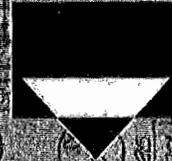




Value Engineering

Value Engineering Study 2003-06 Daniel Boone Bridge Route 40 @ Missouri River St. Charles/St. Louis County



Job number J6P1436
December 1-5, 2003
St. Louis District
Traffic Information Center Bldg



50 Missouri Department of Transportation

Value Engineering Study 2003-06
Executive Summary
Route 40/61
St. Charles County
Job No. J6P1436
December 1-5, 2003
D6 - Traffic Information Center (TIC) Bldg.

Introduction

The subject of this VE study is the crossing of US 40 over the Missouri River. The existing truss bridges are functionally obsolete due to narrow lanes and no shoulders. The bridges are experiencing high accident rates and capacity and delay problems, operating at level of service D during peak hours. These conditions are expected to worsen over time. The project is at Draft EIS stage.

The primary documents for this project include:

- Draft Environmental Impact Statement (DEIS) – July 2003
- Final Environmental Assessment and Finding of No Significant Impact (FONSI) – approved February 21, 1997
- Major Transportation Investment Analysis (MTIA) for US 40/61 from Clarkson Road (Route 340) in St. Louis County to I-70 in St. Charles County – approved May 3, 1996

The DEIS contains five Final Study Alternates plus the “no build”. These alternates were developed for the bridge study. The baseline model for the VE study is Alternate A2’, the preferred alternate in the Draft Environmental Impact Statement.

Project Background

The MTIA approved adding a third lane in each direction to Rte 40 from Chesterfield Parkway to Route K. Construction is nearing completion. The bridges were restriped to their current configuration in December 2001. The narrow lanes on the WBL should be monitored and if safety becomes an issue, a new bridge should be pursued on an accelerated schedule. The MTIA did not specifically address the Missouri River Bridges. The current study is focused on the river crossing. The Route 40/61 corridor is to become future I-64, upgrading to Interstate standards is required to accomplish this. St. Charles County is providing funding for the study, which is to be repaid when construction begins.

Purpose and Need of Project

The following items were identified in the DEIS as needing to be addressed by the project:

- Provide adequate operational efficiency and safety
- Provide interstate design standards
- Accommodate economic growth
- Address current geometric deficiencies
 - WB Bridge is 32' wide w/ 3 – 10' lanes
 - EB bridge is 48' wide w/ 4 – 12' lanes
 - Chesterfield Airport Road (CAR) ramps are close to sharp curve and bridges

The facility is currently operating at LOS D and is expected to operate at LOS E in the build year(2014) and LOS F in the design year (2034).

The bridges are currently in fair to good condition, the WB (1935) bridge was rehabilitated in 1990 and will need to be rehabilitated again in 2020. The EB (1985) bridge is scheduled to be rehabilitated in 2018.

Goals of the VE Study

The goals of this value analysis study include review of what has been developed to date and to develop recommendations to improve upon the preferred alternatives:

- Review what has been developed to date in the MTIA and DEIS.
- Develop recommendations to improve upon the preferred alternates.
- Develop recommendations for new alternates that provide the same function and add value to the project.

Recommendations developed by this VE Team should assist the Project Manager and Area Team to adequately scope this project plus provide suggestions on the best design to accomplish the identified needs of the project.

Major questions to be addressed include whether to build the new bridge upstream or downstream, and whether it is cost effective to rehabilitated and keep using the 1935 bridge.

Significant Items from Project Manager Presentation

The primary reason for the project is to provide adequate capacity and upgrade Route 40/61 to Interstate standards. The accident rate (year 2002) for the WB bridge is 217 compared to a statewide average of 173. The accident rate (year 2002) for the EB bridge is 93 compared to a statewide average of 173.

Physical constraints include:

- Need to use same corridor
- Water tank in St Charles County on the east side
- St. Charles Sand Plant in St. Louis County on the east side
- Quarry lake in St Charles County on the west side
- Navigation Channel-must match piers

There are no major cultural or environmental obstacles, but the following are present:

- KATY trail
- MDC Property
- Floodway and wetlands
- Potential for Indiana Bat and bald eagle
- Potential for Paddlefish, Sturgeon and Chub

Summary of Recommendations/Findings

Eliminate CAR WB flyover bridge (SA 2)

This idea redirects traffic from the existing flyover to a proposed on-ramp at Spirit Airport Road and eliminates the flyover bridge Chesterfield Airport Road (CAR). Potential Savings \$1,700,000.

Reverse curves and narrow median (NA 2, NA 4 & SA 6)

The team recommends utilizing reverse curves to align existing approach roadways with proposed bridge alignments to utilize more of the existing pavement plus decrease the median width. Potential Savings \$1,300,000.

Design Suggestions/Scoping Issues

- Add fourth lane WB from river bridge to Rte 94
 - Possible elimination of South Outer Road connection
 - Add St. Charles Sand Co. access road
-

Value Engineering - Study Identification

Project: J6P1436

Team: VE2003-06

Location: Route 40, St. Charles County

Date: Dec. 1-5, 2003

VE TEAM MEMBERS

Name	Discipline	Organization
Tom Allen	Team Leader	MoDOT (GHQ-Design)
Stacy McMillan	Structural/Hydrology	MoDOT (GHQ-Bridge)
Matt Burcham	Environmental/Cultural	MoDOT (GHQ-Design)
Arisa Prapaisilp	Traffic Capacity	MoDOT(D6-Traffic)
John Grana	Constructability/Traffic Management	MoDOT(D6-Construction)
Edward Stephen	Geometrics/Constructability/Traffic Management	FHWA
Gary Baker	Geometrics/Traffic Management/Estimating	MACTEC

PROJECT DESCRIPTION

Length: 2.1 miles	Cost: \$ 138.4 M
Design Speed: 70 mph	Projected Traffic: 115,000 ADT
Projected Award Date: Future	Type of Funds: Federal, State & Local

Major Project Elements:

Reconstruct Missouri River Bridge Crossing to Interstate standards.
 Improve South and North approaches to the bridge.

Investigation Phase – Sources

Project: J6P1436

Team: VE2003-06

Location: Route 40, St. Charles County Date: Dec. 1-5, 2003

APPROVING / AUTHORIZING PERSONS

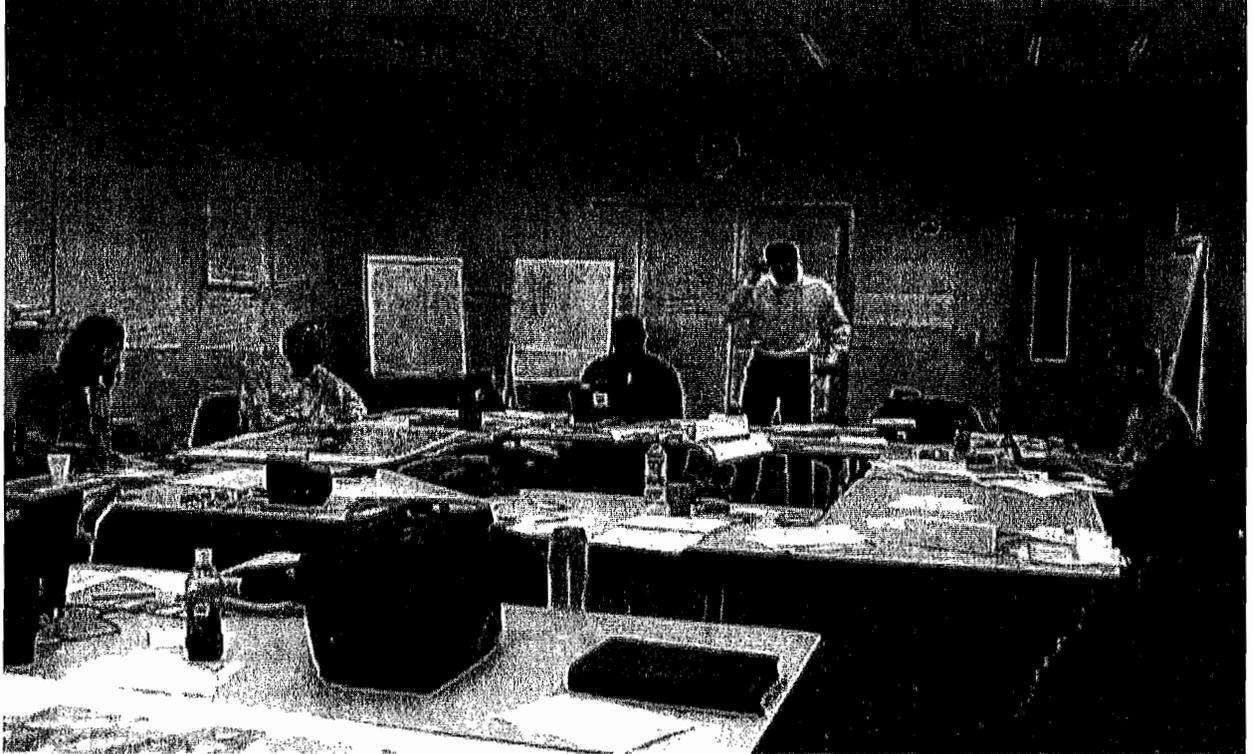
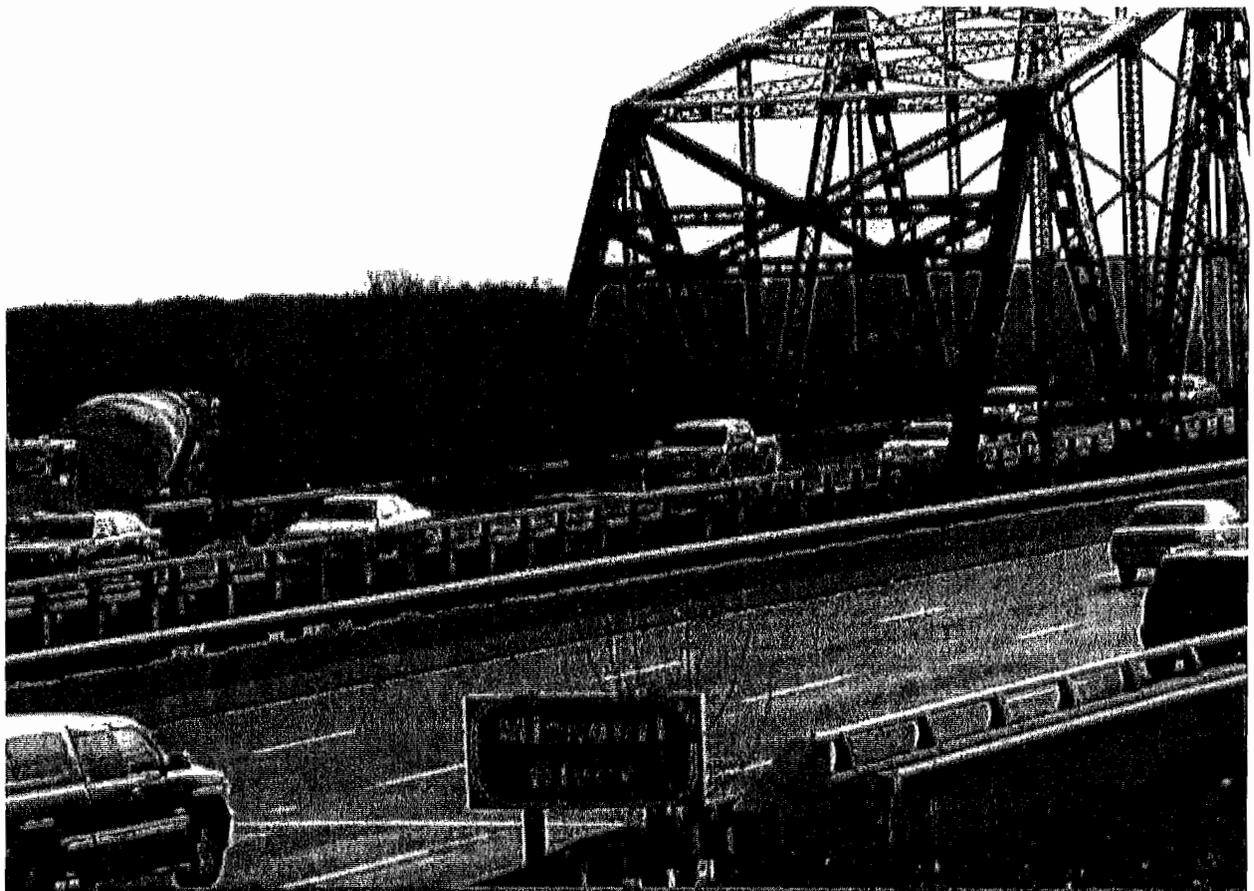
Name:	Telephone:	Notes:
D6 District Engineer		
Ed Hassinger		
PM. Larry Welty		

PERSONAL CONTACTS

Name:	Telephone:	Notes:
City of Chesterfield		Chesterfield Valley Master Plan
Larry Welty		Project Manager

DOCUMENTS / ABSTRACTS

Draft Environmental Impact Statement (DEIS) - July 2003	
Final Environmental Assessment and Finding of No Significant Impact (FONSI) – approved February 21, 1997	
Major Transportation Investment Analysis (MTIA) for US 40/61 from Clarkson Road (Route 340) in St. Louis County to I-70 in St. Charles County – approved May 3, 1996	



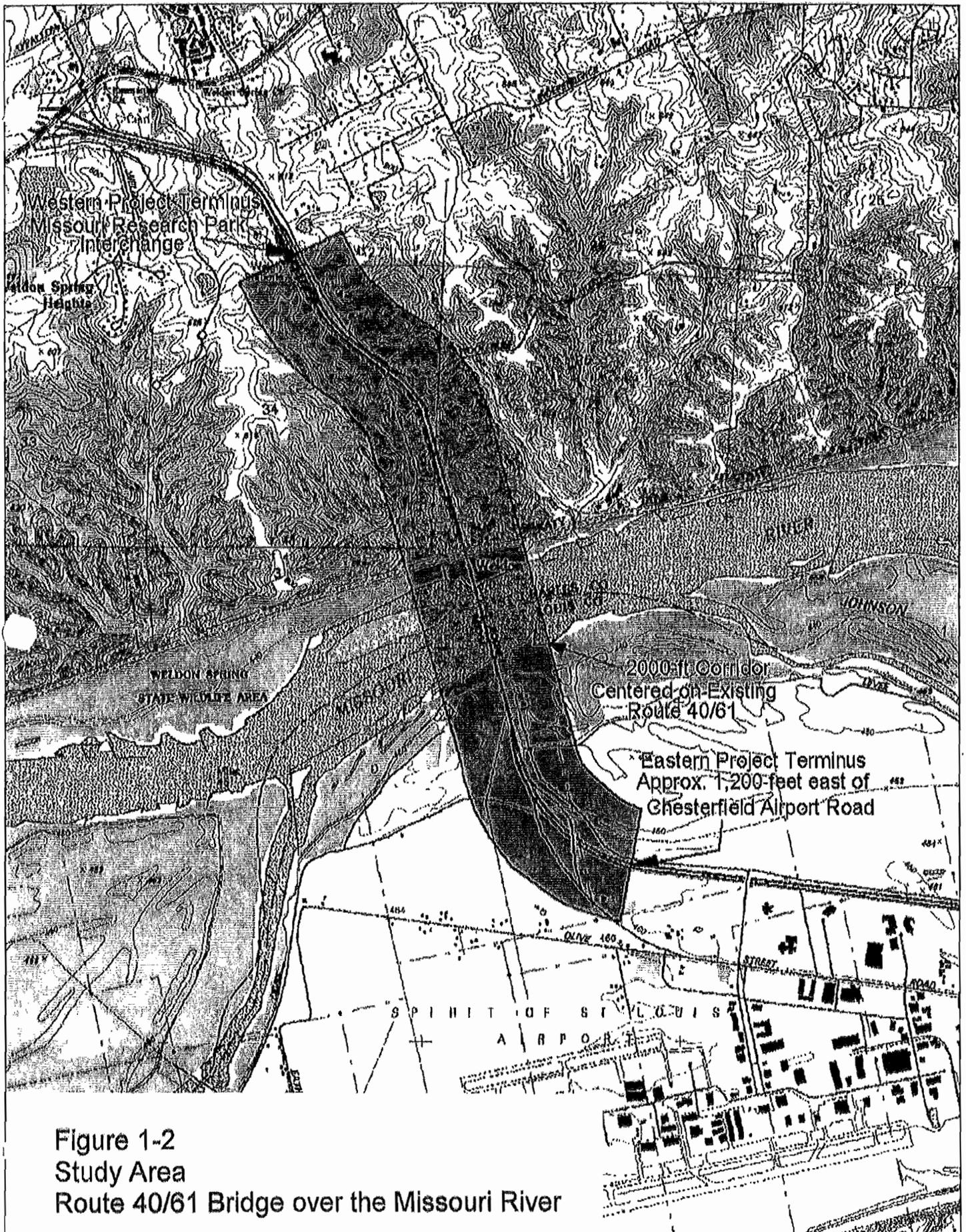
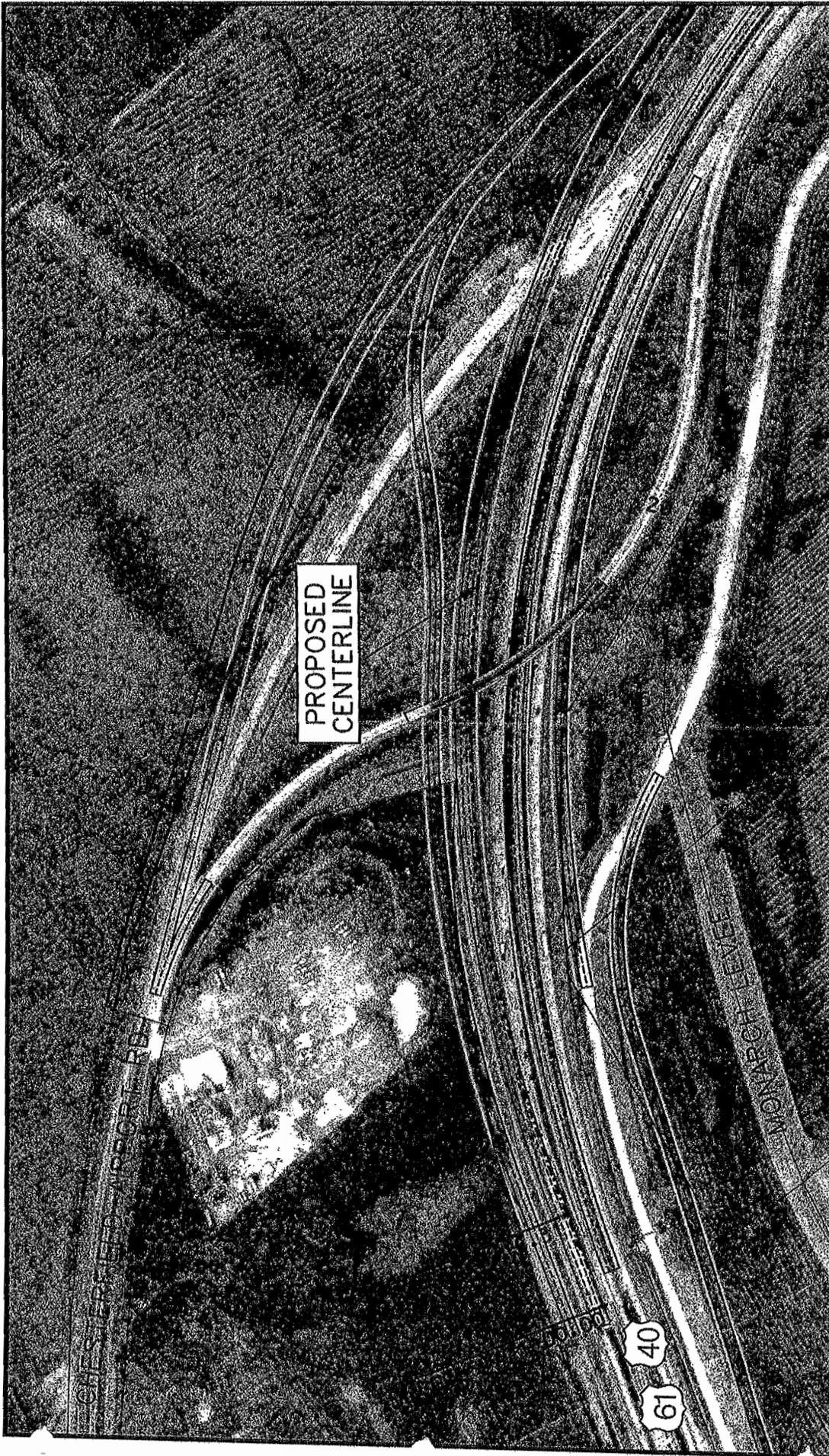


Figure 1-2
Study Area
Route 40/61 Bridge over the Missouri River

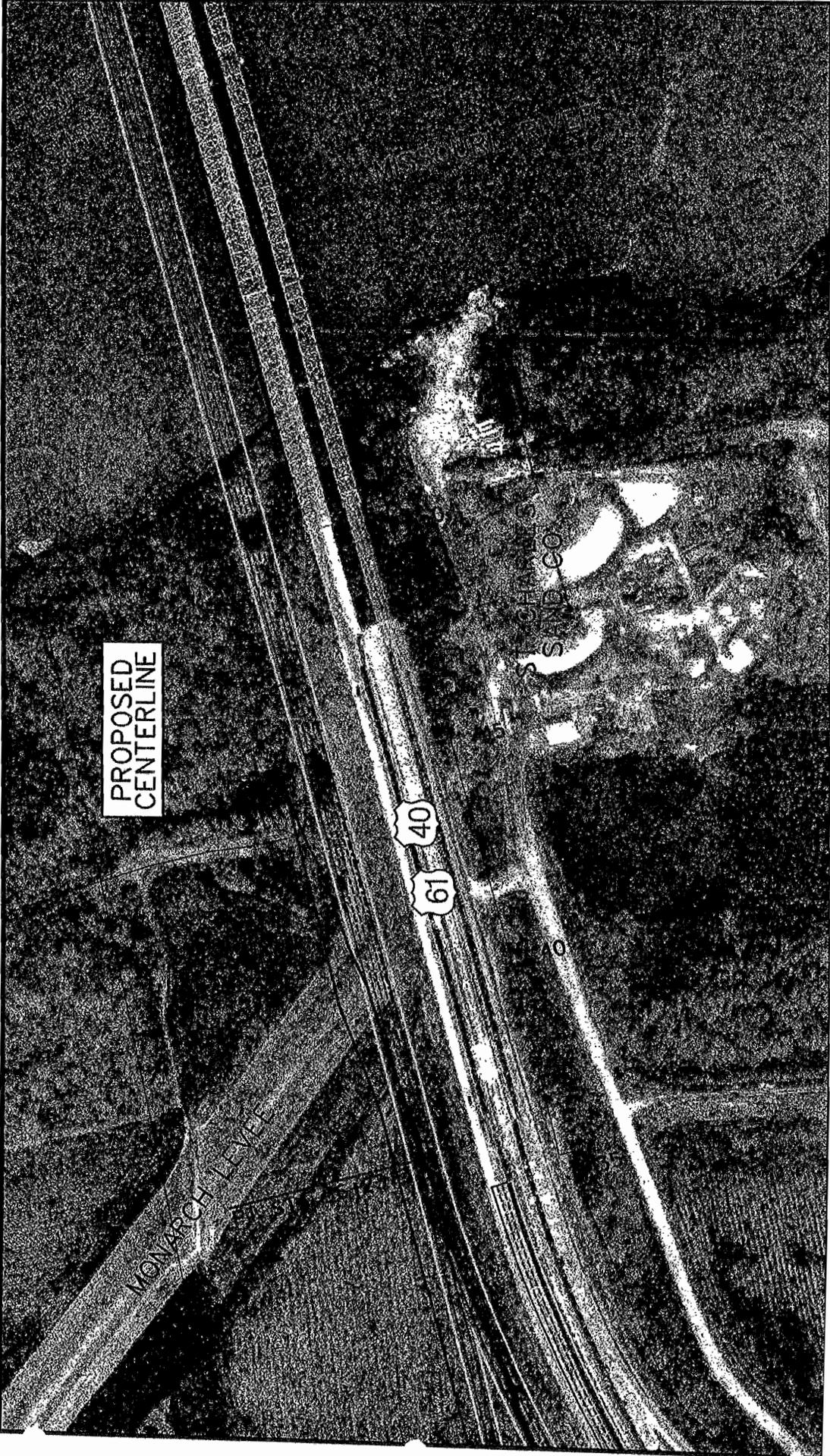


PROPOSED
CENTERLINE

Alternative A2' (1 of 4)
Plate 9

Route 40/61 Bridge
Job No. J6P1436



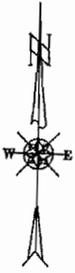


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MONARCH LEVEL

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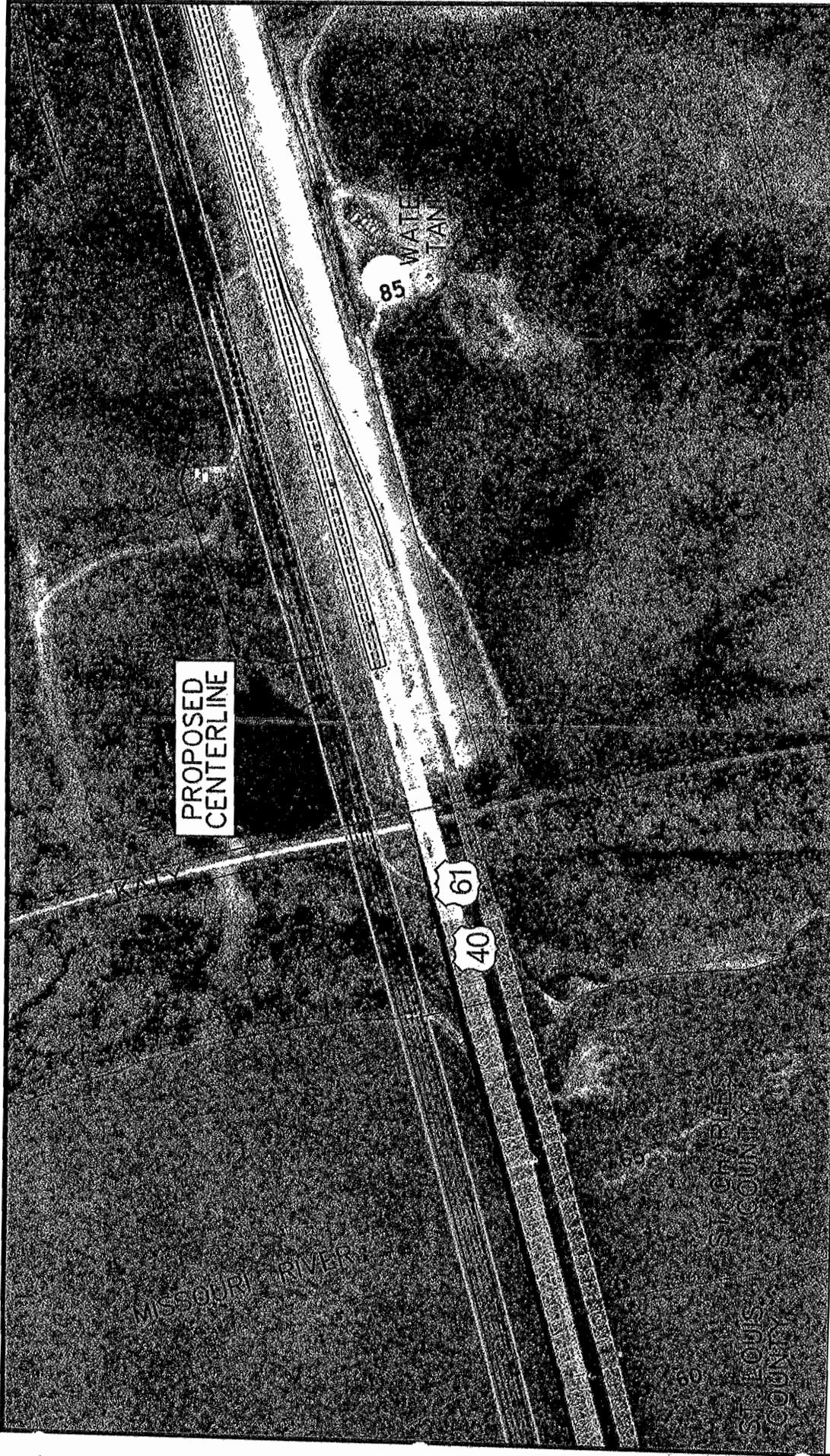
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SCALE: 1" = 200'

Route 40/61 Bridge
Job No. J6P1436

Alternative A2' (2 of 4)
Plate 10



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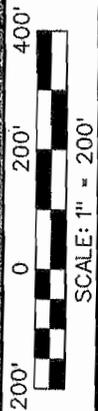
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WATER
TANK



MISSOURI RIVER

ST. LOUIS COUNTY



Route 40/61 Bridge
Job No. J6P1436

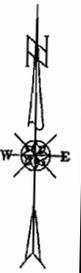
Alternative A2' (3 of 4)
Plate 11



PROPOSED
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Alternative A2' (4 of 4)
Plate 12

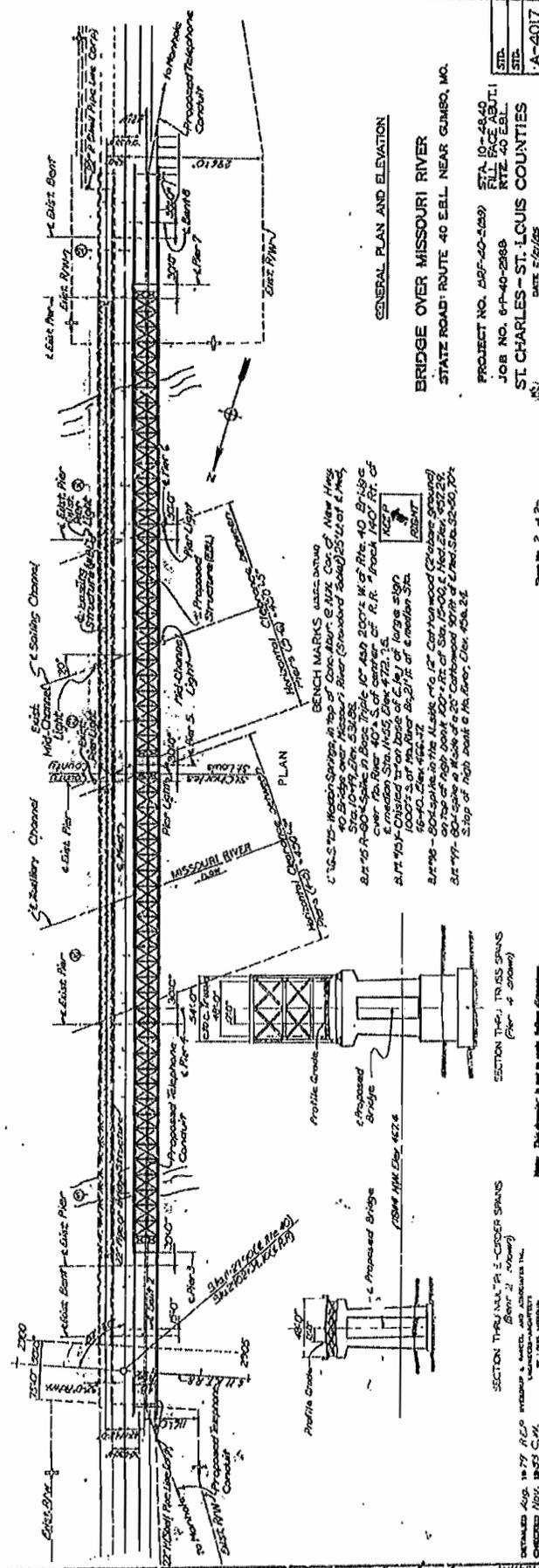
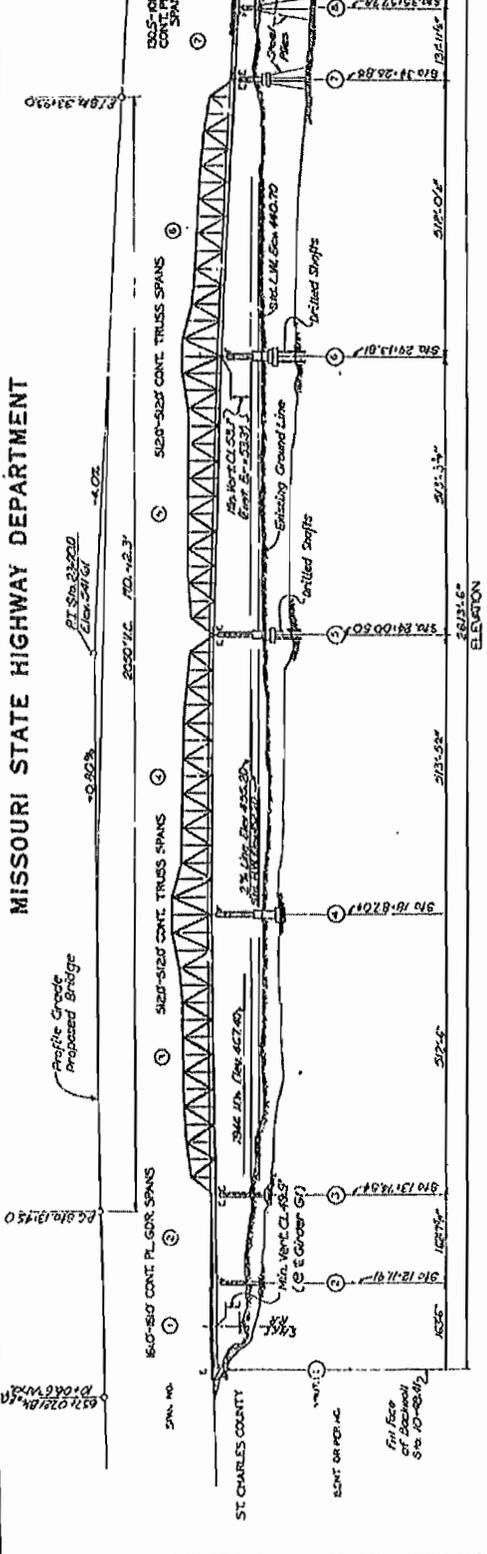
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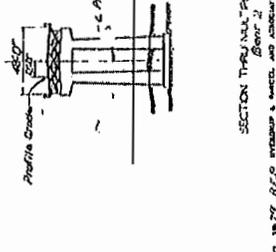
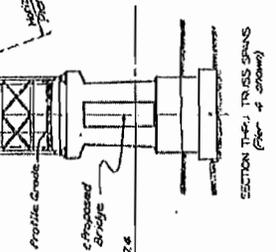
MISSOURI STATE HIGHWAY DEPARTMENT

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GENERAL PLAN AND ELEVATION
BRIDGE OVER MISSOURI RIVER
STATE ROAD ROUTE 40 E.E.L. NEAR GIMSO, MO.

PROJECT NO. 1597-40-2589 STA. 10+48.40
 JOB NO. 64-40-2888 FILL FACE ABUT. 1
 ST. CHARLES - ST. LOUIS COUNTIES RTZ. 40 E.E.L.
 DATE 5/21/65
 SHEET NO. 2 OF 25
 A-4017



ST. CHARLES COUNTY
 ST. LOUIS COUNTY
 MISSOURI RIVER
 BENCH MARKS (AS SHOWN)
 1. 16.575 - Modern Springs at top of Oak Knob, E. N. of Cox of New Hwy. 40 bridge over Missouri River (Shaded) 25-12-12 of 1.140.
 Sta. 10+48.40 Elev. 531.86
 2. 17.15 R-600 - 17.15 Elev. 405.15 at center of R.R. track 1407 ft. of median Sta. 1105 Elev. 472.15
 3. 17.15 - Chisled iron base of E. leg of large sign 1000's at Mo. River Sta. 2171 at median Sta. 1040 Elev. 444.72
 4. 17.15 - 17.15 Elev. 444.72 at top of 12" cast iron wood (cypress species) on top of 600' post 120' x 12" of Sta. 15-00, E. Med. Elev. 452.29
 5. 17.15 - 60' spike at W. side of a 20' Corridorway 30' of Elev. Sta. 32-50, 70's
 6. Top of high bank to Mo. River, Elev. 436.24

SECTION THREE MULTIPLE-CORNER SPANS (From 4 spans)
 SECTION TWO MULTIPLE-CORNER SPANS (From 2 spans)

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 651. 12/1819
 652. 1/1820
 653.

Accident Summary

Summary	1998	1999	2000	2001	2002	Total
Fatal	1	0	0	1	0	2
Injury	9	7	10	7	7	40
PDO	13	18	27	29	19	106
Total	23	25	37	37	26	148
AADT	35667	36264	33423	33825	34040	
1 Year Statewide Rate						
Accident Rate	78.2	83.6	134.25	132.66	92.63	
Statewide Rate	191.06	182.03	173.71	173.72	172.96	RtDes Only
Accident Class						
ANIMAL OTHER THAN DEER	0	0	0	0	0	0
AVOIDING	1	0	0	2	0	3
BACKING	0	0	0	0	0	0
CHANGING LANE	1	3	1	1	0	6
CROSS MEDIAN	1	0	0	0	0	1
DEER	0	2	0	0	0	2
DUAL LEFTS COLLIDE	0	0	0	0	0	0
DUAL RIGHTS COLLIDE	0	0	0	0	0	0
FIXED OBJECT	0	0	0	1	2	3
HEAD ON	0	0	1	0	0	1
JACKKNIFE	0	0	0	0	0	0
LEFT TURN	0	0	0	0	0	0
LEFT TURN RIGHT ANGLE COLLISION	0	0	0	0	0	0
OTHER	1	0	1	4	2	8
OUT OF CONTROL	8	11	14	12	9	54
PARKING OR PARKED CAR	0	0	1	0	0	1
PASSING	1	0	2	5	0	8
PEDALCYCLE	0	0	0	0	0	0
PEDESTRIAN	0	0	0	0	0	0
REAR END	6	9	16	12	13	56
RIGHT ANGLE	1	0	1	0	0	2
RIGHT TURN	0	0	0	0	0	0
RIGHT TURN RIGHT ANGLE COLLISION	0	0	0	0	0	0
SIDESWIPE	1	0	0	0	0	1
TOWED UNIT DISCONNECTS	0	0	0	0	0	0
U - TURN	2	0	0	0	0	2
WRONG WAY ON DIVIDED HIGHWAY	0	0	0	0	0	0
Selected Travelway						
Offset		Designation	Travelway	Direction		
		US	40	E		

From						
District		County	County Log	Continuous Log		
6		ST. CHARLES	18.20899	219.73299		
To						
District		County	County Log	Continuous Log		
6		ST. LOUIS	0.54	221.992		

Accident Summary

Summary	1998	1999	2000	2001	2002
Fatal	0	0	0	0	0
Injury	8	11	3	9	7
PDO	23	28	31	40	54
Total	31	39	34	49	61
AADT	35710	36321	32825	33206	33429
1 Year Statewide Rate					
Accident Rate	103	127.4	122.89	175.08	216.5
Statewide Rate	191.06	182.03	173.71	173.72	172.96
Accident Class					
ANIMAL OTHER THAN DEER	0	0	0	0	0
AVOIDING	0	0	0	1	0
BACKING	0	0	0	0	0
CHANGING LANE	0	2	0	0	2
CROSS MEDIAN	0	0	0	0	0
DEER	0	1	2	0	0
DUAL LEFTS COLLIDE	0	0	0	0	0
DUAL RIGHTS COLLIDE	0	0	0	0	0
FIXED OBJECT	0	0	0	0	1
HEAD ON	0	0	0	0	0
JACKKNIFE	0	0	0	0	0
LEFT TURN	1	0	0	0	0
LEFT TURN RIGHT ANGLE COLLISION	0	1	0	0	0
OTHER	1	6	1	3	3
OUT OF CONTROL	4	4	3	5	8
PARKING OR PARKED CAR	0	0	0	1	0
PASSING	0	0	5	4	2
PEDALCYCLE	0	0	0	0	0
PEDESTRIAN	0	0	0	0	0
REAR END	25	25	23	35	45
RIGHT ANGLE	0	0	0	0	0
RIGHT TURN	0	0	0	0	0
RIGHT TURN RIGHT ANGLE COLLISION	0	0	0	0	0
SIDESWIPE	0	0	0	0	0
TOWED UNIT DISCONNECTS	0	0	0	0	0
U - TURN	0	0	0	0	0
WRONG WAY ON DIVIDED HIGHWAY	0	0	0	0	0
Selected Travelway					
Offset		Designation	Travelway	Direction	Selected City
		US	40	W	NONE SPECIFIED
From					
District	6	County	ST. LOUIS	County Log	19,938
				Continuous Log	27,077
To					
District	6	County	ST. CHARLES	County Log	1,765
				Continuous Log	29,386
Intersecting Travelways					
Designation		Travelway		Direction	
From	RP	US40W TO US40W		W	
To	PVT	OUTER RD		E	

Investigation Phase - Cost Model

Project: J6P1436

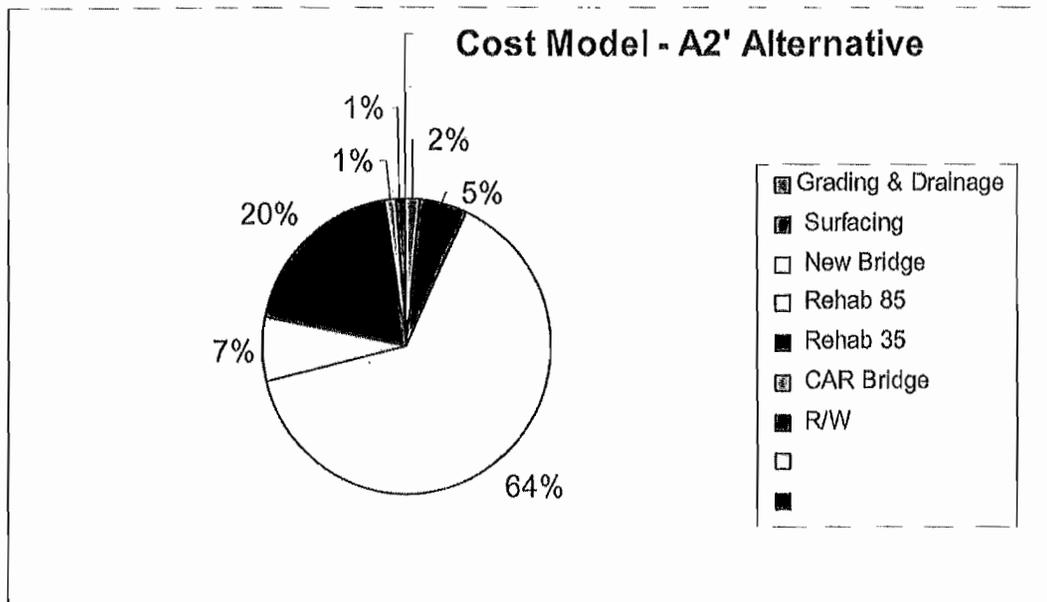
Team VE2003-06

Location: Route 40, St. Charles County

Date: Dec. 1-5, 2003

VE Baseline (A2' Alternative) - Construction of new 4 lane EB bridge and conversion of 85 (3 lane) and 35 (1 lane) for WB traffic.

Construction Costs	All Costs in 2002 Dollars	
	A2' (1000)	% of Total
Grading & Drainage	\$ 2,323	2%
Surfacing	\$ 7,277	5%
Subtotal Roadway Construction	\$ 9,600	
Bridge		
New Bridge	\$ 88,944	64%
Rehab 85	\$ 9,928	7%
Rehab 35	\$ 27,200	20%
CAR Bridge	\$ 1,676	1%
Subtotal Bridge Cost	\$ 127,748	
Subtotal Construction Costs	\$ 137,348	
R/W	\$ 1,401	1%
Total	\$ 138,749	100%



Preliminary Cost Estimate
Route 40/61 Bridge at the Missouri River

St. Charles and St. Louis Counties
 Job No. J6P-1436

January 28, 2003

ITEM	SUB-ITEMS	UNIT COST	QUANTITY	TOTAL COST 2002 Dollars	TOTAL COST \$2,007	TOTAL COST 2012 Dollars
ROADWAY CONSTRUCTION COSTS						
Grading	Clearing & Grubbing (assume 300-foot width)	\$3,000 per acre	40 acres	\$119,865		\$177,365
	Total Excavation		208,690 cu yd			\$432,477
	Class A Excavation (70% total)	\$2 per cu yd	146,083 cu yd	\$292,166	\$355,465	\$432,477
	Class C Excavation (30% total)	\$5 per cu yd	62,607 cu yd	\$313,035	\$380,255	\$453,268
	Compacting Embankment	\$0.40 per cu yd	2,042,986 cu yd	\$817,188	\$894,247	\$1,228,653
	Erosion Control	\$5 per foot	8,300 feet	\$41,500	\$50,491	\$51,430
	Drainage	\$15 per foot	8,300 feet	\$124,500	\$151,473	\$194,290
	Subtotal Grading and Drainage Costs			\$1,708,224	\$1,932,531	\$2,528,604
Surfacing	New Concrete Pavement Local/Service Road(s)	\$500,000 per lane mile	10.7 lane miles	\$5,350,375	\$6,509,554	\$7,919,983
	A.	\$480,000 per mile	miles	\$0	\$0	\$0
	B.	\$480,000 per mile	miles	\$0	\$0	\$0
	C.	\$480,000 per mile	miles	\$0	\$0	\$0
	D.	\$480,000 per mile	miles	\$0	\$0	\$0
	Subtotal Surfacing Costs			\$5,350,375	\$6,509,554	\$7,919,983
				Subtotal Roadway Construction Costs	\$7,058,613	\$10,448,471
BRIDGE CONSTRUCTION COSTS						
	New Missouri River Bridge	Lump Sum		\$95,400,000	\$79,566,100	\$96,807,976
	Rehabilitate eastbound bridge (2018)	Lump Sum		\$7,300,000	\$8,881,566	\$10,805,763
	Rehabilitate westbound bridge (2020)	Lump Sum		\$20,000,000	\$24,333,059	\$29,604,896
	Chesterfield Airport Road	\$85 per sq ft	14,500 sq ft	\$1,232,500	\$1,438,525	\$1,824,401
	Bridge over...	\$95 per sq ft	sq ft	\$0	\$0	\$0
	Bridge over...	\$95 per sq ft	sq ft	\$0	\$0	\$0
	Bridge over...	\$95 per sq ft	sq ft	\$0	\$0	\$0
	Subtotal Bridge Construction Costs			\$93,932,500	\$114,289,249	\$139,043,046
				Subtotal Construction Costs	\$122,725,333	\$149,491,518
OTHER COSTS						
	Right of Way - St. Louis Co.	\$60,000 per acre	8.2 acres	\$489,014	\$589,827	\$729,781
	Right of Way - St. Charles Co.	\$40,000 per acre	13.3 acres	\$533,822	\$649,476	\$790,187
	Subtotal - Right-of-Way Costs		21.6 acres	\$1,022,836	\$1,239,303	\$1,519,968
	OTHER COSTS					
	Miscellaneous	20% of Construction Costs		\$20,198,223	\$24,574,226	\$29,898,304
	Engineering & Administration	16% of Construction Costs		\$16,158,578	\$19,639,281	\$23,918,643
	Subtotal Other Costs			\$36,356,801	\$44,213,507	\$53,816,946
				Total Costs Alternative A2	\$168,374,749	\$204,828,432

SPECULATION PHASE - BRAINSTORMING

Project: J6P14366

Team: VE 2003-06

Date: 12/1-5-03

Item: A: Bridge Options

Function: Cross Obstacle; increase Capacity	VOTES	RATING
1. Replace '35 Bridge on Existing Alignment with 4-lanes & full shoulders; Use In place '85 Bridge; 2-lanes in each direction	3	Drop
2. Replace '35 Bridge on Existing Alignment with 4-lanes & full shoulders; Use In place '85 Bridge; Use Pre-fab deck and float in, minimizing time WB Bridge is closed	0	Drop
3. Replace '35 Bridge on Existing Alignment with 4-lanes & full shoulders; Use In place '85 Bridge; Re-use existing Substructure	1	Drop
4. Replace '35 Bridge with new downstream Bridge w/4-lanes & full shoulders; Use In place '85 Bridge; Build in two stages, using old '35 bridge for traffic in 1 st phase and new partial structure in 2 nd phase when old bridge is removed	1	Drop
5. Replace '35 Bridge with new downstream bridge in close proximity with 4-lanes & full shoulders; Use In place '85 Bridge; use outside lane of '35 bridge as construction staging area	0	Drop
6. Alternative A2' except remove '35 Bridge; Use in Place '85 Bridge striped for 4 lanes eastbound. (Removal of '35 Bridge delayed until major rehab becomes necessary)	2	Drop
7. Alternative A2' except Transfer jurisdiction of '35 bridge to County	0	Drop
8. "Do Nothing"	0	Drop
9. Build New 8-lane Bridge to handle EB and WB traffic; Remove both the '35 and '85 bridge (build in stages)	3	ADV

SPECULATION PHASE - BRAINSTORMING

Project: J6P1436

Team: VE 2003-06

Date: 12/1-5/03

Item: B: South ApproachFunction: **Improve Access; Reduce Cost**

	VOTES	RATING
1. Eliminate South Outer Road Connection	0	DS
2. Remove Chesterfield Airport Road Ramp to WB 40/61; Build Ramps at Spirit of St. Louis Blvd.	5	ADV
3. Minimize construction at tie-in by utilizing existing approach roadway	4	Drop
4. Eliminate proposed St. Charles Sand access road; Tie into North Outer Road	2	Drop
5. Eliminate A2' Outer Road Connection	0	Drop

Item: B: North ApproachFunction: **Improve Access; Reduce Cost**

1. Extend fourth lane northbound to Rte. 94	5	DS
2. Shift approach roadways to the northeast to better utilize existing pavements (Reduces Impact to quarry lake)	2	ADV
3. Avoid impact to quarry lake by extending bridge	0	Drop
4. Avoid impact to quarry lake by narrowing median width	1	ADV
5. Avoid impact to high embankment and ROW by building retaining wall	1	Drop

Evaluation Phase

Project: J6P1436

Team No. VE 2003-06

Date: 12/1-5/03

Item No.	Creative Idea Listing	Advantage	Idea Evaluation	Disadvantage	Idea Rating
SA-2	Remove Chesterfield Airport Road Ramp to WB 40/61; Build westbound access at Spirit of St. Louis Blvd to outer road.	Saves bridge cost (construction and life cycle). Replaces merge at curve with safer merge decision point. Eliminates vertical clearance issue. Works with the Chesterfield master plan.	Adds traffic to Spirit Airport Road and Bridge		Adv.
NA-1	Extend west bound fourth lane to Rte. 94	Meets capacity needs.	Adds cost.		Adv.
SA-3	Minimize construction at tie-in by utilizing existing approach roadway (downstream bridge only)	Saves cost.	Incompatible with any bridge option.		Drop

BR-1	<p>Replace '35 Bridge on Existing Alignment with 4-lanes & full shoulders; Use in place "85 Bridge; 2-lanes in each direction during construction</p>	<p>Provides new interstate typical section westbound. Eliminates 35 bridge and cost to rehab. Utilizes existing approaches.</p>	<p>Maintenance of traffic during construction. More than 15 minute queue. (2-11 foot lanes each direction) No shoulders on EB 85 bridge. Additional cost for bike/ped.</p>	Drop
BR-9	<p>Build New 8-lane Bridge to handle EB and WB traffic; Remove both the '35 and '85 bridge (build in stages)</p>	<p>Provides new interstate typical section both directions. Eliminates 85 and 35 bridge and cost to rehab. Future expansion assuming not a truss.</p>	<p>Additional 41 million dollar cost. (65 mill additional 4-lanes - 27 million rehab cost + 3 million demo)</p>	Adv.
SA-4	<p>Eliminate proposed St. Charles Sand access road; Tie in to North Outer Road</p>	<p>Saves construction costs.</p>	<p>Placing EB traffic on a WB lane.</p>	Drop
BR-6	<p>Alternative A2' except remove '35 Bridge; Use in Place '85 Bridge striped for 4 lanes WB. (Removal of '35 Bridge delayed until major rehab becomes necessary)</p>	<p>Provides new interstate typical section EB. Eliminates 35 bridge and cost to rehab.</p>	<p>4-lanes on 85 bridge, no shoulders in year 2020. Additional cost for bike/ped after 2020.</p>	Drop

NA-2	Shift approach roadways to the northeast to better utilize existing pavements	Reduces impact to quarry lake. Utilize existing pavement. Reduces ROW cost.	Adds reverse curve.	Adv.
BR-3 combined with BR-1	Replace '35 Bridge on Existing Alignment with 4-lanes & full shoulders; Use In place "85 Bridge; Re-use existing Substructure	See BR-1	See BR-1	Drop
NA-4	Avoid impact to quarry lake by narrowing median width	Reduces impact to quarry lake. Reduces ROW cost.	Does not provide desired median width.	Adv.

Project # J6P1436	VE Study # 2003-06
	Evaluative Criteria & Matrix

Evaluative Criteria

ID	Criteria	Unit of Measure	Performance Ratings(1 to 10)
A	Safety	Accident Rate	Range of 500 to 0
B	Capacity	LOS	Range of F to A
C	Maintenance of traffic	Constr. WZ delay	significant delay to no delay
D	Constructability	# of lane shifts	many to few
E	Interstate standards	Shoulder width	Range of 0 to 12 feet
F	Bridge life cycle	Years	Range of 0 to 100 years
G			

Criteria Matrix

						Total points	% of Total
A	A	A	A	A	A	5.0	32.8%
	B	B	B	B	B	4.0	26.2%
		C	C	E	F	1.0	6.6%
			D	E	F	0.3	1.6%
				E	E	3.0	19.7%
					F	2.0	13.1%
					G		
Total						15.3	100.0%

a = A is of greater importance

a/b = A and B are of equal importance

Comments/Discussion

Performance Matrix BRIDGE

Criteria	Unit of Measurement	Criteria Weight	Concept	Performance Rating										Total Performance		
				1	2	3	4	5	6	7	8	9	10			
Safety	Accident Rate	33%	No Build												0	
			A2' BASELINE BR 9							8						262
			VE Option 2 VE Option 3										10			328
Capacity	LOS	26%	No Build												0	
			A2' BASELINE BR 9									9			236	
			VE Option 2 VE Option 3									9			236	
Maintenance of traffic	Constr. WZ delay	7%	No Build												0	
			A2' BASELINE							7					46	
			BR 9 VE Option 2 VE Option 3					5							33	
Constructability	# of lane shifts	2%	No Build												0	
			A2' BASELINE BR 9							7					11	
			VE Option 2 VE Option 3						6						10	
Interstate standards	Shoulder width	20%	No Build												0	
			A2' BASELINE BR 9							7					138	
			VE Option 2 VE Option 3										10		197	
Bridge life cycle	Years	13%	No Build												0	
			A2' BASELINE BR 9							7					92	
			VE Option 2 VE Option 3										10		131	

OVERALL PERFORMANCE						Total Performance	Total Cost	Value Index	% Value Improvement
No Build: Maintain existing conditions						0			
A2' BASELINE						785	126	6.23	
BR 9						934	182	5.13	-18
VE Option 2						0			
VE Option 3						0			

Performance Matrix END to END

Criteria	Unit of Measurement	Criteria Weight	Concept	Performance Rating										Total Performance	
				1	2	3	4	5	6	7	8	9	10		
Safety	Accident Rate	33%	No Build												0
			A2' BASELINE SA2+SA6+A2'+ NA2+NA4						7						
Capacity	LOS	26%	No Build												0
			A2' BASELINE SA2+SA6+A2'+ NA2+NA4						7						
Maintenance of traffic	Constr. WZ delay	7%	No Build												0
			A2' BASELINE SA2+SA6+A2'+ NA2+NA4				4.5								
Constructability	# of lane shifts	2%	No Build												0
			A2' BASELINE SA2+SA6+A2'+ NA2+NA4					6							
Interstate standards	Shoulder width	20%	No Build												0
			A2' BASELINE SA2+SA6+A2'+ NA2+NA4							8					
Bridge life cycle	Years	13%	No Build												0
			A2' BASELINE SA2+SA6+A2'+ NA2+NA4						7						
															105
															0

OVERALL PERFORMANCE				Total Performance	Total Cost	Value Index	% Value Improvement
No Build: Maintain existing conditions				30			
A2' BASELINE				702	138.0	5.08	
SA2+SA6+A2'+NA2+NA4				759	135.0	5.62	10.6
VE Option 3				0			

Development Phase - Executive Summary

Project: J6P1436

Team No. VE 2003-06

Date 12/1-5/03

Proposed Alternate SA-2:

Eliminates the existing Chesterfield Airport Rd. WB flyover bridge by redirecting existing traffic to a proposed WB on-ramp at the Spirit Airport Rd./ Rte 40/61 Interchange.

Advantages:

- Saves bridge cost (Construction and Life Cycle).
- Replaces merge at curve with safer merge decision point.
- Eliminates vertical clearance issue.
- Works with the Chesterfield Valley Master Plan.

Disadvantages:

- More traffic congestion to Spirit Airport Rd. bridge.

Development Phase - Calculations

Creative Idea No. SA2

Team No.VE 2003-06

Date: 12/1-5/03

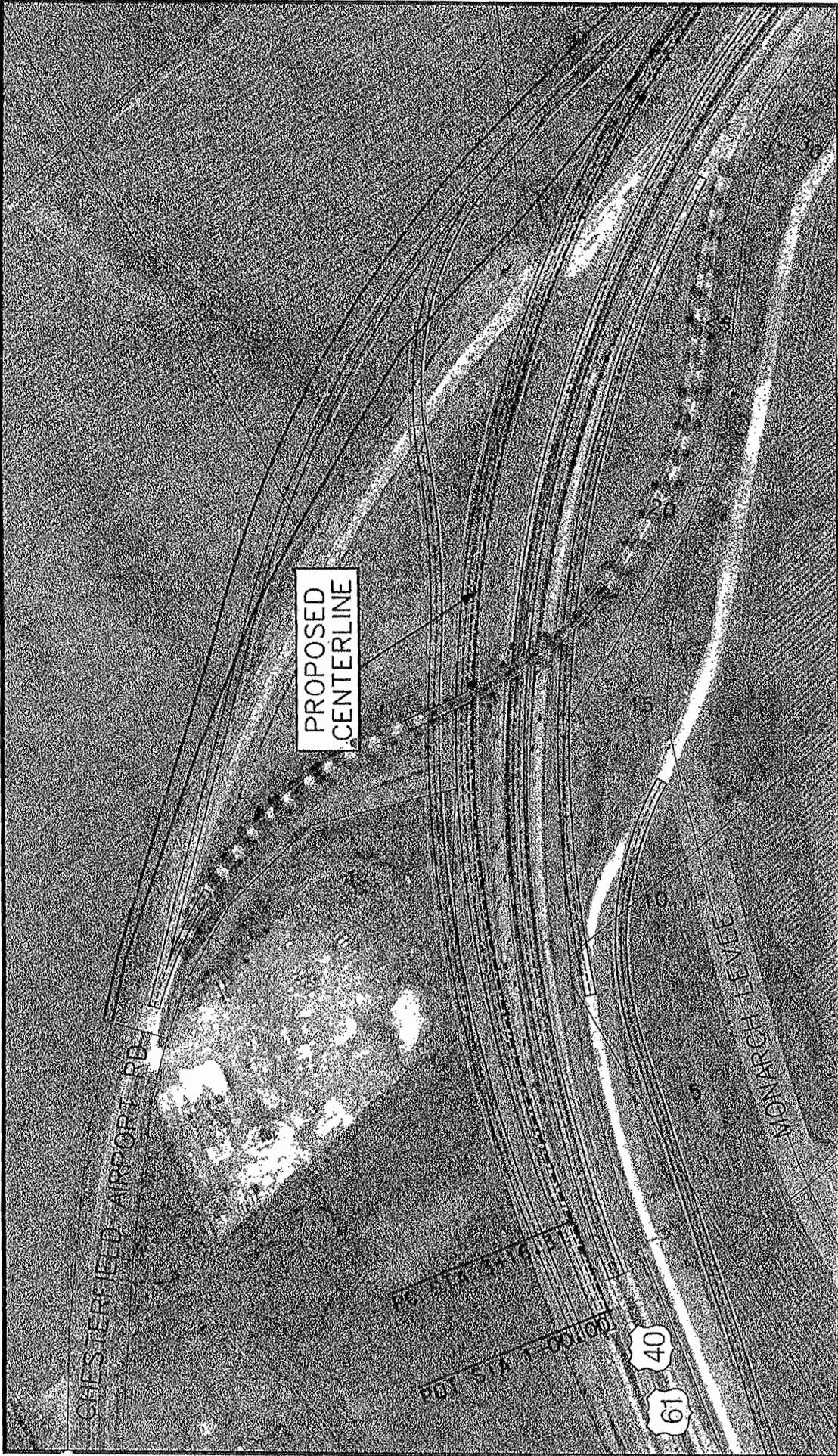
Proposed Alternate SA2:

Eliminate the existing Chesterfield Airport Rd. WB flyover Bridge.

	Baseline (A2')	Proposal SA2
R/W	\$493,000	\$493,000
Roadway	\$5,760,000	\$5,760,000
Bridge	<u>\$1,676,000</u>	<u>\$0</u>
	\$7,929,000	\$6,253,000

Potential Cost Savings:

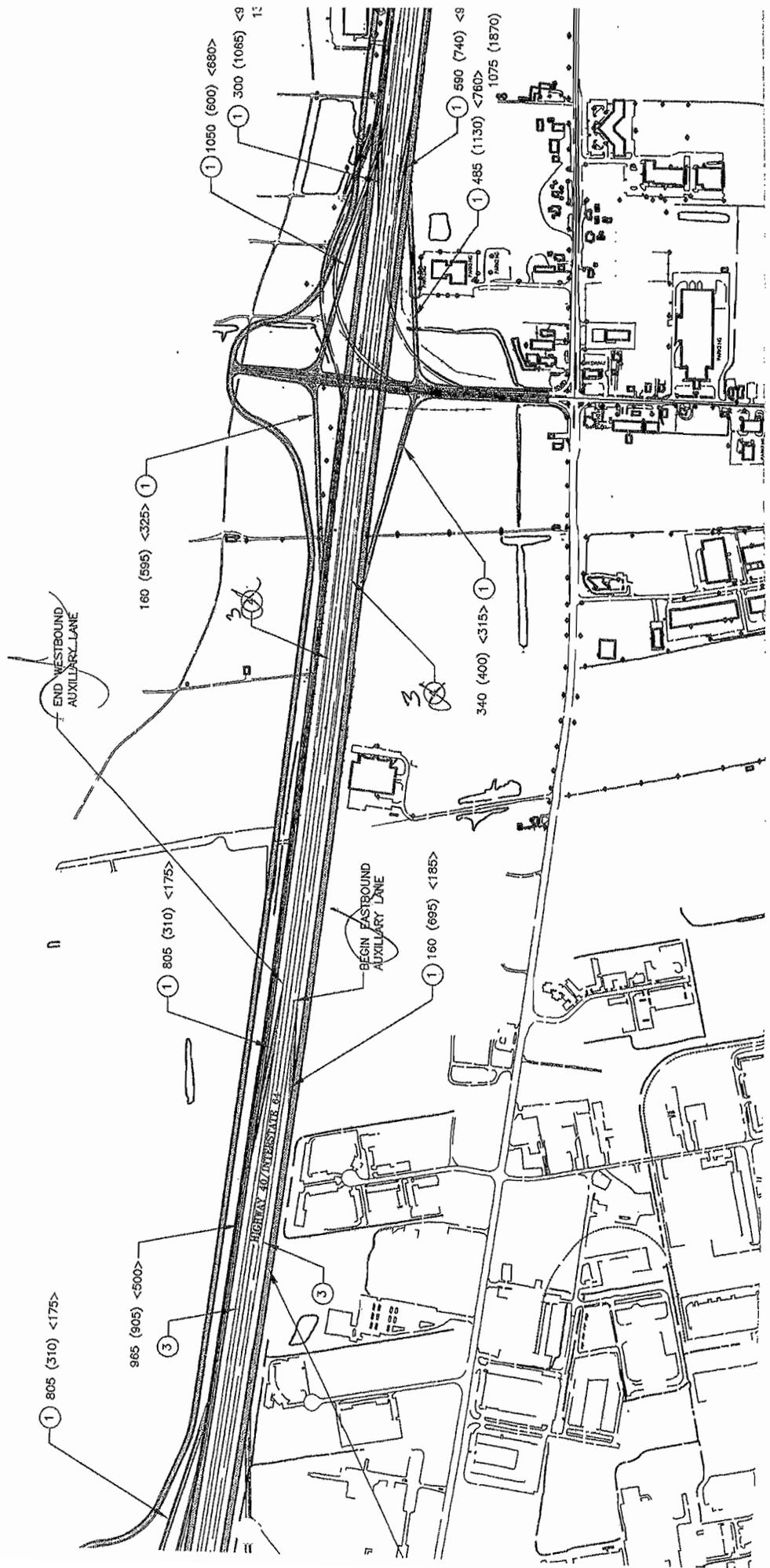
$$\$7,979,000 - \$6,253,000 = \$1,676,000$$



Alternative A2' (1 of 4)
Plate 9

Route 40/61 Bridge
Job No. J6P1436





Development Phase - Executive Summary

Project: J6P1436

Team:

Date:

Proposed Alternate NA2:

Construct reverse curves to align existing North approach roadways with proposed bridge alignments. This proposal is most feasible if the structure type selected maintains the existing grade.

Advantages:

- Utilizes Existing Pavement (saves .95 lane miles)
- Reduces ROW needed to the West (saves approximately 2.0 acres)

Disadvantages:

- Introduces reverse curves
- Not feasible if bridge grade is changed significantly

Development Phase - Calculations

Creative Idea No. NA2

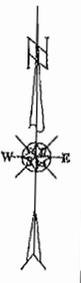
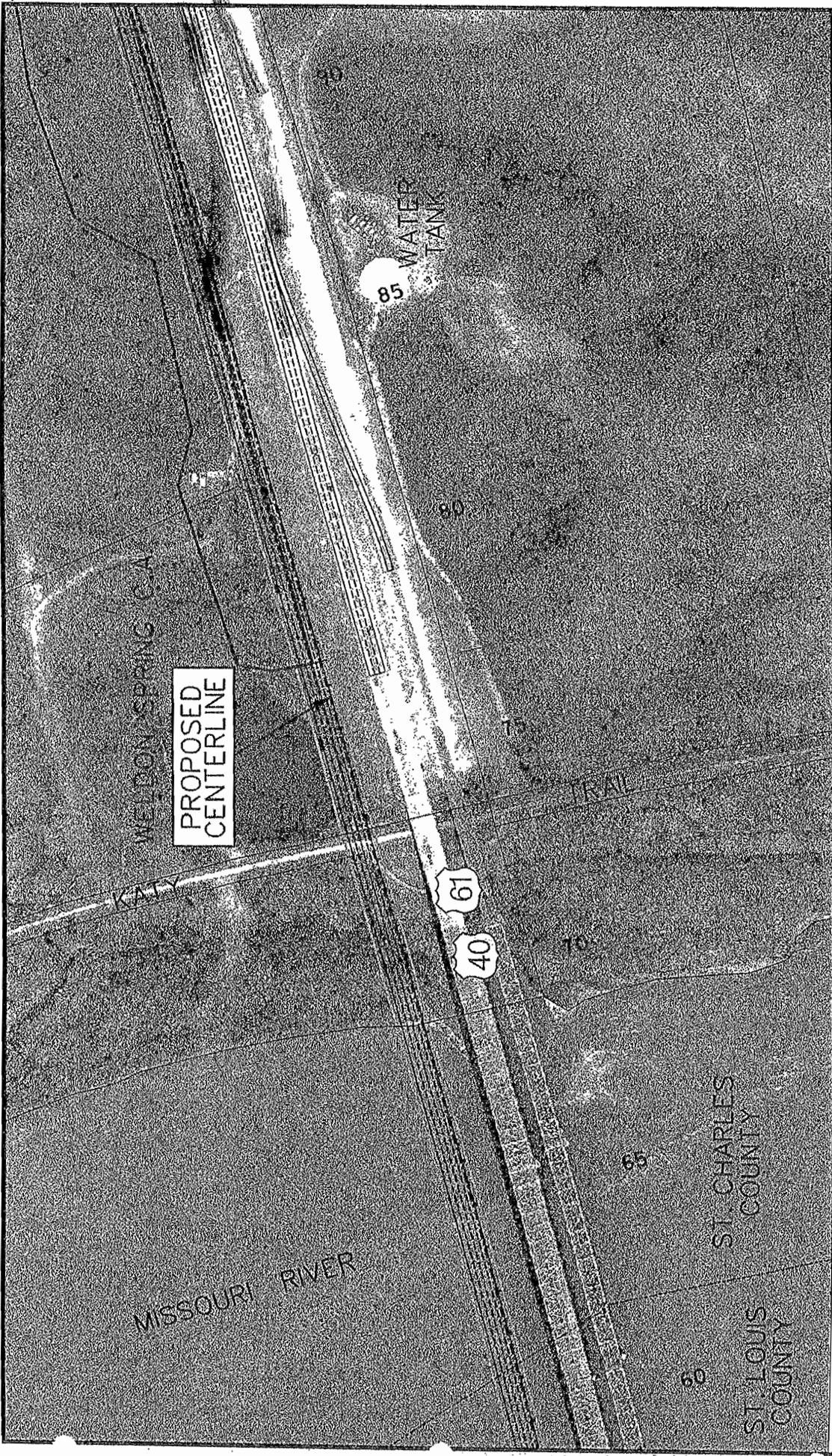
Team:

Date: 12-05-03

Proposed Alternate NA2:

Construct reverse curves to align existing North approach roadways with proposed bridge alignments. This proposal is most feasible if the structure type selected maintains the existing grade.

Item	Baseline (A2')	Proposal NA2
ROW	\$533,822	\$435,000
Grading / Pavement	\$3,839,885	\$3,269,885
	\$4,373,707	\$3,705,000
	Potential Savings =	\$668,000



Route 40/61 Bridge
Job No. J6P1436

Alternative A2' (3 of 4)
Plate 11

Development Phase - Executive Summary

Project: J6P1436, Route 40/61

Team:

Bridge Location Study over the Missouri River

Date: 12/5/03

Proposed Alternative NA2, NA-4 & SA-6:

Reduce typical section median width to allow for less R/W acquisition on both the north (St. Charles) and south (St. Louis county) approaches to the new bridge. Construct reverse curves on north approach to facilitate use of existing pavement.

Proposed changes to typical section:

- Reduce median width between new bridge and 1985 bridge.

Advantages:

- Less R/W necessary
- Less R/W costs
- Less grading and drainage costs

Estimated reduction of new R/W (north 2.5 acres & south 2.0 acres approaches) = 4.5 acres
(assumption: reduce median to 20' from 60' as drawn in EIS on both approaches.)

Total potential cost R/W: \$806,836

NA-4 = \$433,822

SA-6 = \$373,014

\$220,000 savings from A-2' cost

Total potential cost grading/drainage: \$1,195,764

NA-4 = \$650,495

SA-6 = \$975,742

Median barrier cost \$192,000 (\$40/ft. x 4800')

\$505,959 savings from A-2' cost

Disadvantages:

- Median width is less than design standard
- Requires Reverse Curves on North Approaches

Development Phase - Calculations

Creative Idea No. NA-4, SA-6 & NA-2
 Recommendation: Reduce median width

Team:
 Date: 12/5/03

Reduce typical section median width to allow for less R/W acquisition on both the north (St. Charles) and south (St. Louis county) approaches to the new bridge. Construct reverse curves to align existing North approach roadways with proposed bridge alignments

NA2 + NA4 + SA6

Item	Baseline A2'	Proposal NA2,NA4, SA 6
ROW St. Charles	\$533,822	\$393,822
ROW St. Louis	\$493,014	\$373,014
Grading/ Paving	\$9,599,714	\$8,523,000
<i>TOTAL</i>	\$10,626,550	\$9,289,836

Proposed Cost Savings = \$1.3 million

Development Phase - Executive Summary

Project: J6P1436, Route 40/61

Team:

Bridge Location Study over the Missouri River

Date: 12/5/03

Proposed Alternative NA-4 & SA-6:

Reduce typical section median width to allow for less R/W acquisition on both the north (St. Charles) and south (St. Louis county) approaches to the new bridge.

Proposed changes to typical section:

- Reduce median width between new bridge and 1985 bridge.

Advantages:

- Less R/W necessary
- Less R/W costs
- Less grading and drainage costs

Estimated reduction of new R/W = 4.5 acres (north 2.5 acres & south 2.0 acres approaches)

(Assumption: reduce median to 26' from 60' as drawn in EIS on both approaches. 2700' on north approach, 2100' on south approach)

Total potential cost R/W: \$806,836

NA-4 = \$433,822

SA-6 = \$373,014

\$220,000 savings from A-2' cost

Total potential cost grading/drainage: \$1,626,239 (assumed 30% reduction from A-2' cost and 36% miscellaneous and engineering cost)

NA-4 = \$650,495

SA-6 = \$975,742

Median barrier cost \$192,000 (\$40/ft. x 4800')

\$505,959 savings from A-2' cost

Disadvantages:

- Median width is less than design standard
- Requires acceptance of Design Exception

Development Phase - Calculations

Creative Idea No. **NA-4 & SA-6:**

Team:

Recommendation: Reduce median width

Date: 12/5/03

Estimated reduction of new R/W = 4.5 acres (north 2.5 acres & south 2.0 acres approaches)

(assumption: reduce median to 26' from 60' as drawn in EIS on both approaches. 2700' on north approach, 2100' on south approach)

Total potential cost R/W: \$806,836

NA-4 = \$433,822

SA-6 = \$373,014

A-2' = \$1,026,836

\$220,000 savings from A-2' cost

Total potential cost grading/drainage: \$1,626,239 (assumed 30% reduction from A-2' cost and 36% miscellaneous and engineering cost)

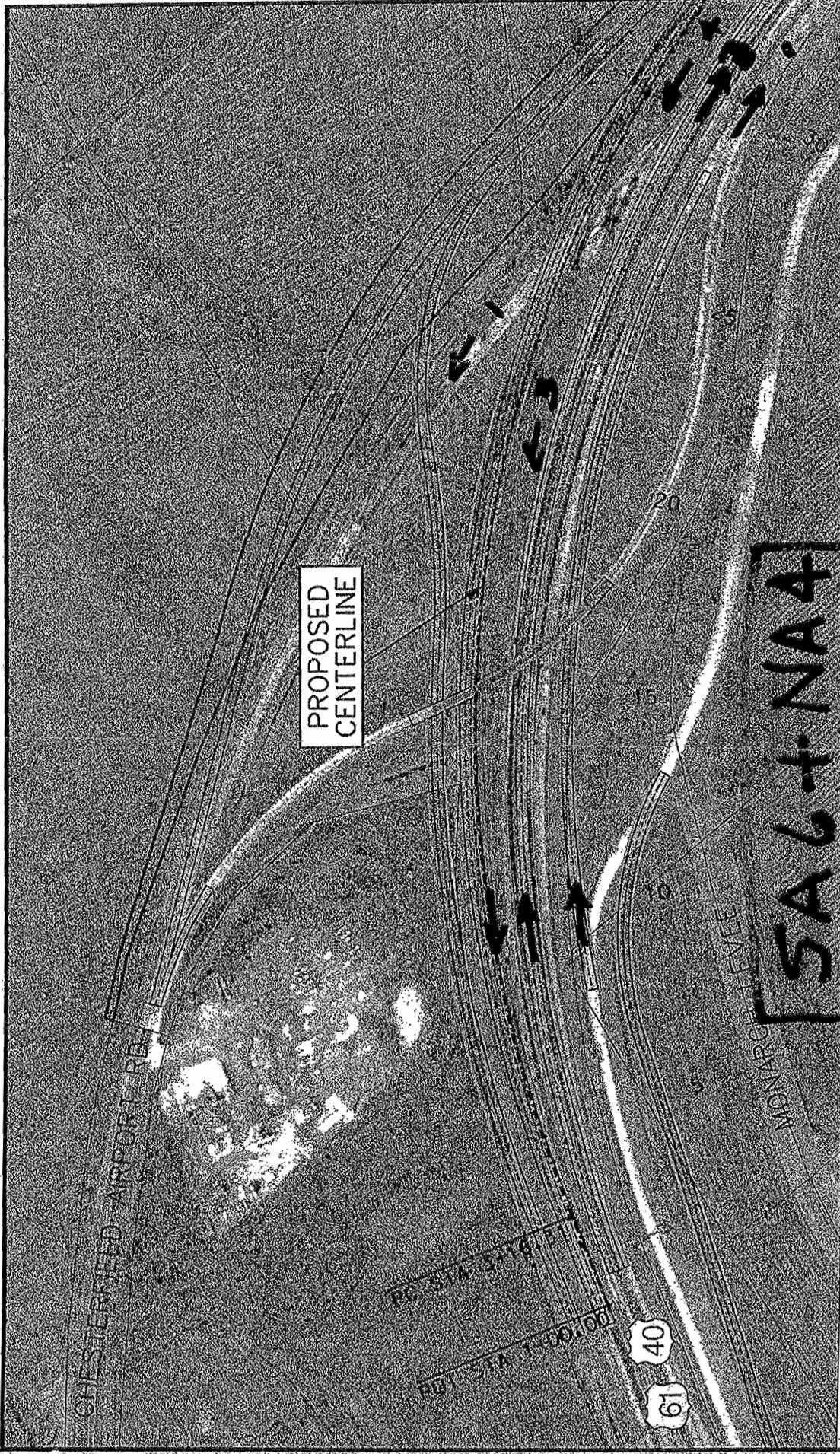
NA-4 = \$650,495

SA-6 = \$975,742

Median barrier cost \$192,000 (\$40/ft. x 4800')

A-2' = \$2,323,198 (includes 36% miscellaneous and engineering cost)

\$505,959 savings from A-2' cost

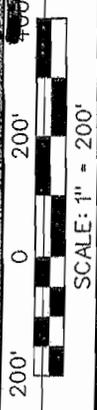


PROPOSED
CENTERLINE

SA 6+NA 4

Alternative A2' (1 of 4)
Plate 9

Route 40/61 Bridge
Job No. J6P1436

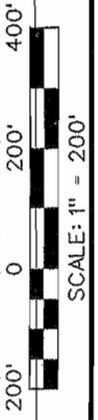
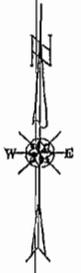
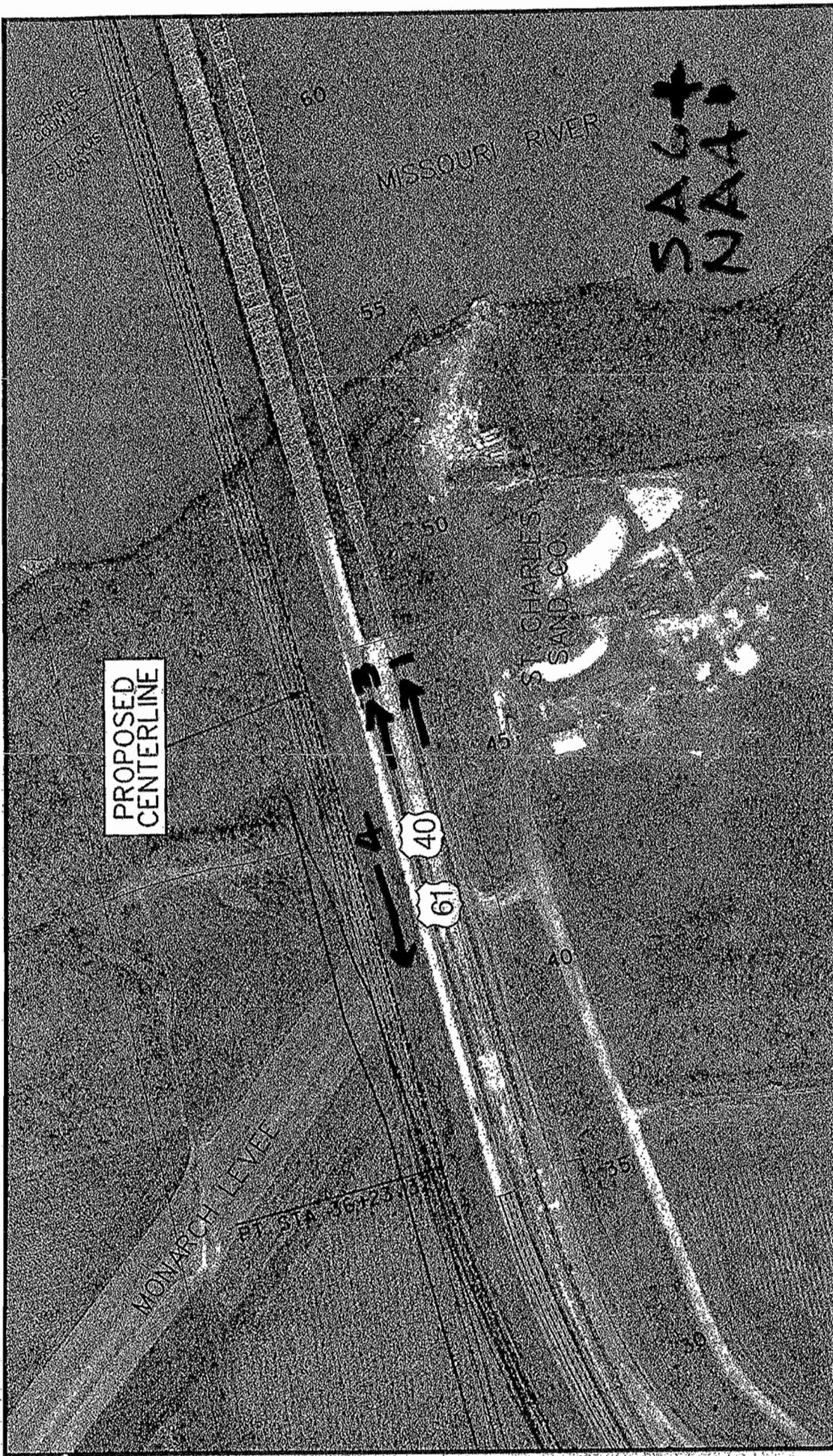


PG STA 1+00.00
PG STA 3+16.51



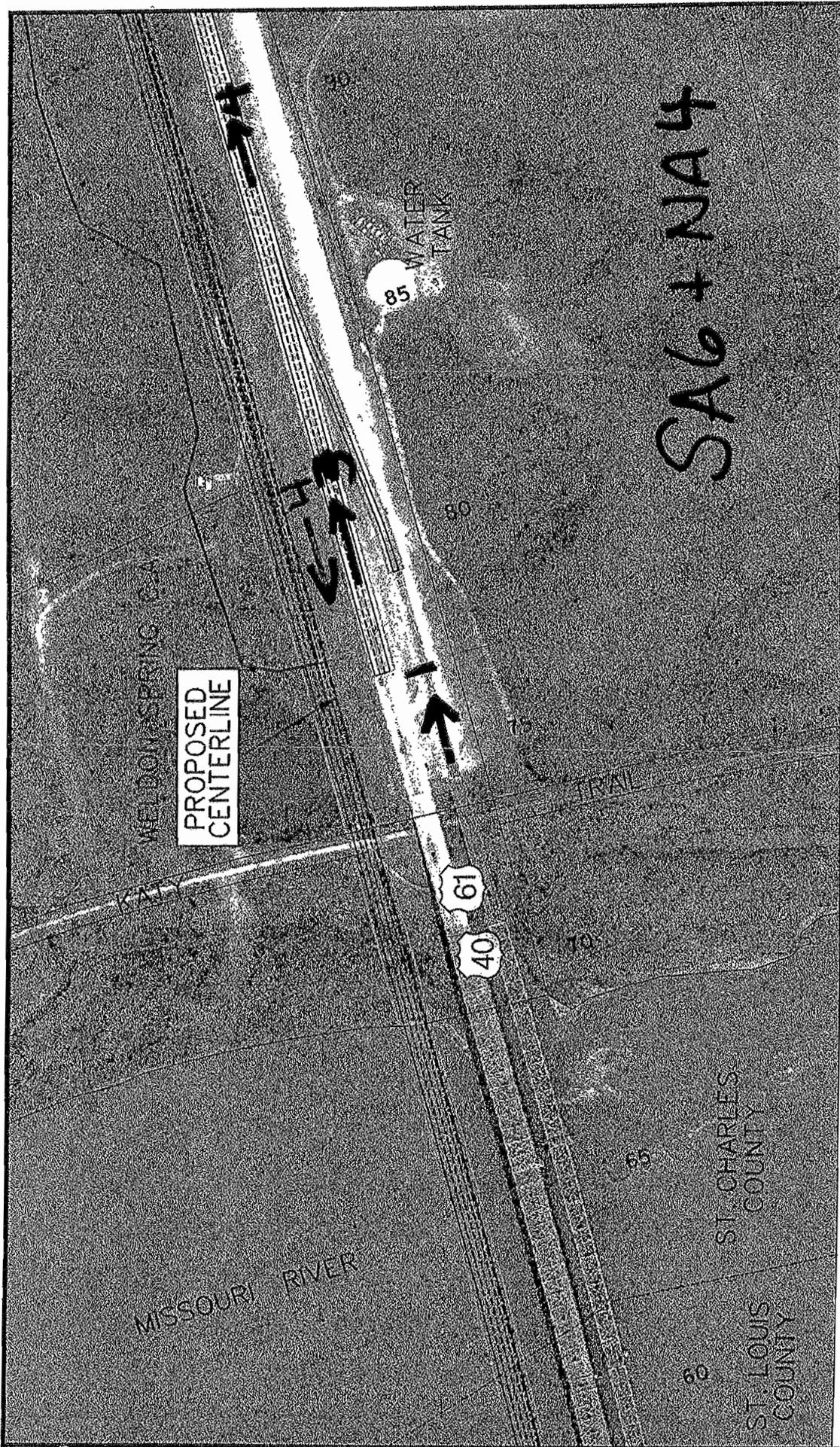
CHESTERFIELD AIRPORT ROAD

MINORVILLE LEVEE



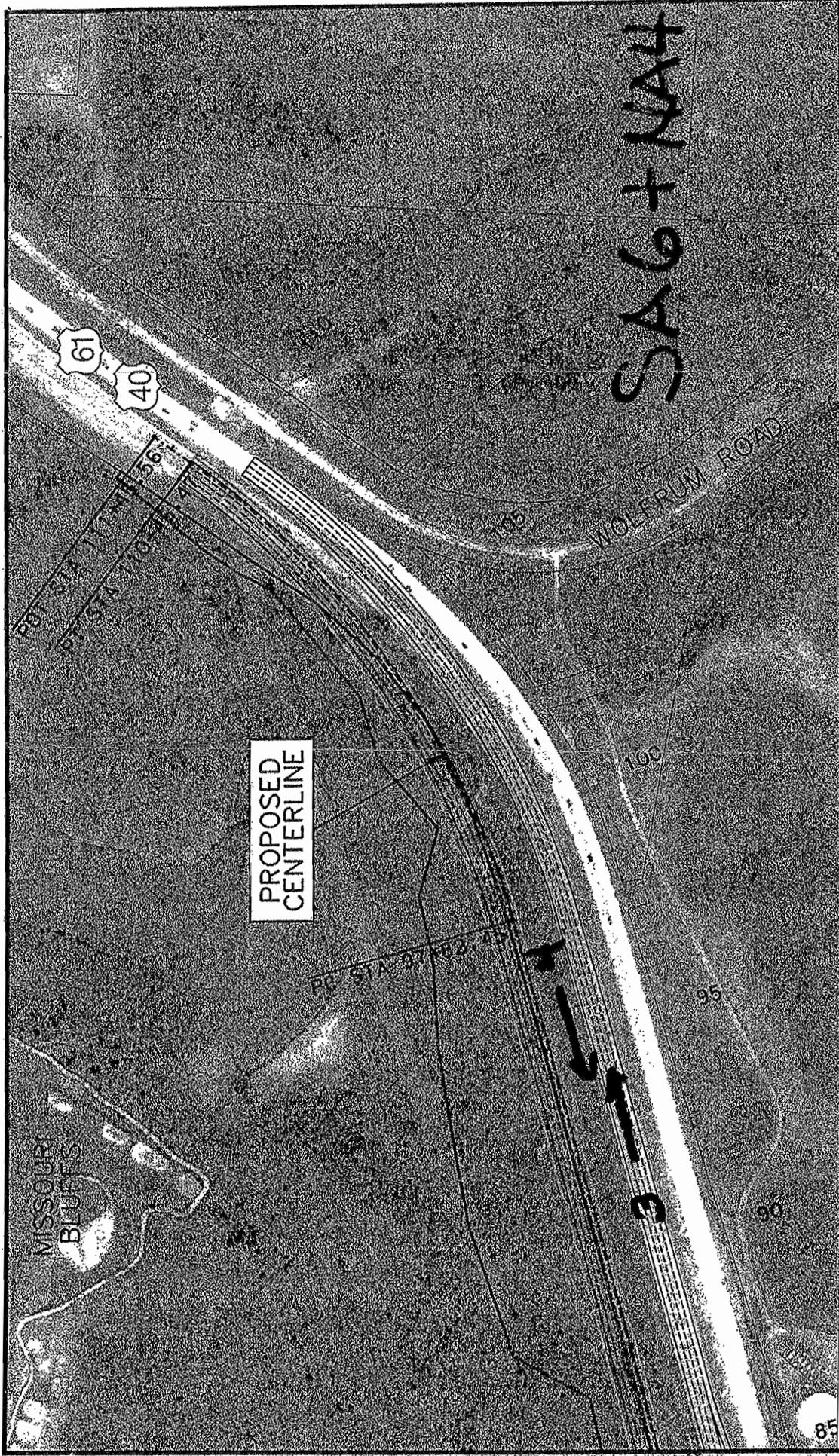
Route 40/61 Bridge
Job No. J6P1436

Alternative A2 (2 of 4)
Plate 10



Route 40/61 Bridge
 Job No. J6P1436

Alternative A2' (3 of 4)
 Plate 11



PROPOSED
CENTERLINE

SAG + NA4



MISSOURI
BLUFFS

PP STA 97+62.45

WOLF CREEK ROAD



Alternative A2 (4 of 4)
Plate 12

Route 40/61 Bridge
Job No. J6P1436

85

Development Phase - Executive Summary

Project: J6P1436, Route 40/61
Build New Bridge in Stage Construction

Team: 03-06
Date: 12-5-03

This option (BR9) looked at building a new Missouri River Bridge in stage construction and removing both of the existing bridges. The new bridge will be bi-directional with 8-12' lanes and 12' shoulders. The existing bridges were built in 1935 (eastbound bridge) and 1985 (westbound bridge). By utilizing this option, there will be the immediate removal of a 69-year-old bridge from the State bridge inventory system. This option will also allow traffic to flow on one structure instead of utilizing three (3) separate structures.

BR 9 was developed and discussed trying to discover an alternate that would meet the primary purpose of maintaining interstate standards while preventing interruption to the traveling public for major bridge rehabilitation.

This option was not chosen because it would increase the cost of the baseline bridge (A2') approximately \$56 million.

Development Phase - Recommendations

Creative Idea No. BR 9

Team: 03-06

Recommendation:

Date: 12-5-03

Original Design (Sketch attached Y N)

Build new bridge upstream of existing 1985 eastbound bridge and keep both the 1935 and 1985 bridge. The new bridge will be dedicated to only eastbound traffic and having 4-12' lanes with 12' shoulder. The westbound traffic would be combined by keeping the existing 1935 westbound bridge and converting the eastbound traffic on the 1985 bridge. The 1985 bridge will be re-stripped for 3-12' lanes and 6' shoulders. The 1935 bridge will be re-stripped for 1-12' lane with 9' shoulders. Once the new bridge is completed traffic will need to be placed on the new bridge for the maintenance of the 1935 and 1985 bridges.

Proposed Change (Sketch attached Y N)

Build new bridge, optional upstream or downstream, in 2 stages. The first stage will include building enough bridge to accommodate 6 lanes of traffic (3 in each direction). Stage 2 will include demolition of both the 1935 and 85 bridges then construct the remaining of the new bridge. The final bridge will be an 8 -12' lane with 12' shoulders.

Justification (Describe advantages/disadvantages, reasoning, and compliance with standards and requirements)

Advantages:

- (1) Provide desirable interstate standards for the entire life of bridge
- (2) Eliminates from the State Bridge Inventory system two bridges whereby saving major rehabilitation cost

Disadvantages:

- (1) Increase cost

