
Construction Site-Fugitive PM-10	NA	NA	NA	19.38	1.94	NA	NA	NA	NA
Construction Workers Commuter & Trucking	0.97	9.06	1.25	0.02	0.02	NA	279.29	411.84	691.13
Total emissions-CONSTRUCTION	**5.87**	**29.50**	**48.65**	**23.53**	**5.98**	**6.71**	**5,146**	**15,277**	**20,422**
De minimis Threshold (1)	100	100	100	100	100	100	NA	NA	27,557

1. Lafayette Parish is in attainment for all NAAQS.

Carbon Equivalents	Conversion Factor
N2O or NOx	311
Methane or VOCs	25

Source: EPA 2010 Reference, Tables and Conversions, Inventory of U.S. Greenhouse Gas Emissions and Sinks;
http://www.epa.gov/climatechange/emissions/usinventoryreport.html