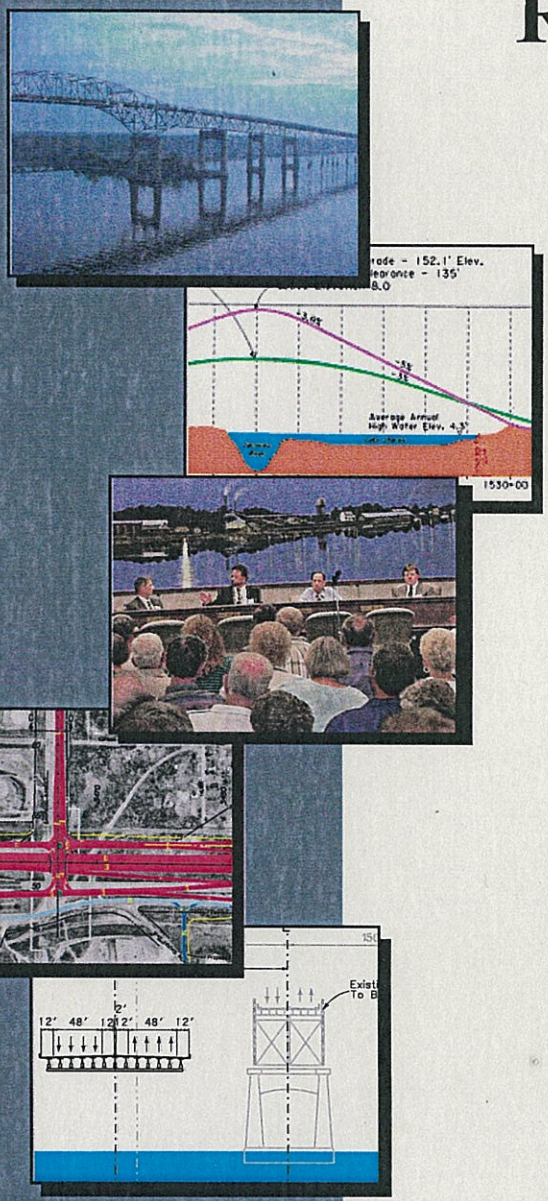
I-10 CALCASIEU RIVER BRIDGE AND APPROACHES

Lake Charles, Louisiana

S.P. No. 700-10-0115
F.A.P. No. BR-10-1(212)29



COMPREHENSIVE PRELIMINARY ALTERNATIVES REPORT

May 2002

Prepared by

HNTB CORPORATION

with

Wilbur Smith Associates
Coastal Environments, Inc.

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DEPARTMENT OF TRANSPORTATION • UNITED STATES OF AMERICA •

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT DOTD

TABLE OF CONTENTS

ATTACHMENTS:

LIST OF TABLES

LIST OF FIGURES

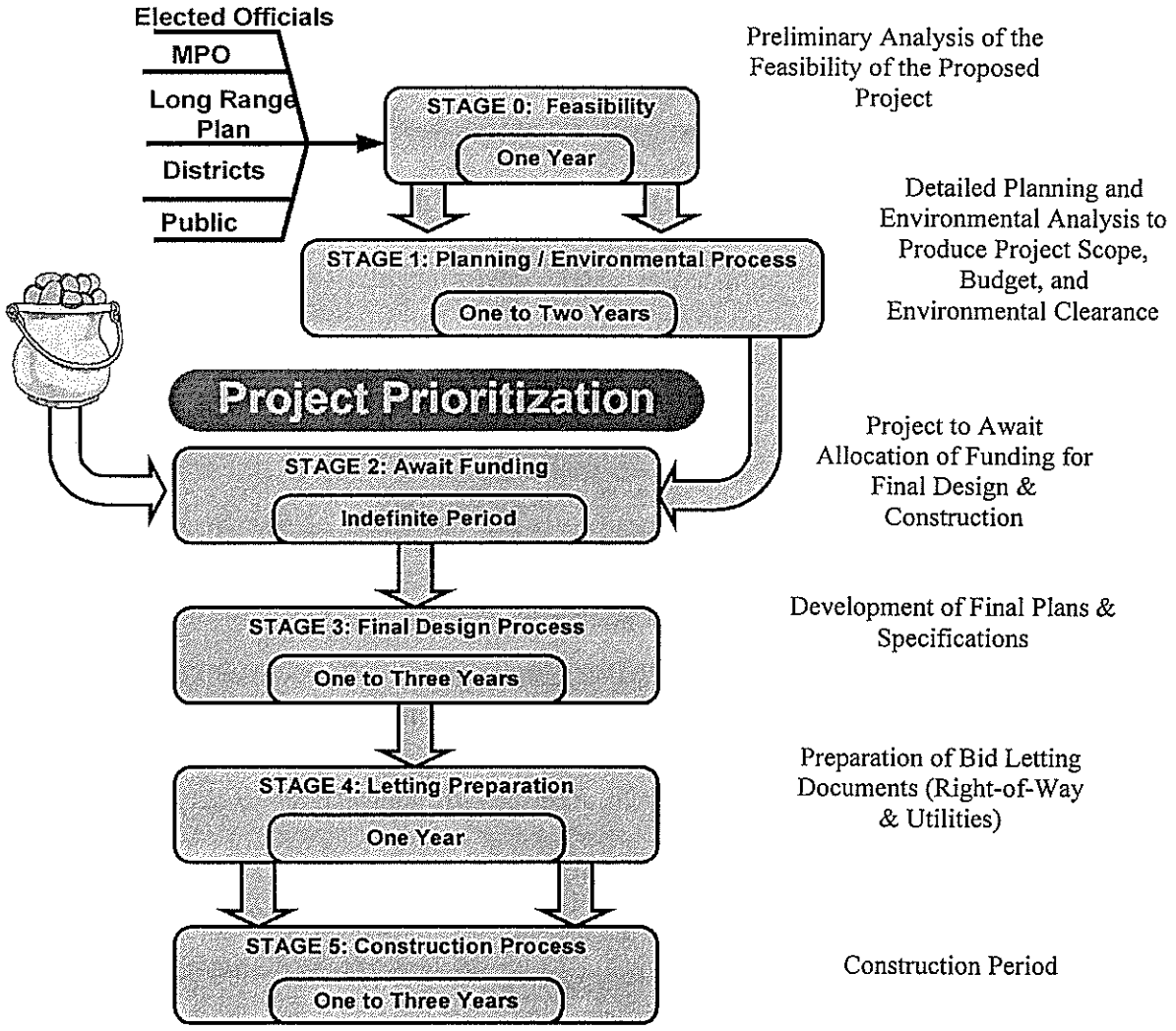
SUMMARY

SUMMARY

The Louisiana Department of Transportation and Development (DOTD) is currently conducting an engineering and environmental feasibility study for improvements along I-10 in Lake Charles, Louisiana. The study corridor is six miles in length and includes the high level Calcasieu River Bridge. One of the primary purposes of the proposed project is to construct a new Calcasieu River Bridge. Another primary purpose of the proposed project is to construct a highway/railroad grade separation at the Sampson Street interchange. Other secondary goals also exist including an upgrade for the frontage road system to the east of the river near the Charpentier Historic District, Central Business District (CBD), and downtown area.

This comprehensive preliminary alternatives report marks the completion of the preliminary feasibility study phase of this project, also known as Stage 0 according to DOTD's project prioritization flow chart for proposed projects (see Figure S-1). With the project having been determined feasible, the report summarizes the six technical memorandums previously submitted to state and federal agencies during the preliminary phase of the project. In addition, this report evaluates the numerous alternatives that were considered during the preliminary phase and presents four selected alternatives that have been recommended to move forward for further study in the detailed planning and environmental phase of the project, Stage 1.

Figure S-1
DOTD PROJECT PRIORITIZATION
FLOW CHART



In order to evaluate the different components of the project alternatives, numerous decision categories were identified. An evaluation was then performed for various engineering and environmental factors as shown in Table S-1. Based on the results as shown in the matrix and discussed more completely in Chapter 3 regarding these evaluations, four recommended system alternatives have been designated for further study. Each recommended alternative has been determined by combining the recommended alternative of each decision category, yielding a complete alternative from the PPG Drive area on the west side of the project to US 90 on the east. Four alternatives have emerged rather than one because for two decision categories more than one alternative is recommended to be carried forward. The four alternatives consist of the following common features:

- Centerline Alignment 3 (or similar offset alignment)
- Steel Box Girders for main span of river bridge
- 200'-270'-270'-200' Main Span Arrangement
- Bridge Profile 2
- U-turns on East End
- Existing Ramp Configuration on East End Modified for westbound exit and eastbound entrance at I-10 and US 90 (east)
- Improving I-10 profile at Abandoned Railroad
- Modify Ryan Street Improvements

These features are described in more detail in the various technical memorandums issued throughout the study and are also presented on the folded drawings in the sleeves at the conclusion of the report. Table S-2 shows the defining characteristics of the recommended alternatives compared to one another. In addition, a brief description of each alternative from one end of the corridor to the other is provided following the table. Each of the alternatives utilizes an elevated diamond-type interchange at Sampson Street, which would allow for a phased construction approach where the Sampson Street interchange can be constructed first and the new Calcasieu River bridge can be constructed at a later date.

Table S-1

EVALUATIONS MATRIX

I-10 CALCASIEU RIVER BRIDGE AND APPROACHES
S.P.No. 700-10-0115
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DECISION CATEGORIES	ALTERNATIVES	ENGINEERING FACTORS: Construction Cost ($)	Length of New Construction	Real Estate Cost ($)	Maintenance Cost	Navigation	Aesthetics	Phased Construction (Samp.St.)	Constructability (River Bridge)	Use Existing Piers	Traffic Service (Casinos)	Traffic Service (Industry)	Traffic Service (Westlake)	Traffic Service (Downtown)	Mainline Operations	Interchange Operations	RR Spur Reloc.	ENVIRONMENTAL FACTORS: 50 yr. Structures Impacted (Bridge)	Archaeological Sites	Tanks and Other Waste Sites	Haz. Spill Sites	Displacements (# Res.)	Displacements (#Comm.)	Displacements (# Public)	Surface / Ground Water	Wetland Impacts (Acres)	Natural Communities Impacted	Impacts to Fauna	Impacts to Threatened / Endangered Species	Floodplains Impacts	Farmland Impacts	Noise and Air	OVERALL RATING	RECOMMENDED ALTERNATIVES FOR FURTHER STUDY
ALIGNMENT	Centerline Alignment 1		1	1 (6.6 M)			2		3	1									(0)	1 (4)	3	(2)	1 (6)	1 (0)		1 (20.40)	1	1					3	
	Centerline Alignment 2		2	2 (18.3 M)			2		2	1									(1)	2 (8)	2	(2)	2 (16)	2 (1)		1 (20.40)	1	1					2	
	Centerline Alignment 3		3	3 (21.6 M)			1		1	3									(1)	2 (8)	1	(2)	3 (17)	2 (1)		3 (26.83)	3	3					1	Centerline Alignment 3
RIVER BRIDGE TYPICAL SECTION	Bridge Concept A	1 (76 M)			1			1	4	1	3	3	3	3	4			2 (1)															1	Concept A
	Bridge Concept B	2 (95 M)			2			1	3	1	1	1	1	1	1			2 (1)															3	
	Bridge Concept C	4 (104 M)			3			1	2	1	1	1	1	1	1			2 (1)															2	Concept C
	Bridge Concept D	3 (100 M)			4			4	1	4	4	4	4	4	3			1 (0)															4	
BRIDGE TYPE	Concrete Haunched Girders	1 (97/SF)			2		4		3																								2	
	Concrete Box Girders	3 (108/SF)			1		1		3																								3	
	Steel Box Girders	4 (119/SF)			3		1		1																								1	Steel Box Girders
	Steel Plate Girders	2 (105/SF)			4		3		2																								4	
MAIN SPAN ARRANGEMENTS	145' - 155' - 155' - 145'	4 (137/SF)				4	4			2																								4	
	210' - 210' - 210' - 210'	2 (106/SF)				3	2			1																								3	
	200' - 250' - 200'	3 (113/SF)				2	3			2																								2	
	200' - 270' - 270' - 200'	1 (105/SF)				1	1			2																								1	200' - 270' - 270' - 200'
BRIDGE PROFILE*	Profile 1	1 (68.7 M)	1					2								1	3 (Y)																2	
	Profile 2	2 (75.5 M)	2					1								2	1 (N)																1	Profile 2
	Profile 3	3 (83 M)	3					2								3	1 (N)																3	
WEST END (PPG AREA)	DOTD Concept Two-Way	2 (11.4 M)									3	1	3			1	1 (N)									1	1						2	DOTD Concept Two-Way
	DOTD Concept (Modified) One-Way	1 (9 M)									1	3	1			1	1 (N)									2	2						1	One-Way
	Frontage Road Overpasses One-Way	4 (17.2 M)									1	3	1			3	3 (Y)									4	4						4	
	Railroad Relocation Two-Way	3 (15.1 M)									3	1	3			3	3 (Y)									3	3						3	
SAMPSON ST. INTERCHANGE	Elevated Diamond** One-Way	1		1				1			1	4	1			2	1 ***			(2)	3	1 (3)	(6)			1	1						1	Elevated Diamond** One-Way
	Two-Way	1		1				1			1	1	1			4	1 ***			(2)	4	1 (3)	(6)			1	1						2	Two-Way
	Mike Hooks Rd. Elevated Diamond*** One-Way	3		5				3			4	5	4			3	1 (N)			(2)	1	4 (5)	(6)			4	4						3	
	Two-Way	3		5				3			4	2	4			5	1 (N)			(2)	2	4 (5)	(6)			4	4						4	
	Directional Free Flow Layout One-Way	5		3				5			3	3	3			1	5 (Y)			(2)	5	1 (3)	(5)			3	3						5	
EAST SIDE U-TURNS	U-Turns	2 (1.5 M)												1		1				2 (2)		2 (1)											1	U-Turns
	No U-Turns	1 (0 M)												2		2				1 (0)		1 (0)											2	
EAST SIDE INTERCHANGES	Existing Configuration Modified WB Exit / EB Ent.	1 (0.02 M)														3				1 (0)													1	Existing Configuration Modified WB Exit / EB Ent.
	WB Ent. / EB Exit	1 (0.2 M)														2				1 (0)													2	
	New Diamond Interchanges	2 (1.2 M)														1				2 (1)													3	
MAINLINE PROFILE @ RR	Widen Existing I-10 at Abandoned RR	1 (1.5 M)														2				(1)													2	
	Proposed At-Grade I-10 at Abandoned RR	2 (2.3 M)														1				(1)													1	At-Grade I-10 @ Abandoned RR
RYAN ST. I/C	Keep Ryan St. Improvements Two-Way	1 (2.3 M)												2		2																	2	
	Modify Ryan St. Improvements One-Way	2 (3.5 M)												1		1																	1	Modify Ryan Street Improvements One-Way

KEY:

=This engineering/environmental factor does not significantly influence the evaluation of the alternative being analyzed due to minimal affects on the alternative or because there is insufficient information at this phase.

*Construction cost for each bridge profile includes preliminary cost to remove existing bridge.
**The one and two way alternatives for the Elevated Diamond interchange at Sampson Street can be used with Bridge Profile 1 or Bridge Profile 2. See Figure 2-1.
***Mike Hooks Elevated Diamond interchange alternatives at Sampson Street use Bridge Profile 3 ONLY. See Figure 2-1.

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Table S-2
DEFINING CHARACTERISTICS OF
THE RECOMMENDED ALTERNATIVES

Recommended Alternative	West Side / Sampson St. Concept	Bridge Concept
Alternative 1	One-Way	Bridge Concept A
Alternative 2	One-Way	Bridge Concept C
Alternative 3	Two-Way	Bridge Concept A
Alternative 4	Two-Way	Bridge Concept C

- ***Alternative 1*:**

This alternative consists of a one-way frontage road on the west end of the corridor to the south of the mainline between PPG Drive and Sampson Street. At Sampson Street the frontage road system ties into an eight-lane mainline river bridge, which consists of six through lanes with one auxiliary lane in either direction (Bridge Concept A). On the east side, one-way frontage roads are redeveloped to run continuous to the north and the south of the mainline with U-turns under the mainline at various cross streets.

- ***Alternative 2*:**

This alternative also consists of a one-way frontage road on the west end of the corridor to the south of the mainline between PPG Drive and Sampson Street. At Sampson Street, the frontage road system is carried continuously across the Calcasieu River, with two-lane one-way parallel frontage road bridges flanking the sides of the six-lane main river bridge. On the east side, the one-way frontage roads run continuous to the north and the south of the mainline with U-turns under the mainline at various cross streets.

- ***Alternative 3:***

This alternative consists of a two-way frontage road on the west end of the corridor to the south of the mainline between PPG Drive and Sampson Street. At Sampson Street, the frontage road system ties into an eight-lane mainline river bridge, which consists of six through lanes with one auxiliary lane in either direction (Bridge Concept A). On the east side, one-way frontage roads are redeveloped to run continuous to the north and the south of the mainline with U-turns under the mainline at various cross streets.

- ***Alternative 4:***

This alternative also consists of a two-way frontage road on the west end of the corridor to the south of the mainline between PPG Drive and Sampson Street. At Sampson Street, the frontage road system is carried continuously across the Calcasieu River, with two-lane one-way parallel frontage road bridges flanking the sides of the six-lane main river bridge. On the east side, the one-way frontage roads run continuous to the north and the south of the mainline with U-turns under the mainline at various cross streets.

The four alternatives presented are recommended to move forward to the refined phase of the project, Stage 1, which will include detailed planning and environmental analysis to produce project scope, budget, and environmental clearance. Upon completion of Stage 1, Final Engineering Feasibility Report and Environmental Assessment documents will be compiled documenting findings throughout the course of the project. These final reports will provide information to support the selection of one alternative, which will be carried forward when funding becomes available (Stage 2), for design (Stage 3), and implementation (Stages 4 and 5). A primary goal throughout these studies and into the next phase is to plan for construction implementation strategies. Maximizing flexibility in phasing separate construction projects over time is an essential element as the Department begins work toward identifying funding.

CHAPTER 1

INTRODUCTION

Chapter One

INTRODUCTION

1.1 PROJECT HISTORY

The Federal Highway Administration (FHWA) in cooperation with the Louisiana Department of Transportation and Development (DOTD) has initiated the NEPA (National Environmental Policy Act) process on a proposal to replace the existing bridge over the Calcasieu River on I-10 near Lake Charles and Westlake, Louisiana, and improve the interstate approaches on east side of the river.

In the late 1970's, there were numerous accidents on the Calcasieu River Bridge that led to an investigation of the skid numbers by the DOTD central lab. There was also a consideration for placing an epoxy overlay or possibly a concrete overlay on the bridge. An inspection of the bridge identified that there were numerous corrosion problems with the structure, and the idea of an overlay was abandoned. In the late 1980's, it was decided to look into the feasibility of replacing the bridge. A brief study indicated that the bridge might be lowered and continuous steel or concrete spans placed across the channel with more lanes to carry the traffic that was using the bridge. New and improved approaches are required to match the new bridge. This includes the Sampson Street interchange at the west foot of the bridge.

In early 2000, the DOTD retained HNTB Corporation to perform an engineering and environmental feasibility study of replacing the bridge. This study also includes a section of the I-10 approaches on each side of the river. To date six Technical Memorandums have been developed to document the results of the study process.

1.2 PURPOSE AND NEED

A Purpose and Need Statement for the proposed project can be found in the Preliminary Line and Grade Studies Technical Memorandum. The Purpose and Need is summarized in the following text.

The primary purpose of this proposed action is to replace the I-10 Calcasieu River Bridge. In conjunction with this primary action, secondary proposed actions include improvements to the interstate approach roadways on either side of the bridge, including several interchanges.

The need for the proposed action is based on the following factors:

- System Linkage
- Improve Capacity
- Transportation Demand
- Geometric and Safety Concerns
- Structural and Navigational Concerns

1.3 STUDY AREA

The proposed action would include roadway and bridge approaches on the Lake Charles side of approximately 18,400 feet in length and on the Westlake side of approximately 13,900 feet in length. The total project length is approximately 6.1 miles. This area is the focus of the feasibility studies.

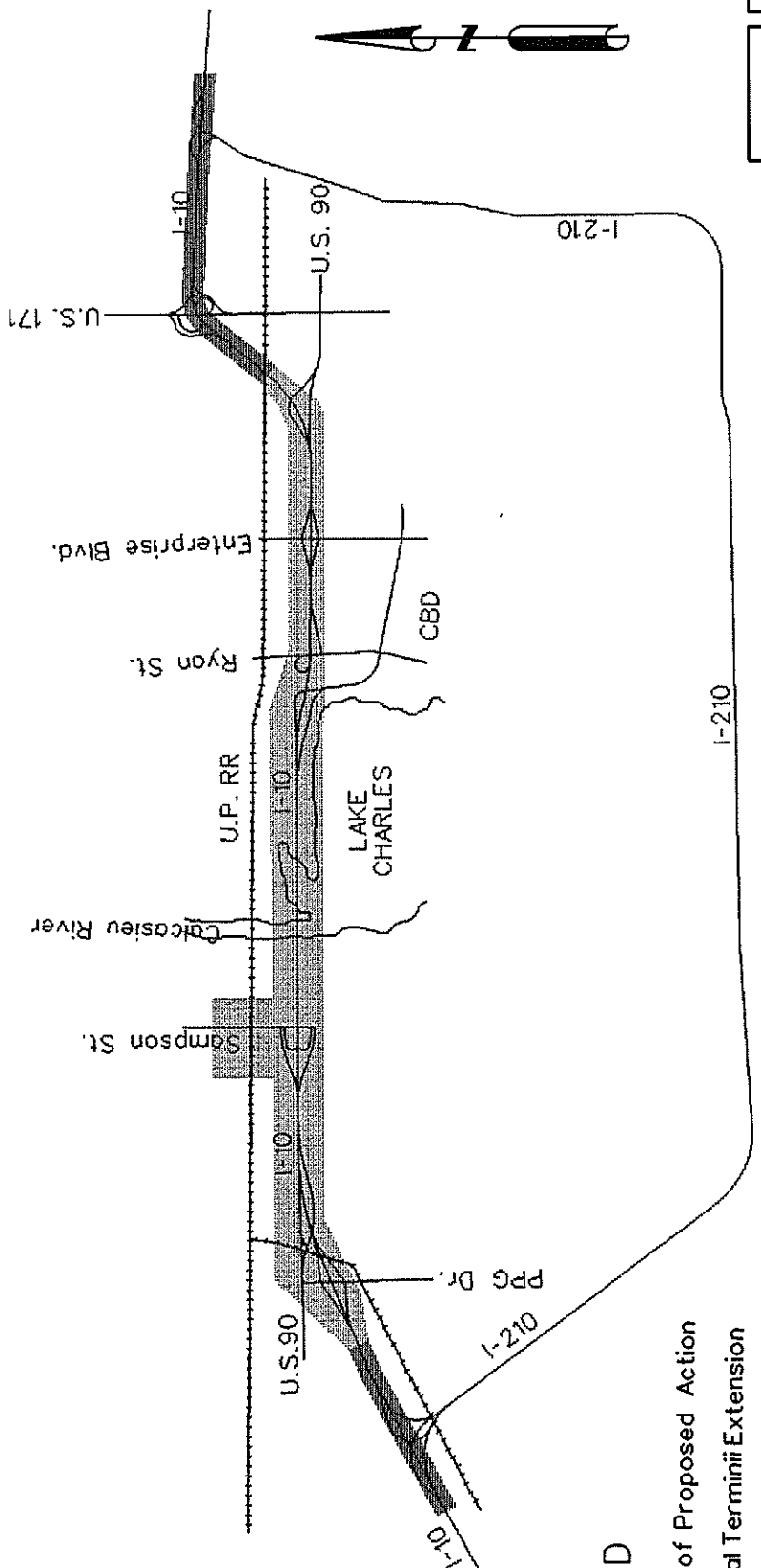
In addition to a new bridge, improvements that have been investigated within the study limits include: a redesign of Sampson Street from Sulfur Avenue, south, to provide grade separations with existing railroads; a redesign of the access to and from the I-10 on the west side of the bridge between Sampson Street and PPG Drive; a redesign of the access to and from I-10 near the east end of the bridge; and consideration of the implementation of one-way frontage roads from PPG Drive to US 90 East. Consideration has been given to using the existing bridge for the frontage roads.

Logical termini for the project have been established as the I-210 interchanges on each of the west and east ends of the corridor. The limits of proposed action and logical termini are shown on Figure 1-1.

Figure 1-1

STUDY AREA MAP

Not To Scale



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1.4 STUDY APPROACH

The study approach for the I-10 Calcasieu Feasibility Study from start to finish includes four phases. A brief description along with the documentation produced for each are listed below.

PHASE 1: Information and Data Gathering

An extensive survey has been made in a number of areas, including:

- Natural, Environmental, Geographic and Hydrologic features
- Air Quality and Noise Impact
- Marine and Rail Traffic
- Cultural and Community Features
- Wetlands, Waterways, Soil, Plants and Terrain
- Hazardous, Toxic and Non-Hazardous Waste Sites
- Existing and Projected Traffic Flows
- Public Involvement from the first public meeting

The technical memorandums produced during the Preliminary Phase of the project present the above information. For example, refer to the Marine Use Study for marine data, to the Existing Environmental Factors Technical Memorandum for existing environmental constraints, and to the Preliminary Line and Grade Technical Memorandum for information concerning the various existing factors throughout the corridor.

PHASE 2: Preliminary Study

With the information gathered in Phase 1, planners and engineers have developed many documents and design proposals. At this stage of the project, there are many alternatives that are being considered for design even though they may not all make it to the next level of study, the refined phase. The Comprehensive Preliminary Alternatives Report is only one of many reports produced within the preliminary phase of the project. The following is a list of preliminary study reports that have been produced within this phase of the project.

1) **Marine Use Study** – Discusses the positioning of the proposed bridge including the design aspects such as vertical and horizontal bridge clearances.

2) **Environmental Factors Technical Memorandum** – Describes the existing environmental factors in the area that may influence location and design of the project.

3) **Preliminary Line and Grade Alternatives Technical Memorandum** – Presents and explains the preliminary conceptual designs for line and grade alternatives within the study area.

4) **Traffic Analysis of Initial Alternatives Technical Memorandum** – Presents and explains the preliminary computer transportation modeling and traffic analysis performed for the various line and grade concept alternatives (prepared by Wilbur Smith Associates).

5) **Preliminary Bridge Studies Technical Memorandum** - Considers bridge designs and layouts in accordance with the preliminary line and grade alternatives being considered.

6) **Environmental Screening Technical Memorandum** – Evaluates the large field of concept alternatives and helps to narrow them to four recommended alternatives which will be studied in more detail in the next phase of the project.

This Comprehensive Preliminary Alternatives Report, which includes Stage 0 of the Department's project prioritization process, summarizes the technical memorandums listed above and uses the information presented to provide a comprehensive and logical procedure for recommending alternatives for further study. The four alternatives that have been recommended for further study are attached and are described in Chapter 3.

PHASE 3: Refined Alternatives Study

The recommended alternatives from Phase 2 will undergo further analysis within Phase 3. This phase of the project falls under DOTD's Stage 1 for project prioritization and involves detailed planning and environmental analysis as environmental study under the NEPA process. One alternative will be designated

as the Selected Alternative at the conclusion of Phase 3 and will be presented in the Feasibility Study Report and Environmental Assessment discussed below.

PHASE 4: Preparation and Submission of a Feasibility Study Report and Environmental Assessment

A Comprehensive Feasibility Report and Environmental Assessment will be prepared containing the Selected Alternative for the study area.

With the completion of Phase 4, state and federal agencies will have completed Stage 1 of the DOTD's project prioritization flow chart and will be positioned for subsequent stages, including final design and construction once funding has been identified.

CHAPTER 2

TECHNICAL MEMORANDUMS

Chapter Two

TECHNICAL MEMORANDUMS

Each of the following sections below refers to one of the six technical memorandums produced during the preliminary studies (Stage 0) of the feasibility study. The technical memorandums discussed include the Marine Use Study, Existing Environmental Factors, Preliminary Line and Grade Studies, Traffic Analysis of Initial Alternatives, Preliminary Bridge Studies, and Environmental Screening technical memorandums. Each section addresses a memorandum individually and discusses its purpose, the procedures involved in conducting the studies to produce it, the contents contained in it, and the conclusions presented. Reference can be made to the appropriate technical memorandum(s), which are on file with DOTD, to access more detailed information concerning each specific area of the preliminary studies.

2.1 MARINE USE STUDY TECHNICAL MEMORANDUM

The final Marine Use Study Technical Memorandum was presented to DOTD, FHWA, and the U.S. Coast Guard in May of 2001. The purpose of this study was to determine if the horizontal and vertical clearances for a new bridge could be reduced without obstructing the marine use of the river. This study presents the results of river traffic research and interviews with various users. Descriptions of the interviews conducted with the users are included within the Marine Use Study Technical Memorandum.

2.1.1 Existing Navigational Clearances

The existing vertical clearance provided for marine traffic passing under the Calcasieu River Bridge is 135.0 feet above 8.0 feet mean sea level (MSL). The existing horizontal clearance in the navigation channel is 200 feet and is located within the limits of the existing main span. The exact location of the 200 feet channel is not specified, however navigation charts list the clearances as "135 feet of vertical clearance for the middle 200 feet." This would incorporate the 93 feet navigation channel for the adjacent

middle 200 feet." This would incorporate the 93 feet navigation channel for the adjacent Union Pacific railroad if the center of the 200 feet channel were projected to the railroad bridge.

2.1.2 Proposed Navigational Clearances

The proposed low structure elevation of the new Calcasieu River Bridge will be reduced from 143.0 feet to a minimum of 77.3 feet, a difference of 65.7 feet. This results in a vertical clearance of 73 feet above 4.3 feet NGVD. Elevation 4.3 feet is the average annual high water elevation. Studies indicate that reducing the vertical clearance will not interfere with marine vessels that currently use the navigation channel under the bridge.

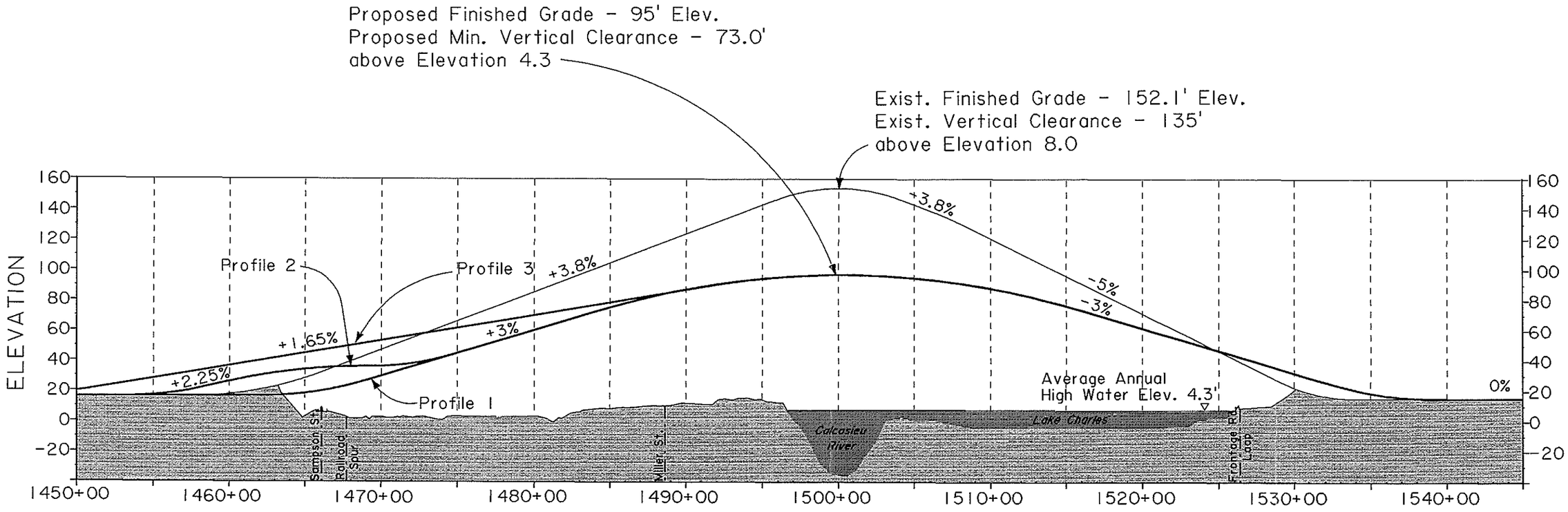
An inquiry of mariners by DOTD into the possibility of reducing the horizontal clearance of the navigation channel from 200 feet to 180 feet resulted in replies that indicated an acceptance. Upon completion of the draft Marine Use Technical Memorandum, discussions with the Corp of Engineers in New Orleans determined that a 250 feet wide dredged channel on the western edge of the Calcasieu River is maintained to a point approximately 700 feet south of the I-10 bridge at which point it terminates in a turning basin for larger ships. The shipping interests that use the area under the I-10 bridge and to the north of that are shallow draft vessels that do not need the dredged channel to operate.

Additional discussions with the Coast Guard and the Corp of Engineers indicated that the location of the piers should be such that the navigation channel under the I-10 bridge, whether 180 feet or 200 feet, should accommodate the marine traffic passing through the 93 feet navigation opening at the railroad. The 180 feet wide channel should be considered the minimum and used only in conjunction with reutilization of the existing piers. The existing 200 feet navigational channel should be maintained as desirable for any other span arrangements.

Figure 2-1 shows profiles of the existing and proposed Calcasieu River Bridges with the corresponding vertical clearances for each. Refer to the Marine Use Study for more information concerning the proposed clearances for the new bridge.

Figure 2-1

CALCASIEU RIVER
BRIDGE PROFILES



LEGEND

- Existing Bridge Profile
- Proposed Bridge Profiles
- Street/Railroad Centerline
- Existing Ground
- Water

PARISH: CALCASIEU
FEDERAL PROJECT: BR-10-1(212)29
STATE PROJECT: 700-10-0115

I-10 CALCASIEU RIVER BRIDGE & APPROACHES

Calcasieu River Bridge Profiles

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2.2 EXISTING ENVIRONMENTAL FACTORS TECHNICAL MEMORANDUM

The final Existing Environmental Factors Technical Memorandum was submitted to DOTD in June of 2001. The purpose of this technical memorandum was to present the existing environmental factors within the study corridor that may influence the preliminary design of alternatives. Field studies and research were conducted to compile the appropriate information needed for the preliminary studies. The following environmental factors were analyzed, and the findings were presented in the technical memorandum.

2.2.1 Cultural Resources

Records indicate that two previously recorded sites are located within the proposed project area. In addition, five previously recorded sites are located within 1/2 mile of the proposed project area. There is a moderate potential of prehistoric sites existing within the proposed project area. However, it is unlikely that any Euro-American sites dating prior to 1870 exist within the proposed project area. It is possible, however, those historic sites dating from the late nineteenth through the early twentieth century exist within the project corridor.

Most of the standing structures, structures recorded as being over fifty years of age, in proximity to the project area are located within the Lake Charles Historic District (Charpentier Historic District). In addition to these structures within the historic district, four National Register of Historic Places (NRHP) properties are located within 1/2 mile of the proposed project area—Calcasieu Marine Bank, Charleston Hotel, Episcopal Church of the Good Shepherd, and the Arcade Theater. Three cemeteries also exist within the eastern quadrant of the project study area. These three cemeteries are not recorded, but all have the potential to be historic. It should also be mentioned that the existing bridge may become eligible for the NRHP since it is approaching 50 years of age. For purposes of this project, the bridge should be considered potentially historic. Refer to Exhibit 2 of the Existing Environmental Factors Technical Memorandum for the graphical locations of these cultural resource sites.

2.2.2 Hazardous, Toxic, and Non-Hazardous Waste Sites

A total of 88 potential hazardous waste and underground storage tank (UST) facilities are located within the search distances. Of this number, a total of 40 potential hazardous waste and UST facilities and/or sites are located within the project corridor.

Two major releases of hazardous materials located within the project corridor were identified 1) near the Sampson Street interchange and 2) near US 90 on the east end of the project area. Refer to the technical memorandum for an exhibit showing the locations and estimated extent of each release. These releases are composed of ethylene dichloride (EDC) and perchlorethylene (PCE) (dry cleaning fluid) and have resulted in groundwater and soil contamination with assessment complete and remediation ongoing at the two sites. Any proposed highway improvement and/or construction activity should be coordinated with the Louisiana Department of Environmental Quality (LaDEQ). The waste spill near the Sampson Street interchange, in particular, has required special design considerations due to the safety issues associated with construction in this area.

Six active UST facilities and one aboveground storage tank (AST) facility are also located within the project corridor. Five facilities, four listed as small generators of hazardous wastes and one as a large generator, are located in the Westlake portion of the project area. Two oil/gas wells were drilled in the project corridor that resulted in dry holes. The locations of these wells could contain contamination from drilling fluids and solvents that may have been contained in pits that were graded upon completion of the drilling operations.

The locations of previous automobile repair, dry cleaning, printing, AST, and other facilities were also identified during the investigation. Some of these facilities were previously removed with the construction of I-10. As a result, there is most likely limited potential for hazardous contamination at these sites. In addition, there is no chronic groundwater contamination problem along the I-10 corridor in Westlake.

Refer to the Existing Environmental Factors Technical Memorandum for the complete listings and the graphical illustration of the hazardous waste sites located within and adjacent to the project corridor.

2.2.3 Socioeconomic Conditions

The socioeconomic conditions analyzed include land use, area zoning, population, employment, environmental justice, cultural features, community service, and special generators of traffic.

The land within the project area falls into the following four zoning classifications:

1) Downtown and Lakefront
2) Industry
3) Mixed Use
4) Neighborhood

Significant findings pertaining to the socioeconomic conditions of these zoning areas within the study area, which may influence location, design, or procedure to proceed, include:

- Most of the population within the study area is east of the Calcasieu River.
- The portion of the study area east of Lakeshore Drive is an area of low income.
- The project area is generally an area of high unemployment compared to Calcasieu Parish.
- An alternative that closely follows the existing alignment would not affect community cohesion. Some environmental justice concerns could result should it be necessary to acquire additional right-of-way within the city of Lake Charles.
- Cultural features, community services and special traffic generators within the project area or in close proximity to the corridor include the 30-mile North Beach Park, the state owned boat launch, four churches, and three historic cemeteries.

Refer to the Existing Environmental Factors Technical Memorandum for more information concerning the socioeconomic conditions within the study area, including figures displaying census block groups below poverty level and those with a minority population.

2.2.4 Natural and Hydrologic Features Data

2.2.4.1 Water Resources

Although the Calcasieu River is not used as a drinking water source, the estuary surface waters have been designated by LaDEQ as supporting primary contact recreation, secondary contact recreation, and fish and wildlife propagation. Drainage within the project area is primarily influenced by the Calcasieu River in conjunction with Bayou Virdine and several other small drainage creeks. However, it should be noted that the hydrology of this project is under the ultimate control of tidal activity from the Calcasieu Estuary and subsequently the Gulf of Mexico.

The EPA gives the Lower Calcasieu Watershed an Index of Watershed Indicator (IWI) score of 5. A score of 5 indicates *More Serious Water Quality Problems and Low Vulnerability* to stressors such as pollutant loading. Selected indicators and representative characterizations used to calculate this index are listed in the Existing Environmental Factors Technical Memorandum.

It was found that the ground water from the aquifer in the area is of fair quality when considering taste, odor or appearance guidelines. The data also show that this aquifer is of good quality as far as short-term or long-term health risks are concerned.

Due to the industrial and urbanized environment, a large number of water wells are located within the general study area. Approximate locations of wells occurring within the study area can be viewed in the Existing Environmental Factors Technical Memorandum.

No natural streams currently designated as scenic streams by the Louisiana Natural Heritage Program occur within the proposed project corridor.

2.2.4.2 Wetland and Floral Communities

Palustrine wetlands are a prominent feature in the project area. The Calcasieu River, Bayou Verdine, and two unnamed drainage creeks are all classified as riverine systems up to the high water mark on the shore. In addition, two areas within this study area are classified as estuarine systems. The wetland communities in this project area are important ecosystems to the local flora and fauna but also serve the needs of the local environment as well.

2.2.4.3 Floodplains

The study site encompasses several areas identified as floodplains on Calcasieu Parish Flood Insurance Rate Maps. These designated areas will encroach upon limits of the 100-year floodplain. The study area does not cross any designated floodways.

2.2.4.4 Fauna

Although the area is highly developed and seemingly has little to offer as far as wildlife habitat, it is utilized by a variety of wildlife species. Refer to the Existing Environmental Factors Technical Memorandum for descriptions of the existing habitat for wildlife within the study area including Essential Fish Habitat.

2.2.4.5 Threatened and Endangered Species

Several species of special concern listed as potentially occurring within this project area are given in the Existing Environmental Factors Technical Memorandum.

2.2.4.6 Natural Areas

No state or federal parks, wildlife refuges, scenic streams, or wildlife management areas are known at this project location. The Louisiana National Heritage Program (LNHP) also lists water bird nesting colonies as special areas of concern in the Westlake area of the project.

2.2.4.7 Prime Farmlands

The study area is located in a predominantly urban corridor, and during the field investigations, no lands under cultivation for crops or in use as tame pasture were observed. Through discussion with the Natural Resource Conservation Service (NRCS), it has been determined that the project study area, which is located in the urbanized and industrial region of Lake Charles and Westlake, is unlikely to meet the definition of farmlands.

2.2.5 Air and Noise Quality

Calcasieu Parish falls just within the health based standards for the pollutant ozone. This project is projected to minimize traffic congestion in the future and is not expected to jeopardize conformity. Construction activities may cause minor short-term air quality impacts in the form of dust from earthwork and unpaved roads and smoke from open burning.

Actual measurement of existing noise levels will occur as part of any future environmental documentation beyond this feasibility study. Previous experience indicates that, for such an elevated interstate highway as exists in Lake Charles with the current traffic levels and vehicle mix, noise levels in excess of the 71 dBA level may be experienced approximately 450 feet from the existing I-10.

2.2.6 Constraints

Based on the information presented in the Existing Environmental Factors Technical Memorandum it can be inferred this project encompasses a large variety of environmental constraints. The existing environmental constraints presented have affected preliminary bridge and roadway design in many ways. For more information concerning these environmental constraints refer to the Existing Environmental Factors Technical Memorandum.

2.3 PRELIMINARY LINE AND GRADE STUDIES TECHNICAL MEMORANDUM

The Final Preliminary Line and Grade Studies Technical Memorandum was submitted to DOTD in November 2001. The main purpose of the technical memorandum was to present a wide field of line and grade concept alternatives throughout the corridor which may be viable for future implementation. The preliminary line and grade studies were conducted in accordance with American Association of State Highway and Transportation Officials (AASHTO) and DOTD design standards. Table 2-1 presents a design criteria chart for the I-10 Calcasieu project developed from these standards.

Table 2-1
GEOMETRIC DESIGN STANDARDS (NEW CONSTRUCTION)

ITEM	UNITS	I-10 MAINLINE	LINEAR RAMP	LOOP RAMP	FRONTAGE ROAD	ARTERIAL AND INTERCHANGE CROSSING STREET	OTHER CROSSING STREET
Design Speed	mph	70	50(Exits & Entrances) Varies Elsewhere	25(min.) 30(des.)	40	40	Varies*
Number of Continuous Travel Lanes		3 each direction	1 or 2	1	2	4	2
Width of Travel Lane	ft	12	15 or 12	15(min.)**	12	12	12
Width of Shoulders Left Right	 ft ft	 12 12	 4 6	 4 6	 Curb and Gutter Curb and Gutter	 Curb and Gutter Curb and Gutter	 ****Curb and Gutter ****Curb and Gutter
Pavement Cross Slope	%	2.5	2.5	2.5	2.5	2.5	2.5
Stopping Sight Distance	ft	625(min.) 850(des.)	275(min.) 475(des.)	150(min.) 200(des.)	275(min.) 325(des.)	275(min.) 325(des.)	Varies
Rate of Vertical Curvature Crest Curve (min)-(des) Sag Curve (min)-(des)	K	 290-540 150-220	 60-160 60-110	 20-30 30-40	 60-80 60-70	 60-80 60-80	 Varies
Maximum Superelevation	%	10%	8%	8%(des.) 10%(max)	4%	4%	4%
Minimum Horizontal Radius	ft	1910 (3°00')	468(40 mph) 764(50 mph)	180(25 mph) 252(30 mph)	521	573	Varies
Maximum Grade Downgrade Upgrade	 % %	 3% 3%	 6% (7% special cases) 4%(5% special cases)	 6% (7% special cases) 4%(5% special cases)	 7% 7%	 7% 7%	Varies 6-9% 6-9%
Minimum Vertical Clearance Roadways and Drives Railroad Tracks	 ft ft	 16.5 23.5	 16.5 23.5	 16.5 23.5	 16.5 23.5	 16.5 23.5	 15.5 23.5
Minimum Horizontal Clearance (without protection) From Edge of Travel Lane (shoulder sections) From Back of Curb	 ft ft	 34 --	 Varies Based on Design Speed	 Varies Based on Design Speed	 -- 6(min.) 15(des.)	 -- 6(min.) 15(des.)	 -- 1(min.) 6(typ.)
Width of Right-of-Way From Edge of Shoulder	 ft	15(min.)	15(min.)	15(min.)	8(min.) 17(des.)	8(min.) 17(des.)	8(min.) 11(des.)
Minimum Weaving Lengths Between Entrance and Exit Ramps Between Frontage Road Ramp Terminal and Cross Street	ft ft	1600 --	-- --	-- --	1000*** 600(des.)	-- --	-- --

*See LaDOTD Standard Criteria
**Wider travel lanes may be necessary depending on roads or design vehicles
***Check distances based on specifications
****Where existing conditions allow, shoulders will be provided on crossing streets though interchange limits.

The Preliminary Line and Grade Studies Technical Memorandum outlines the areas of proposed improvements including sections of existing I-10 mainline to remain and new construction for the project. Two major goals of the preliminary line and grade studies were to maintain a minimum of six lanes on the mainline I-10 throughout the corridor and to upgrade the existing design speeds, which were derived using today's standards, to coincide more closely with the posted speed limits, where practical. See Figure 2-2 for the existing design speeds, posted speed limits, and number of existing lanes used throughout the corridor.

The subsequent sections summarize the various aspects of the line and grade studies contained in the technical memorandum, including the influential factors affecting design and the multiple alternatives considered for further study.

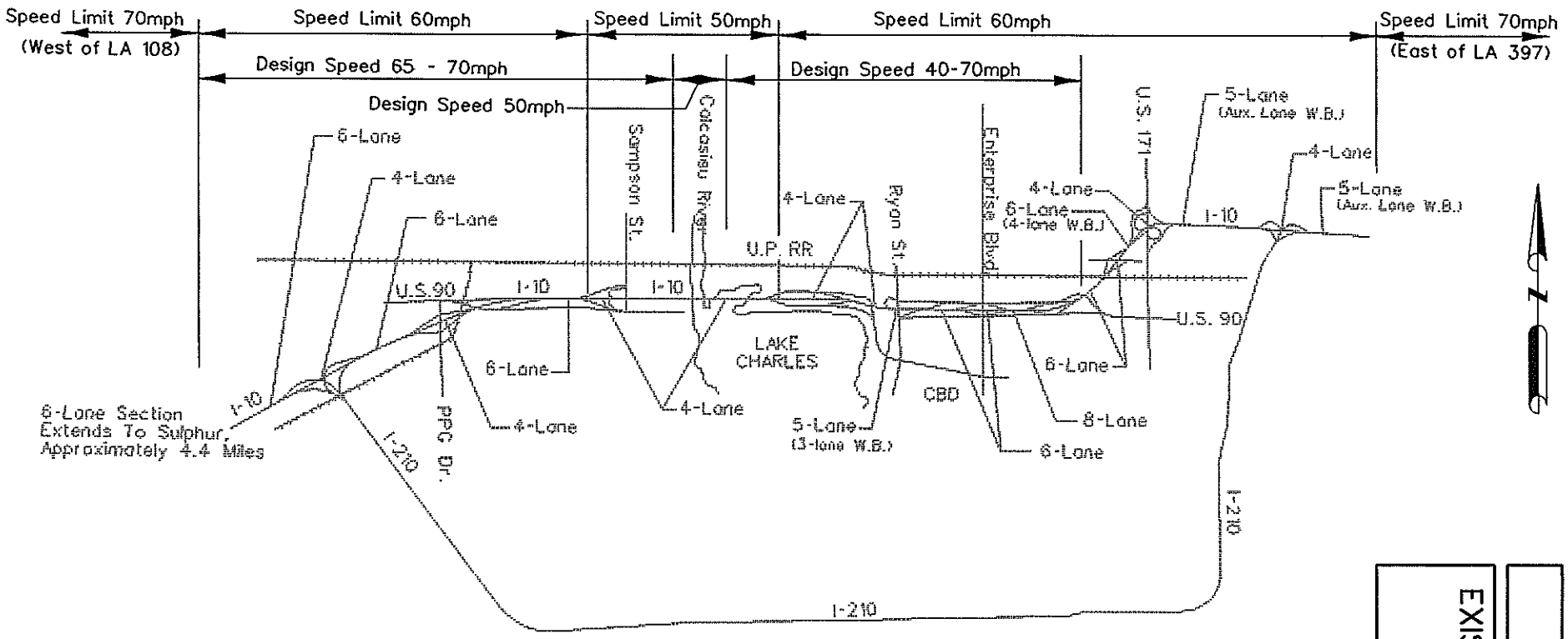
2.3.1 Major Influential Factors

Major factors influencing the preliminary line and grade studies for the project corridor include the following and are graphically represented in the Preliminary Line and Grade Studies Technical Memorandum in various exhibits:

- Sampson Street at Mainline UP and KCS Railroad Crossings
- Rail Spurs to Industry
- Lake Charles Central Business District
- Access to Westlake
- Petrochemical Industry
- Casino Industry
- Frontage Road Circulation Considerations
- Ryan Street Improvements
- Pipeline Crossings
- Environmental Constraints (such as Hazardous Waste Sites, Wetlands, Charpentier Historic District, Public Beach Marina, Cemeteries, Historic Structures)

2.3.2 Centerline Alignments

Three centerline alignment alternatives have been considered for the I-10 mainline within the project limits from PPG Drive to the US 90 East interchange. Figure 2-3 illustrates these three centerline alternatives in relation to one another. This figure also shows that all three centerline alternatives use the center of the navigation channel as a reference point for stationing purposes. This reference point is Station 1500+00 for Centerline Alignment 1, Station 2500+00 for Centerline Alignment 2, and Station 3500+00 for Centerline Alignment 3.



Note:

Design speeds shown are based on current AASHTO criteria and not the criteria in place at the time of original construction

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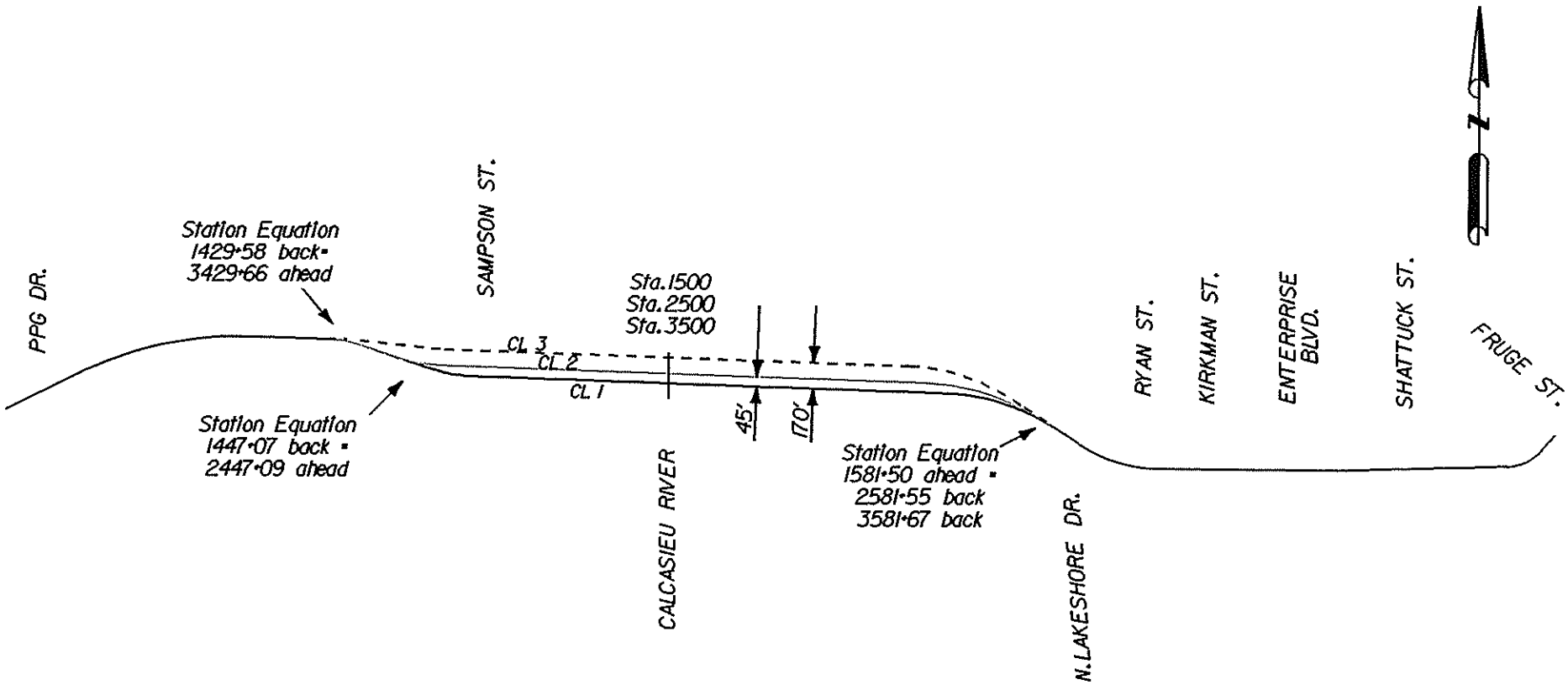
EXISTING DESIGN SPEEDS AND POSTED LIMITS

Not To Scale

Figure 2-2



LEGEND

——— Centerline 1 (CL1) - Alignment of existing bridge

——— Centerline 2 (CL2) - Alignment offset 45' from existing bridge centerline

- - - - - Centerline 3 (CL3) - Alignment offset 170' from existing bridge centerline

HNTB

CENTERLINE ALIGNMENT ALTERNATIVES

Not to Scale

Figure 2-3

2.3.2.1 Centerline Alignment 1

Centerline Alignment 1 follows the existing mainline alignment with an exception of a six-foot shift to the north of the existing alignment between PPG Drive and Sampson Street. The proposed typical section within this area was studied in consideration of the mainline and frontage road needs and what would be feasible within the narrow area of existing right-of-way. The possible typical sections considered in this area are shown in the Line and Grade Studies Technical Memorandum.

By shifting the centerline six feet to the north in the area between PPG Drive and Sampson Street, this will allow new construction to include one additional lane to the outside of the westbound roadway and one additional lane to inside of the eastbound roadway. This avoids having to construct half of a lane on both the inside and outside of each mainline roadway in this section.

2.3.2.2 Centerline Alignment 2

Centerline Alignment 2 represents new bridge construction partially on the existing bridge and partially north of the existing alignment. At the center of the navigation channel, Station 2500+00, Centerline Alignment 2 is 45 feet north of and parallel to the existing alignment. Centerline Alignment 2 joins back with Centerline Alignment 1 just west of Sampson Street on the west and at the North Lakeshore Drive overpass on the east. Therefore, the alignments tie back together well beyond the ends of the structure.

2.3.2.3 Centerline Alignment 3

Centerline Alignment 3 represents new construction north of the existing bridge and is entirely on a new alignment. At the center of the navigation channel, Station 3500+00, Centerline Alignment 3 is 170 feet north of and parallel to the existing alignment. Centerline Alignment 3 joins back with Centerline Alignment 1 just west of Sampson Street on the west and near the Lakeshore Drive overpass on the east. It also would tie back to the existing alignment well beyond the limits of the bridge.

2.3.3 Bridge Concepts

The technical memorandum also described the range of possible bridge concepts. Illustrations showing combinations of bridge concepts and centerline alternatives can be found in Figures 2-4 to 2-7. Most centerline alignments can be applied with any bridge concept with the exception of bridge Concept D. For example, bridge Concept A along Centerline Alignment 1 is shown as Bridge Concept 1A. Bridge Concept D is considered solely in conjunction with Centerline Alignment 3. The following bridge concepts have been considered:

2.3.3.1 Concept A

Bridge Concept A includes a new eight lane mainline bridge over the Calcasieu River crossing. The exterior lane in each direction would serve as an auxiliary lane. This concept requires that the existing bridge be removed.

2.3.3.2 Concept B

Bridge Concept B includes a new six lane mainline bridge over the Calcasieu River crossing, with two lane frontage roads along each side on the same structure as the mainline. This concept also requires the existing bridge to be removed.

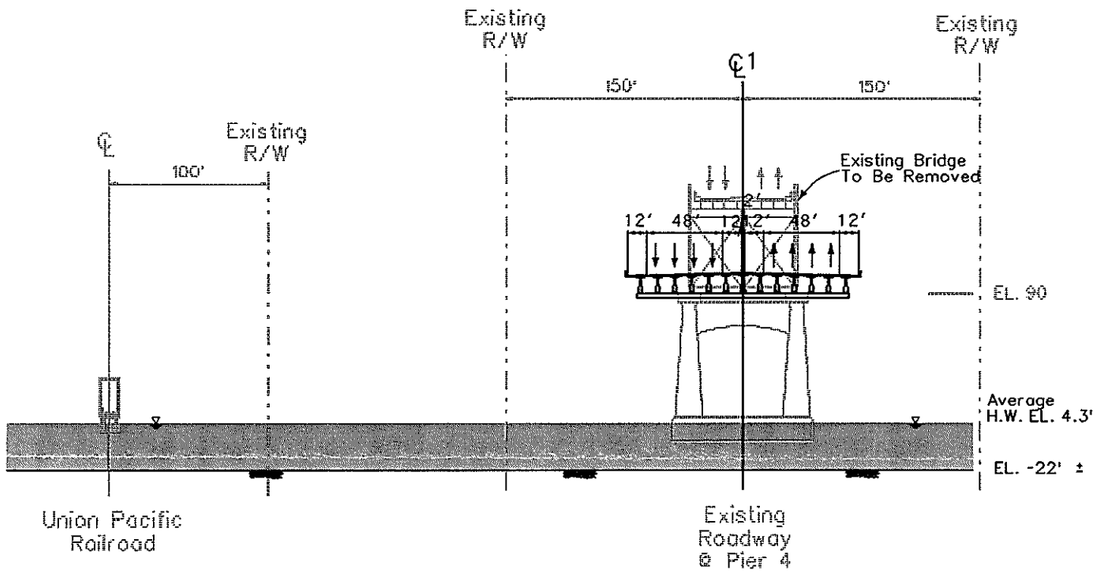
2.3.3.3 Concept C

Bridge Concept C is similar to bridge Concept B which includes a new six lane mainline bridge with the exception of having two lane frontage roads flanking each side on independent structures from the mainline, instead of the same structure. This concept also requires the existing bridge to be removed.

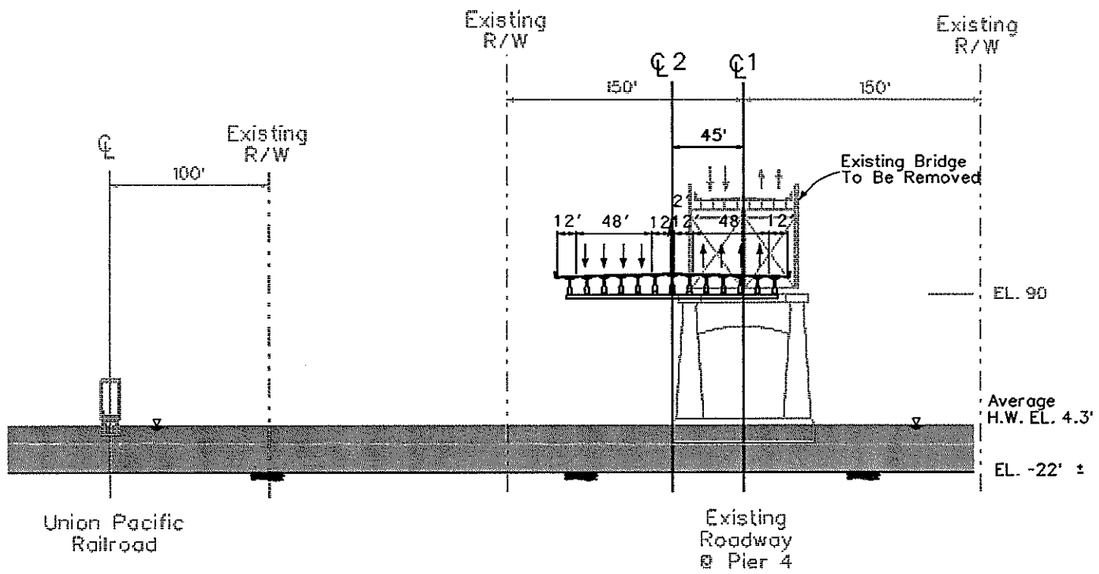
2.3.3.4 Concept D

Bridge Concept D involves a new six lane mainline bridge parallel to the existing bridge with the existing bridge remaining in place to carry the frontage roads. This concept will require the old bridge to be rehabilitated to a condition that would allow it to be used to carry four lanes of frontage road traffic.

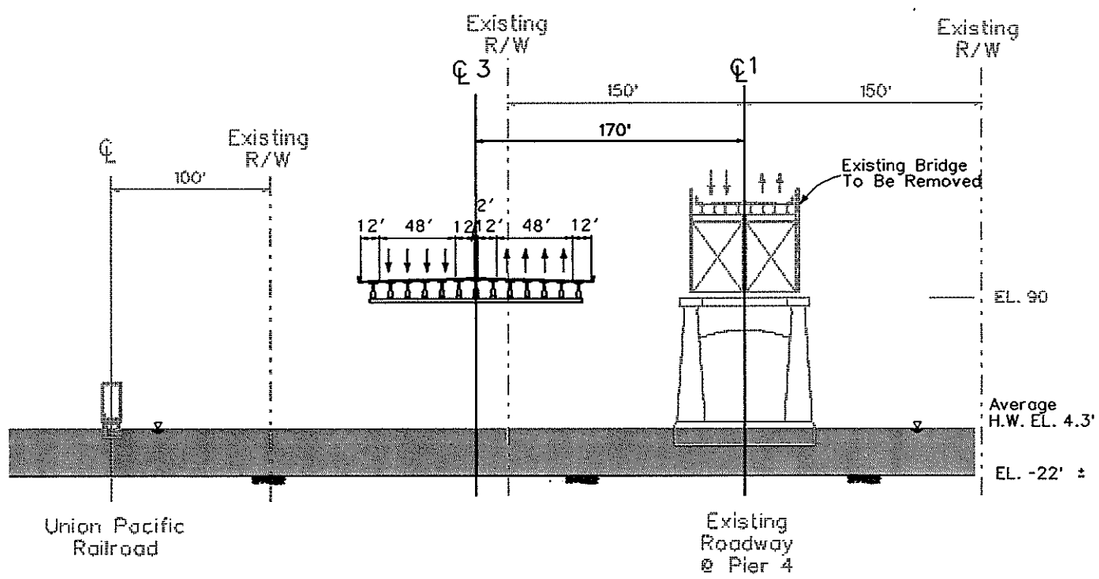
Refer to the Preliminary Line and Grade Studies and the Preliminary Bridge Studies Technical Memorandums for more information on the bridge concepts that have been considered during the preliminary studies.



℄ 1 - CONCEPT A



℄ 2 - CONCEPT A

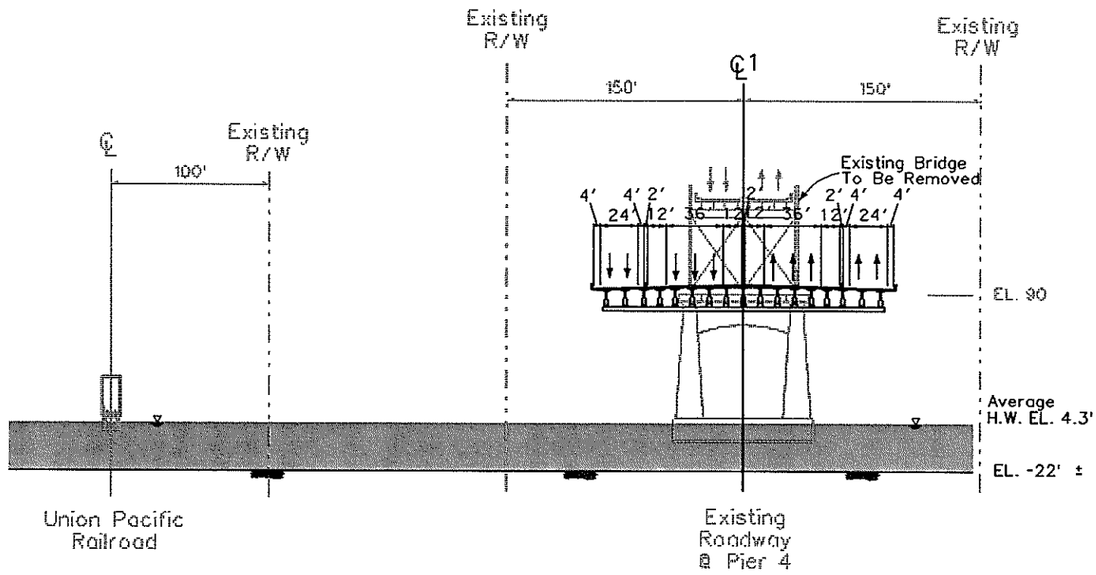


℄ 3 - CONCEPT A

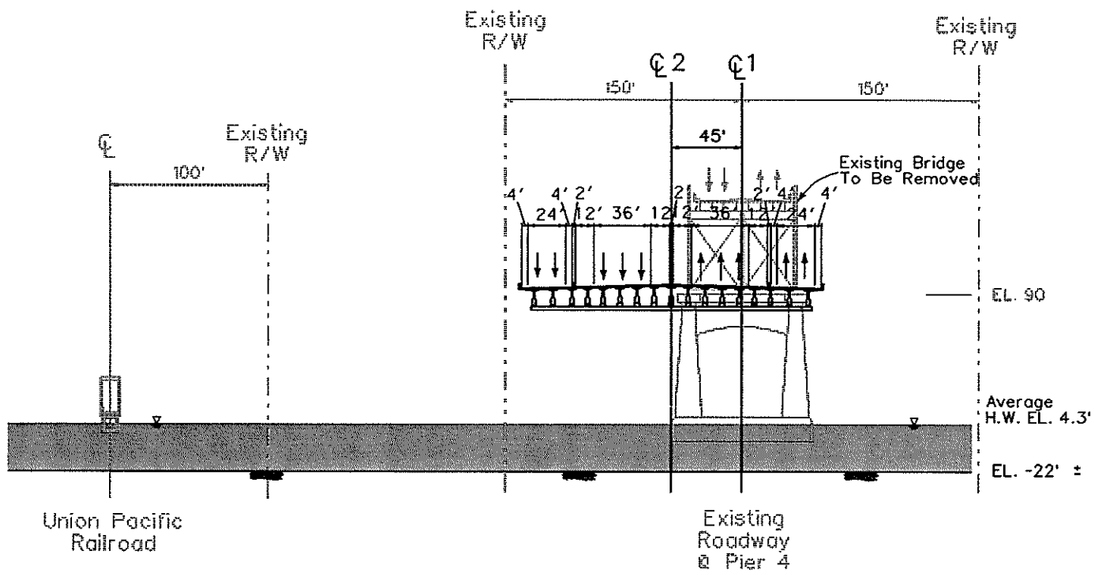
CONCEPT A is an 8-lane main bridge (3 through lanes and 1 auxillary lane in each direction).

Figure 2-4

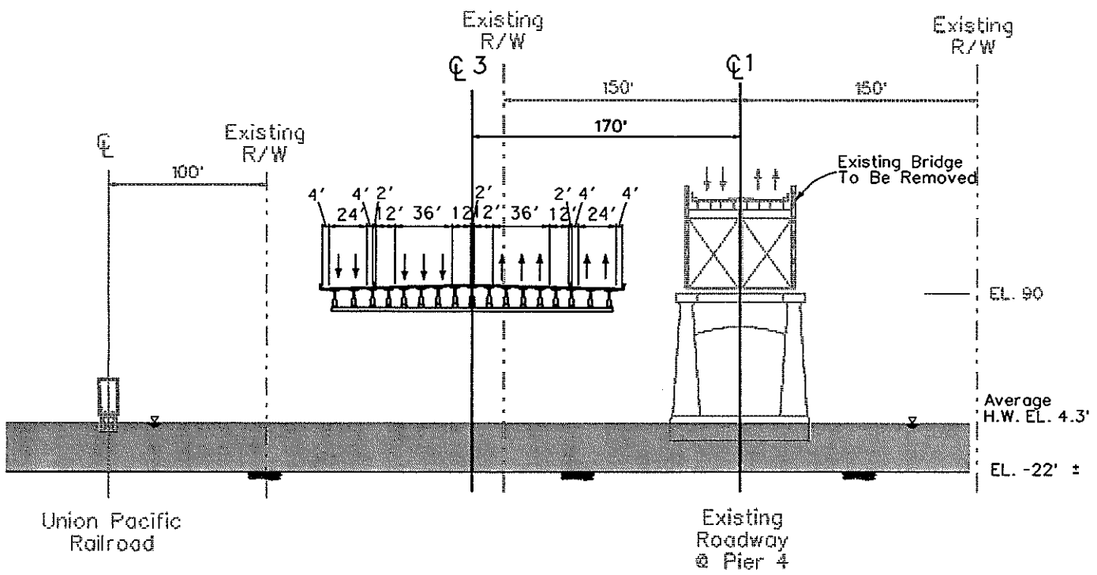
RIVER BRIDGE TYPICAL SECTIONS
CONCEPT A
Centerlines 1, 2, & 3



℄ 1 - CONCEPT B



℄ 2 - CONCEPT B

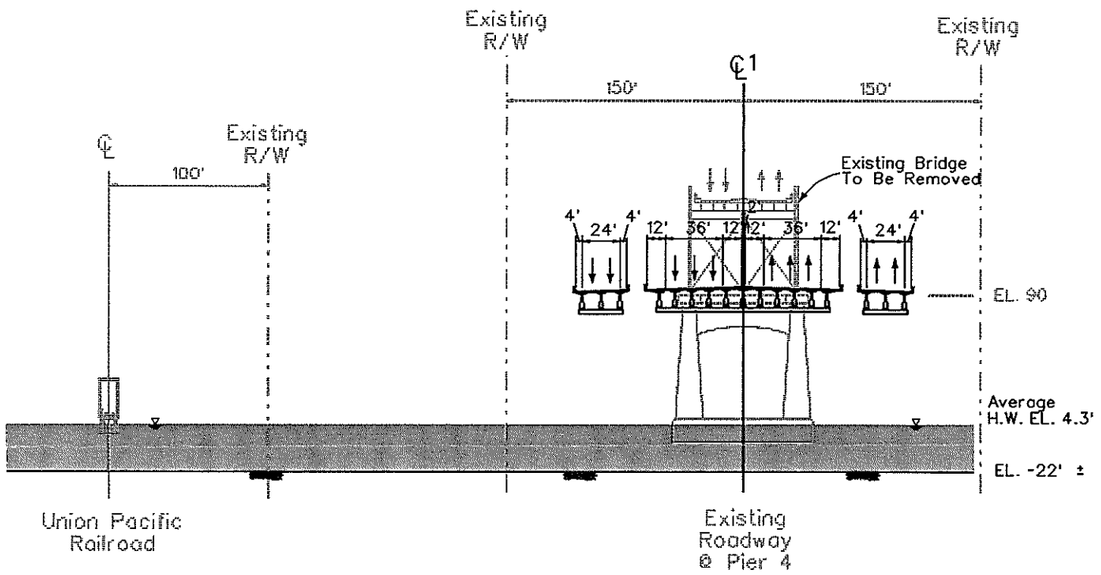


℄ 3 - CONCEPT B

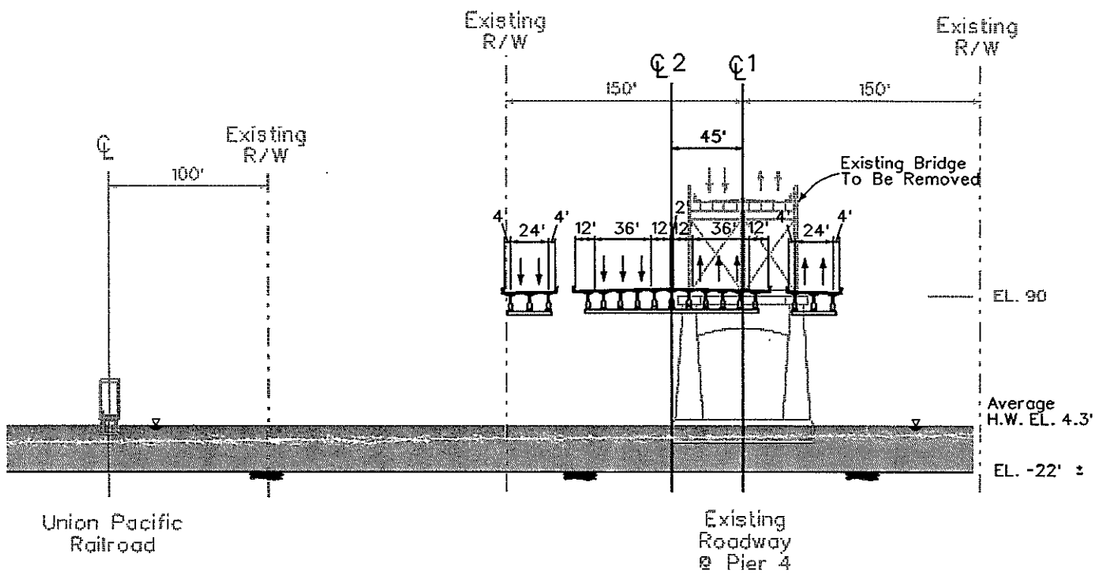
CONCEPT B is a 6-lane mainline bridge with 2-lane frontage roads flanking each side. Frontage roads on same structure as mainline for main spans.

RIVER BRIDGE TYPICAL SECTIONS
CONCEPT B
Centerlines 1, 2, & 3

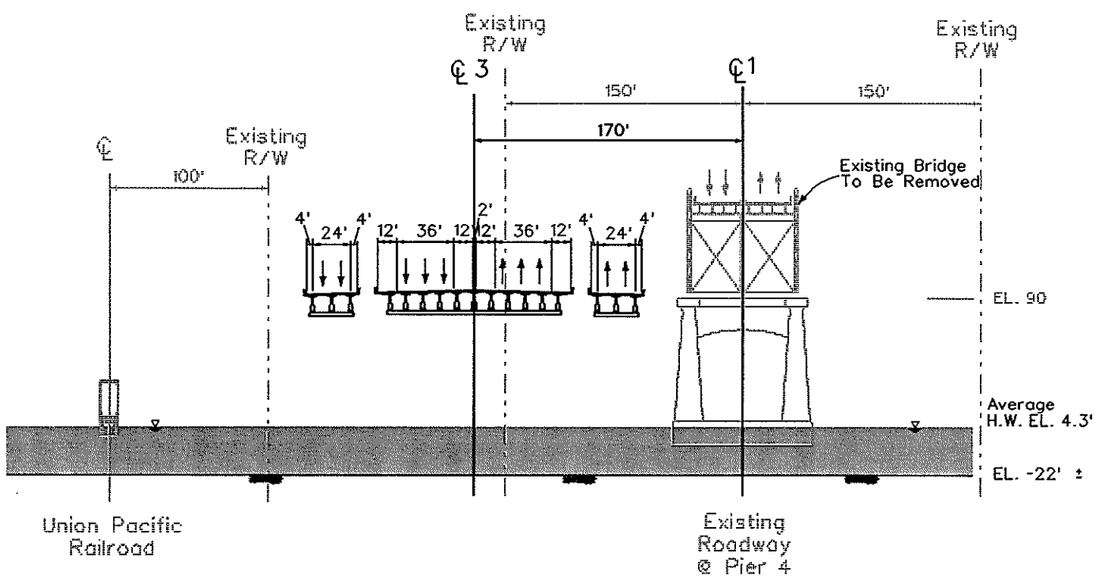
Figure 2-5



℄ 1 - CONCEPT C



℄ 2 - CONCEPT C

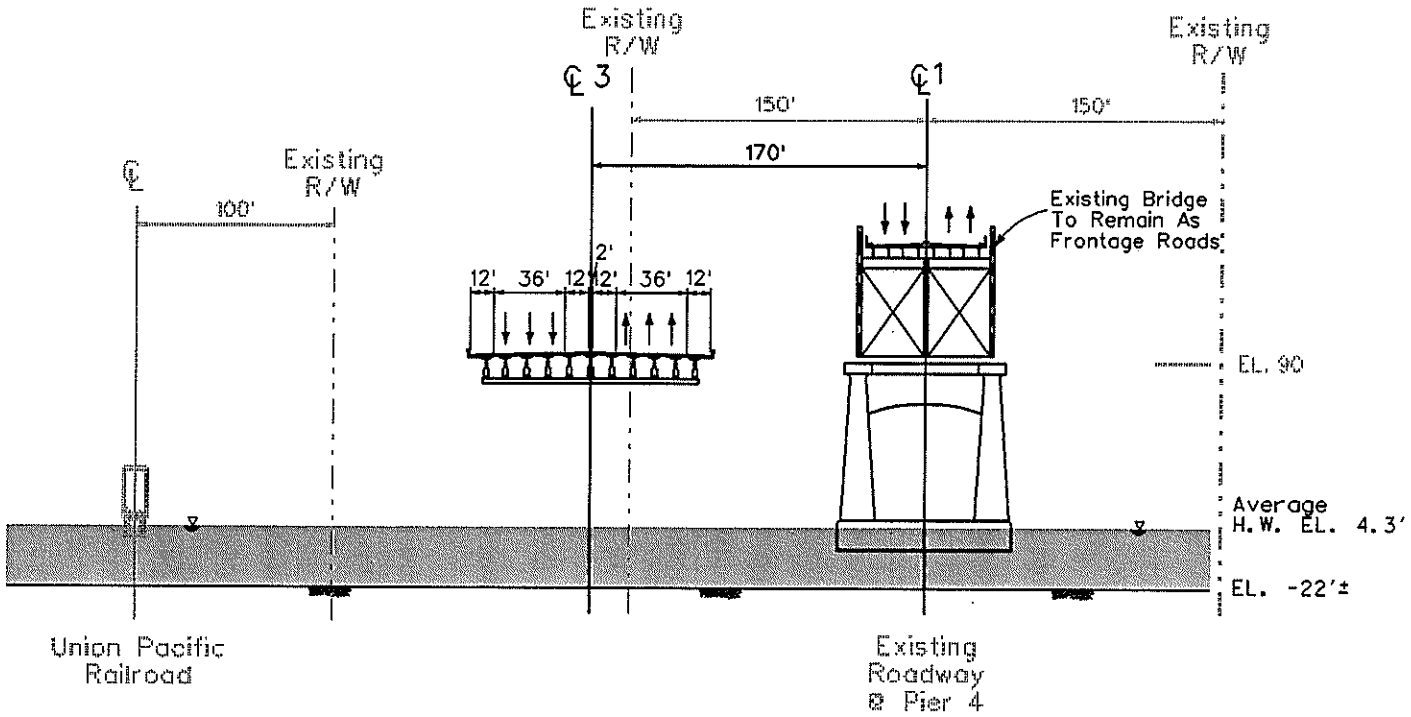


℄ 3 - CONCEPT C

CONCEPT C is a 6-lane bridge with 2-lane frontage roads flanking each side. Frontage roads on independent structures from mainline.

Figure 2-6

RIVER BRIDGE
TYPICAL SECTIONS
CONCEPT C
Centerlines 1, 2, & 3



℄ 3 - CONCEPT D

CONCEPT D is a 6-lane main bridge constructed north of the existing bridge entirely on new alignment. The existing bridge will remain to be utilized for the frontage roads.

RIVER BRIDGE
TYPICAL SECTIONS
CONCEPT D
Centerline 3

Figure 2-7

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TYPICAL SECTION – CONCEPT D

PARISH	CALCASIEU
FEDERAL PROJECT	BR-10-1(212)29
STATE PROJECT	700-10-0115

SHEET NUMBER 4 OF 4

2.3.4 Concept Layouts

Numerous viable alternatives that have been considered in conjunction with these various centerline alignments and bridge concepts are presented in the Preliminary Line and Grade Studies Technical Memorandum. The concept layouts contained in the technical memorandum were developed by dividing the project study area into three sections (west, central, and east sections) within the corridor. Each section was studied individually with the intent to mix and match it with other sections depending on the type of considerations needed for each layout. Figure 2-8 shows the design section limits and legend used for the development of the concept layouts.

2.3.4.1 West Section

The west section includes the area west of Station 1426+00 (between PPG Drive and Sampson Street) and depicts the design concepts for the PPG Drive and US 90 area. The concept layouts being considered for this section are referred to as W1, W2, W3, and W4. Three concept layouts (W1, W2, W3) have been presented in the Preliminary Line and Grade Studies Technical Memorandum for this section of the study area. An additional west section concept layout (W4, DODT Concept Modified, One-Way) has been developed subsequent to the production of the document to allow for more flexibility when combining alternatives from different sections of the corridor. All the concept layouts involve adding an additional travel lane to the mainline I-10 in both directions and widening the inside shoulders to 12 feet. The concept layouts described in the technical memorandum (W1 through W3), in addition to the one developed after the technical memorandum (W4), are summarized below:

1. **<u>DOTD Concept:</u>**

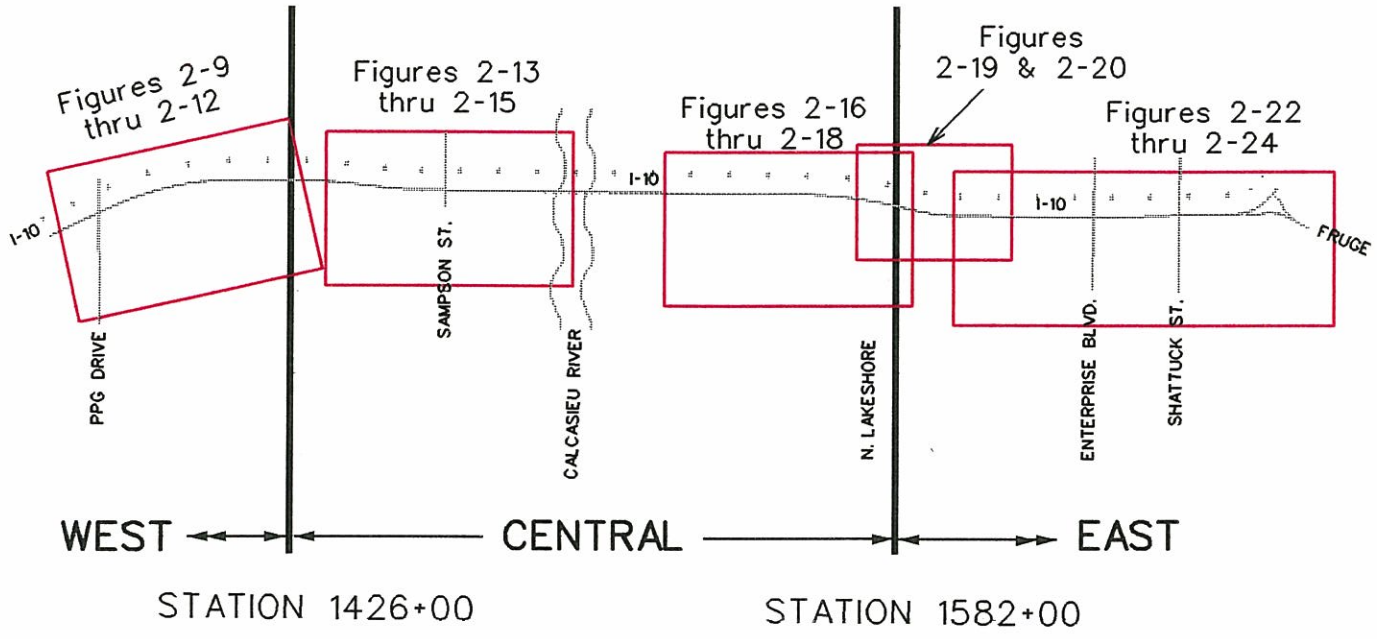
A. Two-Way Frontage Road (W1)

The design of this concept layout is derived from a DOTD design concept shown in a 1988 Traffic Handling Study. This concept layout shows the interactions involving I-10, PPG Drive, US 90 and the two-way frontage road servicing the petrochemical plants between PPG Drive and Sampson Street.

Figure 2-8

DESIGN LIMITS & LEGEND

NOT TO SCALE



LEGEND FOR Figures 2-9 thru 2-25

- Existing Roadway to Remain
- New Roadway Or Roadway Widening
- Existing Bridge To Remain
- New Bridge Or Bridge Widening
- New Railroad Spur Track
- Existing Railroad Spur To Be Removed
- Required R/W
- Lane Arrows
- Existing Signalized Intersections
- Proposed Signalized Intersections

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A major advantage of this concept layout is that it allows a full range of traffic circulation for the petrochemical plants located off of the frontage road while avoiding major conflicts with the Union Pacific Railroad Spur. Unlike Concept Layouts W2 and W3 in the West Section, this concept will not require relocating the railroad spur. Figure 2-9 illustrates the plan and profile view of this concept layout.

B. One-Way Frontage Road (W4)

The DOTD Concept layout presented in the Preliminary Line and Grade Studies Technical Memorandum (W1) contained a two-way frontage road system. However, following the submittal of that technical memorandum the concept layout has been modified to include use of a one-way frontage road system between PPG Drive and Sampson Street. This has been identified as Concept Layout W4. The DOTD Concept presented in the technical memorandum was received positively due to the fact that it did not require relocating the railroad spur and also did not require a great deal of structural modifications. The concept was only compatible with adjoining two-way frontage road system concepts at the Sampson Street interchange. As a result, a modified concept layout emerged to include the basic features of the original DOTD concept, with the exception of utilizing a one-way frontage road system instead of a two-way system. This would create another option to match concept layouts in the central area (the including Sampson Street interchange) that also used one-way frontage roads. See Figure 2-10 for a plan and profile view of the modified DOTD concept layout that utilizes a continuous one-way frontage road between PPG Drive and Sampson Street.

2. Frontage Road Overpasses: One-Way Frontage Road (W2)

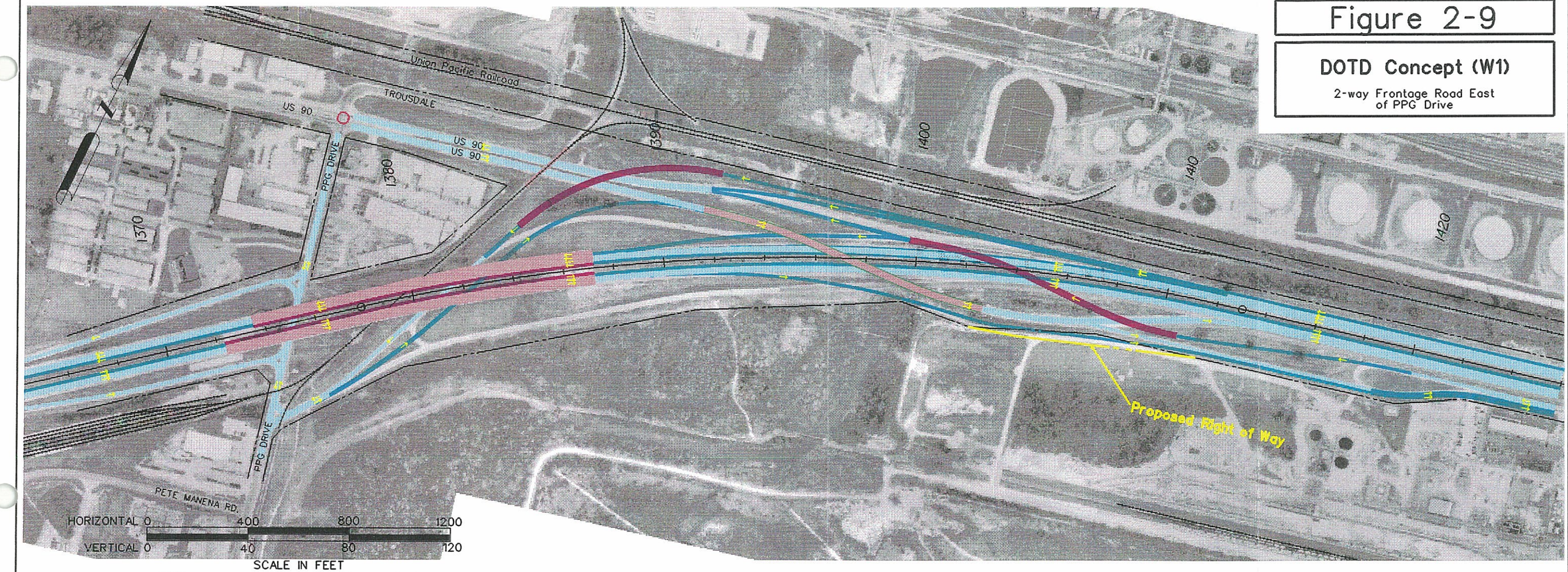
In this concept layout, the existing two-way frontage between PPG Drive and Sampson Street would become a one-way frontage road. The frontage road would become part of a parallel one-way frontage road system servicing I-10.

A disadvantage of this concept layout is the relocation of the existing Union Pacific Railroad Spur to the east, and the two long frontage road bridges needed at the PPG Drive interchange. The realignment of the railroad spur would be necessary to provide adequate clearance at the grade separations with the newly designed one-way frontage roads. The realignment of the railroad spur would, in turn, require the relocation of an existing pier on the eastbound I-10 overpass.

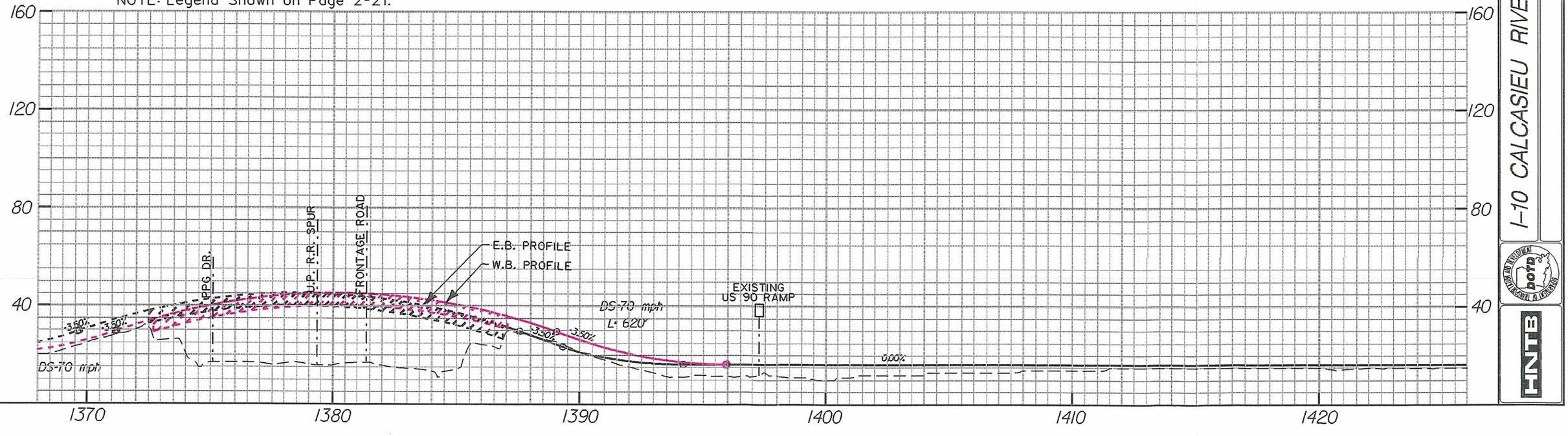
Figure 2-9

DOTD Concept (W1)

2-way Frontage Road East of PPG Drive



NOTE: Legend Shown on Page 2-21.



PARISH: CALCASIEU
FEDERAL PROJECT: BR-10-1(212)29
STATE PROJECT: 700-10-0115

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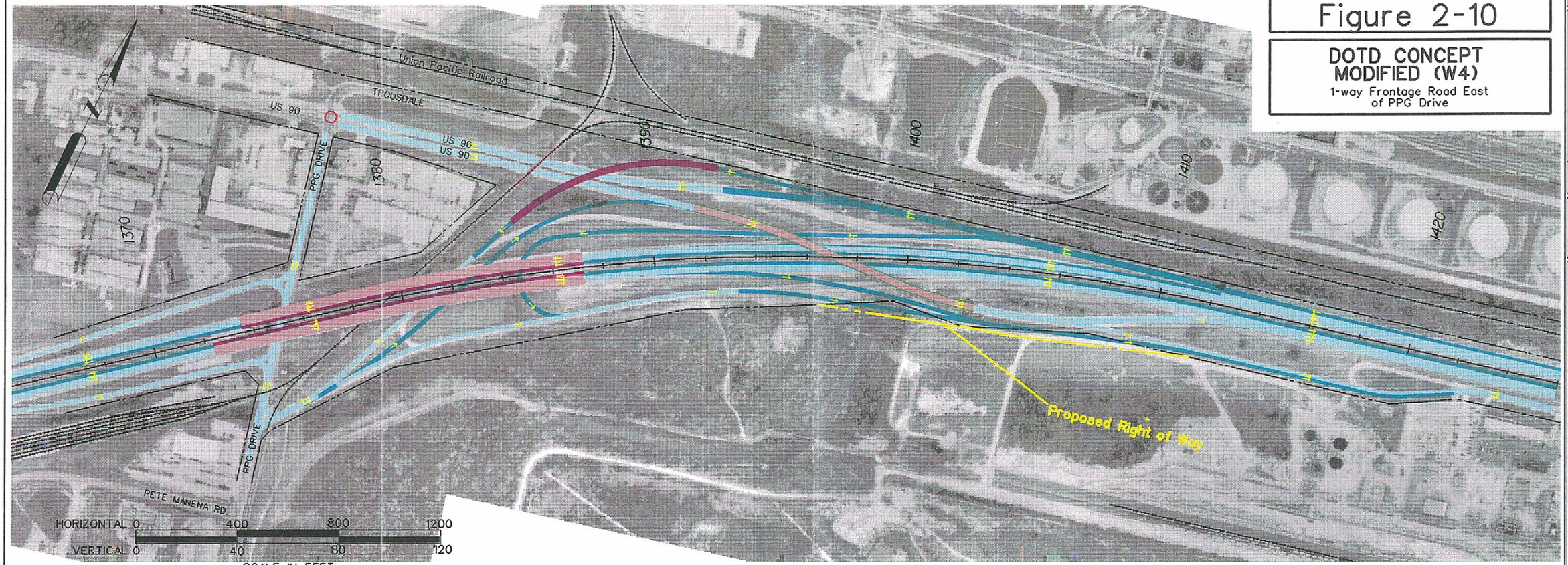
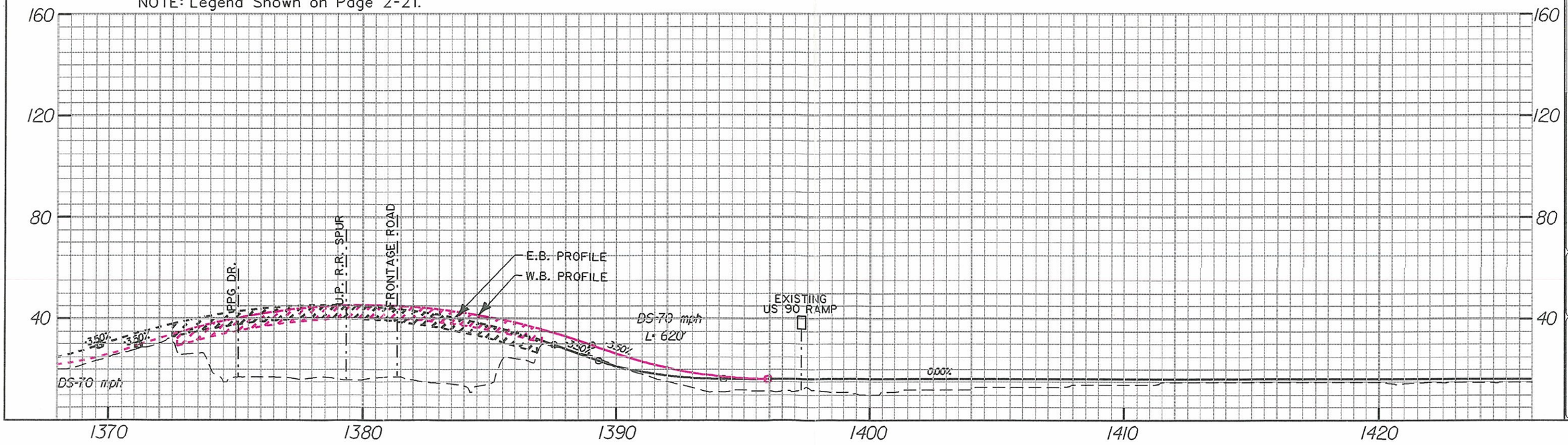
Figure 2-10

DOTD CONCEPT MODIFIED (W4)

1-way Frontage Road East of PPG Drive



NOTE: Legend Shown on Page 2-21.



PARISH: CALCASIEU
FEDERAL PROJECT: BR-10-1(212)29
STATE PROJECT: 700-10-0115

I-10 CALCASIEU RIVER BRIDGE & APPROACHES

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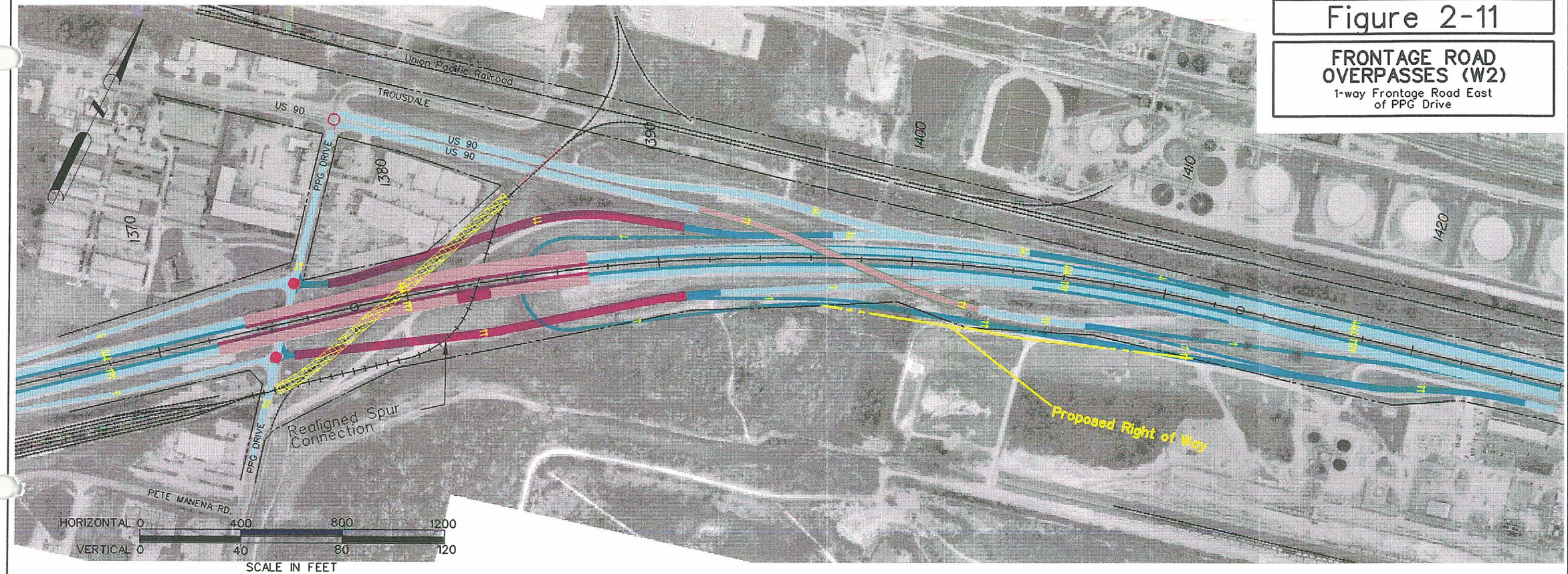
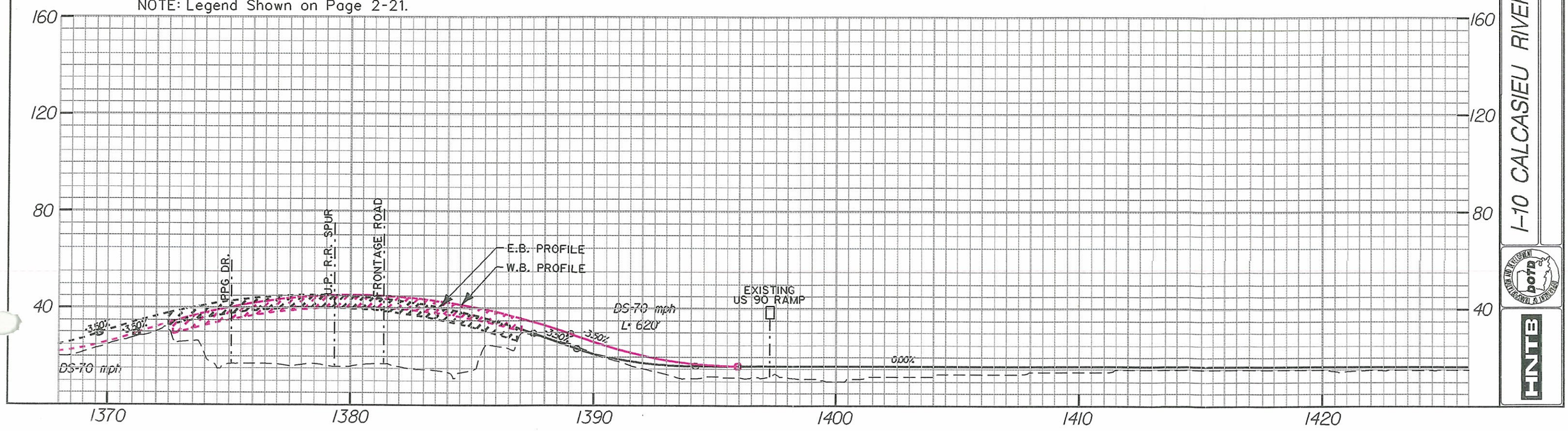
Figure 2-11

FRONTAGE ROAD OVERPASSES (W2)

1-way Frontage Road East of PPG Drive



NOTE: Legend Shown on Page 2-21.



PARISH: CALCASIEU
FEDERAL PROJECT: BR-10-1(212)29
STATE PROJECT: 700-10-0115

I-10 CALCASIEU RIVER BRIDGE & APPROACHES

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An advantage of the concept layout is that it allows for a continuous one-way frontage road while keeping many of the existing roadway features. Refer to Figure 2-11 for the plan and profile view of this concept layout.

3. **Relocated Railroad: Two-Way Frontage Road (W3)**

This concept layout utilizes a two-way frontage road system servicing the petrochemical plants between PPG Drive and Sampson Street.

This concept layout involves replacing the Union Pacific Railroad Spur with a new railroad connection to the south. This could require spur operations through the existing Lyondell facility on the south side of I-10. A disadvantage of this concept layout is that it requires the reconstruction of a segment of the I-10 mainline bridge to accommodate a proposed roadway to run underneath. Another disadvantage is that traffic on PPG Drive south of I-10 would be subject to railroad spur traffic across PPG Drive.

An advantage to this concept layout would be the enhanced traffic circulation provided by facilitating continuous access between I-10, PPG Drive, the two-way frontage road, and US 90. See Figure 2-12 for the plan and profile view of this concept layout.

2.3.4.2 Central Section

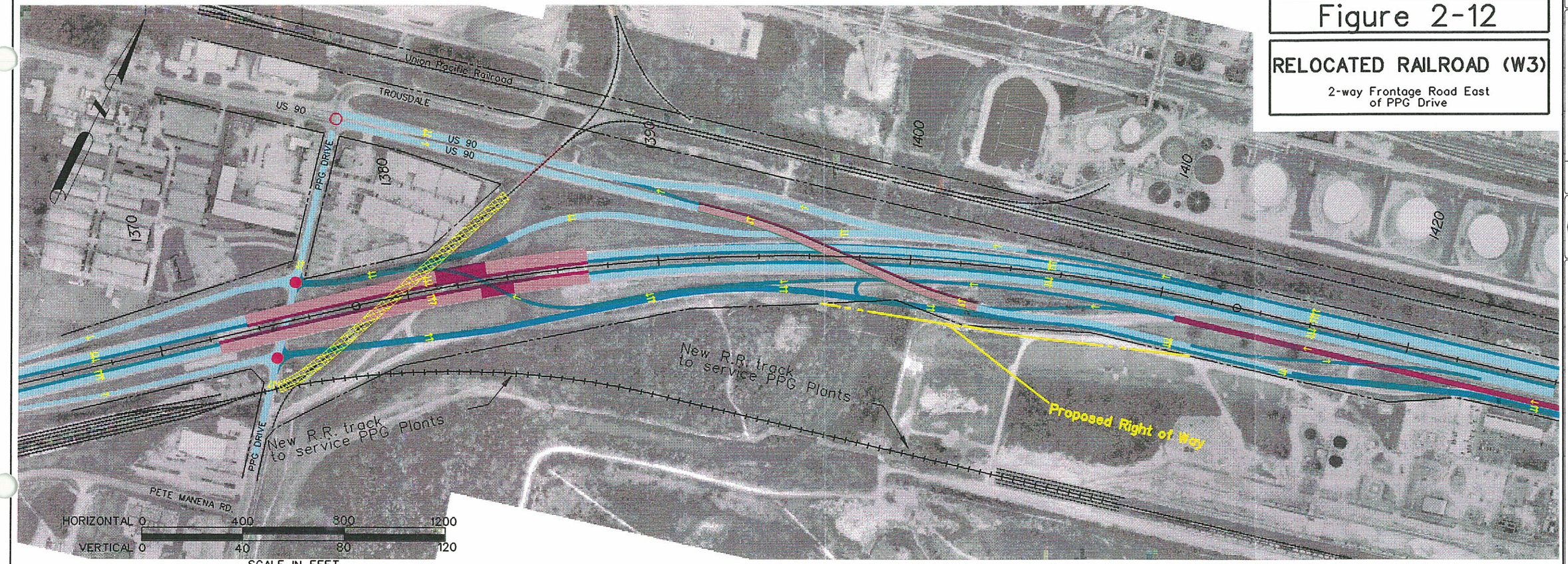
This section is found between Stations 1426+00 (west of Sampson Street) and 1582+00 (Lakeshore Drive). The concept layouts in this area include the relationship between the Calcasieu River Bridge concepts, the Sampson Street interchange, and the at-grade roadways connecting the interstate to the Lake Charles Beach, the casinos, and other businesses and residences in the vicinity. The concept layouts presented in the technical memorandum for the central section were referred to as C1 through C13.

An important aspect of this central section is the interchange possibilities being considered for Sampson Street. Three basic interchange layouts have been deemed viable for Sampson Street and can be applied with various combinations of centerline alignments, bridge concepts, and ramp and frontage road configurations. The three basic layouts presented for Sampson Street are referred to as 1) an Elevated Diamond 2) a Mike Hooks Elevated Diamond, and 3) a Free Flow Configuration with Directional Ramps:

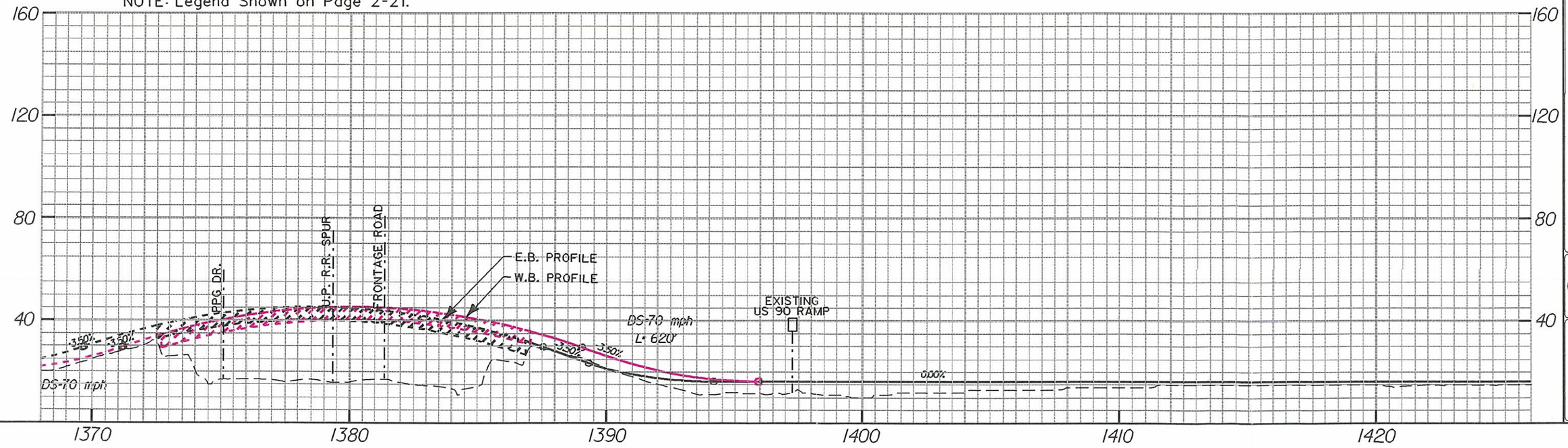
Figure 2-12

RELOCATED RAILROAD (W3)

2-way Frontage Road East of PPG Drive



NOTE: Legend Shown on Page 2-21.



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FEDERAL PROJECT: BR-10-1(212)29
STATE PROJECT: 700-10-0115

I-10 CALCASIEU RIVER BRIDGE & APPROACHES

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A. Sampson Street Area

1. Elevated Diamond (One-Way or Two-Way Frontage Road)

This concept layout configuration would relocate Sampson Street to the east of its existing alignment elevated to provide a grade separation between it and the Kansas City Southern (KCS) Railroad track and the Union Pacific (UP) Railroad track. The Sampson Street profile would remain elevated over the reconstructed I-10 mainline. For this concept layout, the elevated Sampson Street signalized intersections at the I-10 ramps serve as the links connecting all the major traffic operations in the area. This concept layout allows for flexibility in using either a one-way or two-way frontage road to the west of Sampson Street from PPG Drive. Refer to Figure 2-13 for an example of the elevated diamond concept layout at Sampson Street utilizing a one-way frontage road to the west of Sampson Street, which is Concept Layout C5 from the Preliminary Line and Grade Studies Technical Memorandum.

Another feature of the elevated diamond concept layout at Sampson Street is the possible relocation of the UP Railroad spur track to the east (not shown on Figure 2-13) underneath the I-10 mainline. This option was developed to enable lowering the mainline I-10 (and thus the elevated Sampson Street interchange), which would improve the mainline profile and reduce costs.

Due to the nature of the project with early construction anticipated at Sampson Street, relocating the railroad would not be warranted because Sampson Street will be high enough for the future I-10 to allow proper vertical clearance over the railroad and under Sampson Street. Whether the railroad is relocated or not, Sampson Street will be required to provide for adequate vertical clearance over the existing elevated I-10 mainline until the new I-10 is constructed at a later date, and therefore, will allow the railroad to remain in tact with an allowable vertical clearance below the mainline.

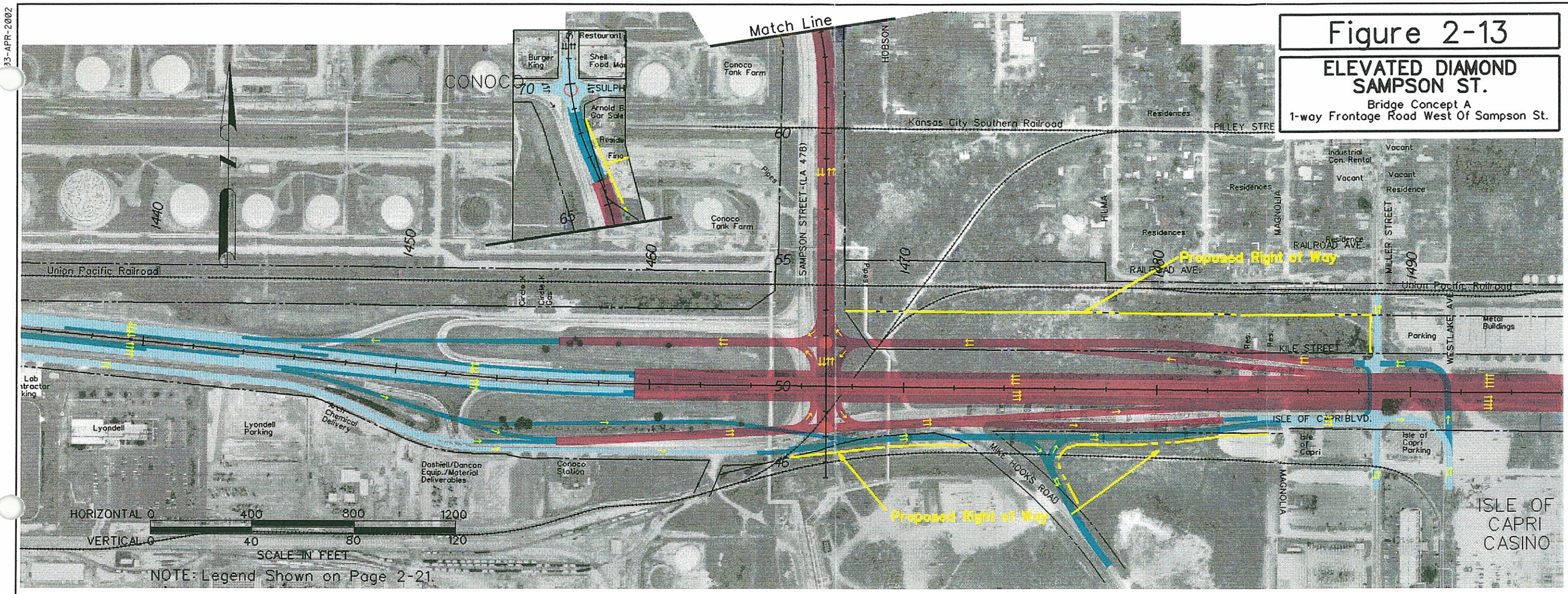
Depending on the relocation of the railroad spur, different mainline profiles can be used. Bridge Profile 1 (see Figure 2-1) would be used in conjunction with alternatives which require relocating the railroad and Bridge Profile 2 for alternatives which maintain the existing railroad alignment.

03-APR-2002

Figure 2-13

ELEVATED DIAMOND SAMPSON ST.

Bridge Concept A
1-way Frontage Road West Of Sampson St.



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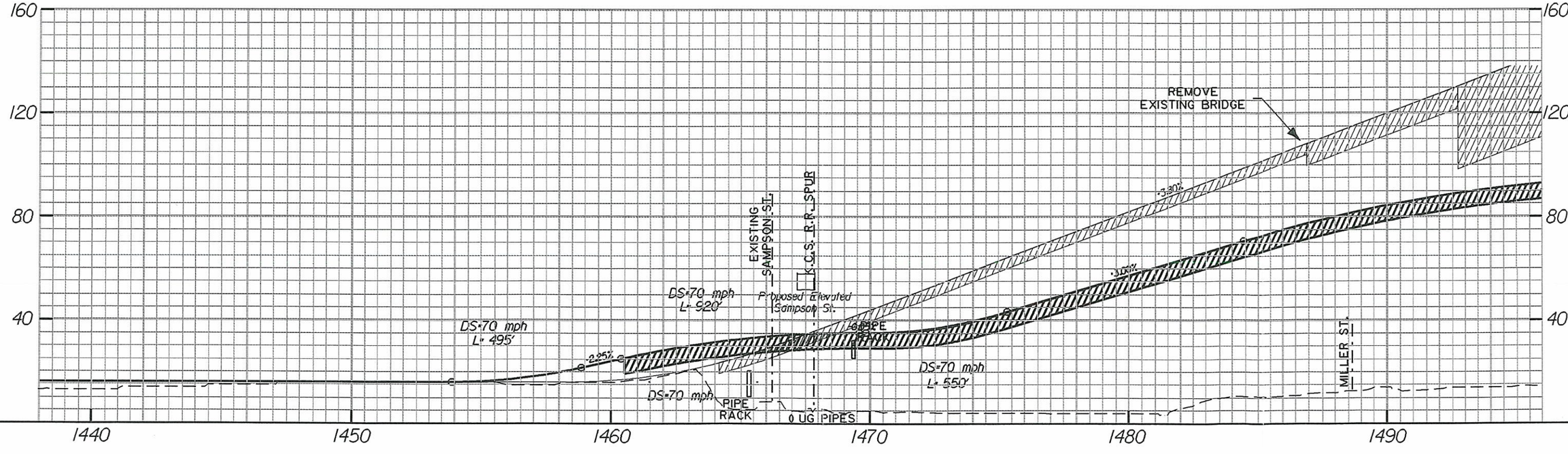

I-10 CALCASIEU RIVER BRIDGE & APPROACHES

PARISH	FEDERAL PROJECT	STATE PROJECT
CALCASIEU	BR-10-1(212)29	700-10-0115

HNTB

2. Mike Hooks Elevated Diamond (One-Way or Two-Way Frontage Road)

This concept layout is unique in that it realigns Sampson Street so that it ties into the existing Mike Hooks Road to the south of the I-10 mainline. The realigned Sampson Street would be elevated with two elevated signalized intersections. These elevated Sampson Street intersections would utilize the parallel frontage roads and serve as the links connecting all the major traffic operations in the area. Similar to the standard elevated diamond concept layout previously mentioned, the Mike Hooks elevated diamond would be able to connect to the west concepts with either a one-way or two-way frontage road system. See Figure 2-14 for an example of the Mike Hooks elevated diamond concept layout at Sampson Street utilizing a two-way frontage road to the west of Sampson Street, which is Concept Layout C6 from the Preliminary Line and Grade Studies Technical Memorandum.

Additional right-of-way would be required to accommodate this new Sampson Street alignment compared to the other Sampson Street alignments.

An advantage of this concept layout is that the Union Pacific (UP) Railroad spur would remain on its existing alignment for this concept layout. In this concept layout, Sampson Street would be elevated over the Kansas City Southern (KCS) Railroad tracks, the UP Railroad tracks and the railroad tracks paralleling Isle of Capri Boulevard, and would pass under I-10. Therefore, the I-10 Calcasieu River Bridge would require using Bridge Profile 3, (see Figure 2-1) to be able to allow adequate clearance above Sampson Street.

3. Free Flow Layout with Directional Ramps (One-Way Frontage Road)

This concept layout is unlike the concept layouts previously mentioned for Sampson Street in that it does not utilize an elevated Sampson Street with signalized intersections. Instead, this concept layout uses a system of one-way ramps to allow free flow access between the major roadways and traffic generators in the area. See Figure 2-15 for an example of the free flow concept layout, Concept C4 from the Preliminary Line and Grade Studies Technical Memorandum, that has been presented to illustrate this basic design.

03-APR-2002

Figure 2-14

MIKE HOOKS CONNECTION AT SAMPSON ST.

Bridge Concept (A) 07
2-way Frontage Road West Of Sampson St.

Match Line

CONOCO

Burger King

Restaurant

Shell Food Mart

Arnold B Car Sale

Residence

Fina

Conoco Tank Farm

Kansas City Southern Railroad

HOBSON

SAMPSON STREET (LA 478)

PILLEY STREET

Residences

Industrial Con. Rental

Vacant

Residence

FILMA

MAGNOLIA

RAILROAD AVE.

MILLER STREET

Proposed Right of Way

Union Pacific Railroad

Pipes

Circle K

Circle K Gas

Lab

Tractor King

Lyondell

Lyondell Parking

Arch Chemical Delivery

Station Equation
1447+07 back =
2447+09 ahead

Dashiell/Duncan Equip./Material Deliverables

Conoco Station

KILE STREET

WEST AVE.

Parking

Metal Buildings

ISLE OF CAPRI BLVD.

Isle of Capri

Isle of Capri Marina

MIKE HOOKS ROAD

ISLE OF CAPRI CASINO

1440

2450

2460

2470

2480

2490

70

65

60

55

50

45

HORIZONTAL 0 400 800 1200
VERTICAL 0 40 80 120
SCALE IN FEET

NOTE: Legend Shown on Page 2-21.

160
120
80
40

REMOVE EXISTING BRIDGE

-3.30%

-1.65%

L=600'
DS=70 mph

EXISTING SAMPSON ST.

K.C.S. R.R. SPUR

PIPE RACK

Proposed Elevated Sampson St.

DS=70 mph

PIPE RACK

0 UG PIPES

MILLER ST.

1440 2450 2460 2470 2480 2490

PARISH	CALCASIEU
FEDERAL PROJECT	BR-10-1(212)29
STATE PROJECT	700-10-0115

I-10 CALCASIEU RIVER BRIDGE & APPROACHES

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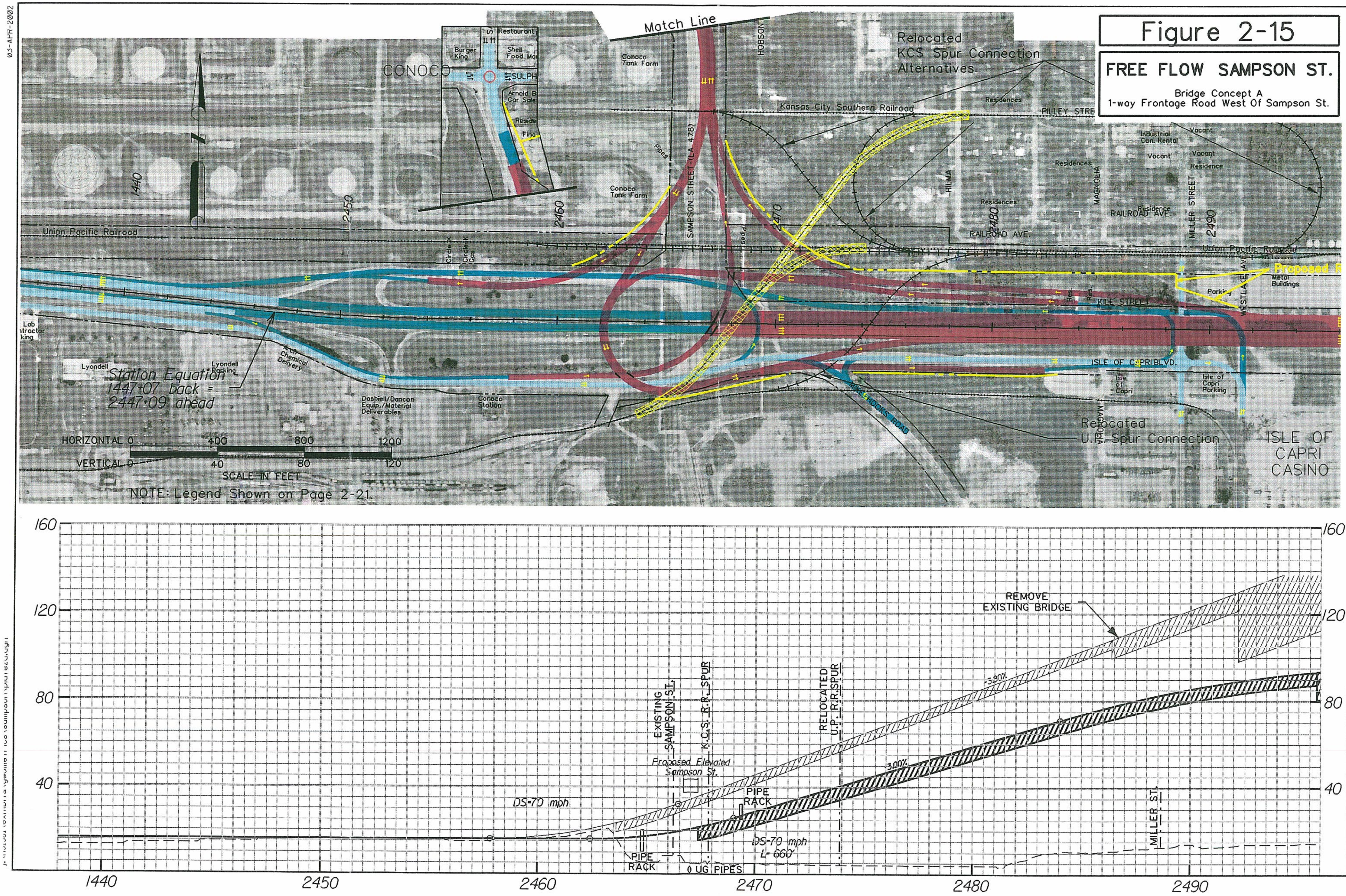
Figure 2-15

FREE FLOW SAMPSON ST.

Bridge Concept A
1-way Frontage Road West Of Sampson St.



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PARISH | FEDERAL PROJECT | STATE PROJECT

I-10 CALCASIEU RIVER BRIDGE & APPROACHES

HNTB

To accommodate the complex geometry associated with the free-flow ramp layouts, it is recommended that the I-10 Calcasieu River Bridge use Bridge Profile 1 and not Bridge Profile 2 (see Figure 2-1). Thus, it is necessary for the railroad spur to be relocated and therefore is not conducive for phased construction for Sampson Street.

B. East of River

To the east of the river near the Lake Charles public beach, marina area, and business district there were three main designs presented in the central concept layouts. Each design presented in the Preliminary Line and Grade Studies Technical Memorandum accommodated a specific Bridge Concept (A, C, and D). Note that Bridge Concept B was not depicted in the concept layouts because it has the same configuration as Bridge Concept C, which includes three lanes of through traffic each direction with parallel frontage roads on either side. The only difference is that Bridge Concept B consists of one wider structure for the mainline and all of the roadways, while Bridge Concept C consists of two additional narrower structures to the mainline for frontage roads.

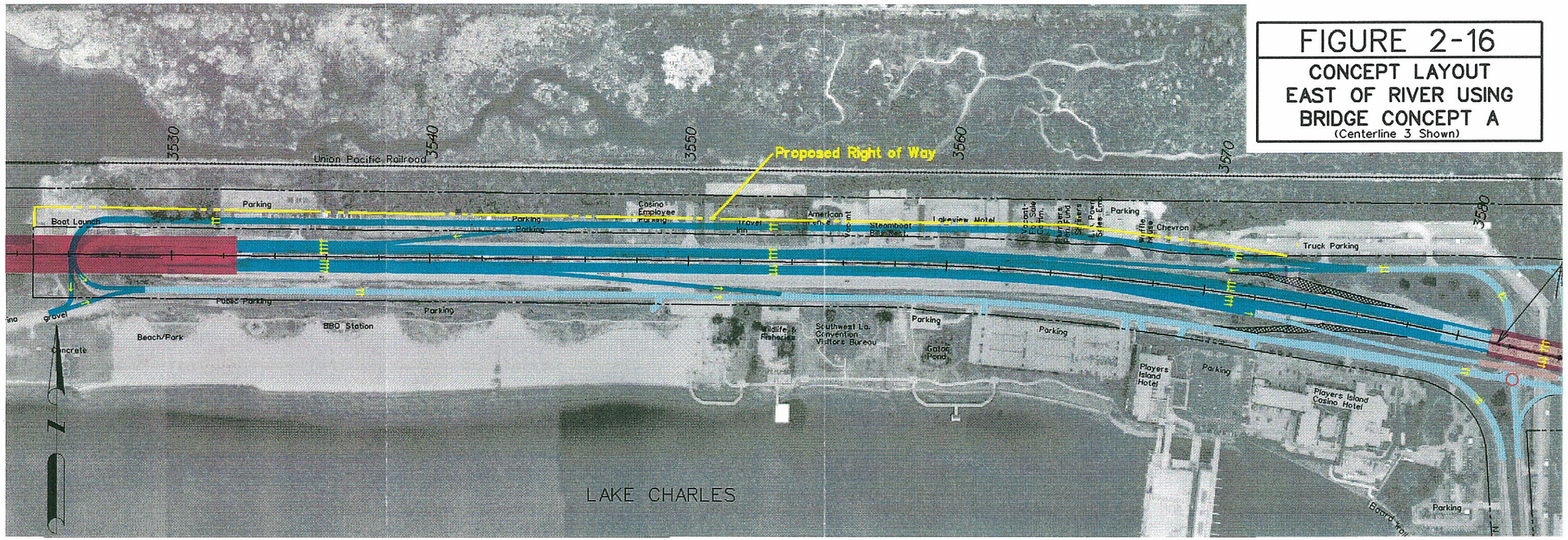
For concept layouts using Bridge Concept A, the mainline auxiliary lane in each direction on the main bridge would be connected to the at-grade one-way frontage roads in the area. An eastbound exit ramp would be located between the beach area and Lakeshore Drive to the south of the mainline, and an entrance ramp westbound would be located between Lakeshore Drive and the boat dock to the north of the mainline. An example of a concept layout connecting Bridge Concept A to the at-grade frontage roads on the east side of the river is shown in Figure 2-16. The basic design shown is applicable to all centerline alignments but would require more right-of-way for the Centerline Alignments 2 and 3 which are further north than the existing alignment.

10-APR-2002

FIGURE 2-16

CONCEPT LAYOUT EAST OF RIVER USING BRIDGE CONCEPT A

(Centerline 3 Shown)

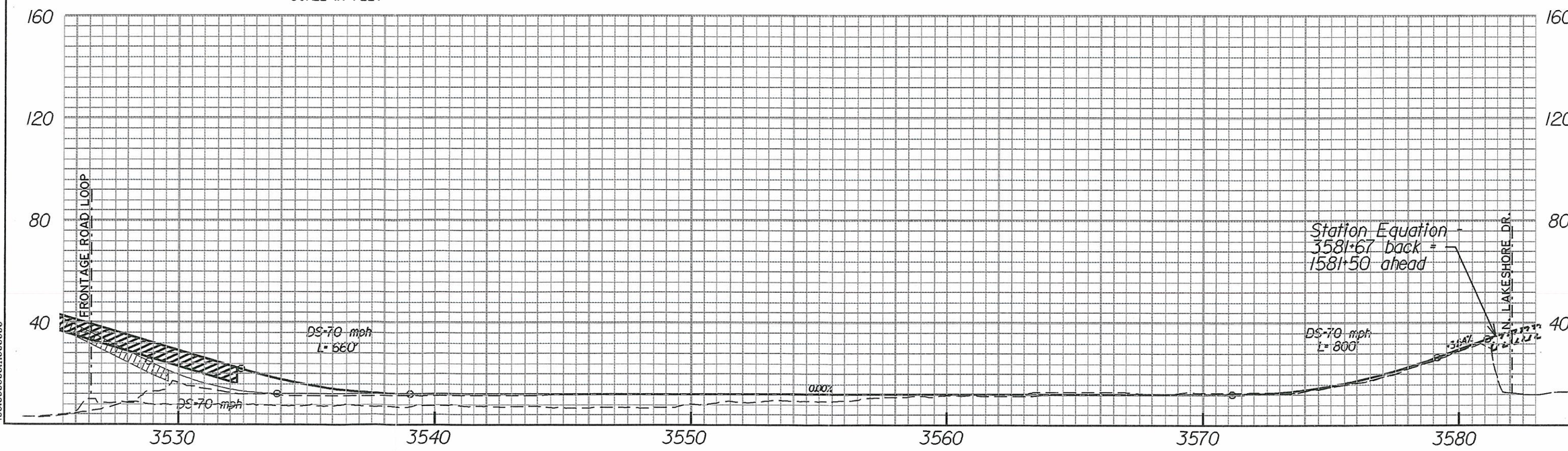


HORIZONTAL 0 400 800 1200

VERTICAL 0 40 80 120

SCALE IN FEET

NOTE: Legend Shown on Page 2-21.



SHEET NUMBER 3 of 4

PARISH CALCASIEU

FEDERAL PROJECT BR-10-1(212)29

STATE PROJECT 700-10-0115

I-10 CALCASIEU RIVER BRIDGE & APPROACHES

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Concept layouts incorporating Bridge Concept B or C would involve tying the parallel frontage roads north and south of the main river bridge to the at-grade frontage roads servicing the Lake Charles beach and downtown area to the east of the river. The design proposed to do this would involve an eastbound entrance ramp onto the mainline from the eastbound frontage roads between the beach area and Lakeshore Drive. To complement this ramp design, a westbound exit ramp would be located on the opposite side of the mainline to accommodate traffic entering onto the westbound frontage roads over the river. These are the ramps that would service the Sampson Street interchange. Figure 2-17 depicts this type of ramp configuration for using Bridge Concept C and can be applied to Bridge Concept B as well. The basic design shown is applicable to all centerline alignments, but would require more right-of-way for the Centerline Alignments 2 and 3 which are further north than the existing alignment.

The concept layout accommodating Bridge Concept D is unique from the other designs presented for this area because it would use the existing bridge to carry the frontage road traffic over the river and tie into the new mainline east of the river. This design would involve modifying the existing mainline alignment into a boulevard-type arterial in the beach area while the proposed mainline would be on new alignment north of that. The existing bridge would feed into the boulevard and an elevated eastbound ramp would exit the bridge as it approaches the beach area and enter onto the I-10 eastbound mainline north of the boulevard prior to Lakeshore Drive. Traffic westbound would access the beach area by entering the frontage roads at Lakeshore Drive while others traveling westbound would be able access an I-10 mainline entrance ramp the west of Lakeshore Drive. Figure 2-18 shows the design presented for using Bridge Concept D from the river channel to Lakeshore Drive. Centerline Alignment 3 is required for Bridge Concept D.

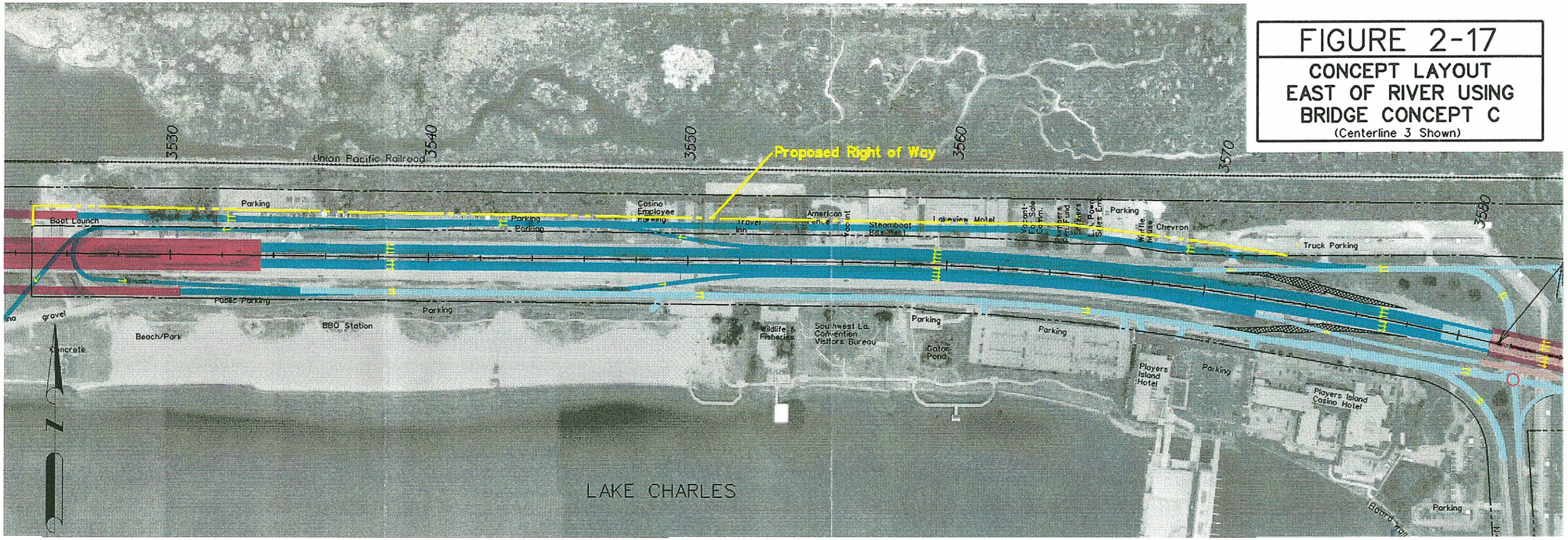
Refer to Chapter 3 of the Preliminary Line and Grade Technical Memorandum for detailed descriptions of the various central concept layouts considered for the preliminary phase of the project. The plan and profile plates showing these and other area concept layouts are contained in Appendix D of the technical memorandum.

10-APR-2002

FIGURE 2-17

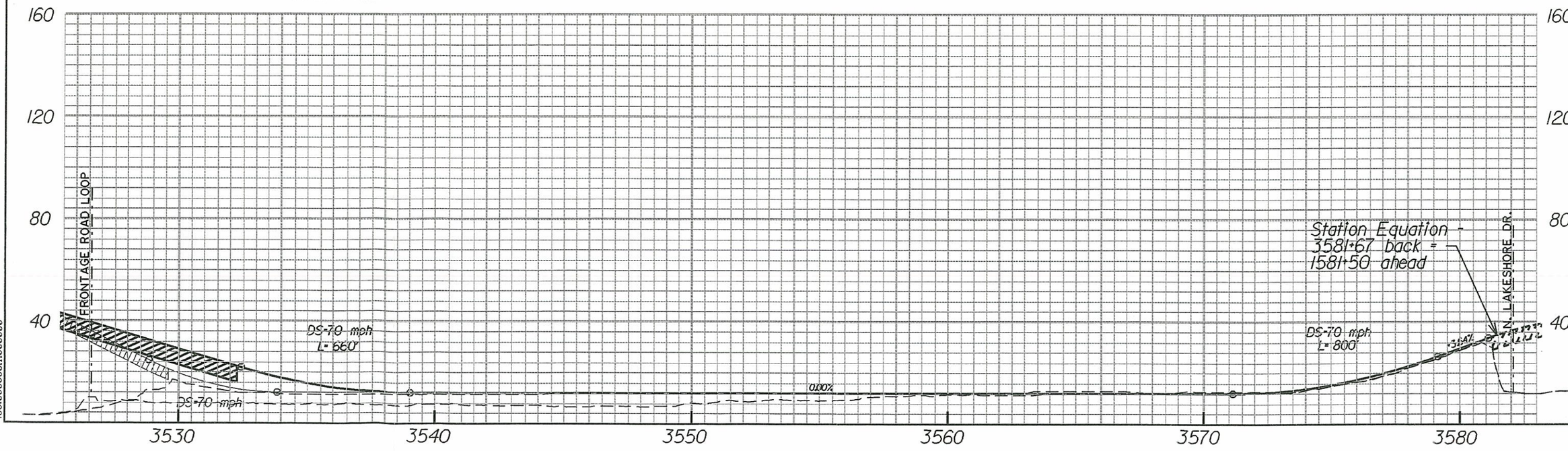
CONCEPT LAYOUT EAST OF RIVER USING BRIDGE CONCEPT C

(Centerline 3 Shown)



HORIZONTAL 0 400 800 1200
VERTICAL 0 40 80 120
SCALE IN FEET

NOTE: Legend Shown on Page 2-21.



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SHEET NUMBER 3 of 4

PARISH CALCASIEU | FEDERAL PROJECT BR-10-1(212)29 | STATE PROJECT 700-10-0115

I-10 CALCASIEU RIVER BRIDGE & APPROACHES

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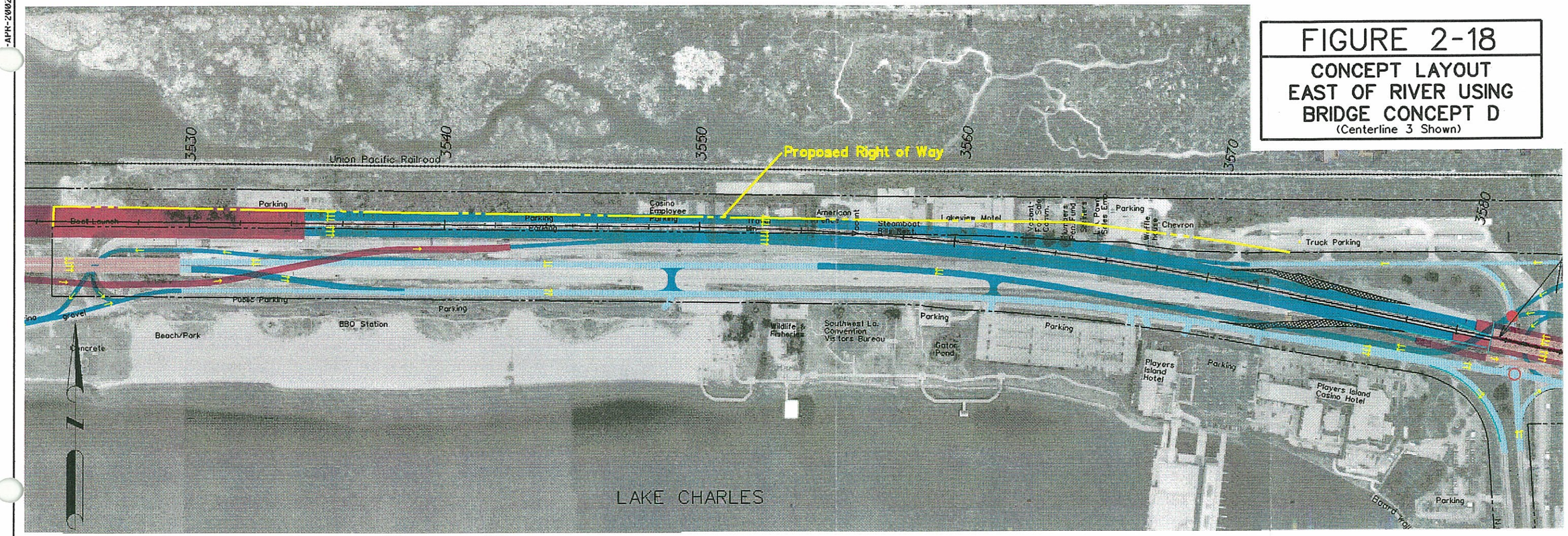
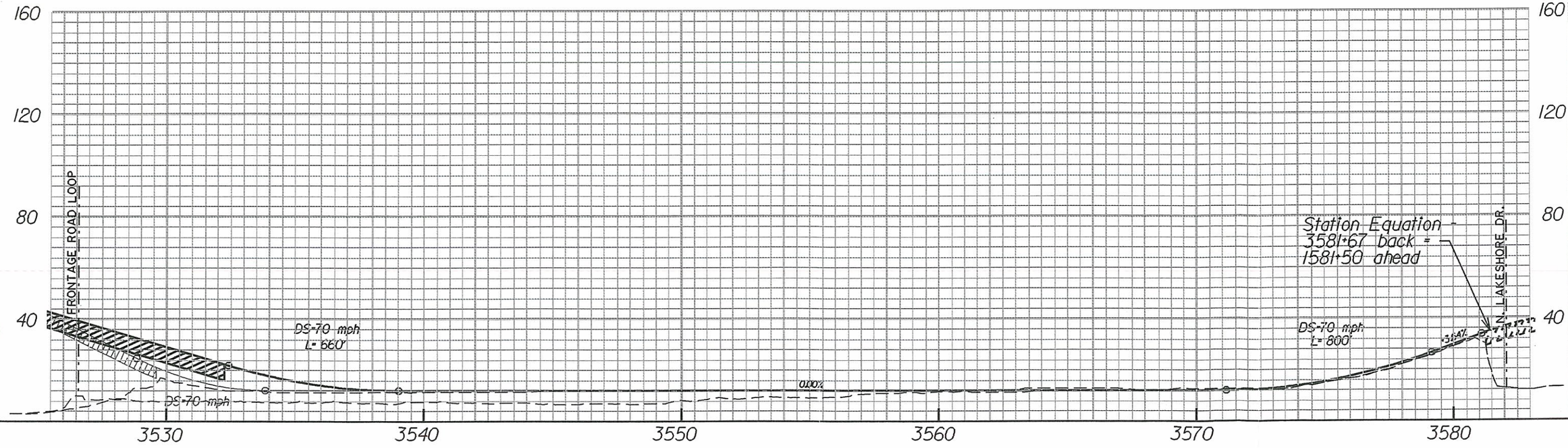
FIGURE 2-18
CONCEPT LAYOUT EAST OF RIVER USING BRIDGE CONCEPT D
(Centerline 3 Shown)



HORIZONTAL 0 400 800 1200
VERTICAL 0 40 80 120
SCALE IN FEET

NOTE: Legend Shown on Page 2-21.



I-10 CALCASIEU RIVER BRIDGE & APPROACHES

PARISH	FEDERAL PROJECT	STATE PROJECT
CALCASIEU	BR-10-1(212)29	700-10-0115

SHEET NUMBER 3 of 4

HNTB

APH-2002

2.3.4.3 East Section

The east section covers the area west of station 1582+00 (Lakeshore Drive) to the study limits at US 90 east and depicts the interaction of I-10 with the present at-grade one-way frontage road system and the proposed improvements. The following considerations pertaining to the east end of the project have been presented in the technical memorandum.

A. Ryan Street Interchange

In addition to widening the I-10 mainline structures over Lakeshore Drive, general modifications have been proposed for the area between Lakeshore Drive and Ryan Street. The area includes the recent proposed and DOTD approved Ryan Street improvements, which recently received a Finding Of No Significant Impacts (FONSI), and are considered existing for this report. Refer to Figure 2-19. Proposed modifications to the area include adjustments to the Ryan Street westbound exit ramp geometry, adding a turn around under the I-10 / Lakeshore Drive overpass, and eliminating a section of two-way roadway that lies within the one-way frontage system. See Figure 2-20 for the modifications proposed for the area near Ryan Street interchange. These modifications can be used in conjunction with any concept layout except with Bridge Concept D. (Bridge Concept D requires a separate concept layout for the Ryan Street area. See Figure 2-18.) The modifications proposed in the area would bring Lakeshore Drive into the interchange operations by providing access from the westbound exit ramp in addition to eliminating the section of two-way frontage road located within the one-way system. The design in this area will be analyzed more thoroughly during the next phase of the project.

B. East Side U-Turns

U-turns are proposed for both directions underneath the I-10 overpasses at Ryan Street, Kirkman Street, Enterprise Boulevard, and Shattuck Street. The U-turns would facilitate access and circulation for the Lake Charles downtown area along the one-way frontage roads to the north and south of the mainline. The I-10 bridges in the area presently only allow enough space for the ground level cross streets. In order to allow adequate width for U-turns, the present embankment underneath these bridges would be replaced with tieback retaining walls. Figure 2-21 shows a typical I-10 overpass elevation with the new U-turns. Figure 2-23 shows a plan view of the U-turns proposed at the appropriate locations.

Figure 2-19

RYAN STREET IMPROVEMENTS

Scale 1" = 400'

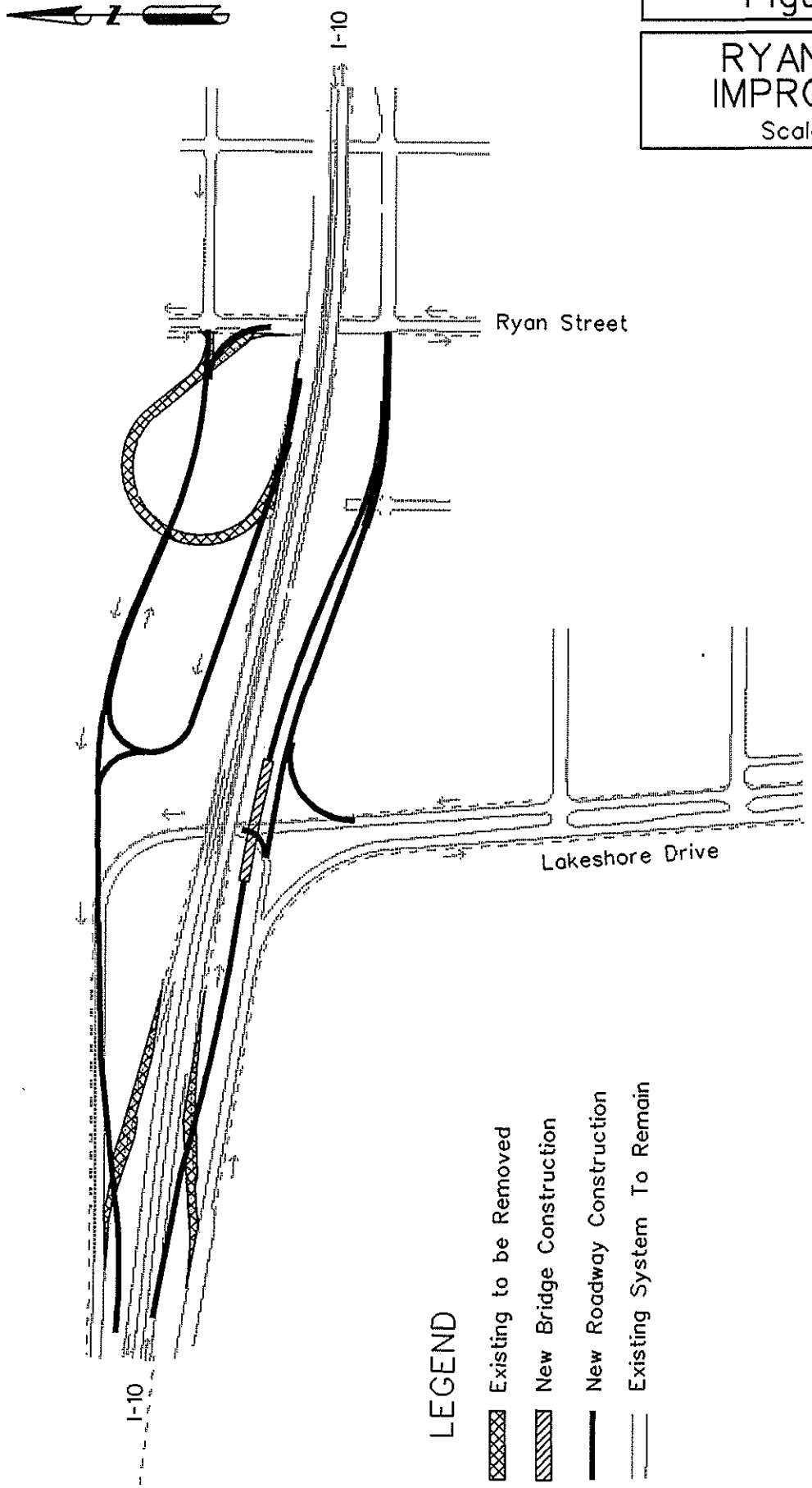


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Figure 2-20

MODIFICATIONS TO RYAN STREET IMPROVEMENTS

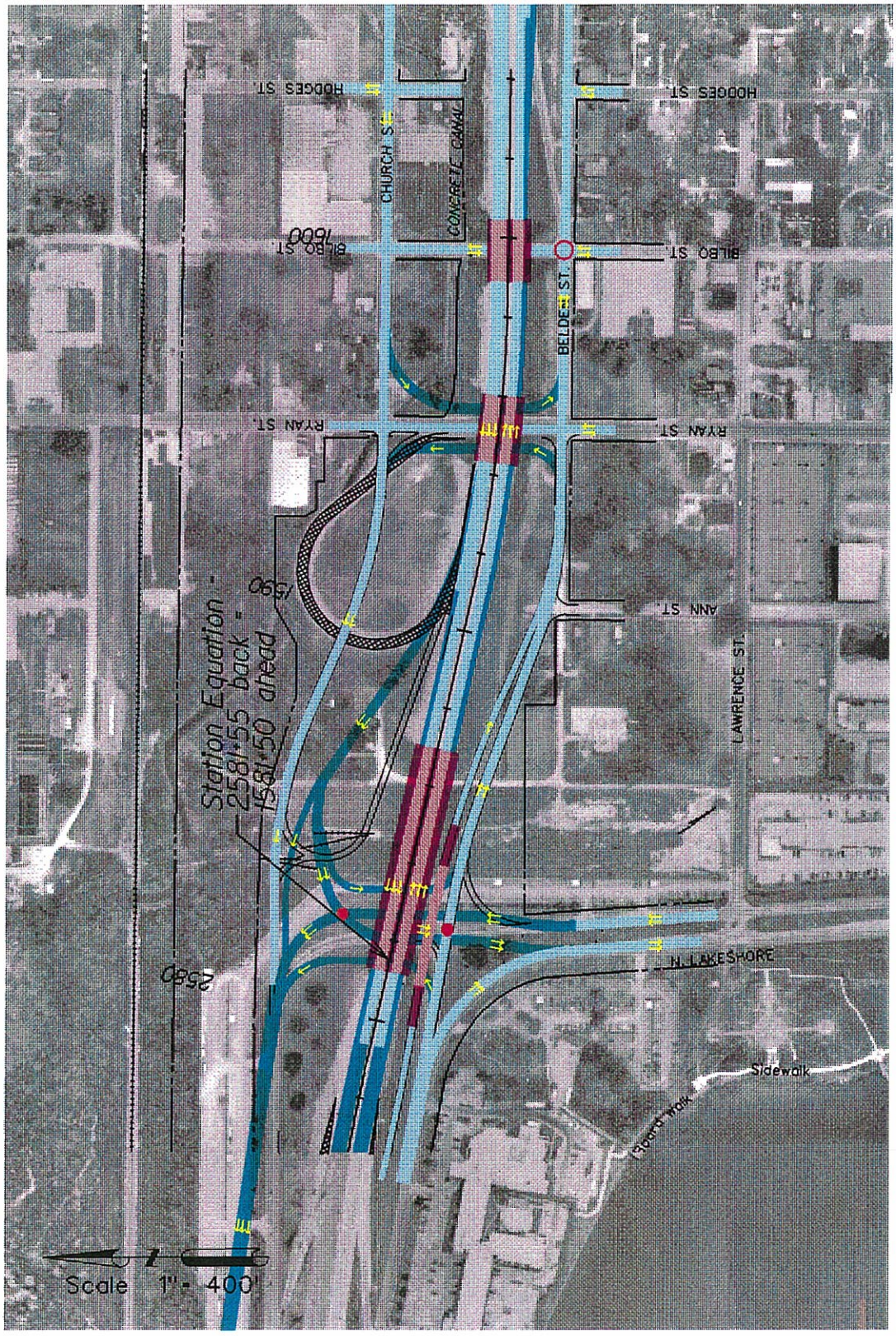
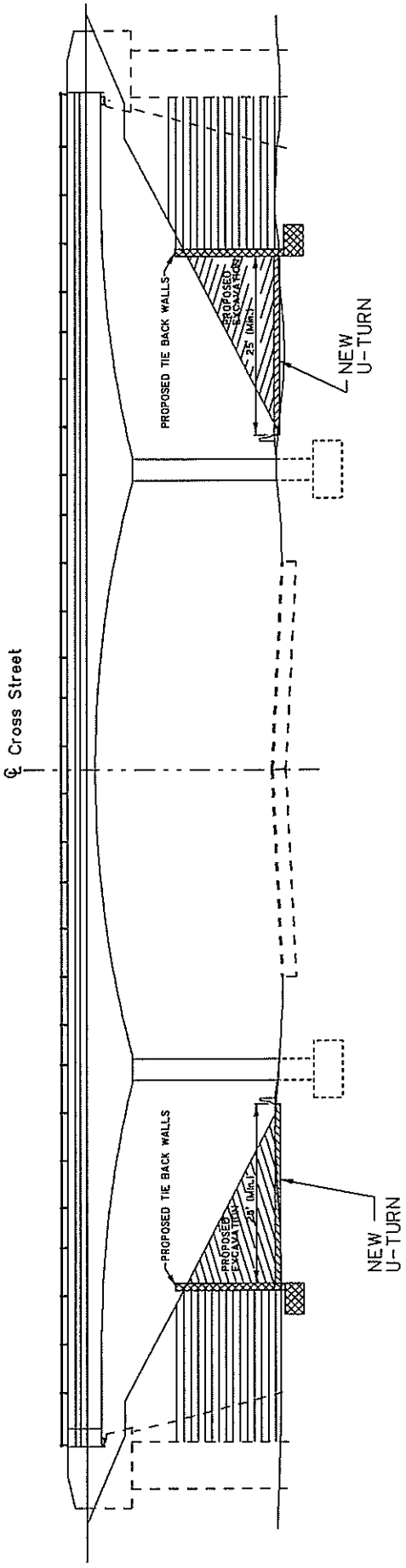


Figure 2-21

EXISTING I-10 OVERPASS
WITH NEW U-TURNS



I-10 OVERPASS
ELEVATION

HNTB

C. East Side Interchange Configurations

Three proposed layouts are possible regarding the east side interchanges and can be characterized as a modified configuration from the existing or having new diamond interchanges.

1.) Existing Configuration Modified

There are two viable concept layouts described as having a modified configuration to the existing. One layout involves using the existing ramp pattern near US 90 (east) which is shown in Figure 2-22 and includes an I-10 westbound exit ramp and an I-10 eastbound entrance ramp near the US 90 (east) area. The other possible layout for the US 90 (east) interchange is a new pattern with an I-10 westbound entrance ramp and an I-10 eastbound exit ramp connecting with the frontage road system. See Figure 2-23. For both of these concept layouts, the full diamond interchange at Enterprise Boulevard is maintained along the eastbound slip ramp east of Bilbo Street.

2.) New Diamond Interchanges

The concept layouts described as having new diamond interchanges involve using different configurations than the existing pattern for entrance and exit ramps at the interchanges on the east side. The concept layouts with this new interchange configuration allow for full diamond interchanges utilizing the frontage roads at Kirkman Street and Shattuck Street. All of the existing slip ramps in the area would be removed. Refer to Figure 2-24 for an example of an east side concept layout using the new diamond interchanges discussed above.

D. Mainline Profile at Abandoned Railroad

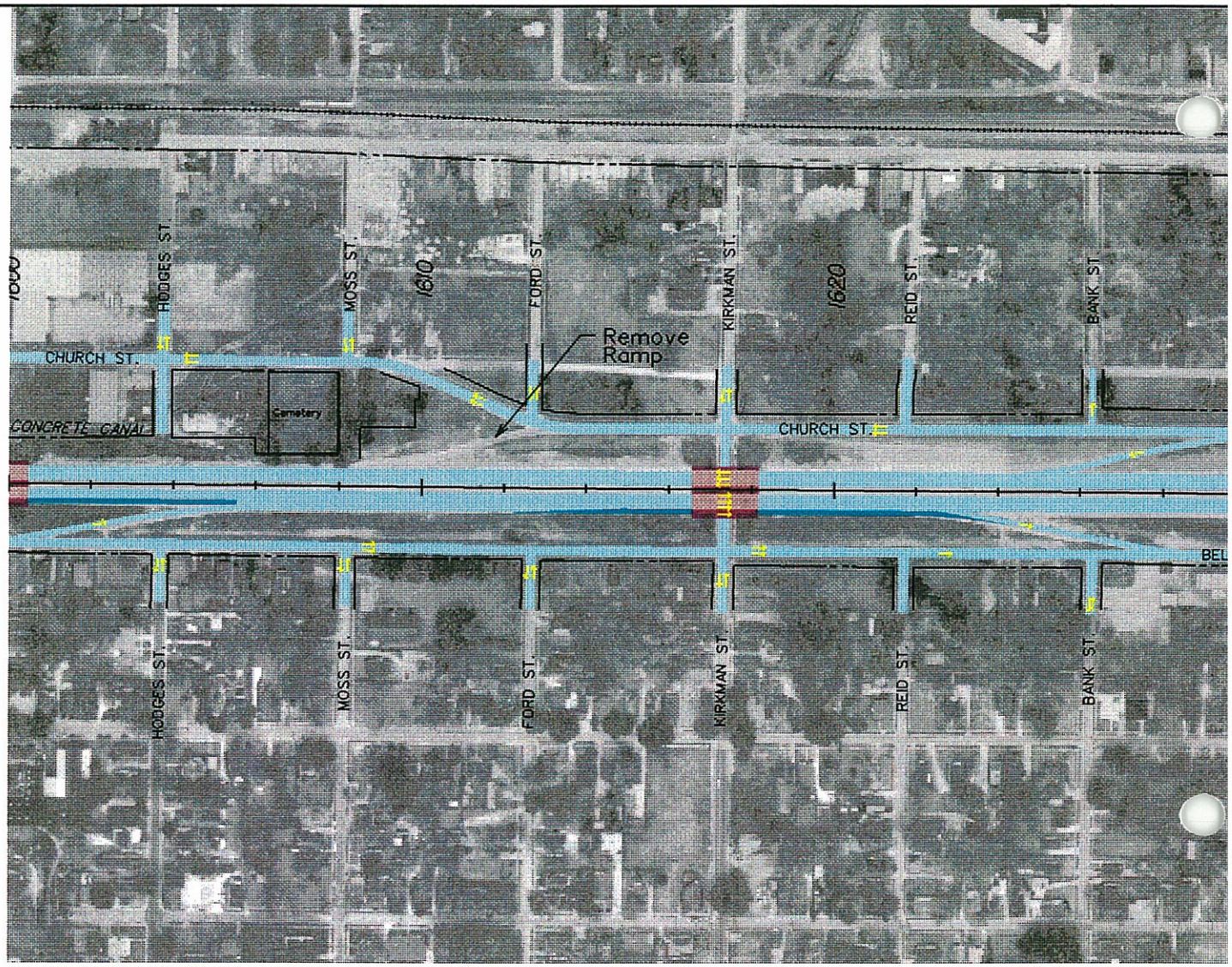
Presently an abandoned Missouri Pacific Railroad spur severs the westbound frontage road to the north of I-10 and the eastbound frontage road to the south of I-10. It is proposed that these abandoned railroad tracks be removed and new roadways be constructed connecting the frontage roads. This would allow the frontage road system paralleling I-10 to be continuous.

In addition to these improvements to the frontage road system, the inactivity and pending abandonment of this rail spur could allow removal of the mainline I-10 overpass and improved vertical geometry and interchange ramps in this area. The mainline I-10 and ramp structures would be removed, and the section of roadway would be reconstructed at a lower elevation on embankment with retaining walls. See Figure 2-23 for the plan and profile view of the I-10 section at the abandoned railroad spur near V.E. Washington Street (Station 1640+00 to Station 1650+00). In the case that the profile at the abandoned railroad spur could not be lowered, the existing I-10 mainline structure would remain but would need to be widened to provide shoulders. Figure 2-22 shows the alteration of keeping the I-10 structure in place at the abandoned railroad.

2.3.5 Preliminary Constructability

During development of the concept layouts, the constructability issue has been viewed from two perspectives: 1) all-at-once construction where the various interchange improvements, mainline widening, and new Calcasieu River Bridge are all part of one continuous construction program; and 2) staged construction over time where immediate improvements can be made to provide a new interchange at Sampson Street, with the remaining construction in the corridor occurring over a more extended period of time. The former approach would be preferred, but the latter approach could be utilized if the full amount of funding for all of the work in the project corridor is not immediately available. The latter scenario is the most likely to occur.

Refer to the Preliminary Line and Grade Studies and Bridge Studies Technical Memorandum for explanations and diagrams showing the options for all at once and phased construction for both the Calcasieu River Bridge and the Sampson Street interchange area.


HODGES ST.
MOSS ST.
1610
FORD ST.
KIRKMAN ST.
1620
REID ST.
BANK ST.
CHURCH ST.
Remove Ramp
CONCRETE CANAL
Cemetery
CHURCH ST.
HODGES ST.
MOSS ST.
FORD ST.
KIRKMAN ST.
REID ST.
BANK ST.

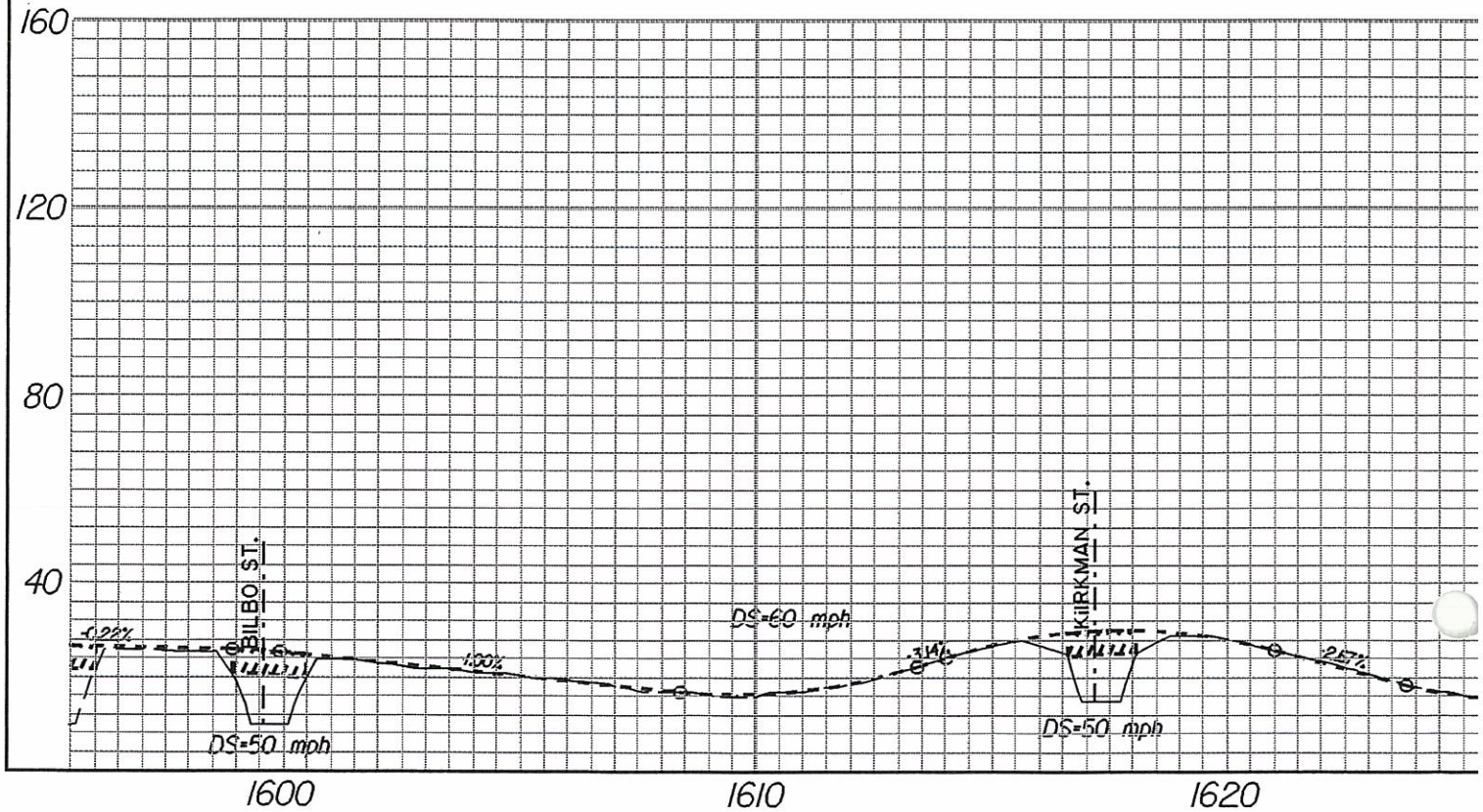
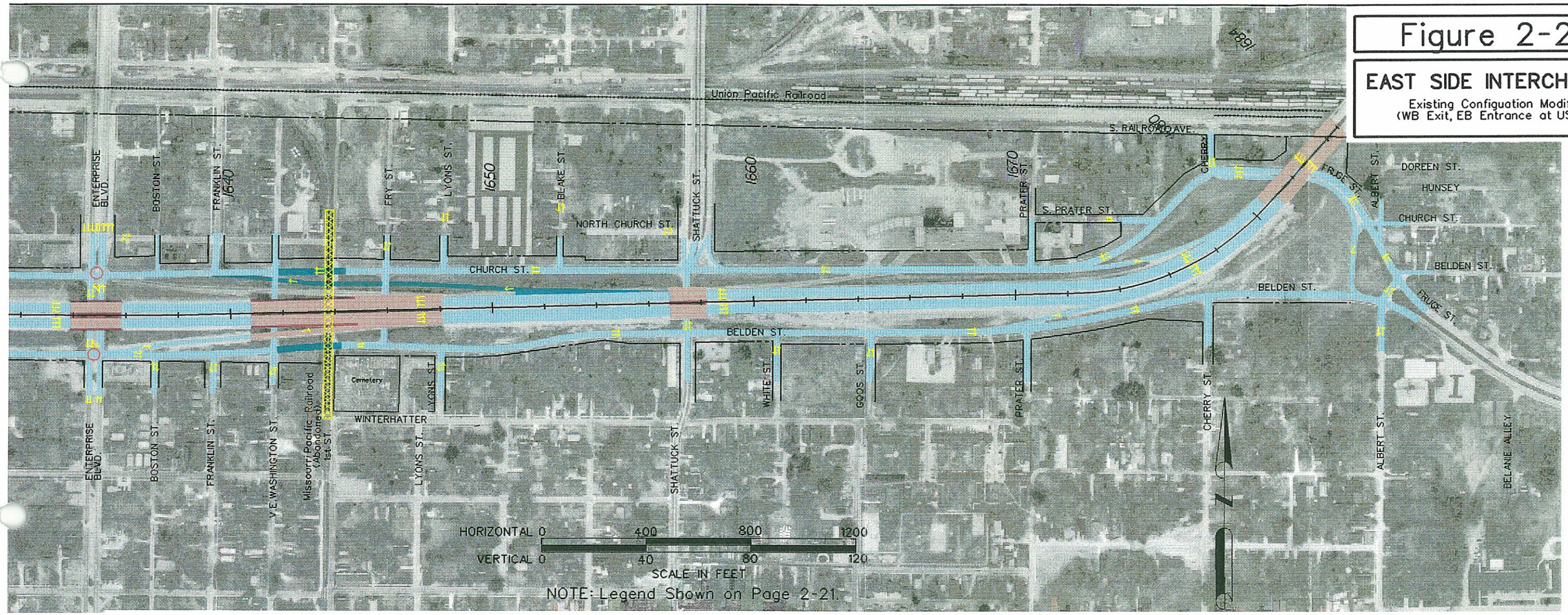

160
120
80
40
BILBO ST.
KIRKMAN ST.
DS=60 mph
DS=50 mph
DS=50 mph
1600
1610
1620

Figure 2-22

EAST SIDE INTERCHANGES

Existing Configuation Modified
(WB Exit, EB Entrance at US 90)



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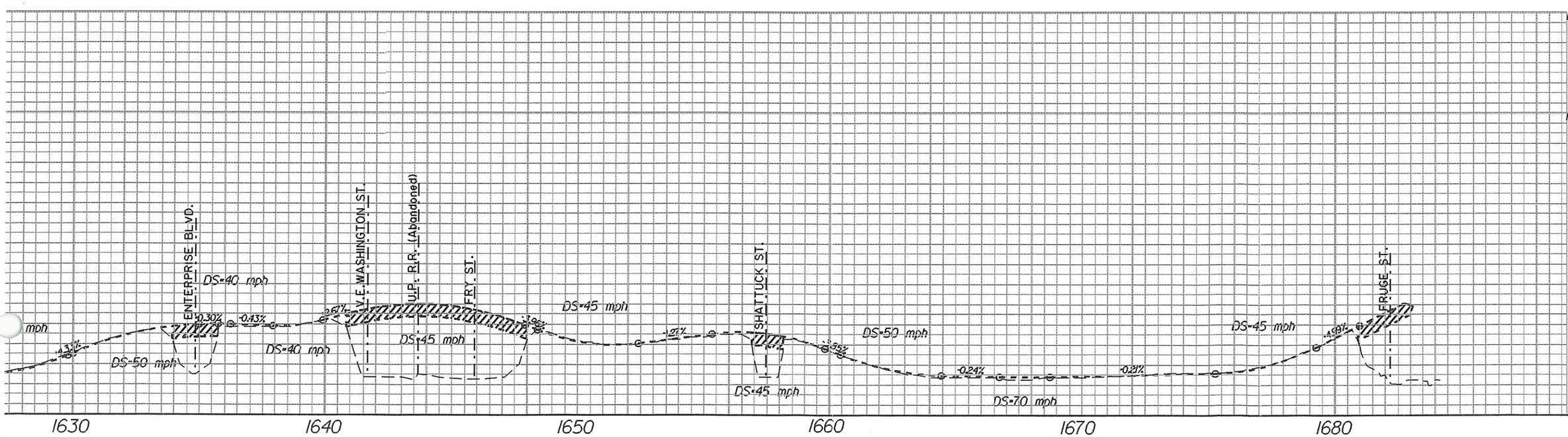

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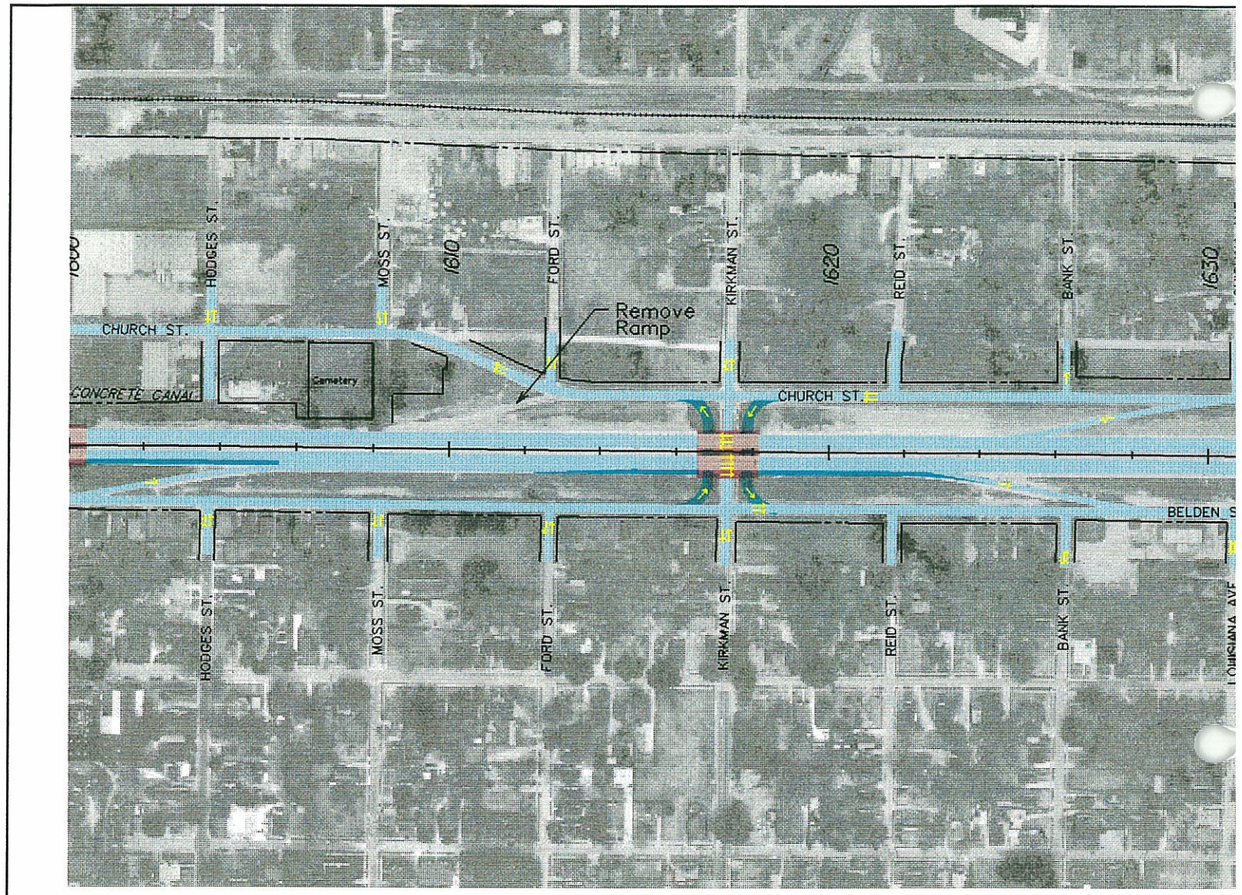
I-10 CALCASIEU RIVER BRIDGE & APPROACHES


HODGES ST.
MOSS ST.
1610
FORD ST.
KIRKMAN ST.
1620
REID ST.
BANK ST.
1630
CHURCH ST.
Remove Ramp
Cemetery
CONCRETE CANAL
CHURCH ST.
BELDEN S
HODGES ST.
MOSS ST.
FORD ST.
KIRKMAN ST.
REID ST.
BANK ST.

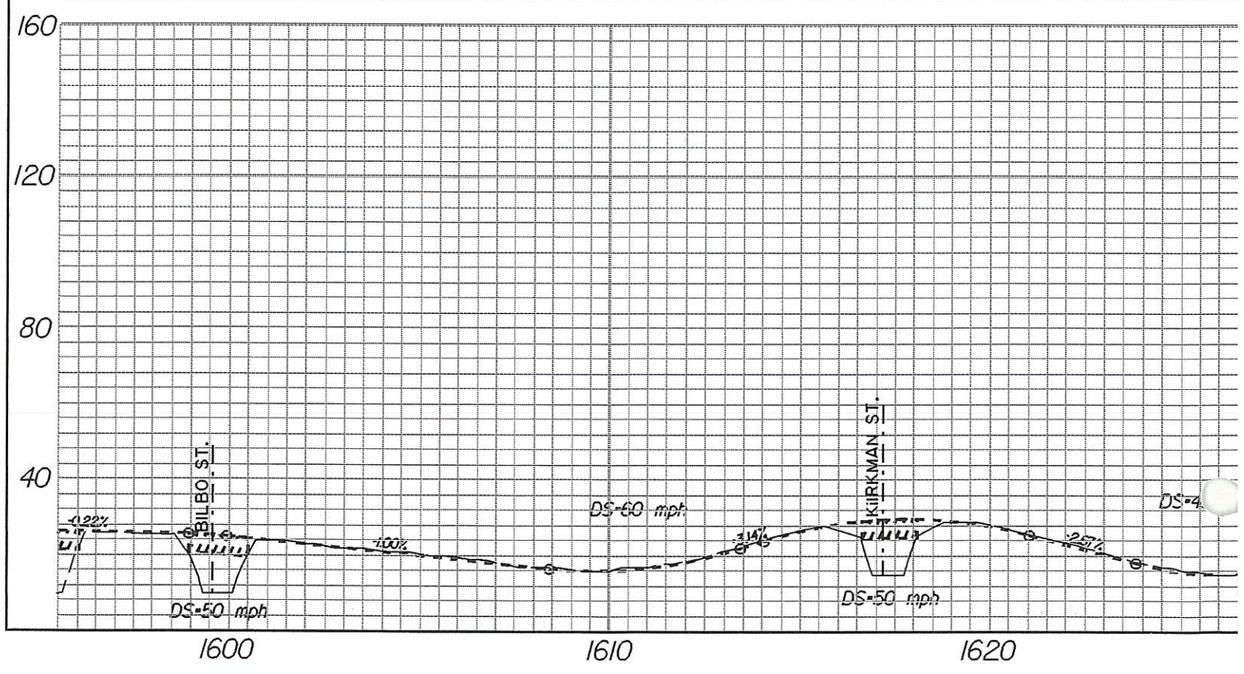
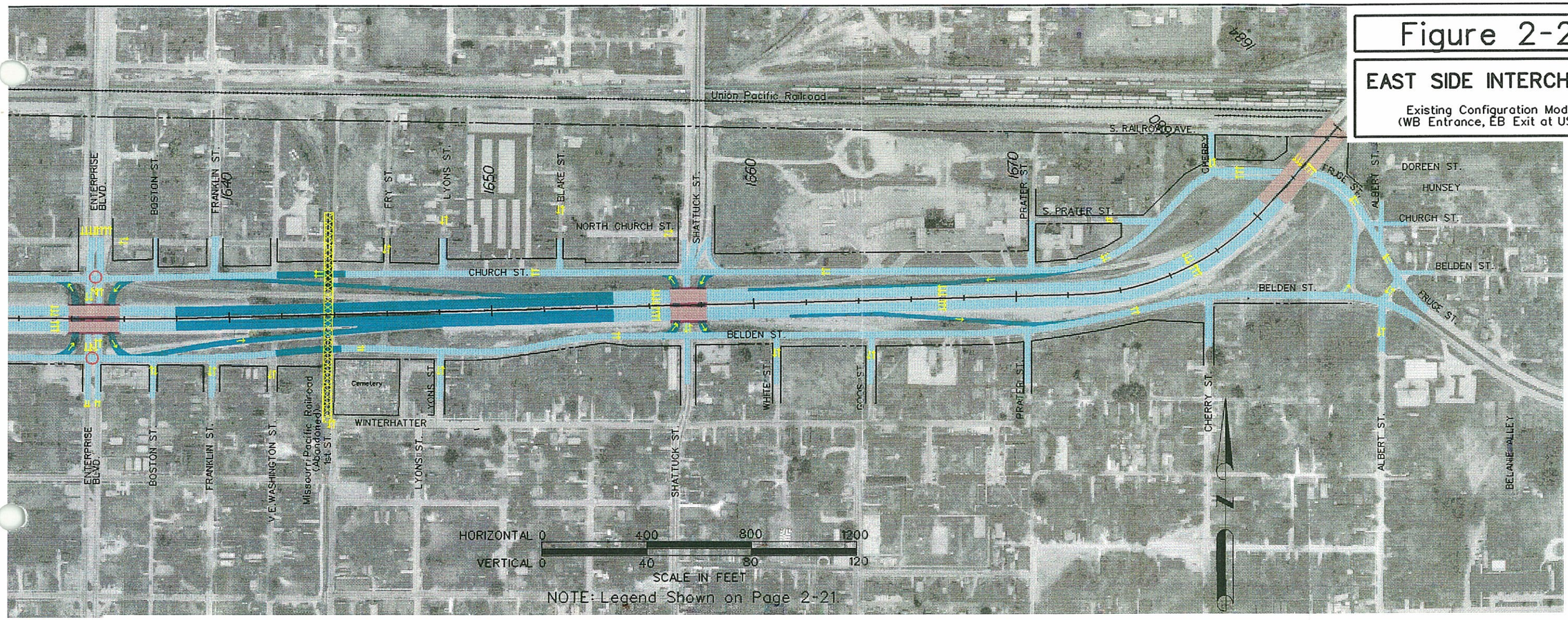

160
120
80
40
BILBO ST.
KIRKMAN ST.
DS=60 mph
DS=50 mph
DS=50 mph
1600
1610
1620

Figure 2-23

EAST SIDE INTERCHANGES

Existing Configuration Modified
(WB Entrance, EB Exit at US 90)



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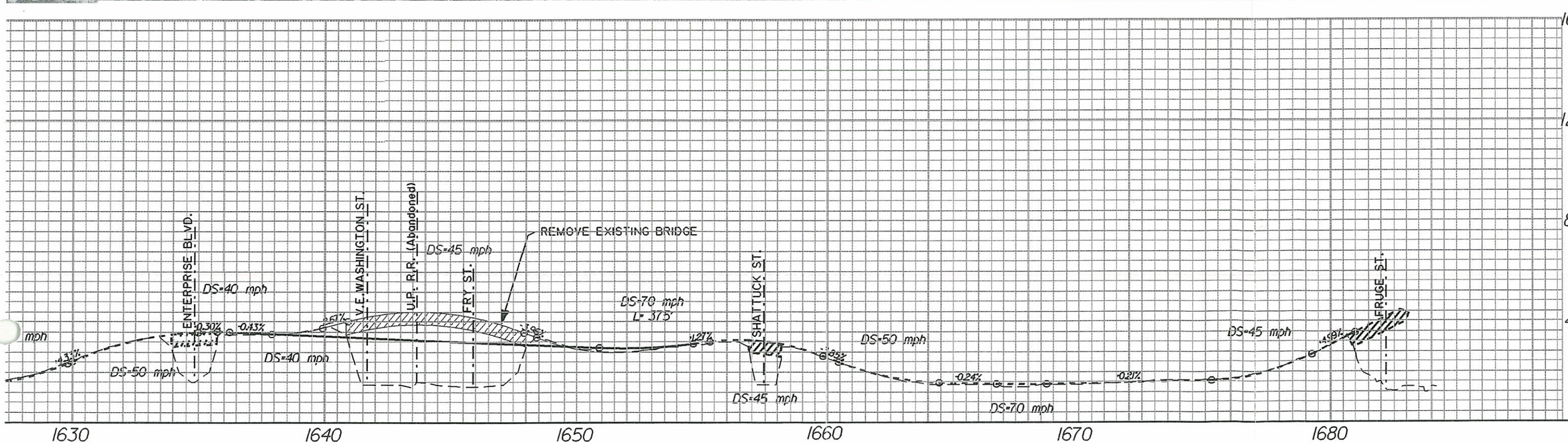

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I-10 CALCASIEU RIVER BRIDGE & APPROACHES

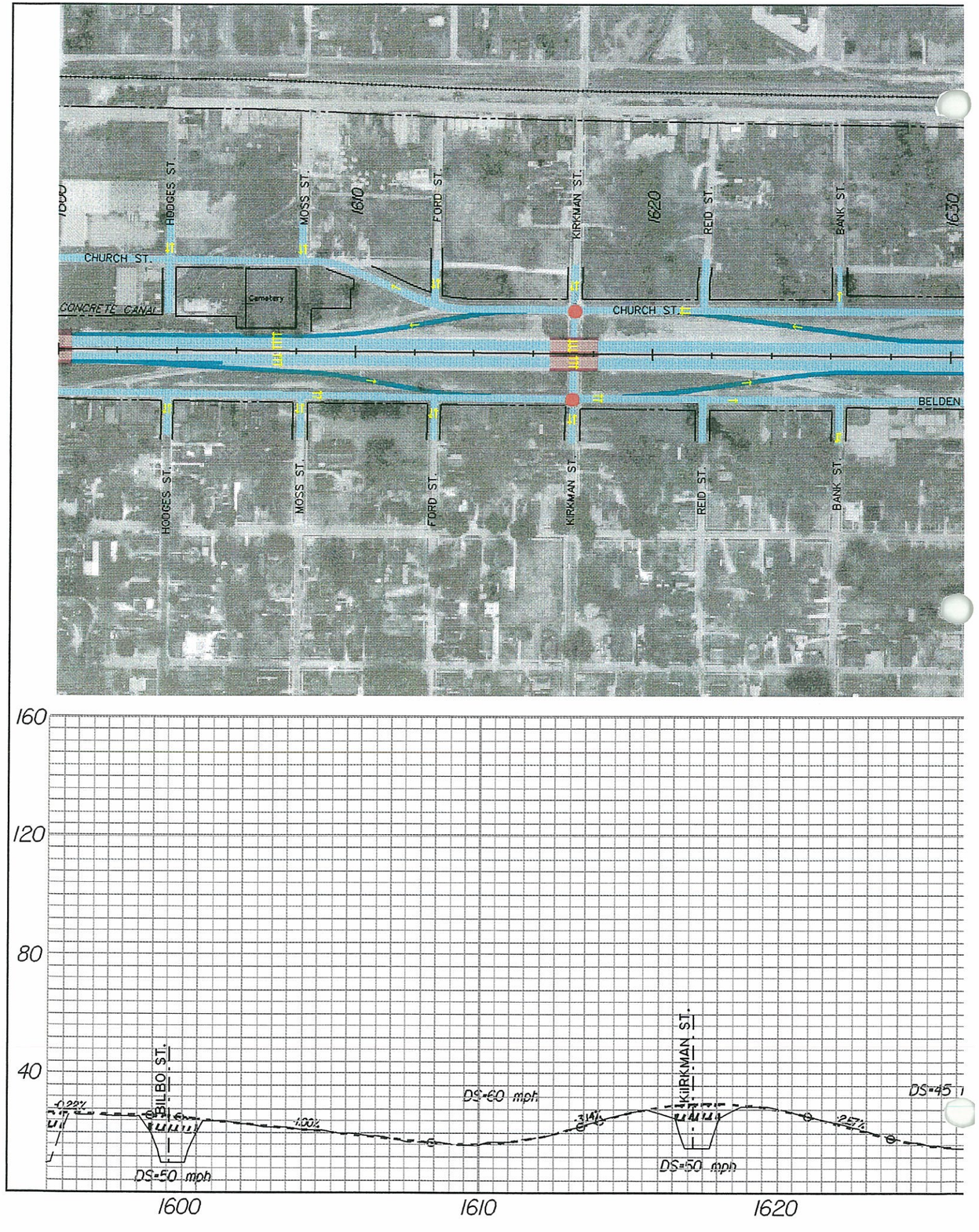
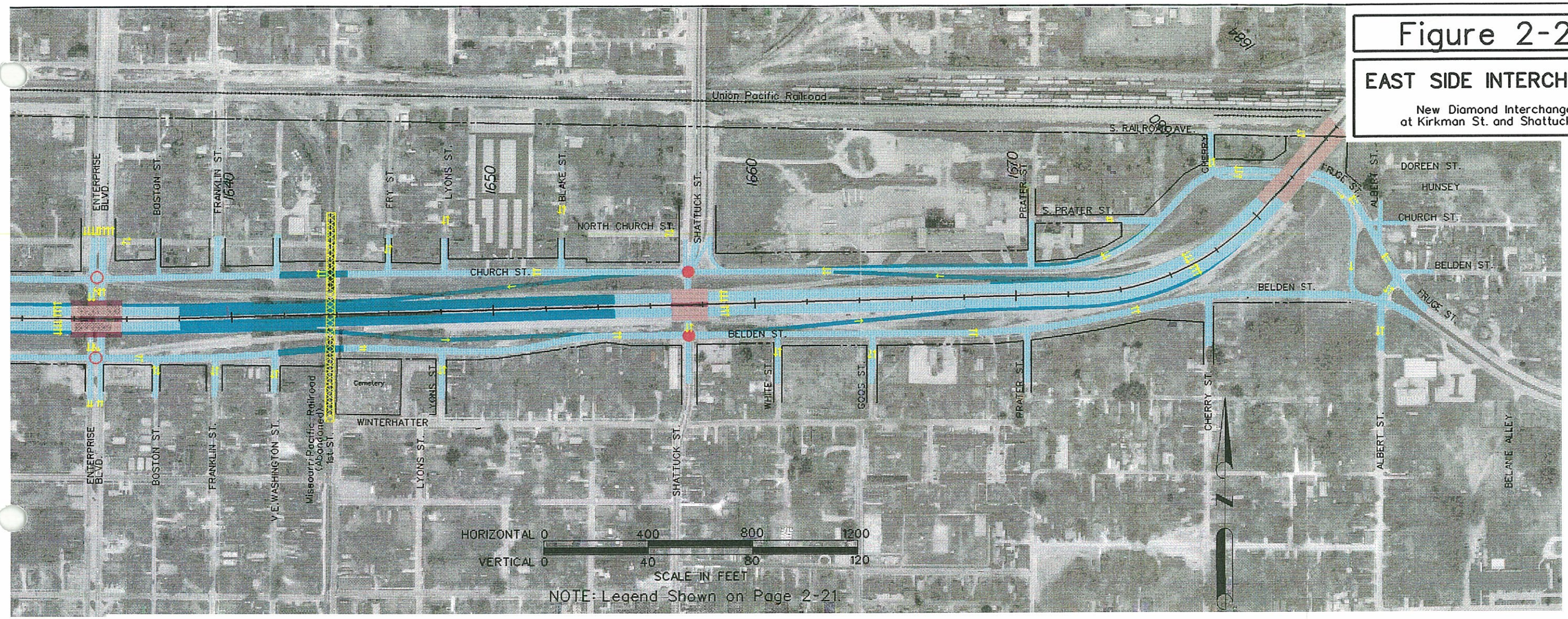

1600
HODGES ST.
MOSS ST.
1610
FORD ST.
KIRKMAN ST.
1620
REID ST.
BANK ST.
1630
CHURCH ST.
Cemetery
CONCRETE CANAL
CHURCH ST.
BELDEN
HODGES ST.
MOSS ST.
FORD ST.
KIRKMAN ST.
REID ST.
BANK ST.
160
120
80
40
BILBO ST.
-0.22%
DS=50 mph
1.00%
DS=60 mph
3.14%
KIRKMAN ST.
DS=50 mph
2.67%
DS=45
1600
1610
1620

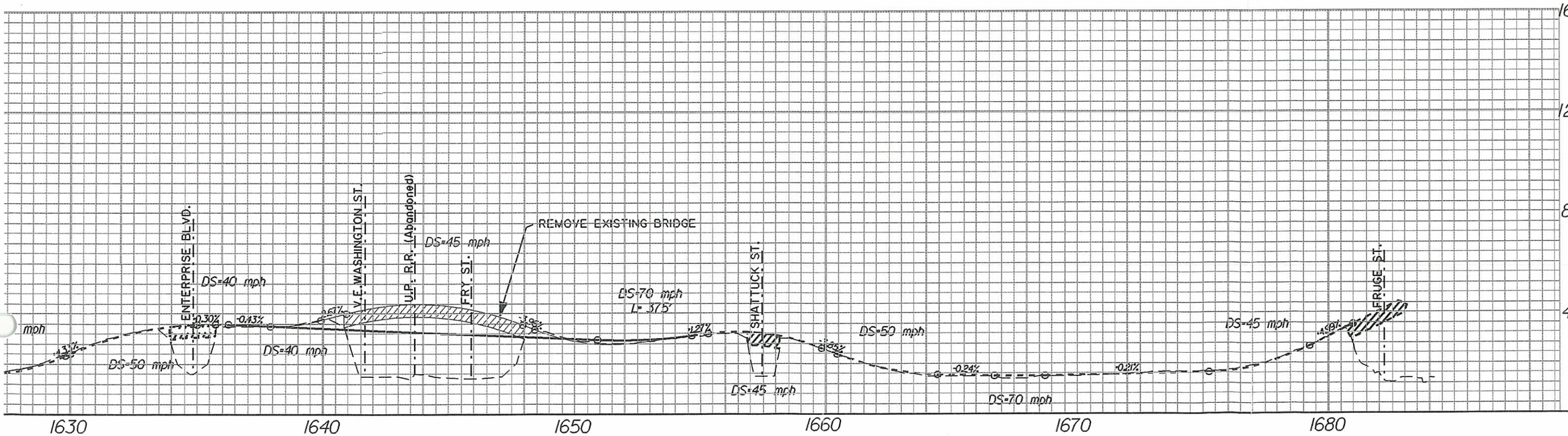
Figure 2-24

EAST SIDE INTERCHANGES

New Diamond Interchanges
at Kirkman St. and Shattuck St.



NOTE: Legend Shown on Page 2-21.



PARISH	CALCASIEU
FEDERAL PROJECT	BR-10-1(212)29
STATE PROJECT	700-10-0115

I-10 CALCASIEU RIVER BRIDGE & APPROACHES

HNTB

2.3.6 Preliminary Cost Estimates

Order of magnitude cost estimates for the concept layouts have been prepared and presented in the technical memorandum, as well. The preliminary costs of the proposed improvements for the corridor including the mainline, frontage roads, and Sampson Street interchange range from $135 to $190 million. Tables 2-2 and 2-3 contain order of magnitude cost estimates compiled for the concept layouts using the different centerline alignments. Refer to Chapter 6 of the Preliminary Line and Grade Studies Technical Memorandum for more information concerning the preliminary cost estimates for each concept layout presented. A summary of the trends observed based upon the preliminary cost estimates are listed below:

- A slight increase is noted for Centerline Alignment 3 concept layout estimates versus Centerline Alignments 1 and 2 concept layout estimates.

- Generally, alternatives with Bridge Concept A are less expensive to construct than alternatives with Bridge Concept B or C. Bridge Concept A includes only one main structure with eight lanes compared to Bridge Concept B and C, which contains six lanes of freeway and two frontage road structures beside it. Also, Bridge Concept A requires less structure for entrance and exit ramps to the Sampson Street area. In general, bridge cost estimates for Bridge Concept A are up to $30 million less than those for Bridge Concept B or C.

- At Sampson Street, concept layouts that relocate the railroad spur to the east instead of keeping it in the existing location are relatively less expensive to construct. This is based on the fact that concept layouts keeping the existing railroad spur in its location require a longer bridge, Bridge Profile 2 or 3, (See Figure 2-1) to maintain vertical clearance over the tracks and longer ramps approaching the bridge. Concept layouts that require the relocation of the railroad utilize the shorter profile, Bridge Profile 1, and can be identified in Tables 2-2 and 2-3 under "Relocate RR."

- Bridge Concept D (C13), which utilizes the existing Calcasieu River Bridge for frontage roads, does not appear to be significantly more or less expensive than the other bridge alternatives. This is because the maintenance cost required for rehabilitating the existing bridge for 50 more years of service would be significant ($35.8 million), even though using the existing bridge would reduce the initial construction cost.

Table 2-2
PRELIMINARY CONSTRUCTION COST ESTIMATES FOR CENTERLINES 1 and 2

SECTION		CONCEPT DESCRIPTION	Relocated RR	APPENDIX D PLATE REFERENCE			PRELIMINARY COST ESTIMATE* ($Millions)			PROGRAMMING ESTIMATE
				From Plate	To Plate	Match To	Bridge	Roadway	Total	
WEST										
W	1	DOTD Concept Two-Way		1-a	2-a, 2-c, or 2-f	C:1,3,6	6.8	4.6	11.4	
	2	Front. Rd. Overpasses One-Way	X	1-b	2-b, 2-d, 2-e, or 2-g	C:2,4,5,7	11.9	5.3	17.2	15
	3	Relocated R.R. Two-Way	X	1-c	2-a, 2-c, or 2-f	C:1,3,6	9.7	5.4	15.1	
	4	DOTD Concept (Modified)** One-Way		N/A	N/A	C:2,4,5,7	4.6	4.4	9.0	
CENTRAL										
C	1	Elevated Diamond - Sampson St Two-Way Front. Rd. Bridge Concept A	X	2-a	3-a	W:1,3 E:1-6	100	18	118	
	2	Elevated Diamond - Sampson St One-Way Front. Rd. Bridge Concept C	X	2-b	3-b	W:2 E:1-6	123	20	143	
	3	Elevated Diamond - Sampson St Two-Way Front. Rd. Bridge Concept C	X	2-c	3-c	W:1,3 E:1-6	123	20	143	
	4	Free Flow - Sampson St. One-Way Front. Rd. Bridge Concept A	X	2-d	3-a	W:2 E:1-6	104	18	122	135
	5	Elevated Diamond - Sampson St One-Way Front. Rd. Bridge Concept A		2-e	3-a	W:2 E:1-6	104	16	120	
	6	Mike Hooks Connect. Sampson St. Two-Way Front. Rd. Bridge Concept C		2-f	3-c	W:1,3 E:1-6	132	17	149	
	7	Mike Hooks Connect. Sampson St. One-Way Front. Rd. Bridge Concept C		2-g	3-c	W:2 E:1-6	133	17	150	
EAST										
E	1	Existing Configuration Modified		3-a	4-a	C:1-7	5.6	2.0	7.6	
	2	Existing Configuration Modified		3-b	4-b	C:1-7	4.8	3.6	8.4	
	3	New Diamond Interchanges		3-c	4-c	C:1-7	5.1	4.9	10.0	
	4	Existing Configuration Modified U-Turns		3-d	4-d	C:1-7	6.0	3.6	9.6	10
	5	Existing Configuration Modified U-Turns		3-e	4-e	C:1-7	5.9	4.1	10.0	
	6	New Diamond Interchanges U-Turns		3-e	4-f	C:1-7	6.2	5.4	11.6	

*Does Not Include Right-of-Way Acquisition or Utility Relocation

$160 M +/-

**DOTD Concept (Modified) does not have a plate reference because the design was developed following the Preliminary Line and Grade Studies Technical Memorandum.

LEAST COST COMBINATION: W1 + C1 + E1 or W4 + C4 + E1 $137 M
MOST COST COMBINATION: W2 + C7 + E6 $180M

Table 2-3
PRELIMINARY CONSTRUCTION COST ESTIMATES FOR CENTERLINE 3

SECTION		CONCEPT LAYOUT*	Relocated RR	APPENDIX D PLATE REFERENCE			PRELIMINARY COST ESTIMATE** ($Millions)			PROGRAMMING ESTIMATE
				From Plate	To Plate	Match To	Bridge	Roadway	Total	
WEST										
W	1	DOTD Concept Two-Way		1-a	2-h, 2-j, 2m	C:8,10, 13	6.8	4.6	11.4	15
	2	Front. Rd. Overpasses One-Way	X	1-b	2-i, 2-k, 2-l	C:9,11, 12	11.9	5.3	17.2	
	3	Relocated R.R. Two-Way	X	1-c	2-h, 2-j, 2m	C:8,10, 13	9.7	5.4	15.1	
	4	DOTD Concept Modified*** One-Way		N/A	N/A	C:9,11, 12	4.6	4.4	9.0	
CENTRAL										
C	8	Elevated Diamond - Sampson St Two-Way Front. Rd. Bridge Concept A	X	2-h	3-d	W:1,3 E:1-6	100	19	119	135
	9	Elevated Diamond - Sampson St One-Way Front. Rd. Bridge Concept C		2-i	3-e	W:2 E:1-6	132	21	153	
	10	Elevated Diamond - Sampson St Two-Way Front. Rd. Bridge Concept C	X	2-j	3-e	W:1,3 E:1-6	125	21	146	
	11	Elevated Diamond - Sampson St One-Way Front. Rd. Bridge Concept A	X	2-k	3-d	W:2 E:1-6	106	20	126	
	12	Free Flow - Sampson St. One-Way Front. Rd. Bridge Concept C	X	2-l	3-e	W:2 E:1-6	140	22	162	
	13	Elevated Diamond - Sampson St Two-Way Front. Rd. Bridge Concept D	X	2-m	3-f	W:1,3 E:1-7	126	19	145****	
EAST										
E	1	Half Interchange with US 90		3-a	4-a	C:8-12	5.6	2.0	7.6	10
	2	Half Interchange with US 90		3-b	4-b	C:8-12	4.8	3.6	8.4	
	3	New Diamond Interchanges		3-c	4-c	C:8-12	5.1	4.9	10.0	
	4	Half Interchange with US 90 U-Turns		3-d	4-d	C:8-12	6.0	3.6	9.6	
	5	Half Interchange with US 90 U-Turns		3-e	4-e	C:8-12	5.9	4.1	10.0	
	6	New Diamond Interchanges U-Turns		3-e	4-f	C:8-12	6.2	5.4	11.6	
	7	Modifications to ABMB Design U-Turns		3-f	4-g	C:8-12	10.6	4.9	15.6	

*Construction cost for Bridge Concept B is assumed to be the construction cost for Bridge Concept C at this level of magnitude **$ 160 M +/-**

**Does Not Include Right-of-Way Acquisition or Utility Relocation

***DOTD Concept (Modified) does not have a plate reference because the design was developed following the Preliminary Line and Grade Studies Technical Memorandum.

****This includes maintenance required to rehabilitate the existing Calcasieu River Bridge for 50 more years of service.

LEAST COST COMBINATION:	**W1 + C8 + E1**	$ 138 M
MOST COST COMBINATION:	**W2 + C12 + E6**	$ 190 M

2.4 TRAFFIC ANALYSIS OF INITIAL ALTERNATIVES TECHNICAL MEMORANDUM

The final Traffic Analysis of Initial Alternatives Technical Memorandum was presented to DOTD in July 2001. The purpose of this technical memorandum was to make traffic assignments to the preliminary alternatives presented in the Preliminary Line and Grade Studies Technical Memorandum and to make general observations of maintenance levels of service for the various networks.

Wilbur Smith Associates, Inc. (WSA) performed the transportation modeling on these alternatives. TRANPLAN, the region's macroscopic travel demand forecasting model obtained from the Imperial Calcasieu Regional Planning and Development Commission (IMCAL), was used in the modeling process. Volume/capacity (v/c) ratios were used for a preliminary assessment of mainline and ramp LOS.

The technical memorandum provides graphical illustrations of existing and projected system traffic volumes, levels of service (LOS), v/c ratios. In addition, the technical memorandum uses Measures of Effectiveness (MOE's) which are represented by vehicle miles of travel (VMT) and vehicle hours of travel (VHT). The macroscopic nature of the studies conducted in the technical memorandum does not provide sufficient information from a traffic standpoint to determine which alternative may be more desirable than another. A more detailed traffic analysis will be performed for the alternatives that are carried into the next phase of the project.

2.4.1 Existing Conditions

Existing land uses in the study area influencing the traffic conditions consist of various types of development, including commercial, industrial, recreational, educational, and residential land uses. Several major developments and significant land uses in the study corridor include Isle of Capri Casino and Hotel, Harrah's Casino and Hotel, Lyondell Industries, Conoco Refinery, Condea Vista Refinery, and PPG Refinery.

From field analysis, it has been determined that the existing I-10 Calcasieu River Bridge currently carries 45,000 vehicles per day (vpd). Traffic volumes along the study corridor range from 37,570 vpd east of US 90 on the east side of the study area to 55,720 vpd west of PPG Drive.

2.4.2 Summary of Findings

Based upon the projections of future year 2025 traffic volumes and identification of measures of effectiveness for the alternatives analyzed in the technical memorandum, the following conclusions have been made:

- On a regional level, all alternatives analyzed in the technical memorandum provide decreases in vehicle miles traveled (VMT) and vehicle hours traveled (VHT), which indicates that the alternatives would benefit the Lake Charles region. However, there was no significant difference in VMT and VHT between alternatives;

- On the I-10 corridor level, all alternatives analyzed provided an increase in VMT, and a decrease in VHT. The increase in VMT on a corridor basis is common with roadway improvement projects, as an improved transportation facility attracts additional vehicle trips to the corridor. The decrease in VHT, as previously mentioned, indicates that all alternatives provided a travel benefit to the I-10 corridor, although the decreases in VHT were not significantly different between alternatives;

- Projected year 2025 traffic volumes on I-10 across the Calcasieu River (including frontage roads) ranged from 69,000 to 72,000 vpd and operated at an acceptable LOS D or better operating conditions. Frontage roads across the Calcasieu River (Bridge Concept B, C, and D) provided additional local access and circulation benefits and provided identical traffic operations with smaller cross section than the eight lane bridge alternative (Bridge Concept A);

- Frontage roads throughout the study area should generally operate as one-way facilities to improve safety at junctions with entrance and exit ramps. Additionally U-turn lanes should be provided at high volume cross street intersections to improve traffic operations at the signalized intersections and reduce delay for vehicles traveling on the one-way frontage road system;

- The south frontage road between PPG Drive and Sampson Street is a critical component of each alternative as it provides important access to several petrochemical plants, the Isle of Capri Casino, and Westlake area via Sampson Street. A two-way or one-way frontage road in this area could be used. The one-way frontage road concept provides for a more efficient interchange with Sampson Street and eliminates many conflicting turn movements into and out

of the petrochemical facilities. The two-way frontage road concept provides more direct access to the petrochemical facilities and eliminates the need for westbound traffic to U-turn at PPG Drive to access local businesses. More detailed traffic operations analysis during the next phase of this project will help to resolve this issue;

- Ramp configurations east of Ryan Street generally provide the same level of service in which the ramp levels of service are compared to each other.

Refer to the Traffic Analysis of Initial Alternatives Technical Memorandum for more information concerning existing and predicted traffic conditions for the corridor.

2.5 PRELIMINARY BRIDGE STUDIES TECHNICAL MEMORANDUM

The Final Preliminary Bridge Studies Technical Memorandum was submitted to DOTD in February 2001. The purpose of the technical memorandum was to document the feasibility of various alignments, their utilization, constructability, and the costs of various structural configurations for the I-10 Calcasieu River Bridge crossing, a proposed grade separation at Sampson Street, and also improvements for existing structures along the I-10 mainline. Preliminary bridge studies have been completed to the level of detail needed to make assessments regarding practicality and cost. Typical sections, substructure layouts, superstructure types, preliminary evaluation of staged construction, and order of magnitude cost estimates for preliminary alternatives have been reviewed for this document.

Structural modifications described in the technical memorandum, in addition to the river bridge and Sampson Street, are as follows:

- Widening the I-10 overpasses at PPG Drive to the inside of each structure to allow the addition of one lane in each direction.

- Widening and also lengthening the structure at the I-10 overpass at Lakeshore Drive to accommodate proposed at grade roadways underneath.

- Widening the I-10 overpasses east of Lakeshore Drive (which includes: Ryan Street, Bilbo Street, Kirkman Street, Shattuck Street, and Enterprise Boulevard) on both the inside and outside of structures.

- Constructing tied-back walls at many I-10 interchange structures east of Lakeshore Drive to accommodate proposed ground level frontage road turn arounds beneath the structures.

- Removal of an I-10 overpass structure over an abandoned railroad near V. E. Washington Street and reconstructing the I-10 mainline at grade.

The bridge design criteria for the Calcasieu River Bridge and other structures within the corridor was based on AASHTO and DOTD standards. A complete listing of the design criteria used for the preliminary bridge studies is shown in the Preliminary Bridge Studies Technical Memorandum.

2.5.1 Major Influential Factors

Similar to the Preliminary Line and Grade Studies Technical Memorandum, this technical memorandum also identifies the environmental factors which influence the position, constructability, and preliminary costs associated with the reconstruction of structures within the study corridor. As previously mentioned, one major issue that may directly affect the location of the proposed new Calcasieu River Bridge is a large chemical spill, which is relatively close to the west approach to the existing bridge and the Sampson Street interchange.

2.5.2 Bridge Concepts

As shown in Section 2.3, there is a wide range of possible configurations for the new river bridge. Three centerline alignments can be considered with any one of the bridge concepts discussed in Section 2.3 with the exception of Bridge Concept D. See Figures 2-4 through 2-7 for illustrations of the bridge typical sections being considered. Below is a brief summary of the observations presented in the Preliminary Bridge Studies Technical Memorandum for each bridge concept. Refer to the complete technical memorandum for more detailed information.

2.5.2.1 Bridge Concept 1A

Bridge Concept 1A is considered not feasible. The construction of the roadways is so close to the existing bridge. The edge of the existing piers would be less than 3 feet from the face of the new structure. Also, removal of the existing bridge after the widening is completed may be impractical. Instead of using explosives and floating out the structure to dismantle it away from the site, the structure would need to be dismantled piece by piece in the same manner that it was built, using expensive falsework in the

river. The liability associated with working close to traffic and the difficulty in removing the existing bridge has led to the recommendation that Concept 1A be eliminated from further study.

2.5.2.2 Bridge Concept 1B

Bridge Concept 1B is similar to Concept 1A, but the extra width of the ten-lane bridge allows more clearance between the edge of the existing cap and edge of the temporary traffic lane during construction of the first phase. Reusing existing piers could be considered with this alternate. Removal of the existing bridge remains a paramount problem, and it must be removed in the same manner as mentioned in the Bridge Concept 1A description above. See Figure 2-25 for an illustration of the staged construction needed for Bridge Concept 1B.

2.5.2.3 Bridge Concept 1C

Bridge Concept 1C is similar to Bridge Concept 1A and 1B, but the separate ramps allow the traffic to be entirely separated from the construction of the second phase and also allow more clearance between the edge of the existing cap and edge of the traffic lanes. While construction of Phase II is still in close proximity of traffic, this concept may be more practical. The challenges associated with removal of the old bridge still remain, and the liability issues and costs associated with phased construction also exist for this concept. Figure 2-26 shows the staged construction for Bridge Concept 1C.

2.5.2.4 Bridge Concept 2A

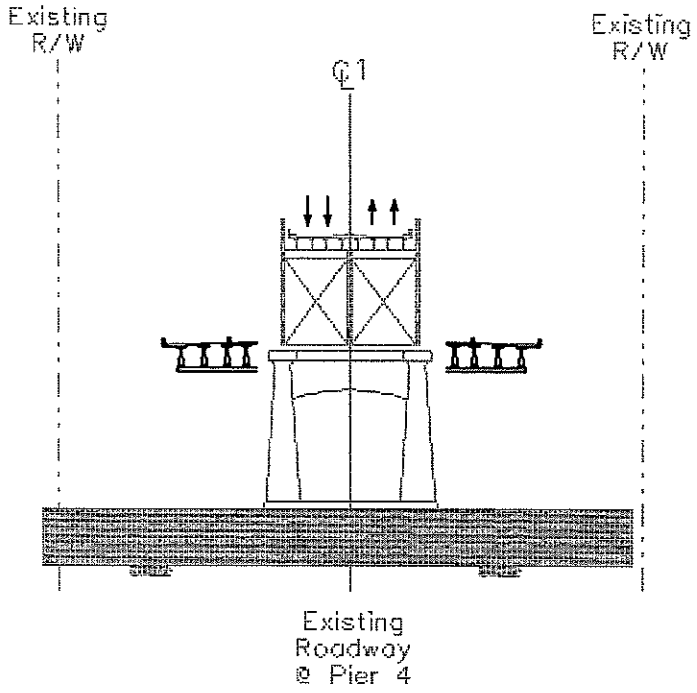
Bridge Concept 2A has the same roadway width as Concept 1A but is centered 45 feet north of the existing centerline. In this concept, the old bridge could be floated out and dismantled away from the site. Figure 2-27 shows the staged construction involved in using this bridge concept.

A slight modification of the concept 2A would be to divide the new bridge into two separate 75 feet wide structures with a small median between them. The centerline of these two structures could be shifted to an offset greater than 45 feet from the centerline of the existing bridge. The northern structure could be constructed first and placed under traffic, then the original bridge would be removed and the new southern structure built. The increased clearance between the bridges would provide for safer and easier construction, while still allowing the option of utilizing the old piers.

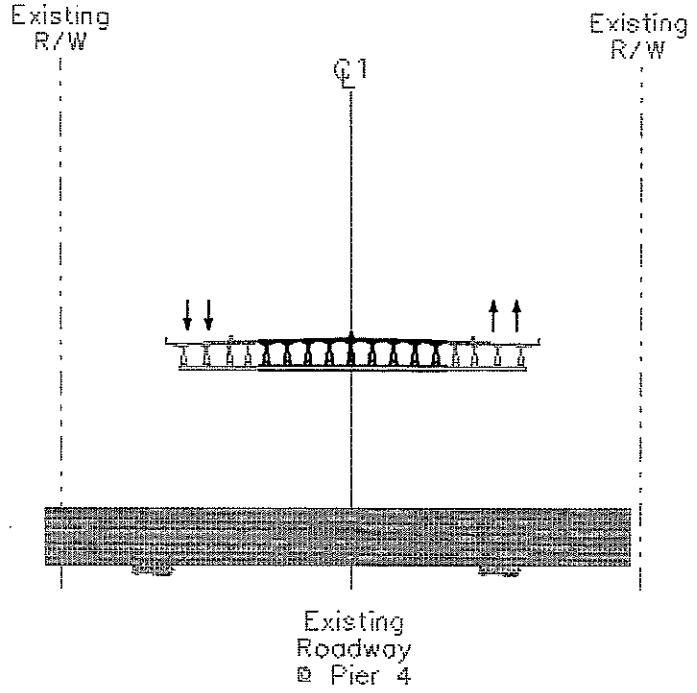
Figure 2-25

RIVER BRIDGE STAGED CONSTRUCTION

Concept 1B



PHASE I



PHASE II

LEGEND:

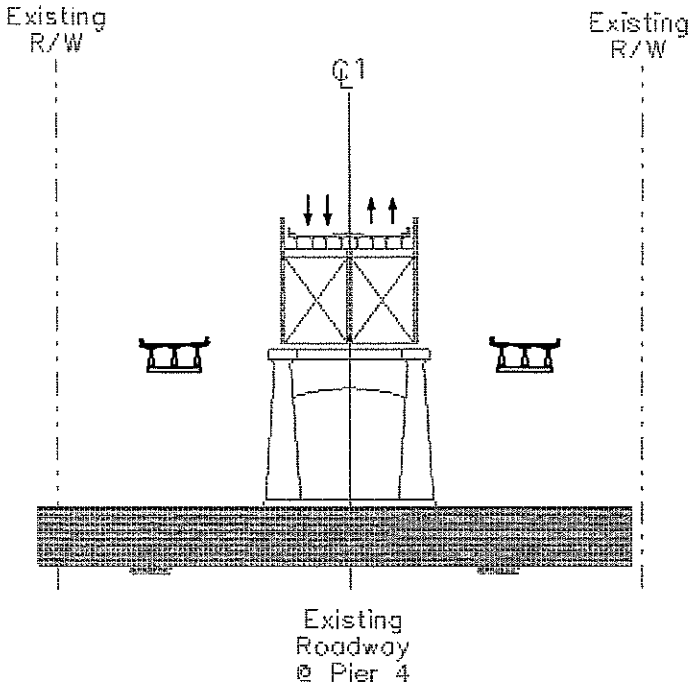
- Location of Traffic
- Construction

HNTB

Figure 2-26

RIVER BRIDGE STAGED CONSTRUCTION

Concept 1c



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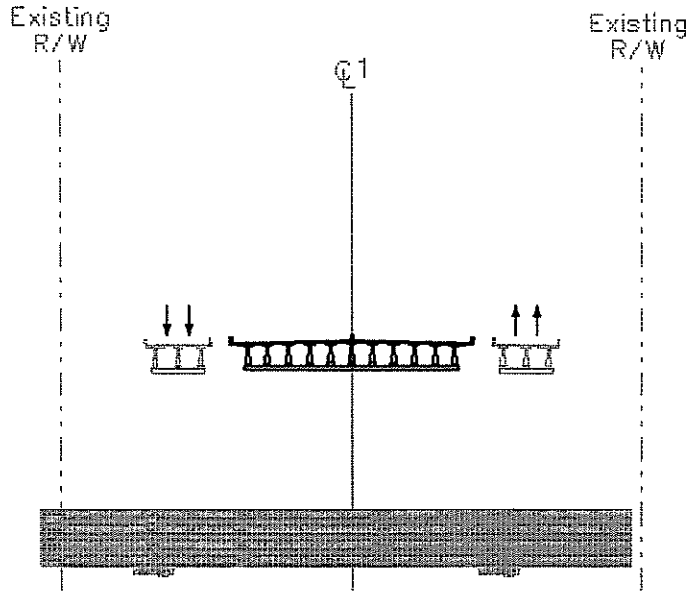


PHASE II

LEGEND:

Location of Traffic

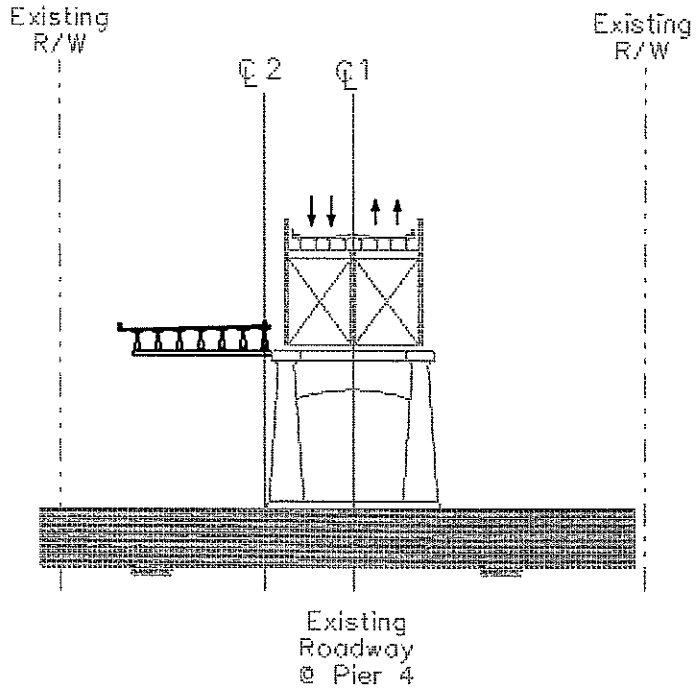
Construction

HNTB

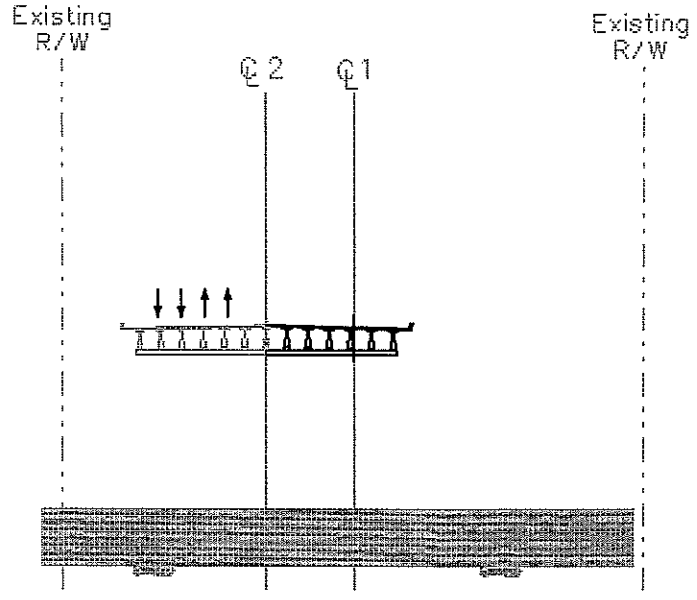
Figure 2-27

RIVER BRIDGE STAGED CONSTRUCTION

Concept 2A



PHASE I



PHASE II

LEGEND:

Location of Traffic

Construction

HNTB

2.5.2.5 Bridge Concept 2B

Construction of Bridge Concept 2B is similar to Concept 2A. In this concept, the old bridge could be floated out and dismantled away from the site. Refer to Figure 2-28.

2.5.2.6 Bridge Concept 2C

Construction of Bridge Concept 2C is similar to Bridge Concepts 2A and 2B. See Figure 2-29 for staged construction of Bridge Concept 2C.

2.5.2.7 Bridge Concept 3A

Bridge Concept 3A, in addition to the other concepts on Centerline Alignment 3, requires additional right-of-way acquisition compared to the other centerline alignments being considered. This concept allows the construction of the new structure in one phase thus reducing the time required for construction. Also, because it is located away from existing traffic, it would cause less interference, and could have reduced exposure to liability. After the new bridge is in service, the old bridge could then be removed with explosives or by floating.

2.5.2.8 Bridge Concept 3B

Right-of-way and construction factors are similar to Concept 3A.

2.5.2.9 Bridge Concept 3C

Same as above.

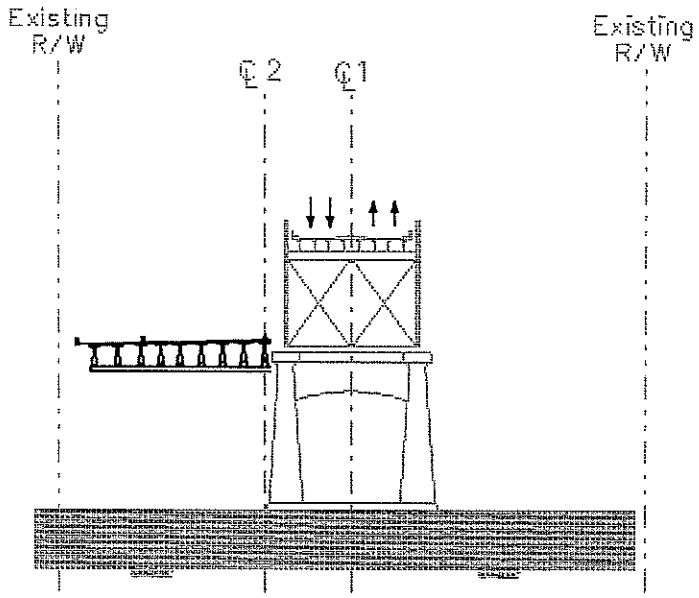
2.5.2.10 Bridge Concept 3D

Bridge Concept 3D could construct the new six-lane main roadway structure 170 feet north of the existing centerline while rehabilitating and extending the old structure to allow it to be used to carry service roads and possibly pedestrian and bicycle traffic, depending on the number of lanes required for traffic flow. If this concept were adopted, the offset distance could be reduced in the refined design to as little as 125 feet. The bridge would remain a landmark for the citizens of southwest Louisiana. The reduced loading and frequency of loading would allow the structure to be refurbished and utilized for many years to come.

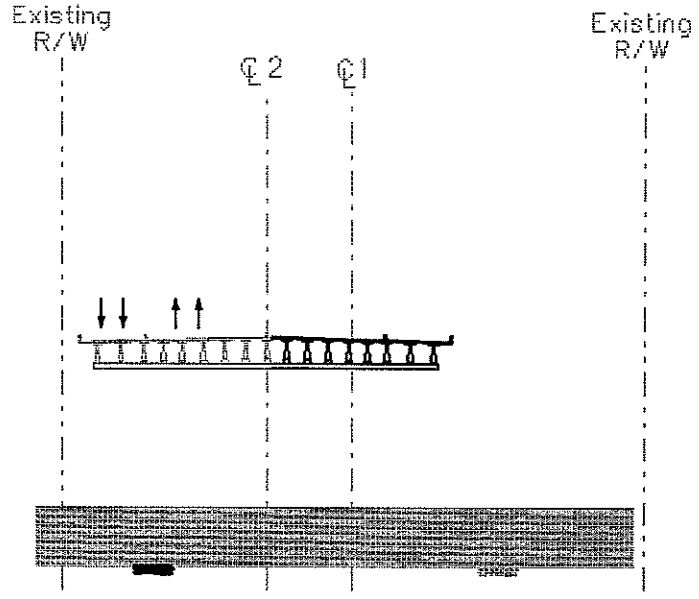
Figure 2-28

RIVER BRIDGE STAGED CONSTRUCTION

Concept 2B



PHASE I



PHASE II

LEGEND:

Location of Traffic

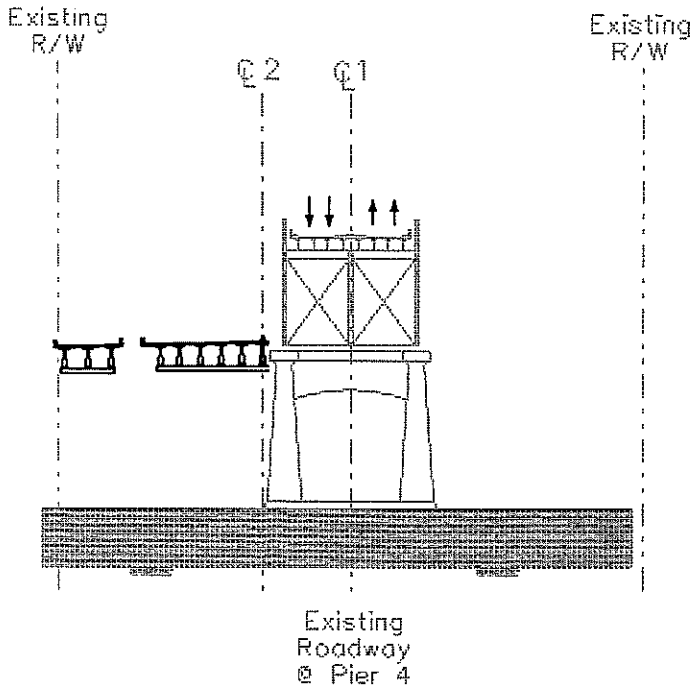
Construction

HNTB

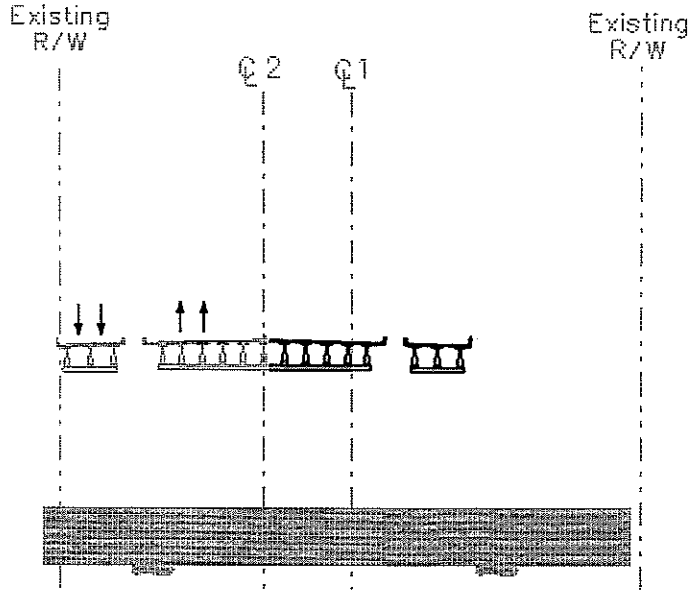
Figure 2-29

RIVER BRIDGE STAGED CONSTRUCTION

Concept 2C



PHASE I



PHASE II

LEGEND:

Location of Traffic

Construction

HNTB

This concept could allow the construction of the new structure in one phase, thus reducing the time required for the new construction. Also, since it is located away from the traffic, it would cause less interference and, as a result, there would be reduced exposure to liability associated with this concept. The refurbishing of the old structure would, of course, be a second phase. The liability would be relatively small where traffic is concerned.

2.5.3 Bridge Types

Many different types of superstructure and substructure types have been studied and presented in the technical memorandum along with the advantages and disadvantages of each. Below is a brief description of the superstructure types discussed in the technical memorandum for the main span. For illustrative purposes, Figure 2-30 shows the preliminary layout for the different bridge types considered for the main span for Bridge Concept A.

2.5.3.1 Concrete Haunched Girders

The concrete haunched girders used in this study are taken from the design of the Rigolets Pass Bridge replacement in southeast Louisiana and the Fuller Warren Replacement Bridge currently being constructed on I-95 in Jacksonville, Florida. The Rigolets Pass Bridge was designed by the State of Louisiana. The Fuller Warren Bridge was designed by HNTB Corporation and features a three span unit over the navigation channel that consists of two 200 feet spans on either side of a 250 feet main span.

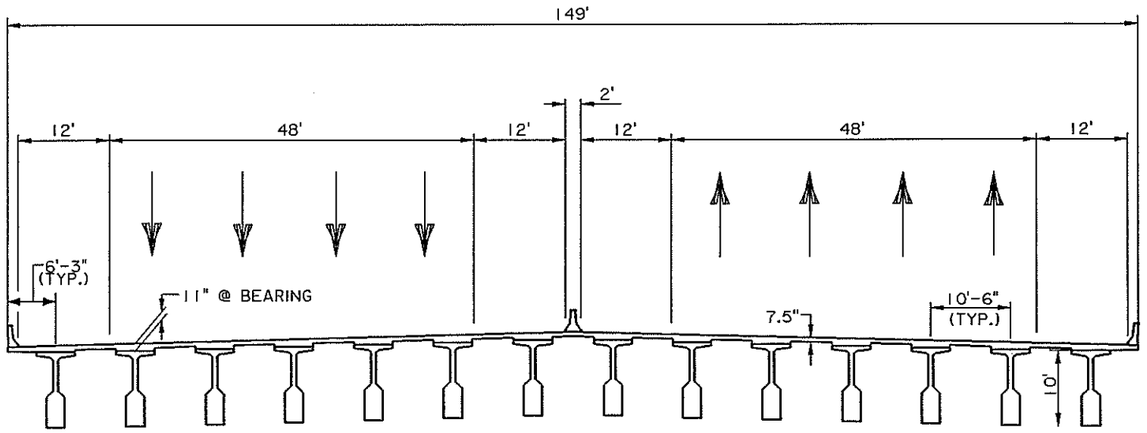
The Fuller Warren spans utilize modified Florida Bulb Tees that are supported by concrete girders which vary in depth from 6 feet, 8 inches at mid-span to 10 feet at the piers. Their spacing is from 9.1 feet to 10.4 feet. Each girder is made fully continuous by multi-phased post-tensioned.

For the Calcasieu River Bridge, the girder spacing was chosen to approximate those used on the Fuller Warren Bridge, but the spacing was adapted to meet the requirements of the various roadway widths for the various concepts used in the study. Spacing in the final design phase will be affected by the selection of alignment and alternate and how the structure will be phased constructed. For illustrative purposes, Figure 2-30 shows the preliminary layout for a concrete haunched girder main span for Bridge Concept A.

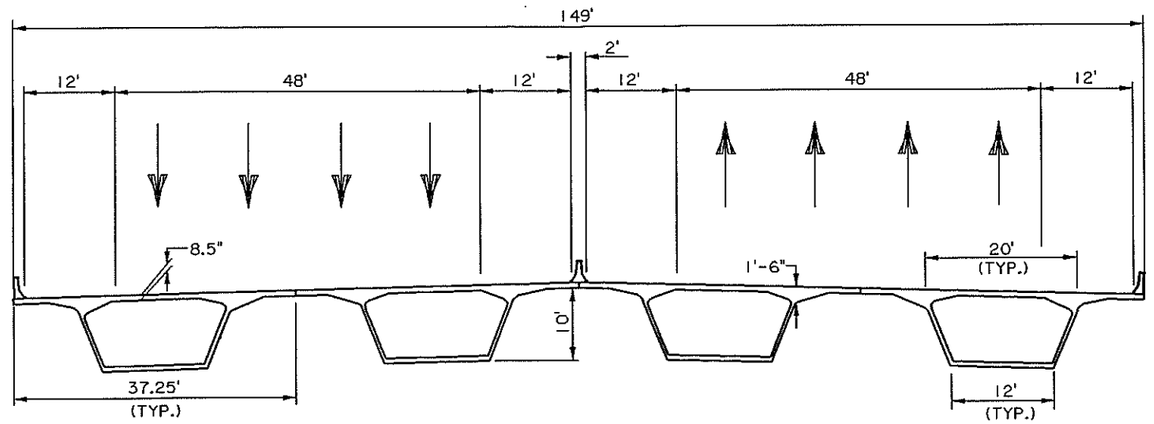
FIGURE 2-30

MAIN SPAN BRIDGE TYPES

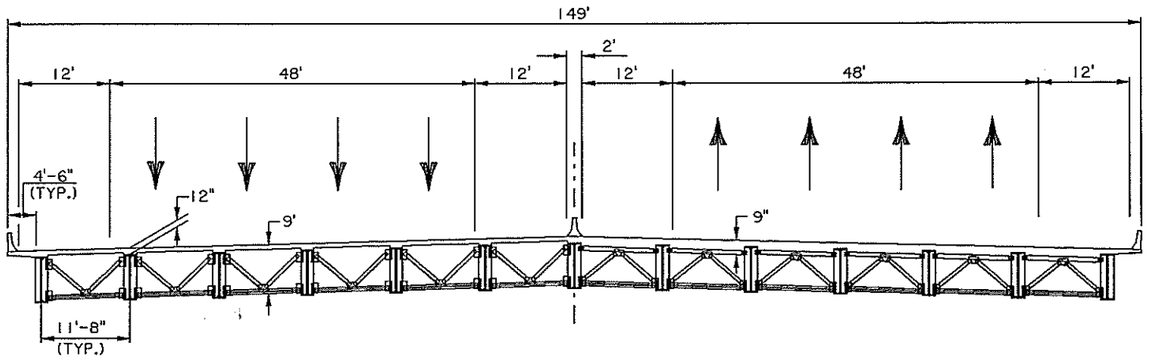
Concrete Haunched, Concrete Box,
Steel Plate, Steel Box



CONCRETE HAUNCHED GIRDER

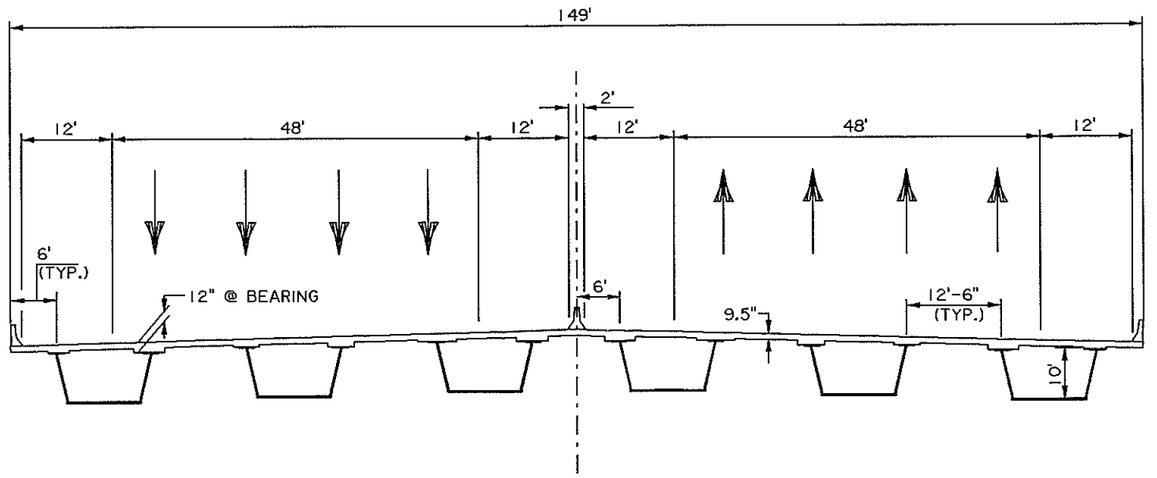


CONCRETE BOX GIRDER



Half Section at Intermediate Cross Frame Half Section at End Cross Frame

STEEL PLATE GIRDER



STEEL BOX GIRDER

2.5.3.2 Concrete Box Girders

Concrete box girders are being considered only for the main span crossing in this preliminary study. They can be used throughout the length of the bridge if aesthetics are preferred over economics. The river spans would be constructed by the balanced cantilever method while the spans over land could be constructed by the more economical span by span method. For Concept B, three individual boxes each direction approximately 32 feet in width each would provide adequate flexibility in accommodating entrance and exit ramps and would be economically feasible to construct. Concept A would require special configurations to accommodate entrance and exit ramps and would be less economically feasible because of varying box sizes. For illustrative purposes, refer to Figure 2-30 which shows the preliminary layout for the concrete box girders on the main span for Bridge Concept A.

2.5.3.3 Steel Plate Girders

Previous experience has shown that the wider the girders are spaced, the more economical the design. Spacing is limited, however, by the capabilities of the concrete deck. The use of a nine-inch thick deck and 12 feet 6 inch girder spacing was selected for this study. Girders would utilize A-709 Grade 50 steel. A-709 Grade 70 steel could be considered in the final design depending on whether it is cost effective. Higher strength steels are not recommended because of the exposure to marine impact and the possible need to heat straighten.

Although steel plate girders are feasible for the main river crossing, they are not as feasible for the approach spans due to economical reasons. Based on cost, concrete girder spans are the better choice for the approach spans. Steel would offer the opportunity for longer spans and aesthetics with a more open look under the bridge, should the Department decide to pursue that venue over the costs. For illustrative purposes, refer to Figure 2-30 which shows the preliminary layout for the steel plate girders on the main span for Bridge Concept A.

2.5.3.4 Steel Box Girders

The steel box girders would be a minimum of 84 inches deep so as to allow inspectors to walk through the boxes comfortably and inspect the steel and deck. Steel box girders offer the advantage of improved aesthetics, torsional rigidity, and less cross bracing between the girders. There is reduced maintenance to a large portion of the surface of the girders, as compared to steel I-girders, because the protected interior of the boxes requires less maintenance. Boxes also offer the opportunity for a lower profile on the longer spans, and they can easily be designed to allow a single box to carry diverging ramps. Refer to Figure 2-30 for an illustration of a steel box girder layout being considered for Bridge Concept A.

2.5.4 Approach Spans

The superstructure layouts of the approach spans have also been studied and discussed in the Preliminary Bridge Studies Technical Memorandum. Approach spans are all spans not included in the main span design. In this technical memorandum, they are assumed for cost analysis purposes, to consist of a seven inch thick concrete deck cast on standard 72 inch bulb tee girders that would be 135 feet in length for the higher spans and 125 feet in length for the lower spans. Although steel plate girder and steel box girder spans are constructible, they are not as economical as precast, prestressed 72 inch bulb tees.

Concrete spans, however, are very heavy and require additional foundation support. The use of concrete girder spans would be limited in the area of the Sampson Street interchange because it would not be feasible to try to frame concrete girder spans into the sides of other concrete girders due to the heavy loads involved. A complex array of bents would be required to utilize concrete girder spans in the interchange area. Steel spans would be better suited to this type of elevated intersection because of their framing capabilities and aesthetics may encourage the use of steel plate girders and steel box girders in the final design.

2.5.5 Use of Existing Piers

Studies conducted concerning constructing new piers and/or rehabilitating existing piers for the substructure of the bridge also were presented in the technical memorandum. Re-use of the piers may be an option for Centerline Alignments 1 and 2.

It was preliminarily reported that the foundation for the existing bridge is in good condition, and it is recommended that more investigation be done prior to making any decision to reuse the piers. Refer to the Appendix in the Preliminary Bridge Studies Technical Memorandum for the geotechnical analysis conducted on the existing piers and the recommendation on the issue.

For the new river piers, waterline footings are recommended. These footings would be more economical than constructing the pier with cofferdams in the river bottom. It was also stated in the technical memorandum that all piers in the river must be designed to adequately resist barge impact forces.

2.5.6 Additional Structure Modifications within Corridor

2.5.6.1 I-10 Overpass at PPG Drive

Structural improvements to the PPG Drive area of the corridor would include widening of the I-10 structures to the median side in order to accommodate three lanes of traffic plus a 12 foot shoulder on the inside while maintaining the existing ten foot shoulder on the outside. This would involve widening each of the existing structures eighteen feet. Eighteen feet of additional structure would provide each structure with an additional twelve feet lane plus an additional six feet of shoulder that when added to the existing six foot shoulder would provide twelve feet shoulders to the inside of each roadway. Because widening will be accomplished to the inside of the structures, the clearance over the railroad on the westbound lanes will be reduced unless the beams supporting the deck are reduced in depth as compared to those currently in place or unless the railroad grade is lowered. Refer to the technical memorandum for more information.

In addition, special consideration must also be given to a concept layout presented in the Preliminary Line and Grade Studies Technical Memorandum which involves relocation of the railroad to provide for a service road overpass. This would require the replacement of at least two existing prestressed girder spans using steel spans. More spans and bents may require replacement if analysis shows that the existing bents cannot carry the additional live loads imposed by the longer spans necessitated by the removal of an intermediate bent that conflicts with the railroad relocation. Refer to the Preliminary Line and Grade Studies and Bridge Studies Technical Memorandums for more information concerning the improvements presented for the PPG Drive interchange.

2.5.6.2 US 90 Overpass (West End)

One alternative being considered for the west end of the corridor includes modifications to the existing US 90 overpass. This alternative would involve widening the existing structure to handle two-way traffic. Under one of the alternatives, it is being proposed that the current one-way, two lane structure be converted to a two-way two lane structure instead. See Preliminary Line and Grade and Bridge Studies Technical Memorandums for an illustration of this concept layout and its description.

2.5.6.3 Sampson Street

For several of the alternatives considered, the construction of an elevated interchange at Sampson Street in Westlake could be built as a first phase and later incorporated into the construction of a new river bridge. Various alternatives for this interchange have been developed and are presented in the Preliminary Line and Grade Studies Technical Memorandum. The various structure types being studied for this area are presented in the Preliminary Bridge Studies Technical Memorandum.

An elevated interchange would involve a complex array of column bents or would require framing ends of ramp structures into the sides of other structures, creating complex torsion analysis of the span members. If it is decided to utilize the column bents to support the spans, the use of single column bents could improve the aesthetics in the area, and prestressed girders could be used in the superstructure. If framing at mid-span is the desired alternative, the spans could be made longer, thus reducing the number of bents. However, the more expensive steel spans must be utilized with framing. A box girder with many interior diaphragms would be required to resist the torsion.

2.5.6.4 Lakeshore Drive

Both sides of the existing I-10 structures at Lakeshore Drive would be widened for all concept layouts in order to keep the six lane freeway system consistent throughout the I-10 corridor and provide continuous 10 feet shoulders.

In addition to the widening, one layout used in conjunction with Bridge Concept D requires that both Lakeshore structures be lengthened to provide for vertical clearance over a proposed at-grade roadway providing access to the service roads. This reconstruction at Lakeshore Drive will require that mainline I-10 traffic be detoured to the opposite roadways while each structure is lengthened.

2.5.6.5 Ryan Street to Shattuck Street

The bridges between Ryan Street and Shattuck Street are proposed to be widened to both the inside and the outside of the existing structures. Additional pilings or drilled shafts must be used to lengthen the caps, and the cast in place girders and deck will then be added.

The structures between Ryan Street and Shattuck Street would be widened to provide shoulders on the bridges that will match the width of the approach roadway shoulders.

Many of the concept layouts for the east section of the project utilize U-turns for the one way frontage road system. These proposed U-turns are to be provided under the structures at Ryan Street, Kirkman Street, Enterprise Boulevard, and Shattuck Street. Figure 2-21 illustrates a typical section of the construction involved in creating the U-turns.

2.5.6.6 I-10 Modifications Over Abandoned Railroad

The inactivity and pending abandonment of the rail spur located parallel to V.E. Washington Street (Sta. 1646+00) could allow removal of the mainline I-10 overpass and adjacent ramp structures structure. By removing the overpass at the abandoned rail spur and replacing it with an at grade roadway, the area would meet current vertical geometric design standards set by AASHTO.

Removal of the existing I-10 mainline and ramp bridges in the area would eliminate the proposed bridge widening needed for the safety shoulders.

2.5.7 Preliminary Construction Assessment

2.5.7.1 Main Span Arrangements

145' – 155' – 155' – 145'

This layout requires using three river piers designed for barge impact and also using two fender systems that tie to the existing Union Pacific railroad fenders. This main span layout also may have an impact on navigation through the channel. The additional costs associated with the piers and the fender systems and the impact on navigation result in this layout being less feasible. This span configuration is shown in Figure 2-31.

210' – 210' – 210' – 210'

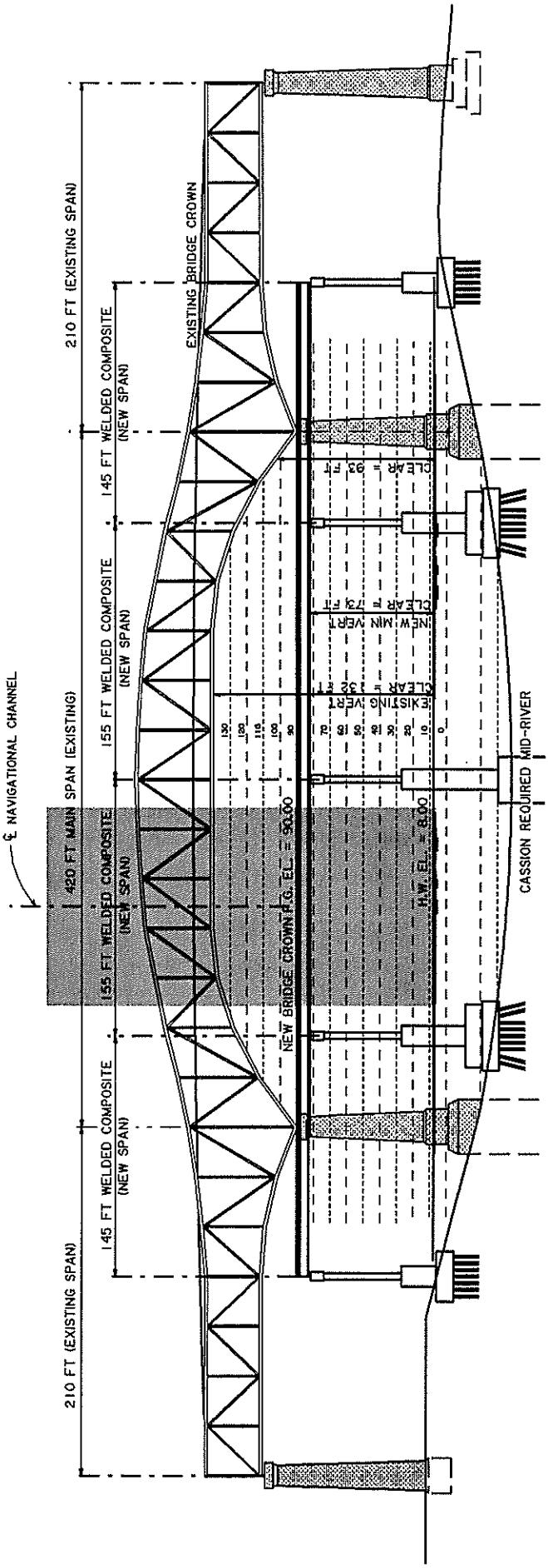
This span layout maintains similar lengths to the existing main span. An advantage of constructing this span layout is that for Centerline Alignments 1 and 2 the existing piers may be used with the lighter superstructure types. Spans of this length have been discussed with the Coast Guard, and public notice of a proposed 180 feet clear navigation channel was presented without significant objection. The 210 feet span would accommodate a clearance of this magnitude. Figure 2-32 shows this type of main span layout which utilizes the existing piers.

200' – 250 – 200'

The lengths of these spans require the use of two river piers. The 250 foot span could be either centered on the center of the existing railroad navigation channel or centered on the railroad bridge. Centering on the channel would provide more navigational clearance from the edge of the existing channel located at the railroad. The main piers would be river piers, and the piers at the ends of the unit would support both the main river spans and the approach spans from either bank. The end piers would be either land piers, or the eastern end could be a river pier in shallow water depending on the location selected for the 250 feet main span. This span layout is shown in Figure 2-33.

Figure 2-31

BRIDGE PROFILE
SPAN LENGTHS
145' - 155' - 155' - 145'



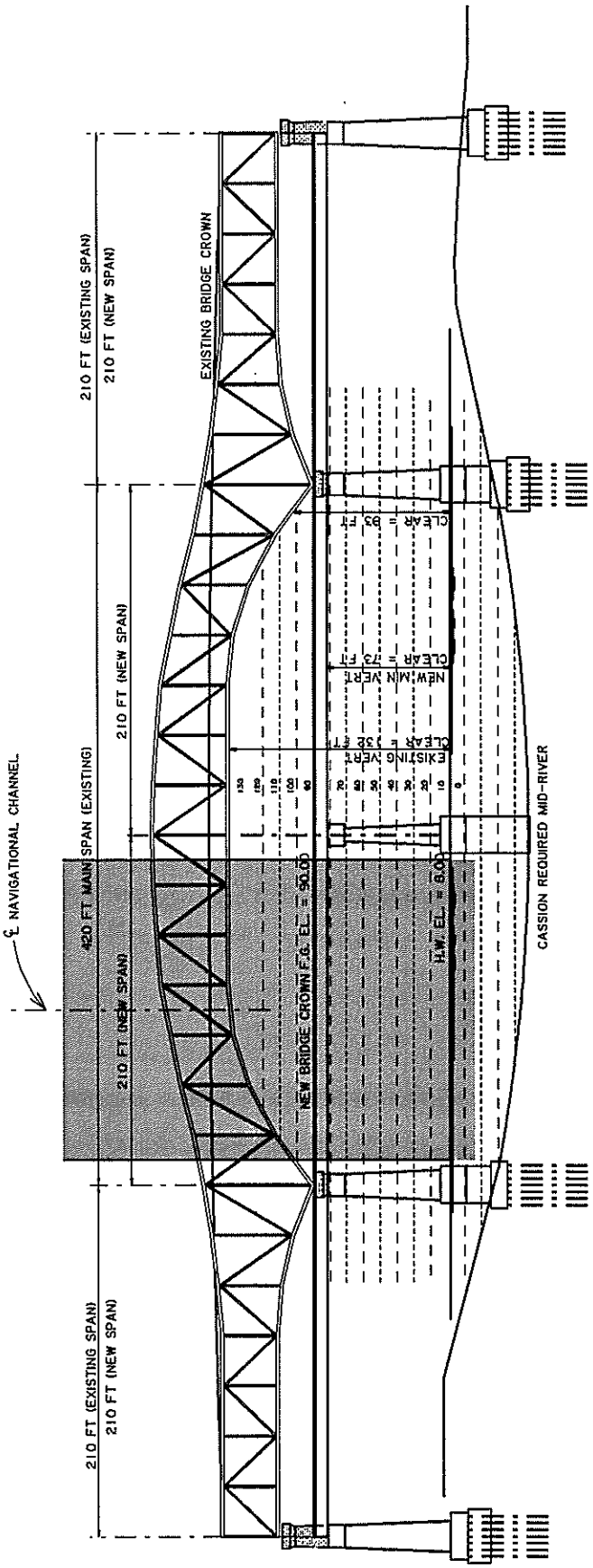
PROFILE AT CENTER OF MAIN CHANNEL
72" BULB-T CONCRETE GIRDER CONSTRUCTION

CALCASIEU RIVER - INTERSTATE 10 - LAKE CHARLES, LA
PROPOSED NEW STRUCTURE

HNTB

Figure 2-32

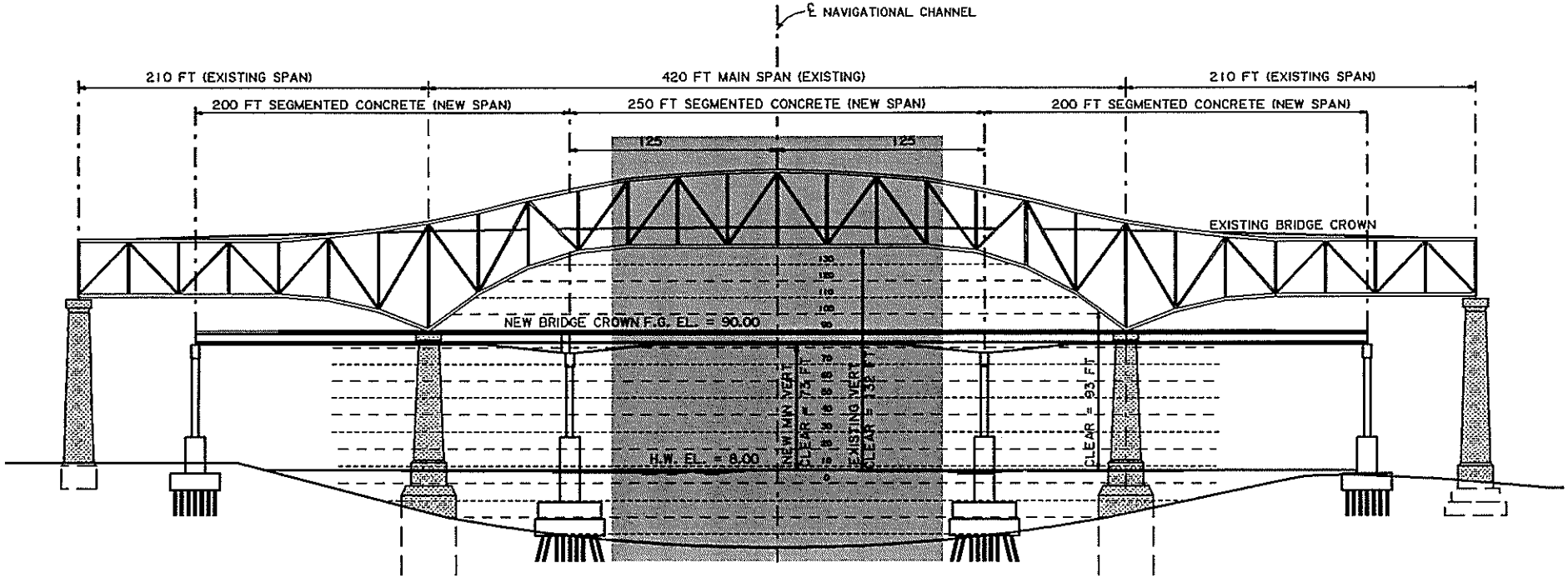
BRIDGE PROFILE
SPAN LENGTHS:
210'-210'-210'-210'



PROFILE AT CENTER OF MAIN CHANNEL
WELDED COMPOSITE STEEL GIRDER CONSTRUCTION SHOWN

CALCASIEU RIVER – INTERSTATE 10 – LAKE CHARLES, LA
PROPOSED NEW STRUCTURE

HNTB



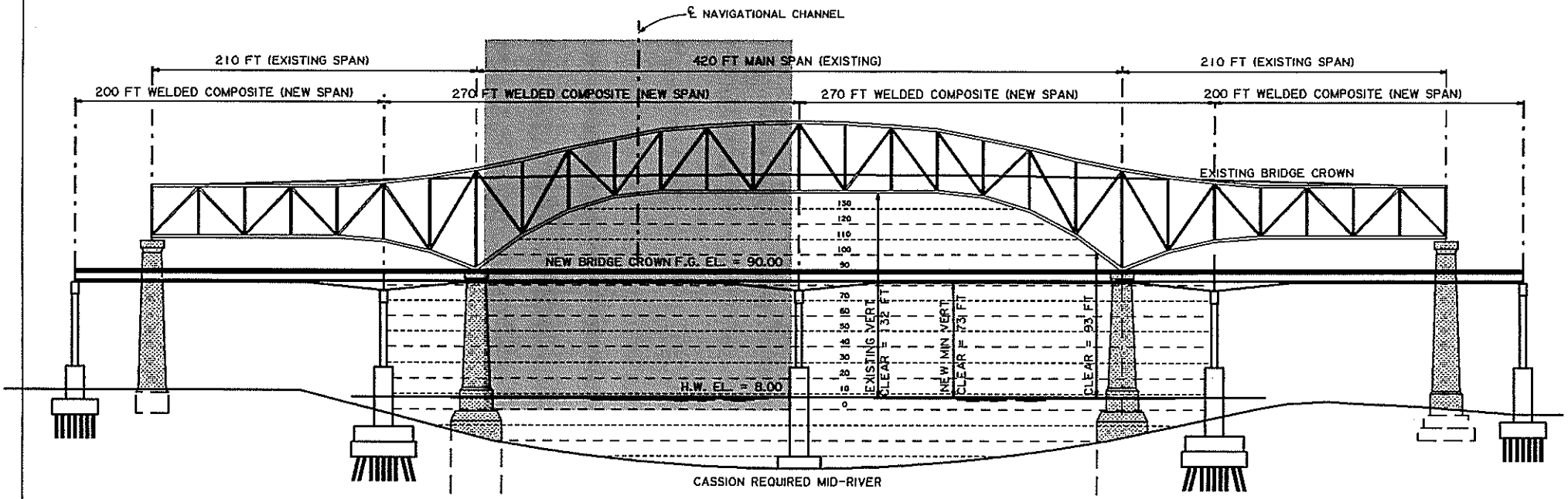
PROFILE AT CENTER OF MAIN CHANNEL
SEGMENTAL CONCRETE GIRDER CONSTRUCTION SHOWN

CALCASIEU RIVER - INTERSTATE 10 - LAKE CHARLES, LA
PROPOSED NEW STRUCTURE

BRIDGE PROFILE
SPAN LENGTHS
200' - 250' - 200'

Figure 2-33

HNTB



PROFILE AT CENTER OF MAIN CHANNEL
STEEL BOX OR CONCRETE GIRDER CONSTRUCTION SHOWN

CALCASIEU RIVER – INTERSTATE 10 – LAKE CHARLES, LA
PROPOSED NEW STRUCTURE

HNTB

BRIDGE PROFILE
SPAN LENGTHS:
200'-270'-270'-200'

Figure 2-34

200' – 270'– 270' – 200'

This layout was selected for consideration because it requires only one river pier and two piers at the shorelines. The span arrangement would provide adequate room for construction without interfering with the existing navigation channel. This span layout would work well with phased construction due to the offset from the existing piers. A haunched girder superstructure is not considered suitable for this layout using current design criteria due its long span lengths. However, utilization of high performance concrete may make the use of concrete haunched girders feasible. This span configuration can be seen in Figure 2-34.

2.5.7.2 Phased Construction

Phased construction of the main spans would be required for either Centerline Alignments 1 or 2. A new structure would be built adjacent to the existing bridge. Traffic would then be shifted to the new structure and the old bridge would be removed. The remainder of the new structure could then be built. The four bridge concepts under consideration on Centerline 3 would be constructed completely on new alignment while maintaining existing I-10 traffic on the existing bridge.

It would not be feasible to construct Bridge Concept 1A as a single structure, but it could be constructed using separate parallel structures. However, this would require the placing of one or more severe reverse curves on the eastbound roadway at the east end of the bridge to avoid taking of a portion of the beach property on the southeast quadrant of the bridge. The taking of recreation properties is not acceptable if other alternatives are available and placing reverse curves in the roadway alignment is undesirable from a geometric viewpoint. Centerline Alignment 2 offers the same benefits without having to separate the structures and avoids the beach property. Construction on Centerline Alignment 2 also allows the existing bridge to be removed more safely and easily.

Any of the girder types could be used to fit any layout, but steel plate girders would offer the most flexibility in constructing the spans. The decks are entirely cast-in-place and the required variations in the girder spacing, particularly in the flared areas, would make spans constructed with steel plate girders less difficult to design, fabricate, and construct than those built using box girders.

2.5.8 Preliminary Bridge Cost Estimates

2.5.8.1 Calcasieu River Bridge

The preliminary order of magnitude cost estimates for the bridge types and span lengths of the river bridge are shown in Table 2-4. Most span lengths listed in the table may be applied to all of the following superstructure types with the single exception of the 200'-270'-270'-200' span configuration which is not suitable for a haunched girder superstructure due to the long span lengths involved. Refer to the Preliminary Bridge Studies Technical Memorandum for more information on the unit costs used to derive the cost estimates.

Table 2-4
MAIN SPANS PRELIMINARY COST ESTIMATES
INCLUDING SUPERSTRUCTURE AND SUBSTRUCTURE*
(Per Square Feet)**

Span Lengths	Concrete Box Girder	Concrete Haunched Girders	Steel Box Girder	Steel Plate Girder
145'-155'-155'-145'	$157.80	$136.92	N/A	N/A
210'-210'-210'-210'	$123.69	$105.57	$124.95	$115.53
200'-250'-200'	$123.00	$112.81	$131.15	$118.59
200'-270'-270'-200'	$107.73	$107.03***	118.72	$105.19

*Bridge Concept A main span was used for these preliminary cost estimates.
**Costs do not reflect the possible reuse of existing piers.
***Will require high performance concrete.

2.5.8.2 Additional Structure Modifications within Corridor

Preliminary cost estimates for additional structure modifications within the corridor were also presented in the technical memorandum and are based on the level of detail of the concept layouts presented in the Preliminary Line and Grade Studies Technical Memorandum. The preliminary estimates have been prepared to provide order of magnitude comparisons of the various structure modifications associated with each concept layout presented in the Preliminary Line and Grade Studies Technical Memorandum. Tables 2-5, 2-6, and 2-7 describe the structure modifications involved with each concept layout and the preliminary cost estimate prepared for each.

Table 2-5
PRELIMINARY BRIDGE COST ESTIMATES
WEST SECTION LAYOUTS

SECTION		CONCEPT DESCRIPTION	PRELIMINARY COST ESTIMATES* ($Millions)				
			INDIVIDUAL BRIDGES				TOTALS
			PPG Drive Overpasses	Existing US 90	New Ramps	New Front. Rd.	
WEST							
W	1	DOTD Concept Two-Way Front. Rd.	*Widen 2 by 18'* **3 M**	-	*25' Structure over US 90* **1.5 M** *25' Structure over I-10* **2.3 M**	-	**6.8 M**
	2	Front. Rd. Overpasses One-Way Front. Rd.	*Widen 2 by 18'* **3 M** *Removal and Reconstruction of Bridge Segment* **1.2 M**	-	-	*2 @ 32' Structures* **7.7 M**	**11.9 M**
	3	Relocated R.R. Two-Way Front. Rd.	*Widen 2 by 18'* **3 M** *Removal and Reconstruction of Bridge Segment* **3 M**	*Widen by 8'* **0.6 M**	*25' Structure over Front. Rd.* **3.1 M**	-	**9.7 M**
	4	DOTD Concept (Modified) One-Way Front. Rd.	*Widen 2 by 18'* Cut back Fill **3 M**	-	*25' Structure over US 90* **1.5 M**	-	**4.5 M**

*Does Not Include Right-of-way Acquisition or Utility Relocation

Table 2-6
PRELIMINARY BRIDGE COST ESTIMATES
CENTRAL SECTION LAYOUTS

CONCEPT LAYOUT		CONCEPT DESCRIPTION*	Relocate RR Spur	PRELIMINARY COST ESTIMATES* ($Millions)					
				INDIVIDUAL BRIDGES					TOTALS
				Remove or Rehab. Existing River Bridge	New River Bridge	New Front.Rd. Bridge	Elevated Ramps	Elevated Sampson Street	
CENTRAL									
$C_{CL1,2}$	1	Elevated Diamond - Sampson St Two-Way Front. Rd. Bridge Concept A	X	3.8 M	68.8 M	-	18.8 M	8.8 M	100 M
	2	Elevated Diamond - Sampson St One-Way Front. Rd. Bridge Concept C	X	3.8 M	59.0 M	31.4 M	18.7 M	9.5 M	122 M
	3	Elevated Diamond - Sampson St Two-Way Front. Rd. Bridge Concept C	X	3.8 M	57.4 M	36.5 M	14.6 M	10.3 M	123 M
	4	Free Flow - Sampson St. One-Way Front. Rd. Bridge Concept A	X	3.8 M	68.5 M	-	28.7 M	3.2 M	104 M
	5	Elevated Diamond - Sampson St One-Way Front. Rd. Bridge Concept A		3.8 M	72.0 M	-	18.5 M	9.8 M	104 M
	6	Mike Hooks Connect. Sampson St. Two-Way Front. Rd. Bridge Concept C		3.8 M	69.5 M	33.5 M	14.0 M	11.0 M	132 M
	7	Mike Hooks Connect. Sampson St. One-Way Front. Rd. Bridge Concept C		3.8 M	69.5 M	33.5 M	14.3 M	12.0 M	133 M
C_{CL3}	8	Elevated Diamond - Sampson St Two-Way Front. Rd. Bridge Concept A	X	3.8 M	65.0 M	-	22.3 M	8.6 M	100 M
	9	Elevated Diamond - Sampson St One-Way Front. Rd. Bridge Concept C		3.8 M	65.0 M	21.9 M	32.9 M	8.6 M	132 M
	10	Elevated Diamond - Sampson St Two-Way Front. Rd. Bridge Concept C	X	3.8 M	57.0 M	21.9 M	32.6 M	9.8 M	125 M
	11	Elevated Diamond - Sampson St One-Way Front. Rd. Bridge Concept A	X	3.8 M	68.1 M	-	24.5 M	9.8 M	106 M
	12	Free Flow - Sampson St. One-Way Front. Rd. Bridge Concept C	X	3.8 M	57.0 M	18.9 M	57.6 M	3.2 M	140 M
	13	Elevated Diamond - Sampson St Two-Way Front. Rd. Bridge Concept D	X	35.8 M	57.8 M	-	16.5 M	15.8 M	126 M***

*Construction Cost for Bridge Concept B Is Taken to be Equivalent to Construction Cost Associated with Bridge Concept C

**Does Not Include Right-of-way Acquisition or Utility Relocation

***Includes maintenance cost required to rehabilitate the existing Calcasieu River Bridge for 50 more years of service.

Table 2-7
PRELIMINARY BRIDGE COST ESTIMATES
EAST SECTION LAYOUTS

SECTION		CONCEPT DESCRIPTION	PRELIMINARY COST ESTIMATES* ($Millions)							
			INDIVIDUAL BRIDGES							TOTALS
			Lakeshore Drive	Ryan Street	Bilbo Street	Kirkman Street	Enterprise Blvd.	V.E. Wash. Street	Shattuck Street	
EAST										
E	1	Existing Configuration Modified (WB Exit/EB Ent.)	*Widen 2 by 28'* 2.3 M	*Widen 1 by 16' 1 by 28'* 0.4 M	*Widen 1 by 16' 1 by 28'* 0.4 M	*Widen 1 by 16' 1 by 28'* 0.4 M	*Widen 2 by 16'* 0.4 M	*Widen 2 by 16'* 1.5 M	*Widen 2 by 8'* 0.2 M	5.6 M
	2	Existing Configuration Modified (WB Ent./EB Exit)	*Widen 2 by 28'* 2.3 M	*Widen 1 by 16' 1 by 28'* 0.4 M	*Widen 1 by 16' 1 by 28'* 0.4 M	*Widen 2 by 16'* 0.2 M	*Widen 2 by 16'* 0.4 M	*Remove Structures* 0.8 M	*Widen 2 by 16'* 0.3 M	4.8 M
	3	New Diamond Interchanges	*Widen 2 by 28'* 2.3 M	*Widen 1 by 16' 1 by 28'* 0.4 M	*Widen 1 by 16' 1 by 28'* 0.4 M	*Widen 2 by 16'* 0.2 M	*Widen 2 by 28'* 0 .8 M	*Remove Structures* 0.8 M	*Widen 2 by 8'* 0.2 M	5.2 M
	4	Existing Configuration Modified (WB Exit/EB Ent.) U-Turns	*Widen 2 by 28'* 2.3 M	*Widen 1 by 16' 1 by 28'* 0.4 M *U-Turns* 0.2 M	*Widen 1 by 16' 1 by 28'* 0.4 M	*Widen 1 by 16' 1 by 28'* 0.4 M *U-Turns* 0.3 M	*Widen 2 by 16'* 0.4 M *U-Turns* 0.3 M	*Remove Structures* 0.8 M	*Widen 2 by 8'* 0.2 M *U-Turns* 0.3 M	6.0 M
	5	Existing Configuration Modified (WB Ent./EB Exit) U-Turns	*Widen 2 by 28'* 2.3 M	*Widen 1 by 16' 1 by 28'* 0.4 M *U-Turns* 0.2 M	*Widen 1 by 16' 1 by 28'* 0.4 M	*Widen 2 by 16'* 0.2 M *U-Turns* 0.3 M	*Widen 2 by 16'* 0.4 M *U-Turns* 0.3 M	*Remove Structures* 0.8 M	*Widen 2 by 16'* 0.3 M *U-Turns* 0.3 M	5.9 M
	6	New Diamond Interchanges U-Turns	*Widen 2 by 28'* 2.3 M	*Widen 1 by 16' 1 by 28'* 0.4 M *U-Turns* 0.2 M	*Widen 1 by 16' 1 by 28'* 0.4 M	*Widen 2 by 16'* 0.2 M *U-Turns* 0.3 M	*Widen 2 by 28'* 0.8 M *U-Turns* 0.3 M	*Remove Structures* 0.8 M	*Widen 2 by 8'* 0.2 M *U-Turns* 0.3 M	6.2 M
	7	Accommodate Bridge Concept D Modifications to Ryan Street Improvements U-Turns	*Widen 2 by 28'* 2.3 M *Extend Structures* 3.8 M *Detours* 0.8 M	*Widen 1 by 16' 1 by 28'* 0.4 M *U-Turns* 0.3 M	*Widen 1 by 16' 1 by 28'* 0.4 M	*Widen 2 by 16'* 0.2 M *U-Turns* 0.3 M	*Widen 2 by 16'* 0.4 M *U-Turns* 0.3 M	*Remove Structures* 0.8 M	*Widen 2 by 16'* 0.3 M *U-Turns* 0.3 M	10.6 M

*Does Not Include Right-of-way Acquisition or Utility Relocation

2.6 INITIAL ENVIRONMENTAL SCREENING TECHNICAL MEMORANDUM

The Final Initial Environmental Screening Technical Memorandum was submitted to DOTD in December of 2001. The document provides the results of the initial environmental screening of the alternatives presented in the Preliminary Line and Grade and Bridge Studies Technical Memorandums. The preliminary evaluations and screenings have been completed with regard to environmental features and sensitive areas within the corridor. The following sections are an overview analysis of the major areas of study shown in the Initial Environmental Screening Technical Memorandum.

2.6.1 Cultural Resources

2.6.1.1 Potential Impacts to Archaeological Sites

Archaeological Site 16 CU128 may potentially be impacted by all build alternatives being studied for the proposed action, in particular those along Centerline Alignments 1 and 2. There is a moderate potential of prehistoric sites existing within the proposed project area. Because the proposed project area traverses Lake Charles, it is possible that prehistoric sites may be located within the proposed project area.

2.6.1.2 Potential Impacts to Important Standing Structures

The northeast corner of the Charpentier Historic District abuts the limits of the existing right-of-way. Additionally, all three cemeteries in the eastern terminus of the project study area also abut the existing right-of-way. These four sites will not be directly impacted by construction activities; however, secondary impacts from noise and traffic may potentially affect these areas. It should also be mentioned that the existing bridge may become eligible for the National Register of Historic Places (NRHP) since it is approaching 50 years of age. For purposes of this project, the bridge should be considered potentially historic.

2.6.2 Potential Hazardous Waste Impacts

As mentioned in the technical memorandum, there are two hazardous waste spills located in the project area. Through coordination with LaDEQ, it has been determined that no piles should be placed within the limits of these spills. In addition, any road surface work that may potentially occur in these areas should incorporate careful

planning to address risk concerns dealing with worker exposure and soil contamination. Further coordination with LaDEQ will be necessary as this project proceeds.

Other waste sites that occur within the existing and proposed right-of-way are discussed in the technical memorandum, and a complete list of all waste sites located within the project study area can be found in Appendix B of the Initial Environmental Screening Technical Memorandum.

2.6.3 Potential Impacts to Socioeconomic Features

At the macro level, the overall land use pattern within the study area would not change in a major way. However, the various alternative alignments would require additional right-of-way, and therefore would displace housing units and businesses.

West of the Calcasieu River, alternatives that would utilize Centerline Alignments 1 or 2 would displace the same number of businesses regardless of the Sampson Street interchange layout. There would be six (6) commercial sites displaced for the alternatives considered. These sites include: Circle K convenience store and gas station, Dairy Queen, Fina, two Isle of Capri Parking lots, and Isle of Capri Human Resources Building. The residential displacements in this area would vary depending on the Sampson Street interchange layout. The elevated diamond and directional free flow layouts would include three (3) residential displacements while the Mike Hooks elevated diamond layout would include these three displacements in addition to two more for a total of five (5) residential displacements. The number of displacements for the Sampson Street area are similar among the alternatives because existing access for residences and businesses from an at-grade Sampson Street would be denied with an elevated Sampson Street which is characteristic of all alternatives.

In addition to the displacements noted above, Alternatives utilizing Centerline Alignment 3 would displace some metal industrial buildings at the west edge of the Calcasieu River at Kile Street.

East of the Calcasieu River, alternatives that would utilize Centerline Alignment 1 would not require displacement of any additional residences or businesses. For all alternatives, one residence has the potential of being displaced near Ryan Street to accommodate alternatives using a U-turn east of the cross street between the one-way frontage roads.

Alternatives utilizing Centerline Alignments 2 or 3 would displace ten (10) businesses and one (1) public property to the east of the river. The businesses that would

be displaced are located to the north of the mainline along Lakeshore Drive between the river and Ryan Street and would include: Café Du Lac Restaurant, Travel Inn, American Fence, Steamboat Bill's Restaurant, Lakeview Motel, Plumbers and Steamfitters Retirement Office, Shriners Association, Casino Pawn Shop, Waffle House, Chevron convenience store and gas station.

The boat launch located directly north of the existing bridge approach is owned and maintained by the DOTD and therefore, may require the preparation of a Section 4(f) property evaluation. Based upon the preliminary phases for the line and grade and bridge studies, it was determined that all alternatives would have an affect on the boat launch mentioned because of its close proximity to the existing alignment of the main bridge. Although alternatives using Centerline Alignment 1 (the existing alignment) would have the least impact to the boat launch, construction of a new wider bridge would still interfere with the functionality of the boat launch. Alternatives which would bring the mainline further away from the boat launch to the south of the existing alignment were considered at this phase but were eliminated because they would cause greater impact at the Lake Charles public beach and marina area instead. It is likely that the boat launch can be reconstructed in the same proximity as a part of the new bridge project.

None of the concept layouts would require additional right-of-way along the south side of the existing highway. Thus, neither North Beach Park nor Bilbo Cemetery would be adversely impacted. In addition, Corporate Cemetery, the Hamilton Garden of Memories, and the four churches located near I-10 are located east of the areas where additional right-of-way would be required, so no taking impacts would occur.

2.6.4 Potential Impacts to Surface Water and Groundwater

The study area was found to be relatively free of features that may provide a rapid connection of surface water to the groundwater network. Nearly all of the runoff will be transmitted to surface waters. The area's public water is supplied from the Chicot Aquifer (Sole Source Aquifer) whose recharge is outside the study area. A large number of water wells exist in the study area, primarily industrial wells, as much of the area is heavy industry. Refer to the Initial Environmental Screening Technical Memorandum for an illustration of the present water well locations. Present regulations regarding well construction would prevent any contamination to local wells from surface contaminants. During the design phase, these wells will be identified, any impact remediated, and displaced wells plugged or replaced.

2.6.5 Potential Impacts to Wetlands

As can be seen in Tables 2-8 and 2-9 below, the palustrine marsh complexes to the east of Sampson Street near the I-10 mainline are the primary wetland habitats where the majority of impacts would occur. All three alignments encroach upon the wetland complexes located in this area. The proposed Centerlines 1 and 2 concepts offer the greatest potential for reducing wetland impacts in these areas. The majority of wetland impacts occur in the western terminus of the study area in the vicinity of Sampson Street. Smaller sized tracts are scattered throughout the remainder of the study area. Though all alignments are similar in terms of wetland impacts, concepts utilizing Centerlines 1 and 2 exhibit the least impacts to wetland communities in the project study area.

Table 2-8
POTENTIAL WETLAND IMPACTS BY COMMUNITY TYPE

Wetland Communities	Potential Impacts (Acres)		
	Concept Layouts for Centerline Alignments 1 & 2	Concept Layouts for Centerline Alignment 3	Mike Hooks Road Concept Layouts for Centerline Alignments 1 & 2
PFO	3.36	3.76	6.41
PFO/PSS	7.12	12.51	7.12
PEM	5.04	5.87	5.79
PEM/PSS	2.36	2.17	2.36
RIV	1.01	1.01	1.01
PSS	1.31	1.31	1.31
EEM	.20	.20	.20
TOTAL	20.40	26.83	24.20

Legend: PFO- Palustrine forested; PFO/PSS-Palustrine forested/ Palustrine scrub shrub; PEM-Palustrine emergent; PEM/PSS- Palustrine emergent/ Palustrine scrub shrub; RIV- Riverine; PSS-Palustrine scrub shrub; EEM- Esturine emergent.

2.6.6 Potential Impacts to Natural Communities

The technical memorandum also describes the potential impacts to the natural communities for the preliminary alternatives. There are many different types of impacts that may influence the natural communities throughout the corridor. The largest impacts to natural communities are caused indirectly through right-of-way acquisition and

directly through habitat modification and habitat fragmentation. The natural vegetation is impacted primarily by activities involved in preparing the right-of-way. In addition, the use and maintenance of the proposed new bridge and roadway may contribute to operational impacts. Operational impacts include spillage of fuels and lubricants and their dispersal into the natural environment, loss of wildlife by vehicle collision, and vegetation loss by herbicides and mechanical means. However, all of these potential operational impacts are already present along the existing bridge and approaches.

Although all the preliminary concepts have some impact on the natural communities in the corridor, it has been determined that concepts associated with Centerline Alignment 3 impact more acres of natural communities than the other alignments. Table 2-9 summarizes the acreage impacts to natural communities for all three alignments.

Table 2-9
POTENTIAL IMPACTS
TO NATURAL COMMUNITIES

Natural Communities	Potential Impacts (Acres)		
	Concept Layouts for Centerline Alignments 1 & 2	Concept Layouts for Centerline Alignment 3	Mike Hooks Road Concept Layouts for Centerline Alignments 1 & 2
Bottomland Hardwood	3.36	3.76	6.41
Bottomland Hardwood/ Scrub Shrub Swamp	7.12	12.51	7.12
Freshwater Marsh	5.04	5.87	5.79
Freshwater Marsh/ Scrub Shrub Swamp	2.36	2.17	2.36
Scrub Shrub Swamp	1.31	1.31	1.31
Brackish Marsh	.20	.20	.20
TOTAL	19.39	25.82	23.19

* Source: "The Natural Communities of Coastal Louisiana", The Louisiana Natural Heritage Program.

2.6.7 Potential Impacts to Fauna

Potential impacts to fauna are also described in the technical memorandum. Due to the industrialized/urbanized nature of the study area, much of the wildlife habitat previously has been encroached upon. The areas to the east of Sampson Street are the primary habitat blocks that would be affected by the build alternatives for the proposed action. Concepts utilizing Centerline Alignments 1 and 2 offer the greatest opportunity for avoidance of direct impacts to wildlife habitat and also minimize habitat fragmentation. None of the proposed alignments require substantial clearing of right-of-way in large, contiguous forested areas, thus reducing any serious fragmentation-related impacts to species known to inhabit these areas.

2.6.8 Potential Impacts to Threatened and Endangered Species

The technical memorandum indicates that no rare, threatened, or endangered species or critical habitats were found or recorded within the study area.

2.6.9 Potential Impacts to Natural Areas

No state or federal parks, wildlife refuges, scenic streams, or wildlife management areas are known at this project location.

2.6.10 Potential Impacts to Floodplains

The study site encompasses several areas identified as floodplains on Calcasieu Parish Flood Insurance Rate Maps (FIRM). Refer to the Initial Environmental Screening Technical Memorandum for descriptions and illustrations of the floodplains in the area. These designated areas will encroach upon limits of the 100-year floodplain (FIRM Zone AE, special flood hazard areas). No regulatory floodways were designated on Calcasieu Parish FIRM maps. Upon completion of the project design, hydraulic data and construction plans will be submitted to Calcasieu Parish for review, approval, and permitting as specified by local floodplain ordinances.

2.6.11 Potential Impacts to Prime Farmlands

Since the study area is located in a predominantly urban corridor, no lands under cultivation for crops or in use as tame pasture were observed. However, the current Calcasieu Parish Soil Survey Report (Soil Survey 1982) indicates several small parcels of undeveloped land containing prime farmland soils. As this project proceeds, further coordination with the Natural Resource Conservation Service (NRCS) will be necessary

to verify that the project complies with the provisions of the Farmland Protection Policy Act of 1984.

2.6.12 Air and Noise Quality

As noted in the Initial Environmental Screening Technical Memorandum, construction activities for this project will cause minor short-term air quality impacts in the form of dust from earthwork and unpaved roads and smoke from open burning. These impacts will be minimized by adherence to all state and local regulations and to the DOTD Standard Specifications for Road and Bridge Construction. Future environmental documentation will include air quality modeling that will be coordinated with the Imperial Calcasieu Regional Planning and Development Commission (IMCAL).

The complete procedure for measuring existing noise quality and predicting the noise quality of new construction in a study area is described within the Existing Environmental Factors and Initial Environmental Screening Technical Memorandums. Actual measurement of existing noise levels will occur as part of any future environmental documentation beyond this feasibility study. The FHWA's Noise Abatement Criteria (NAC) and DOTD's Highway Traffic Noise Policy will be used in the analysis of the acoustic impact of the proposed action can be assessed and the needs for abatement measures determined. Previous experience indicates that for such an interstate highway as exists in Lake Charles with the current traffic levels and vehicle mix, noise levels in excess of the 71 decibels for the A-weighting scale (dBA) may be experienced approximately 450 feet from the existing I-10 mainline.

CHAPTER 3

EVALUATIONS AND RECOMMENDATIONS FOR FURTHER STUDY

Chapter Three

EVALUATIONS AND RECOMMENDATIONS FOR FURTHER STUDY

An evaluation process to consider the numerous factors involved in the study process has been devised to recommend the most viable alternatives for further study based upon the findings from the preliminary studies, which have been documented in the technical memorandums (see Chapter 2). The evaluation process includes breaking down the alternatives into various decision categories, with each category evaluated separately based on the engineering and environmental factors influencing the category. For example, there are three centerline alignment alternatives being considered. All alignments can be used in any combination with alternatives grouped in the other decision categories (bridge typical section, bridge type, concept layout, etc). Therefore, the centerline alignments have been compared to one another independently of the other decision categories. The alignment with the best overall rankings compared to the other alignments would most likely be recommended for further study along with the other alternatives receiving the best overall ranking within the other decision categories. In some decision categories the highest ranked alternative within a decision category may not be recommended depending on intangible factors as discussed in the associated text.

The Evaluations Matrix shown in Table 3-1 presents the evaluations used to rank alternatives from each category. A recommendation is then given for the alternatives to be carried forward for further study in the refined phase of the project. The multiple alternatives within each decision category along with the engineering and environmental factors used to evaluate each are listed in the table. The rankings for the alternatives are "1", "2", "3", etc. with "1" denoting the most desirable alternative for the group based on the factor at hand. Quantitative values (i.e. construction cost, number of displacements, number of sites/acres impacted, etc.) are shown in the table for factors in which the information is available and useful.

Table 3-1

EVALUATIONS MATRIX

I-10 CALCASIEU RIVER BRIDGE AND APPROACHES
S.P.No. 700-10-0115
F.A.P.No. BR-10-1(212)29

DECISION CATEGORIES	ALTERNATIVES	ENGINEERING FACTORS: Construction Cost ($)	Length of New Construction	Real Estate Cost ($)	Maintenance Cost	Navigation	Aesthetics	Phased Construction (Samp.St.)	Constructability (River Bridge)	Use Existing Piers	Traffic Service (Casinos)	Traffic Service (Industry)	Traffic Service (Westlake)	Traffic Service (Downtown)	Mainline Operations	Interchange Operations	RR Spur Reloc.	ENVIRONMENTAL FACTORS: 50 yr. Structures Impacted (Bridge)	Archaeological Sites	Tanks and Other Waste Sites	Haz. Spill Sites	Displacements (# Res.)	Displacements (#Comm.)	Displacements (# Public)	Surface / Ground Water	Wetland Impacts (Acres)	Natural Communities Impacted	Impacts to Fauna	Impacts to Threatened / Endangered Species	Floodplains Impacts	Farmland Impacts	Noise and Air	OVERALL RATING	RECOMMENDED ALTERNATIVES FOR FURTHER STUDY
ALIGNMENT	Centerline Alignment 1		1	1 (6.6 M)			2		3	1									(0)	1 (4)	3	(2)	1 (6)	1 (0)		1 (20.40)	1	1					3	
	Centerline Alignment 2		2	2 (18.3 M)			2		2	1									(1)	2 (8)	2	(2)	2 (16)	2 (1)		1 (20.40)	1	1					2	
	Centerline Alignment 3		3	3 (21.6 M)			1		1	3									(1)	2 (8)	1	(2)	3 (17)	2 (1)		3 (26.83)	3	3					1	Centerline Alignment 3
RIVER BRIDGE TYPICAL SECTION	Bridge Concept A	1 (76 M)			1			1	4	1	3	3	3	3	4			2 (1)															1	Concept A
	Bridge Concept B	2 (95 M)			2			1	3	1	1	1	1	1	1			2 (1)															3	
	Bridge Concept C	4 (104 M)			3			1	2	1	1	1	1	1	1			2 (1)															2	Concept C
	Bridge Concept D	3 (100 M)			4			4	1	4	4	4	4	4	3			1 (0)															4	
BRIDGE TYPE	Concrete Haunched Girders	1 (97/SF)			2		4		3																								2	
	Concrete Box Girders	3 (108/SF)			1		1		3																								3	
	Steel Box Girders	4 (119/SF)			3		1		1																								1	Steel Box Girders
	Steel Plate Girders	2 (105/SF)			4		3		2																								4	
MAIN SPAN ARRANGEMENTS	145' - 155' - 155' - 145'	4 (137/SF)				4	4			2																							4	
	210' - 210' - 210' - 210'	2 (106/SF)				3	2			1																							3	
	200' - 250' - 200'	3 (113/SF)				2	3			2																							2	
	200' - 270' - 270' - 200'	1 (105/SF)				1	1			2																							1	200' - 270' - 270' - 200'
BRIDGE PROFILE*	Profile 1	1 (68.7 M)	1					2								1	3 (Y)																2	
	Profile 2	2 (75.5 M)	2					1								2	1 (N)																1	Profile 2
	Profile 3	3 (83 M)	3					2								3	1 (N)																3	
WEST END (PPG AREA)	DOTD Concept Two-Way	2 (11.4 M)									3	1	3			1	1 (N)									1	1						2	DOTD Concept Two-Way
	DOTD Concept (Modified) One-Way	1 (9 M)									1	3	1			1	1 (N)									2	2						1	One-Way
	Frontage Road Overpasses One-Way	4 (17.2 M)									1	3	1			3	3 (Y)									4	4						4	
	Railroad Relocation Two-Way	3 (15.1 M)									3	1	3			3	3 (Y)									3	3						3	
SAMPSON ST. INTERCHANGE	Elevated Diamond** One-Way	1		1				1			1	4	1			2	1 ***			(2)	3	1 (3)	(6)			1	1						1	Elevated Diamond** One-Way
	Two-Way	1		1				1			1	1	1			4	1 ***			(2)	4	1 (3)	(6)			1	1						2	Two-Way
	Mike Hooks Rd. Elevated Diamond*** One-Way	3		5				3			4	5	4			3	1 (N)			(2)	1	4 (5)	(6)			4	4						3	
	Two-Way	3		5				3			4	2	4			5	1 (N)			(2)	2	4 (5)	(6)			4	4						4	
	Directional Free Flow Layout One-Way	5		3				5			3	3	3			1	5 (Y)			(2)	5	1 (3)	(6)			3	3						5	
EAST SIDE U-TURNS	U-Turns	2 (1.5 M)												1		1				2 (2)		2 (1)											1	U-Turns
	No U-Turns	1 (0 M)												2		2				1 (0)		1 (0)											2	
EAST SIDE INTERCHANGES	Existing Configuration Modified WB Exit / EB Ent.	1 (0.02 M)														3				1 (0)													1	Existing Configuration Modified WB Exit / EB Ent.
	WB Ent. / EB Exit	1 (0.2 M)														2				1 (0)													2	
	New Diamond Interchanges	2 (1.2 M)														1				2 (1)													3	
MAINLINE PROFILE @ RR	Widen Existing I-10 at Abandoned RR	1 (1.5 M)														2				(1)													2	
	Proposed At-Grade I-10 at Abandoned RR	2 (2.3 M)														1				(1)													1	At-Grade I-10 @ Abandoned RR
RYAN ST. I/C	Keep Ryan St. Improvements Two-Way	1 (2.3 M)												2		2																	2	
	Modify Ryan St. Improvements One-Way	2 (3.5 M)												1		1																	1	Modify Ryan Street Improvements One-Way

KEY:

=This engineering/environmental factor does not significantly influence the evaluation of the alternative being analyzed due to minimal affects on the alternative or because there is insufficient information at this phase.

*Construction cost for each bridge profile includes preliminary cost to remove existing bridge.
**The one and two way alternatives for the Elevated Diamond interchange at Sampson Street can be used with Bridge Profile 1 or Bridge Profile 2. See Figure 2-1.
***Mike Hooks Elevated Diamond interchange alternatives at Sampson Street use Bridge Profile 3 ONLY. See Figure 2-1.

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By comparing the results of the rankings and the relative level of importance for the factors influencing them, an alternative within each category has been recommended for further study. In some cases the two highest ranked alternatives have been recommended to be carried forward. The following text describes the engineering and environmental reasoning used for the evaluations depicted in Table 3-1, and also presents the recommended alternatives complete from one end of the project to the other for further study.

3.1 EVALUATION OF CENTERLINE ALIGNMENTS

The following evaluations, which are shown in Table 3-1, have been made regarding the centerline alignments being considered for the project. The bases for these evaluations are summarized below. For more detailed descriptions of Centerline Alignments 1, 2, and 3 refer to Section 2.3.2 and the Preliminary Line and Grade Studies Technical Memorandum. Also, see Figure 2-3 for an illustration of the alignments.

3.1.1 Length of New Construction

There is an increase in length of new construction for Centerline Alignment 3 concept layouts versus Centerline Alignments 1 and 2 concept layouts. The basis for this is that Centerline Alignment 3 diviates from the existing alignment more than any other alignment. In comparison, Centerline Alignment 1, which closely follows the existing alignment, requires the least amount of new construction. The difference in length for Centerline Alignment 3 versus Centerline Alignment 1 is not considered a significant factor in the evaluation process.

3.1.2 Real Estate Cost

The DOTD real estate field studies, which are on file at the Department, present the real estate cost estimates associated with the worst case for concept layouts associated with each centerline alignment. The real estate cost estimates shown in the matrix include total estimates of relocation assistance, land, improvements, and damages associated with each alignment alternative. Centerline Alignment 1 is closest to the existing alignment, and therefore, the real estate cost will be less than the other alignments. Centerline Alignments 2 and 3 relocation assistance costs are higher due to the additional proposed rights-of-way required for these alignments. However, there is only a marginal difference between real estate cost estimates for the worst case concept layouts for Centerline Alignments 2 and 3.

3.1.3 Aesthetics

Centerline Alignment 3 has more opportunities for improving the aesthetics in the beach/marina area. This alignment brings the I-10 mainline farthest to the north, and therefore, makes room to the south of the proposed mainline for recreational improvements. Proposed improvements may include a landscaped boulevard, a pedestrian walk, and possibly a mitigation pond.

3.1.4 Use Existing Piers

If the main span arrangement chosen for design would correlate to the existing pier locations, Centerline Alignments 1 and 2 may permit the use of the existing piers since they are in close proximity to the existing alignment of the river bridge. Although the preliminary studies have shown that using the existing piers is viable, they have not determined the desirability of this. Additional investigations would need to be conducted to determine this. Centerline Alignment 3 would not be able to utilize the existing piers because it is far removed from the existing bridge.

3.1.5 Tanks and Other Waste Sites

Centerline Alignment 1 would potentially impact four total waste sites throughout the corridor which would consist of one aboveground storage tank, one former dry cleaning facility, one former auto repair shop, and one former drill well site. Centerline Alignments 2 and 3 would potentially impact four additional waste sites east of the river (one former drill well site and three potential underground storage tanks) for a total of eight waste sites. Refer to the Environmental Screening Technical Memorandum for more information concerning waste sites affected by the various alternatives.

3.1.6 Hazardous Spill Sites

When considering interchange alternatives at Sampson Street, Centerline Alignment 3 helps to avoid the potentially dangerous chemical spill located just south of Sampson Street. This is a highly sensitive area, and therefore, it has been recommended by LaDEQ representatives that construction in the vicinity should be avoided. Construction along Centerline Alignment 1 has the lowest rating for this factor because it is more likely to encroach into the area of contamination regardless of which concept layout is chosen for the Sampson Street interchange. None of the other spill sites identified in the corridor will be impacted for any of the centerline alternatives. Refer to Section 2.6.2 or the Environmental Screening Technical Memorandum for more discussion of hazardous spill sites in the corridor.

3.1.7 Displacements

Each of the three centerline alignments have the potential to displace three (3) residences. However, Centerline Alignments 2 and 3 have more commercial and public displacements than Centerline Alignment 1, since Centerline Alignment 1 does not require a great deal of right-of-way acquisition. Therefore, Centerline Alignment 1 is the most desirable based on the number of commercial and public displacements involved. For more detail on the displacements that would occur with the alignments refer to Section 2.6.3 and the Environmental Screening Technical Memorandum.

3.1.8 Wetland Impacts

Wetland impacts are considered minimal due to the low quality and the impacted acreage does not vary greatly among the alignments. Centerline Alignments 1 and 2 have the lowest acreage of wetlands impacted within the corridor (approximately 20.40 acres). Centerline Alignment 3 impacts the most wetlands (approximately 26.83 acres). These worst case conditions for wetland impacts are reported in the Environmental Screening Technical Memorandum. Section 2.6.5 also contains a brief description of the impacts to the wetlands in the corridor.

3.1.9 Natural Communities

The impacts to natural communities do not vary greatly among different alignments, and are considered minimal. However, Centerline Alignments 1 and 2 impact the least number of acres containing natural communities, while Centerline Alignment 3 impacts the most acres. This is due to the greater amount of proposed right-of-way needed for Centerline Alignment 3. Section 2.6.6 and the Environmental Screening Technical Memorandum discuss the minimal effects to natural communities by the alignments.

3.1.10 Impacts to Fauna

Centerline Alignments 1 and 2 impact the least fauna in the area, while Centerline Alignment 3 impacts the most fauna, although the impacts are minimal. There is more impact for Centerline Alignment 3 due to the greater amount of proposed right-of-way needed. See Section 2.6.7 or the Environmental Screening Technical Memorandum for more information regarding the impacts to fauna.

3.1.11 Conclusions

From the evaluations presented above, it can be concluded that Centerline Alignment 3 for the new river bridge is more conducive for the project compared to Centerline Alignments 1 and 2. One major factor for selecting Centerline Alignment 3 compared to the other alignments is its practicality. Structurally, Centerline Alignment 3 is easier to build, requires the least amount of time for construction, and involves the least liability. Another major factor is that it avoids the chemical spill near Sampson Street. Therefore, it is recommended that Centerline Alignment 3 move forward to the refined stage of the project in conjunction with the other alternatives chosen for further study. Although Centerline Alignment 3 has been reported as having more negative effects regarding several of the environmental factors, in most cases these are not consequential compared to Centerline Alignments 1 and 2. One exception is in the area of business displacements. To minimize impacts, it is recommended that Centerline Alignment 3 be modified as needed during the refined studies to decrease the amount of proposed right-of-way, especially on the east side of the bridge approach where there is more flexibility in the design.

3.2 EVALUATION OF BRIDGE TYPICAL SECTIONS

The bridge concepts considered for the typical section of the new bridge (Bridge Concepts A, B, C, and D) are described in Section 2.3.3 and are shown in Figures 2-4 through 2-7.

3.2.1 Construction Cost

The preliminary construction cost estimates shown in Table 3-1 were calculated using an average length of structure for all bridge concepts the bridge widths of the various concepts, and the number of main spans for each concept. The bridge concept with the lowest cost is Bridge Concept A. This bridge concept involves constructing an eight-lane structure. Utilizing Bridge Concept A is least expensive because it has the least total width (eight lanes versus ten lanes). Bridge Concept D is estimated to have the least capital cost. However, when factoring in the maintenance cost associated with rehabilitating the old bridge for 50 more years of service Bridge Concept D becomes more expensive than Bridge Concept A. This is due to the maintenance costs associated with this alternative to repair the section losses and structural damage that has been imposed by climatic conditions in the area.

Bridge Concept C, which involves building one main structure with two smaller structures as frontage roads, is considered the most expensive because it involves the widest structure.

3.2.2 Maintenance Cost

The maintenance cost associated with using Bridge Concept D is considerably greater compared to the other concepts, and therefore, receives the lowest ranking for the category. The majority of the maintenance cost required for this bridge concept is due to the improvements needed for the nearly 50-year-old existing bridge (to accommodate frontage road traffic) as mentioned in Section 3.2.1. The other concepts have been ranked according to the amount of maintenance they may encounter after years of service. Bridge Concept A, the narrowest bridge, is expected to require the least amount of maintenance, while Bridge Concept C, which involves constructing a total of three structures, is predicted to require a greater amount of maintenance.

3.2.3 Phased Construction (Sampson Street)

Bridge Concept D would not allow for the economical construction of the Sampson Street interchange prior to the I-10 mainline, because much of the Sampson Street interchange construction would need to be removed and reconstructed when the new I-10 mainline is added at a later date. For this bridge concept, the new bridge on an offset alignment would need to be constructed first, the traffic then moved to the new structure, and only then could the interchange be built. The existing bridge would then be lengthened and rehabilitated to allow the newly constructed Sampson Street interchange to tie into the reconstructed portion of the existing I-10 river bridge. Each of the other bridge concepts (A, B, and C) offer equal opportunity for economical phased construction of the Sampson Street interchange.

3.2.4 Constructability (River Bridge)

From a constructability viewpoint, Bridge Concept D is the most desirable. This concept allows the construction of the new structure in one phase, thus reducing the time required for the new construction. Also, since it is located away from the traffic, it will cause less interference and, as a result, there will be reduced liability associated with this concept. The refurbishing of the old structure would, of course, be a second phase. But again, the liability would be relatively small where traffic is concerned.

The ranking of constructability for the other bridge concepts is more difficult to determine without specifying a centerline alignment. Overall, Bridge Concept A is the least desirable regarding constructability mainly due to the close proximity to traffic during construction for Centerline Alignments 1 and 2.

3.2.5 Use Existing Piers

Bridge Concept D would not allow using the existing piers for new construction because the existing bridge would remain and be rehabilitated for frontage road traffic, and a new bridge would be built for mainline traffic. All other bridge concepts (on Centerline Alignments 1 and 2) would be able to use the existing piers for new construction if an accommodating span arrangement is selected.

3.2.6 Traffic Service

Bridge Concepts B and C would provide the most beneficial traffic service to the areas both to the east and the west of the river. These typical sections include a main river bridge for the mainline with six lanes of traffic and two lanes of frontage road traffic running parallel to the mainline in both directions. Having the frontage road traffic separate from the mainline would maintain continuity of the frontage roads across the river which would help alleviate congestion and weaving conflicts that may occur on the mainline with Bridge Concept A.

Bridge Concept D received the lowest rating for traffic service which is primarily because the Sampson Street interchange would not operate as efficiently.

3.2.7 Mainline Operations

Bridge Concepts B and C, which utilize a frontage road system across the river instead of auxiliary lanes, would be most beneficial to the mainline operations. The weaving conflicts associated with Bridge Concept A having an auxiliary lane on the river bridge would be eliminated by using the frontage roads. Bridge Concept D would also be more favorable than Bridge Concept A because it would not have a weaving section across the river.

3.2.8 50 Year Standing Structures Impacted

Since the existing I-10 Calcasieu River Bridge was constructed over 50 years ago, it may be considered potentially eligible to be declared a historic bridge. Bridge Concept D

is the only bridge concept that would not require removing the 50-year-old standing structure and therefore receives the highest rating.

3.2.9 Conclusions

From the evaluations presented above, it can be concluded that more study should be performed on Bridge Concepts A and C. Bridge Concept B has not been recommended for further study, although it would provide the same levels of service as Bridge Concept C, because it would not be as practical from a geometric or constructability viewpoint. Bridge Concept D was not recommended for further study mainly because it would not allow for phased construction at Sampson Street. In addition, the cost associated with Bridge Concept D (including the maintenance cost to rehabilitate the existing bridge) would not be significantly lower than the other alternatives. There are two recommendations for this decision category because it has not been determined from the preliminary studies whether using the more expensive Bridge Concept C would be necessary to meet the future traffic demands in the area, or whether Bridge Concept A will be adequate. During the next phase, more detailed traffic analysis will help to determine which bridge concept is most desirable for the area's traffic needs.

3.3 EVALUATION OF BRIDGE TYPES

The different bridge type configurations studied for the new bridge (concrete haunch, concrete box, steel box, and steel plate) are discussed in Section 2.5.3, and examples are shown in the Preliminary Bridge Studies Technical Memorandum for each bridge concept. For illustrative purposes, Figure 2-30 shows examples of the bridge types that may be used in conjunction with Bridge Concept A.

3.3.1 Construction Cost

The preliminary cost estimates in the Preliminary Bridge Studies Technical Memorandum indicate that concrete haunched girders for the main bridge are the most economical. The cost estimates listed in Table 3-1 include both the superstructure and the substructure for each bridge type and are the minimum costs reported for the various span arrangements. The steel box type proves to be most expensive per square foot than the other types being considered. Refer to the Preliminary Bridge Studies Technical Memorandum for more discussion on the bridge types being considered and associated cost estimates.

3.3.2 Maintenance Cost

It is generally accepted that concrete girders require less maintenance than steel girders, particularly when the steel is painted. If steel girders are used, they should be painted for aesthetic reasons. Steel box girders have less exposed surface area and less cross bracing than steel I-girders, and boxes would therefore have less maintenance requirements.

3.3.3 Aesthetics

Aesthetics should be a consideration for this project because the river bridge is highly visible and is a local landmark. The project crosses the Calcasieu River just to the northwest of Lake Charles' downtown area and is near the Convention Center in Lake Charles. The project is also located near the entrance into Westlake. The longer span lengths and more slender column bents allowed by the use of steel spans is more pleasing than the appearance of the many prestressed girders and their supports. As discussed in the Constructability item, concrete girders could be used, however the forest of piles or the heavy column bents would produce a less sightly area beneath the structure.

3.3.4 Constructability (River Bridge)

From a constructability standpoint, the steel girders are most desirable compared to the concrete girders because the steel girders are lighter in weight and would require less false work for temporary support during the construction phase (unless segmental concrete boxes are used). Between the steel girder alternatives, the steel box girders are easier to construct because they are lighter in weight and have more torsional resistance. Due to the fact that steel plate girders would need to be erected in pairs, they would be heavier than the steel box girders and would require more framing of the diaphragms.

3.3.5 Conclusions

Based on the above evaluations, it is recommended that the river bridge main span be constructed with steel box girders. The benefits of using this type of structure (such as reasonable maintenance cost, aesthetics, and constructability) outweigh the slightly higher costs associated with using steel box girders. Under this recommendation, steel box girders will be carried forward into the more detailed study phase of the project.

3.4 EVALUATION OF MAIN SPAN ARRANGEMENTS

The four main span arrangements which have been analyzed for the new bridge are presented in Section 2.5.5 along with illustrations for each as shown in Figures 2-31 through 2-34. For more information concerning the main span arrangements considered for the new river bridge, refer to the Preliminary Bridge Studies Technical Memorandum.

3.4.1 Construction Cost

Preliminary cost estimates presented in the Preliminary Bridge Studies Technical Memorandum indicate that the 200'-270'-270'-200' span arrangement is the least costly option, from a unit cost standpoint, for the river bridge, regardless of the type of structure chosen (concrete box, steel box, etc.). The unit cost estimates listed in Table 3-1 include both the superstructure and the substructure for the span arrangements and are the minimum costs for the various bridge types. When considering that the total length of the four span unit is greater than the total costs differences the various alternatives are not large and are not considered a discriminating factor.

The span unit consisting of 155 feet main spans was studied to determine whether the economics of the unit would justify pursuit of a much narrower navigation opening. The costs of the increased number of deep river piers more than offset any savings gained by the shorter spans. Additionally, the increase in potential impacts by marine users makes this option unfeasible. As a result, this option has been eliminated from any further study. Refer to the Preliminary Bridge Studies Technical Memorandum for more discussion on the bridge types being considered relative to construction costs.

3.4.2 Navigation

Generally the use of 250 feet to 270 feet long spans for new alignments are considered better for navigation. The longer spans would allow the existing 200 feet requirement to be met and would allow the center of the 200 feet channel to incorporate the existing 93 feet navigation channel at the railroad.

A span unit consisting of 155 feet main spans was studied to determine whether the economics of the unit would justify pursuit of a much narrower navigation opening. The costs of the increased number of deep river piers more than offset any savings gained by the shorter spans. Additionally, the increase in potential impacts by marine users makes this option unfeasible, and as a result was eliminated from any further study.

3.4.3 Aesthetics

Generally, the use of longer spans is considered more aesthetically pleasing. This means that, in general, the 200'-270'-270'-200' configuration would be the most desirable. This option would place a pier in the center of the visible width of the Calcasieu River. The 200'-250'-200' arrangement would have shorter spans, but would center the main span over the visible width of the Calcasieu River.

3.4.4 Use Existing Piers

The 210'-210'-210'-210' span arrangement was considered during this study because these lengths would allow the reuse of the existing river piers when supplemented by an additional pier near the middle of the river. None of the other span arrangements presented have the ability to use the existing piers.

3.4.5 Conclusions

The 200'-270'-270'-200' span arrangement for the main river is recommended to be carried forward for further study. This conclusion is based primarily on the fact that this longer span would allow the existing 200 feet requirement to be met and would allow the center of the 200 feet channel to incorporate the existing 93 feet navigation channel at the railroad, as well as reasonable cost and aesthetic advantages.

3.5 EVALUATION OF BRIDGE PROFILES

The three preliminary bridge profiles for the new river bridge are presented in Figure 2-1. The profiles were developed to accommodate various concept layouts for the Sampson Street interchange area just west of the river. For more information concerning the proposed vertical clearance for marine traffic under the new river bridge, refer to the Marine Use Study Technical Memorandum. For more information on the concept layouts that correspond to the proposed bridge profiles, refer to the Preliminary Line and Grade Studies and Bridge Studies Technical Memorandums.

3.5.1 Construction Cost

The preliminary construction cost estimates presented in Table 3-1 were based primarily on the length of the bridge profile for each. For comparison reasons, the estimates were prepared assuming all profiles were constructed using the main span and approaches of Bridge Concept A. Since Bridge Profile 1 has less total structure length, it

is the least expensive to construct compared to the other profiles. In contrast, Bridge Profile 3 is the most expensive because it requires the longest structure.

3.5.2 Phased Construction (Sampson Street)

Bridge Profile 2 was developed to allow for phased construction at the Sampson Street interchange accommodating the construction of the interchange at an earlier date prior to constructing the new I-10 mainline at some time in the future. The other profiles are suited only for an all-at-once-construction of the entire project.

3.5.3 Interchange Operations

Bridge Profile 1 is most desirable for the interchange operations near Sampson Street because it has a smoother vertical alignment and is a shorter structure. The Sampson Street interchange, located west of the river near the bridge approach, would have a lower elevation with Profile 1 because the mainline comes down faster. The longer and higher mainline profiles (Profiles 2 and 3) would require the interchange to be higher and therefore are less desirable.

3.5.4 Railroad Spur Relocation

Bridge Profiles 2 and 3 for the mainline river bridge do not require the relocation of the existing railroad spur underneath the mainline just east of the existing Sampson Street interchange and, therefore, received better ratings for this factor.

3.5.5 Conclusions

Profile 2 is recommended to be carried forward in the detailed studies based primarily on providing the ability to construct the Sampson Street interchange prior to the mainline. Profile 2 accommodates improvements that will most probably be made to the Sampson Street interchange while keeping the railroad spur operational and keeping the bridge to a reasonable length. This will, however, result in a higher grade separation structure over the mainline I-10.

3.6 EVALUATION OF WEST END ALTERNATIVES NEAR PPG DRIVE

The various concept layouts presented for the PPG Drive interchange (DOTD Concept, DOTD Concept Modified, Frontage Road Overpasses, and Relocated Railroad) are summarized in Section 2.3.4.1, and the concept layouts can be viewed in Figures 2-9 through 2-12. For more detailed information on these concept layouts, refer to the Preliminary Line and Grade Studies, Bridge Studies, and Traffic Analysis Technical Memorandums.

3.6.1 Construction Cost

According to the order of magnitude preliminary cost estimates developed for the concept layouts, DOTD Concept Modified with one-way frontage roads is the least expensive alternative on the west end. The preliminary cost estimates consist of roadway and bridge improvements within the PPG Drive area. DOTD Concept Modified with one-way frontage roads is most economical primarily because it requires the least amount of new structure and roadway. In addition, it does not require any type of railroad relocation. The Frontage Road Overpasses Concept proves to be the most expensive because it requires the largest amount of new structure and also involves railroad relocation. For more information on the individual cost estimates for improvements within the area, refer to the Preliminary Line and Grade Studies and Bridge Studies Technical Memorandums.

3.6.2 Traffic Service

The type of frontage road used between PPG Drive and Sampson Street affects the traffic service to the area. Concept layouts with a two-way frontage road are more desirable for traffic service to the industries while concept layouts with a one-way frontage road are more conducive to serving traffic at the Sampson Street interchange, the casinos, and Westlake. The concepts with a one-way frontage road are less convenient to industries south of I-10 because they cause truck traffic for the industries to use U-turn roadways instead of taking a direct route on a two-way road system. However, the concept layouts with a one-way frontage road are more desirable for traffic service at the Sampson Street interchange, the casinos, and Westlake because they involve more direct ramp configurations and less complex signal operations at the Sampson Street interchange, thus increasing capacity.

3.6.3 Interchange Operations

Based on the movements offered within the constraints existing in the area (railroad spurs, primarily) DOTD Concept (two-way) and DOTD Concept Modified (one-way) are most desirable. The Frontage Road Overpass and Railroad Relocation Concepts, primarily intended to provide continuous one-way frontage road systems, do not provide any compelling advantages. In fact, in one sense they are disadvantageous because truck movements to and from the south on PPG Drive that currently avoid the east-west rail spur would be forced to cross this spur under these concepts.

3.6.4 Railroad Spur Relocation

The west end alternatives that do not relocate the railroad spur near PPG Drive are more desirable due to the complications involved in relocating the railroad spur. The DOTD Concept (two-way) and DOTD Concept Modified (one-way) do not require the relocation of the railroad spur and from that perspective are more viable. They do not require the removal and relocation of the existing rail spur and also, do not involve removal and reconstruction of the I-10 span(s) conflicting with the relocated rail spur or new roadway at grade.

3.6.5 Conclusions

The two DOTD Concept Layouts for the west end of the study area are recommended to be carried forward for more detailed design. These alternatives have been determined to be the most practical based on traffic operations, costs and constructability. More detailed traffic analysis and more public input during the next phase of the study will help to determine whether the one-way or two-way frontage roads are most advantageous for the area between PPG Drive and Sampson Street.

3.7 EVALUATION OF ALTERNATIVES AT SAMPSON STREET INTERCHANGE

The general concept layouts for the Sampson Street interchange are briefly described in Section 2.3.4.2 and are shown in Figures 2-13, 2-14, and 2-15. Refer to the Preliminary Line and Grade Studies Technical Memorandum for a complete set of plates showing the multiple concept layouts considered for this interchange and the descriptions for each. For simplicity, the concept layouts were grouped together based on configuration (elevated diamond, Mike Hooks connection, and free flow) and access (two-way frontage roads vs. one-way frontage roads).

3.7.1 Construction Cost

In general, the free flow configuration for Sampson Street costs more than the other configurations. This is because the elevated ramp systems would require more structure. The elevated diamond configuration, independent of centerline alignment, bridge concept, or typical section, costs the least compared to the other two configurations based on the length of structure and ramp arrangement required for the interchange design.

3.7.2 Real Estate Cost

Based on the average real estate cost estimates for each type of Sampson Street configuration, the Mike Hooks Diamond interchange is the most costly alternative for the area. This is mainly because it requires the greatest amount of required right-of-way and has two additional residential displacements. The elevated diamond is the least costly because it stays within the existing right-of-way as much as possible. The free flow alternative falls between the two.

3.7.3 Phased Construction (Sampson Street)

The elevated diamond interchange (one-way or two-way) would be most favorable for phasing construction, where the Sampson Street interchange would be constructed first and then the new I-10 mainline constructed at a later date. This design would allow an elevated Sampson Street to be built above the existing mainline with the appropriate ramps joining it to the existing mainline. Few or no modifications would need to be made to the ramps constructed initially to connect the elevated diamond design to the new I-10 mainline constructed at a later date. In contrast, the directional ramps needed for the free flow design would need to be reconstructed once the mainline was built at a later date.

3.7.4 Traffic Service

Generally, from the traffic review conducted on the various types of interchanges at Sampson Street, the one-way alternatives are the most desirable. The one-way systems result in adequate access to industry, Westlake, and the casino within the constraints in the area and geometric design criteria. Also, signal operations at the ramp terminals are simplified. No particular type of interchange (elevated diamond, Mike Hooks, or free flow) is considered to offer significantly better or worse access to surrounding activities than the other.

3.7.5 Interchange Operations

In general, a free-flow configuration, like the Directional Free Flow interchange, will provide the best interchange operations, simply due to the lack of traffic conflicts associated with them. Any interchange in conjunction with a one-way frontage road would be the second best, with only three movements of traffic associated with them. The two-way frontage road option is the least desirable because it would involve two full four-way intersections on either side of the interstate.

3.7.6 Railroad Spur Relocation

The free flow Sampson Street interchange concept is the least desirable concept for this factor because it would require the relocation of the railroad spur under I-10.

3.7.7 Hazardous Spill Sites

Mike Hooks elevated diamond interchange layout is the most desirable because of the hazardous spill sites impacted by the Sampson Street alternatives. Mike Hooks elevated diamond avoids the potentially dangerous chemical spill located just south of Sampson Street. This is a highly sensitive area, and therefore, it has been recommended by LaDEQ representatives that construction in the vicinity should be avoided. Constructing the free flow directional ramp layout at Sampson Street has the lowest rating for this factor because it is more likely to encroach the area of contamination regardless of which centerline alignment is chosen for the mainline.

3.7.8 Displacements

Regardless of the centerline alignment, Mike Hooks elevated diamond would require the greatest number of displacements (5 residential and 6 commercial). This is due to the additional residences it would impact by veering away from the existing alignment beginning at the Sulfur Avenue intersection. The displacements associated with the other layouts for Sampson Street would be fewer (3 residential and 6 commercial).

3.7.9 Wetland Impacts

The elevated diamond layout (one-way or two-way) for the Sampson Street interchange has the least impacts to wetlands because the elevated diamond layout remains generally within the existing right-of-way in the area. Mike Hooks elevated diamond (one-way or two-way) veers the most from the existing Sampson Street alignment and, thus, has

the greatest impact to wetlands in the area between Sampson Street and the river. The free flow alternative falls between the two.

3.7.10 Natural Communities

Similar to the evaluation made for wetlands impacted, the elevated diamond layout (one-way or two-way) for Sampson Street has the least impacts to natural communities. This is due to the minimal additional right-of-way required for construction of the layout. Mike Hooks elevated diamond layout (one-way or two-way) has been determined to have the greatest impact to the natural communities in the area between Sampson Street and the river because it requires the most amount of additional right-of-way in the area.

3.7.11 Conclusions

Based on the evaluations mentioned above, the elevated diamond layout for Sampson Street is recommended to be carried forward for more detailed design. It is inconclusive at this time whether the one-way or two-way frontage roads are appropriate for the area. Therefore, both versions of the layout are recommended to move forward. One major influential factor for recommending this layout is its flexibility for staged construction, providing the ability to construct Sampson Street prior to the mainline with the least amount of reconstruction later when the mainline is built. Other influential factors are the construction cost, the avoidance of the hazardous spill in the area, and the impacts to the environment.

3.8 EVALUATION OF EAST SIDE U-TURNS

The issue of adding U-turns in advance of crossing streets on the east side of the project area is addressed in Section 2.3.4.3. An elevation view showing the construction involved in adding the U-turns at the existing cross streets is shown in Figure 2-23. For more information concerning the addition of these U-turns, refer to the Preliminary Line and Grade Studies and Bridge Studies Technical Memorandums.

3.8.1 Construction Cost

Adding U-turns at various cross streets on the east side is more costly than the no build alternative in which no U-turns are constructed. The cost for constructing these U-turns includes the preliminary bridge reconstruction costs for cutting embankment, placing tie back walls, and detouring traffic. It also includes roadway pavement costs. The cost

($1.5 M) is small relative to the overall project cost and the value provided in traffic service.

3.8.2 Traffic Service

U-turn lanes will improve cross street intersections by improving traffic operations at the signalized intersections and reducing delays for vehicles traveling on the one-way frontage road system.

3.8.3 Interchange Operations

As stated above, U-turn lanes will improve cross street intersections by improving traffic operations at the signalized intersections and reducing delay for vehicles traveling on the one-way frontage road system.

3.8.4 Tanks and Other Waste Sites

Although the U-turns would be constructed within the existing mainline right-of-way, one former auto repair shop and one former dry cleaning facility would be located near the proposed U-turns on the east end. It is not clear at this time if they would be encroached upon by construction of the U-turns.

3.8.5 Displacements

One U-turn at Ryan Street would require a residential displacement because this residence lies within a narrow strip of land between the existing frontage road and I-10. This right-of-way should be considered for purchase to include in the I-10 system. During the next phase of design, modifications to the placement of the U-turns could be considered to avoid impacts to the residential dwelling.

3.8.6 Conclusions

Based on the traffic operation benefits the U-turns would provide the one-way frontage roads and cross streets, they are recommended to be carried forward for more detailed design.

3.9 EVALUATIONS OF EAST SIDE INTERCHANGE CONFIGURATIONS

For a brief description of the possible interchange configurations near US 90 east, refer to Section 2.3.4.3. For a complete explanation of the traffic flow and circulation related to these different configurations, refer to the text and plates presented in the Preliminary Line and Grade Studies and the Traffic Analysis Technical Memorandums.

3.9.1 Construction Cost

For the interchange configurations used in the east section concept layouts, it has been determined that using a configuration similar to the existing configuration is less expensive. The interchange configuration alternative that keeps a full diamond interchange at Enterprise Boulevard and a half interchange with westbound exiting at US 90 east, proves to be the least expensive of the modified existing ramp configuration alternatives. The basis for this is that this interchange configuration alternative requires the least amount of new construction. The option to add new full diamond interchanges at Shattuck Street and Kirkman Street and remove those at Enterprise Boulevard and US 90 east proves to be the most expensive due to the extent of new construction involved.

3.9.2 Interchange Operations

Since ramps configured in an X pattern rather than a diamond configuration generally provide for better traffic operations on the mainline and ramps in urban areas like Lake Charles with one-way frontage road systems, the new diamond interchange layout has received the highest rating for this category. The X configuration, which is used in the new diamond interchange layout, involves the location of an exit ramp followed by an entrance ramp between two arterials. A diamond configuration involves the location of an exit ramp prior to the arterial with the entrance ramp located after the arterial. The X configuration shifts a majority of the weaving movements to the frontage road and provides better traffic operations on the mainline. In addition, motorists are provided better access to adjacent land uses along the frontage roads with an X configuration and can re-enter the mainline without having to travel through a signalized intersection.

Given the relatively low traffic volumes for the ramp systems on the east side, the existing diamond type configurations are considered adequate for traffic circulation and access as well as interchange operations. The existing system as defined here includes the removal of two westbound entrance ramps (at Shattuck Street and Kirkman Street), one

eastbound exit ramp (at Shattuck Street), and the relocation of one westbound exit ramp (at Enterprise Boulevard) to provide greater weaving distances on the frontage roads in advance of the cross street intersections.

3.9.3 Tanks and Other Waste Sites

The new diamond interchange layout for the east end would impact one additional waste site (former auto repair shop) along the corridor and therefore received the lowest rating for this category. The other interchange configuration alternatives did not impact any additional waste sites.

3.9.4 Conclusions

The existing ramp systems modified as discussed in Section 3.9.2 is recommended to be carried forward for further study. This recommendation is based on the conclusion that there is no compelling reason to substantially change the existing ramp system in consideration of the additional costs involved. This also facilitates the goal of providing better I-10 mainline operations by meeting ramp spacing criteria.

3.10 EVALUATIONS OF I-10 PROFILE AT ABANDONED RAILROAD

The existing and proposed I-10 profiles at the abandoned railroad near V.E. Washington Street are briefly discussed in Section 2.3.4.3. Complete discussions of the proposed modifications to the vertical geometry in this area are contained in the Preliminary Line and Grade Studies and Bridge Studies Technical Memorandums.

3.10.1 Construction Cost

Improvements to the vertical geometry at the abandoned railroad cost slightly more than the other alternative which would widen the structures in the area for additional lanes and/or shoulders ($2.3 M versus $1.5 M). The reconstruction involved in lowering the profile of the mainline includes removing the I-10 structures and building an at-grade roadway in its place along with the ramps for Enterprise Boulevard. Some retaining wall would be required.

3.10.2 Interchange Operations

The proposed lower, at-grade, profile is more desirable for interchange operations because the design reduces the elevation of the mainline and the entrance and exit ramps leading to the mainline at this location. By reconstructing the roadways in this area at-grade, the vertical geometry would be improved to accommodate AASHTO's current geometric design standards, thus improving sight distance and driver expectancy along the mainline and throughout the interchange. The westbound Enterprise Boulevard exit ramps would be reconstructed to provide greater weaving distance in advance of the intersection under both of the alternatives.

3.10.3 Tanks and Other Waste Sites

Either widening the existing I-10 bridge or recoonstructing the mainline at-grade in the area near the abandoned railroad would potentially impact one formerly drilled well site, and therefore, neither alternative for this decision category is more desirable than the other.

3.10.4 Conclusions

Lowering the profile at the mainline segment near the abandoned railroad on the east end, along with reconstruction of the corresponding entrance and exit ramps in the area is recommended to be carried forward for more detailed design. Reducing the elevation of the mainline and ramps would improve the mainline I-10 and ramps vertical geometry to meet current design standards and would be practical based on cost. Regarding constructability, the section of roadway could be rebuilt by using the parallel frontage roads for temporary traffic while the structures are removed and the new roadways are constructed. On two-way mainline traffic could be accommodated on one of the directional mainline roadways while the other direction of the mainline is reconstructed. The costs associated with maintaining the existing profile would not be significantly lower than the proposed lower profile because the former would involve widening the existing I-10 mainline structure for shoulders and widening the eastbound entrance ramp to meet standards. The westbound exit would be reconstructed under each of the alternatives identified for the area.

3.11 EVALUATIONS OF RYAN STREET IMPROVEMENTS

In addition to widening the I-10 mainline structures over Lakeshore Drive, general modifications have been proposed for the area between Lakeshore Drive and Ryan Street. The area includes the recent proposed and approved Ryan Street improvements, which are considered an existing condition for this study. Refer to Figure 2-19. Proposed modifications to the area include adding a U-turn under the I-10 / Lakeshore Drive overpass, thus eliminating a section of two-way roadway that lies within the one-way frontage system. See Figure 2-20 for the modifications proposed for the area near the considered existing Ryan Street improvements. Additional improvements to the area could include access provisions to Lakeshore Dive from Westbound I-10 (this is not currently in the plan that has been moving forward independent of this study).

3.11.1 Construction Cost

The construction cost presented in the evaluation matrix for the proposed Ryan Street improvements is relatively close to the cost associated with modifying these improvements with U-turns and at-grade roadway access to Ryan Street and Lakeshore Drive. Both alternatives include the cost to widen the I-10 overpass at Lakeshore Drive. The component of the proposed modifications that would add access to Lakeshore Drive and provide an eastbound-to-westbound U-turn roadway is estimated to cost an additional $1.2 million.

3.11.2 Traffic Service

Proposed modifications in the area, which includes adding a U-turn roadway under the I-10 / Lakeshore Drive overpass, thus eliminating a section of two-way roadway that lies within the one-way frontage system would improve the traffic service by maintaining the continuity of the one-way frontage roads. The other component of the proposed modifications would improve traffic service by providing more direct access to the CBD via Lakeshore Drive.

3.11.3 Conclusions

It is recommended that the modifications proposed for the Ryan Street and Lakeshore Drive area be carried forward to the next phase of the project. These modifications proposed, which include U-tuns for frontage roads and more direct access to Lakeshore Drive from the mainline, would provide better traffic operations and circulation for both the beach/marina area and the central business district. The additional costs associated with

implementing these modifications are primarily for new roadway since there would be minimal reconstruction of the I-10 structure over Lakeshore Drive. The structure originally was built to accommodate a railroad spur which since time has been abandoned, therefore, adequate clearance is available in the area for new roadways. The only structure alteration that may be encountered is the for the U-turn from the eastbound frontage road which would require cutting the fill in place and constructing a retaining wall with tie backs. The advantages of improving the access and circulation for the Ryan Street and Lakeshore area outweigh the additional cost to implement the modifications previously mentioned, and therefore, are recommended to be studied in more detail during the next phase of the project.

3.12 RECOMMENDATIONS FOR FURTHER STUDY

Based on the results of the evaluations shown in Table 3-1, four alternatives for the entire length of the project corridor have been recommended for further study. Each recommended alternative has been determined by combining the recommended alternative(s) of each decision category to form a complete alternative from the PPG Drive area on the west side of the project to US 90 on the east. Four alternatives have emerged rather than one because for two decision categories more than one alternative is recommended to be carried forward. The four alternatives consist of the following common features:

- Centerline Alignment 3 (or similar offset alignment)
- Steel Box Girders for main span of river bridge
- 200'-270'-270'-200' Main Span Arrangement
- Bridge Profile 2
- U-turns on East End
- Existing Ramp Configuration on East End Modified for westbound exit and eastbound entrance at I-10 and US 90 (east)
- Improving I-10 profile at Abandoned Railroad
- Modify Ryan Street Improvements

These features are described in more detail in the various technical memorandums issued throughout the study and are also presented on the folded drawings in the sleeves at the conclusion of the report. Table 3-2 shows the defining characteristics of the

recommended alternatives compared to one another. In addition, a description of each alternative from one end of the corridor to the other is provided following the table. Each of the alternatives utilizes an elevated diamond-type interchange at Sampson Street, which would allow for a phased construction approach where the Sampson Street interchange can be constructed first and the new Calcasieu River bridge can be constructed at a later date.

Table 3-2
DEFINING CHARACTERISTICS OF
THE RECOMMENDED ALTERNATIVES

Recommended Alternative	West Side / Sampson St. Concept	Bridge Concept
Alternative 1	One-Way	Bridge Concept A
Alternative 2	One-Way	Bridge Concept C
Alternative 3	Two-Way	Bridge Concept A
Alternative 4	Two-Way	Bridge Concept C

The four alternatives presented are recommended to move forward to the refined phase of the project, Stage 1 (See Figure S-1), which will include detailed planning and environmental analysis to produce project scope, budget, and environmental clearance. Upon completion of Stage 1, Final Engineering Feasibility Report and Environmental Assessment documents will be compiled documenting findings throughout the course of the project. These final reports will provide information to support the selection of one alternative, which will be carried forward when funding becomes available (Stage 2), for design (Stage 3), and implementation (Stages 4 and 5). A primary goal throughout these studies and into the next phase is to plan for construction implementation strategies. Maximizing flexibility in phasing separate construction projects over time is an essential element as the Department begins work toward identifying funding.

3.12.1 Alternative 1

3.12.1.1 Mainline Operations

Alternative 1 consists of upgrading the mainline to a six-lane facility throughout the corridor and widening the inside shoulders in some segments to either 10 or 12 feet depending on the available area at various locations.

A. Eastbound

In the area near PPG Drive, the I-10 eastbound mainline would be widened by one additional lane to the inside to consist of a total of three lanes. This would be accomplished by tapering to widen the inside lane to create a new lane in the median area. A proposed exit ramp immediately east of the PPG Drive would allow access for industry via the one-way frontage road to the south of the mainline. The entrance ramp from US 90 (west) would remain in its current location. Just west of Sampson Street the mainline (both eastbound and westbound) would be constructed on new alignment for all lanes of traffic. At the Sampson Street interchange (elevated diamond) there would be an exit ramp from the mainline allowing access to Westlake via the elevated Sampson Street and another exit ramp that would be at-grade for accessing the casino located on Isle of Capri Boulevard. An eastbound entrance ramp from the elevated Sampson Street interchange would allow access onto the I-10 mainline river bridge which would consist of three through lanes and one auxiliary lane in either direction (Bridge Concept A).

Once the mainline eastbound has crossed the river, the traffic would then be able to exit the mainline and access the one-way frontage road near the beach area, which leads to Lakeshore Drive and the Lake Charles central business district (CBD). In–progress modifications in the Lakeshore Drive and Ryan Street area would allow traffic to continue east on the one-way frontage road or access the CBD to the south via Lakeshore Drive.

The mainline would then join with the existing alignment just west of Lakeshore Drive. The remainder of the mainline eastbound would include a new lane to the outside to make three through lanes until the mainline ties into the three lanes existing on the mainline just east of Bilbo Street. The existing entrance ramp at Bilbo Street would remain in addition to the exit ramp east of Kirkman Street. In the area between Enterprise Boulevard and Shattuck Street the I-10 mainline would be reconstructed at-grade and the existing mainline and ramps would be removed. Therefore, a new entrance ramp east of Enterprise Boulevard would allow for frontage road traffic to access the mainline eastbound. On the east end of the corridor the existing exit ramp east of Shattuck Street

would be removed to accommodate better weaving distances on the mainline between entrance and exit ramps. The following entrance ramp west of US 90 (east) would remain in its current location for local traffic to access the mainline eastbound.

B. Westbound

The westbound mainline on the east end of the corridor from US 90 (east) to Ryan Street would maintain many existing features. Three through lanes would be maintained throughout and the existing bridges would be widened to accommodate wider shoulders to the inside and outside of the westbound mainline. Modifications to the westbound mainline include removing the entrance ramp near Shattuck Street to improve weaving distance, reconstructing the mainline exit ramp prior to Enterprise Boulevard to provide additional weaving on the frontage road in advance of the intersection, and removing the entrance ramp east of Moss Street to improve ramp spacing geometry.

West of Ryan Street the westbound mainline would be widened to three through lanes in the area over Lakeshore Drive. Modifications would also be made to the exit ramp between Ryan Street and Lakeshore Drive. The exit ramp would provide access to the westbound frontage road, and a proposed U-turn located off of this ramp and under the Lakeshore Drive overpass would allow access to eastbound frontage road (and possibly Lakeshore Drive with more detailed design). Soon after this interchange the mainline would move onto new alignment to the north of the existing alignment to accommodate the new river bridge location. A proposed entrance ramp west of Lakeshore Drive would allow traffic from the beach area and the CBD to access the mainline westbound and cross the river on the main river bridge.

Once over the main river bridge westbound, the mainline would continue elevated through the Sampson Street interchange. Prior to Sampson Street the auxiliary lane from the main river would exit the mainline onto the elevated ramp leading to Sampson Street. West of Sampson Street, an entrance ramp would allow traffic from Westlake and the casino to access the mainline westbound towards PPG Drive. In this area the mainline would join back with the existing alignment and the mainline would then be widened to the outside to make three through lanes westbound. Prior to PPG Drive and US 90 (west) modifications would be made to an exit ramp to allow access to these roadways and the eastbound frontage road via a U-turn under the I-10 mainline overpass at PPG Drive. Along the mainline from this exit ramp to the beginning of the I-10 mainline overpass at PPG Drive, the mainline would be widened partially to the inside and partially to the outside to create an additional lane. The I-10 overpass at PPG Drive would be widened to the inside to accommodate an additional lane and a wider shoulder. West of PPG Drive the at-grade mainline westbound

would continue to be widened to the inside for the additional lane to make a total of three lanes. This third lane would be carried to the I-210 interchange area where it would be discontinued by tapering the inside lane into the middle lane. The entrance ramp in this area for traffic from PPG Drive and US 90 (west) would remain in place.

3.12.1.2 Frontage Road Operations

In addition to the improvements to the mainline mentioned above, the frontage road systems in the PPG Drive/Sampson Street area and the east area would also be upgraded to be continuous throughout, with the exception of the Calcasieu River crossing.

A. Eastbound

The existing frontage road on the west end of the corridor south of the mainline and between PPG Drive and the river, which is partially one-way and partially two-way, would be modified to become a continuous one-way frontage road eastbound throughout. This one-way frontage road would lead eastbound traffic into an elevated diamond interchange at Sampson Street just west of the river crossing. At this point, motorists would be able to continue on the frontage road to casinos located near the river docks, turn left to access Westlake via Sampson Street, or enter the I-10 mainline eastbound. Traffic from the frontage road desiring to continue eastbound across the river to the Lake Charles area would be required to enter the I-10 mainline river bridge which would consist of three through lanes and one auxiliary lane in either direction (Bridge Concept A).

The one-way frontage road would then continue for the remainder of the corridor on the east end. A small segment of new frontage road at the abandoned railroad spur near V.E. Washington Street would be constructed to maintain continuity and potentially allow for temporary traffic during time of reconstructing the mainline profile at this location. In addition, U-turns at strategic cross streets would enhance the traffic circulation between interchanges. One ramp from the mainline to the frontage road would be removed.

B. Westbound

Westbound movements for the frontage road would be made in a similar but opposite manner. The frontage road would begin at US 90 (east), join the mainline to cross the river, and then begin again in advance of Sampson Street. North of I-10 between Sampson Street and PPG Drive, no frontage road is proposed because no land access is needed. Therefore traffic would enter the westbound mainline and then be able to access PPG Drive and US 90 (west).

On the east side of the river, a small segment of new frontage road at the abandoned railroad spur near V.E. Washington Street would be constructed to maintain continuity and potentially allow for temporary traffic during time of reconstructing the mainline profile at this location. In addition, U-turns at strategic cross streets would enhance the traffic circulation between interchanges. Two entrance ramps from the existing frontage road to westbound I-10 would be removed.

3.12.2 Alternative 2

Alternative 2 is similar to Alternative 1 with the exception of the type of river crossing used for frontage road traffic and the implications this has with regard to entrance and exit ramp locations.

3.12.2.1 Mainline Operations

A. Eastbound

The eastbound mainline would operate much in the same way as Alternative 1. With this alternative, however, the river crossing would include continuous frontage roads adjacent to the mainline (Bridge Concept C). Traffic bound to the beach area and the CBD would exit west of the river and travel on the frontage road to the east side of the river to reach its destination. Traffic coming from Westlakle, the Isle of Capri Casino, or the west side industries would travel on the frontage road to enter I-10 on the east side of the river. This design scheme would eliminate the auxiliary lane from the mainline I-10 over the crest of the river bridge.

A subalternative shown for Alternative 2 is the ramp exit immediately in advance of Sampson Street, which provides access to both Sampson Street and the Isle of Capri area. A short weaving section would be created on the frontage road between where the ramp joins and where the frontage road splits in advance of the Sampson Street interchange. This scheme avoids traffic bound for the Isle of Capri and Miller Street area from having to pass through the elevated signalized intersection. The remainder of the eastbound mainline would be the same as that described for Alternative 1.

B. Westbound

For Alternative 2, the mainline operations westbound would be the same as for Alternative 1 except in the area of the main river crossing. Similar to the eastbound mainline for Alternative 2, a continuous frontage road would be carried across the river. Traffic destined to the west side (including West Lake, the Isle of Capri, or the industries), would exit east of the river and travel via the continuous frontage road. Traffic originating east of the river would travel on the frontage road across the river and enter on the west side. The auxiliary lane across the crest of the I-10 mainline river crossing would be eliminated.

The remainder of the westbound mainline would operate in much the same way as Alternative 1.

3.12.2.2 Frontage Road Operations

A. Eastbound

The frontage road operations eastbound for Alternative 2 are similar to those for Alternative 1 with the exception being that the frontage road is carried continuously across the river rather than crossing on the I-10 mainline.

B. Westbound

The frontage road operations westbound for Alternative 2 are similar to those previously described for Alternative 1, again with the exception as noted above for the eastbound frontage road.

3.12.3 Alternative 3

Alternative 3 is the same as Alternative 1 with the exception of the type of frontage road used south of the mainline between PPG Drive and Sampson Street. Alternative 3 incorporates a two-way frontage in this area instead of one-way frontage road.

3.12.3.1 Mainline Operations

A. Eastbound

Mainline operations eastbound for Alternative 3 would be the same as those previously discussed for Alternative 1 throughout the corridor. The single exception is that the exit ramp immediately in advance of Sampson Street would not be provided (due to conflicts with two-way frontage road). This means that Samspon Street (Westlake) traffic would exit just east of PPG Drive and travel on the frontage road to the elevated Sampson Street crossing.

B. Westbound

Operations westbound would be the same as those described for Alternative 1, except that industry traffic south of I-10 between PPG Drive and Sampson Street would enter I-10 westbound via the ramp just east of PPG Drive (from the two-way frontage road) rather than the Sampson Street entrance ramp.

3.12.3.2 Frontage Road Operations

A. Eastbound

For Alternative 3, the existing two-way frontage road on the west end of the corridor south of the mainline between PPG Drive and the river, which currently is not continuous because it does not connect to PPG Drive, would be modified to connect to PPG Drive. Also, it would be converted to one-way operations east of Sampson Street to the river.

East of the river the eastbound frontage road operations would be the same as those discussed for Alternative 1.

B. Westbound

Westbound frontage road operations would be the same as for Alternative 1.

3.12.4 Alternative 4

Alternative 4 is the same as Alternative 2 (Bridge Concept C) with the exception of the type of frontage road used south of the mainline between PPG Drive and Sampson Street. Alternative 4 incorporates a two-way frontage in this area instead of one-way frontage road.

3.12.4.1 Mainline Operations

A. Eastbound

The mainline operations between the west end of the project and Sampson Street for this alternative would be the same as those described for Alternative 3. The mainline operations between Sampson Street and just east of the river would be the same as described for alternative 2. From just east of the river to the east end of the project, the mainline operations would be the same as described for Alternative 1.

B. Westbound

The mainline operations westbound for this alternative would be the same as those discussed for Alternative 2.

3.12.4.2 Frontage Road Operations

A. Eastbound

The frontage operations between the west end of the project and Sampson Street for this alternative would be the same as those described for Alternative 3. The frontage road operations between Sampson Street and just east of the river would be the same as described for alternative 2. From just east of the river to the east end of the project, the frontage road operations would be the same as described for Alternative 1.

B. Westbound

The frontage operations westbound for this alternative would be the same as those discussed for Alternative 2.

RECOMMENDED ALTERNATIVES