Missouri
Department
of Transportation

Daniel Niec, District Engineer

**North Central District**
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December 1, 2008

2009 Awards for Excellence Committee:

The implementation of "Practical Design" has provided a great opportunity for our district to showcase our ability to innovate and meet our customers' transportation needs in the most cost effective manner available. The J2P0448 project, involving the replacement of threes bridges on Route 136 near the Putnam/Schuyler County Line, is a "poster" image of our ability to meet the public's needs during a time of increasing fiscal pressures.

**Project Purpose and Need**

There were three bridges in approximately a half-mile length of Route 136 on the Putnam/Schuyler County Line. Bridge No. K0026 was a 227' long truss over the Chariton River that had a 22' driving width and restricted trucks over 21 tons to 15 mph. Bridge No. K0060 was a 223' long overflow bridge. Bridge No. K0025 was a 383' long bridge over the old channel. Both of these two latter bridges had timber piling and had the same width and load restrictions as the truss bridge.

There is a long history of near misses on these bridges and significant anecdotal history of trucks "exchanging" mirrors on these three bridges and of cars having to wait for farm equipment to pass over. It is therefore no surprise that replacing these three bridges has long been an area priority supported by the Northeast Missouri Regional Planning Commission.

The primary purpose and need, as redefined by the Core Team, was to remove these functionally obsolete and structurally deficient structures from our inventory.

**Scope Comparison**

Before Practical Design: The original scope called for the replacement of these three bridges while maintaining traffic through the corridor. This was to be accomplished through use of a new alignment to the south of existing. To maintain the freeboard on the new channel structure, an increase in profile grade across the bridge and approaches would be necessary. In addition to the replacement of these three structures, the project scope also included removing an existing bridge over an abandoned railroad several miles to the east on Route 136. That bridge (A116) is rated 5-7-6, was constructed in 1958 and is 28' wide.

After Practical Design: Upon re-evaluation, it was determined that through application of practical design, we could maximize the effectiveness of this project (cost vs. output) through scope reduction, and closure of the route. Highway 136 is a high volume minor route in District 2 and serves as an important corridor for traffic in the Northern Missouri / Southern Iowa region. However, analysis of the local traffic generators and traffic count indicated that closure could be a viable option. Closure of this route in the location of these three bridges allowed replacement to occur along the existing alignment without the time/expense associated with constructing along a new alignment. Additionally, the hydrology of the area had changed significantly since the construction of the three bridges – a reservoir had since been constructed upstream. In-depth analysis of the watershed confirmed the overflow bridge and old channel bridges were no longer functioning as designed and that they could be replaced with smaller structures. The old channel bridge would be replaced with a box culvert (2x10'x8'), while the overflow bridge would be replaced with a reinforced concrete pipe (60" RPC). Furthermore, it was determined that it would not be necessary to maintain the existing freeboard on the new bridge structure. This design exception allowed the existing profile grade to remain, which reduced roadway costs associated with raising the grade. In addition, it was determined that removing the bridge over the abandoned railroad did not fall within the primary need of this project, and was not immediately necessary, so was therefore delegated to some future time.

**Cost & Time Savings**

The pre-practical design scope was estimated to cost over $6 million and would have taken two construction seasons. The post-practical design final cost was less than $1.6 Million and was completed in approximately three months. The new scope addressed the primary need, the replacement of the deficient bridges, without addressing the superfluous items originally included in the scope. In addition, practical design efforts led us to re-evaluate the hydraulics at, and upstream, of the project site, which further allowed for effective cost savings through redesign of the new bridge structures. Furthermore, the reduced cost of this project, and the complete elimination of any utility relocation or new right-of-way needs, allowed us to accelerate it one year forward in our STIP.

Through the application of practical design policies, we have been able to meet our customers' expectations for this project while minimizing construction time and saving the tax-payers' money. We feel that this project is but one example of how our district is striving to meet our customers' expectations under the current economic climate.

If you have any further question regarding this project, please contact Preston Kramer or myself.

Sincerely,

Daniel Niec, PE
District Engineer

# 2009 APPLICATION FORM

(required for each entry)

Complete this section for (check one): **XSmall Project** ☐**Large Project**

☐**Post-Design Solution** ☐**Off System Project**

**Job No.** J2P0448 **Route** 136 **County / LPA** Schuyler

**Description** (attach separate sheet if necessary) Replace deficient bridges over the Chariton River, Chariton River (old channel), and Chariton River Overflow.

Complete this section for: **Process Improvement**

**Process or Product**

**Description** (attach separate sheet if necessary)

**Project Leader** Preston Kramer

**Key Team Members** (include key personnel irrespective of employer-nine individuals maximum)

| | | |
|---|---|---|
| James Gillespie | Erin Gruber | David Gipson |
| Dennis Brucks | Dan Skouby | Larry Dixon |
| Phil Sandifer | Anousone Arounpradith | |

**Project Budget:**

**Initial Estimate** $6.026 Million (06 STIP, R/W and Construction) **Final Cost** $1,598,531.54

**What would make this entry stand out from the rest of the entries when considering MoDOT's practical design philosophy?** (In layman's terms - 200 words or fewer-attach separate sheet if necessary) Pre-practical design, the original estimate for this project was over $6 Million. Through application of Practical Design, the final cost for these improvements was less than $1.6 Million, more than a 73% reduction in project costs. This cost decrease was achieved through a practical scope reduction, application of practical design to our typical sections, closing the roadway during construction, and a thorough analysis of the actual hydraulic need for the project area.

**Send entries to:** MoDOT Design Division, ATTN: Joe Jones
1320 Creek Trail Dr., Jefferson City, Missouri 65109

**ALL ENTRIES MUST BE RECEIVED NO LATER THAN CLOSE OF BUSINESS ON DECEMBER 1, 2008**

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## Effects of Practical Design Implementation

Summarized

Job J2P0488, Schuyler County

| | Pre-practical Design | Post-practical Design |
|---|---|---|
| **Estimated Construction Cost to Replace Bridges** | $5.856 Million | $1,598,532 (***Actual Final Cost***) |
| **Estimated Cost of New Right of Way** | $50,000 | $0 (***No New R/W***) |
| **Estimated Cost of Utility Relocation** | $70,000 | $0 (***No Utility Relocations***) |
| **Decrease in Project Cost** | ---- | **73%** |
| **Estimated Time for Construction** | Two Construction Seasons | Three Months (***Actual***) |
| **Decrease in Construction Time** | ---- | **87%** |
| **Estimated Date for Completion of Improvements** | Fall 2010 | October 2008 (***Actual***) |
| **Handling of Traffic During Construction** | Maintain Traffic on Existing Alignment, Build Bridges on New Alignment | Close Road, Replace Bridges on Existing Alignment |

# MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
# PLANS FOR PROPOSED
# STATE HIGHWAY

## PUTNAM/SCHUYLER COUNTIES

| ROUTE | STATE | DISTRICT | SHEET NO. |
|---|---|---|---|
| 136 | MO | 2 | 1 |

JOB NO. J2P0448

CONTRACT ID.

PROJECT NO.

COUNTY PUTNAM/SCHUYLER

STATE OF MISSOURI
PRESTON L. KRAMER
NUMBER
PE-2006002629
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### DESIGN DESIGNATION

A.A.D.T. - 2009 = 1800
A.A.D.T. - 2029 = 2370

T = 20%
V = 60 M.P.H.

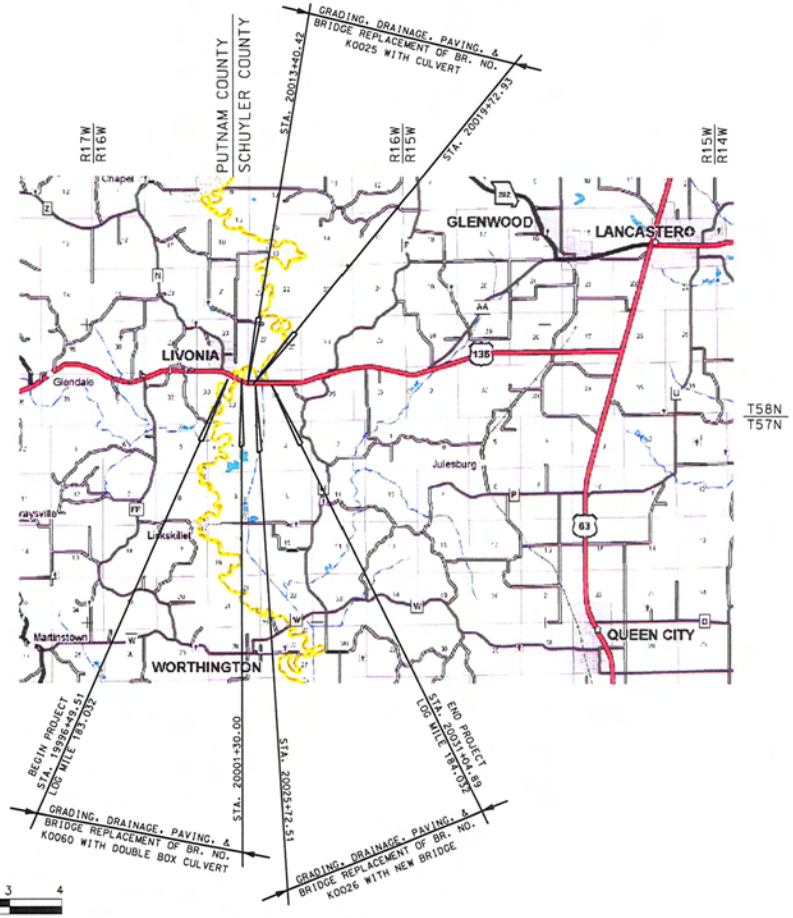
FUNCTIONAL CLASSIFICATION- MINOR ARTERIAL

NORMAL RIGHT OF WAY

### CONVENTIONAL SYMBOLS
(USED IN PLANS)

| | EXISTING | NEW |
|---|---|---|
| BUILDINGS AND STRUCTURES | | |
| GUARD RAIL | | |
| CONCRETE RIGHT-OF-WAY MARKER | | |
| STEEL RIGHT-OF-WAY MARKER | | |
| LOCATION SURVEY MARKER | | |
| UTILITIES | | |
| FIBER OPTICS | FO | FO |
| OVERHEAD TELEPHONE | | |
| UNDERGROUND TELEPHONE | T | T |
| OVERHEAD POWER | | |
| UNDERGROUND POWER | P | P |
| GAS | G | G |
| WATER | W | W |
| MANHOLE | SAN | |
| FIRE HYDRANT | | |
| WATER VALVE | W | |
| WATER METER | W | |
| DROP INLET | | |
| DITCH BLOCK | | |
| GROUND MOUNTED SIGN | SIGN | |
| LIGHT POLE | | |
| H-FRAME POWER POLE | | |
| TELEPHONE PEDESTAL | | |
| FENCE | | |
| CHAIN LINK | V | |
| WOVEN WIRE | X | |
| GATE POST | | |
| BENCHMARK | | |

NOTE: DASHED OR OPEN SYMBOLS INDICATE EXISTING FEATURES




1 ½ 0 1 2 3 4
SCALE IN MILES

PROJECT LIMITS (0.654 MILE)

### INDEX OF SHEETS


| DESCRIPTION | SHEET NUMBER |
|---|---|
| TITLE SHEET | 1 |
| TYPICAL SECTIONS (TS) (1 SHEET) | 2 |
| QUANTITIES (QU) (2 SHEETS) | 3 |
| PLAN-PROFILE (PP) | 4-5 |
| RIGHT OF WAY (RW) | - |
| REFERENCE POINTS (RP) | 6 |
| COORDINATE POINTS (CP) | 7 |
| SPECIAL SHEETS (SS) | 8-9 |
| TRAFFIC CONTROL SHEETS (TC) | 10-11 |
| EROSION CONTROL SHEETS (EC) | 12 |
| LIGHTING (LT) | - |
| SIGNALS (SG) | - |
| SIGNING (SN) | - |
| PAVEMENT MARKING (PM) | - |
| CULVERT SECTIONS (CS) | 13 |
| BRIDGE DRAWINGS (B) | |
| A7558 | 1-5 |
| A7559 | 1-29 |
| CROSS SECTIONS (XS) | 1-16 |


### LENGTH OF PROJECT

BEGINNING OF PROJECT STA. 19996 + 49.51
END OF PROJECT STA. 20031 + 04.89

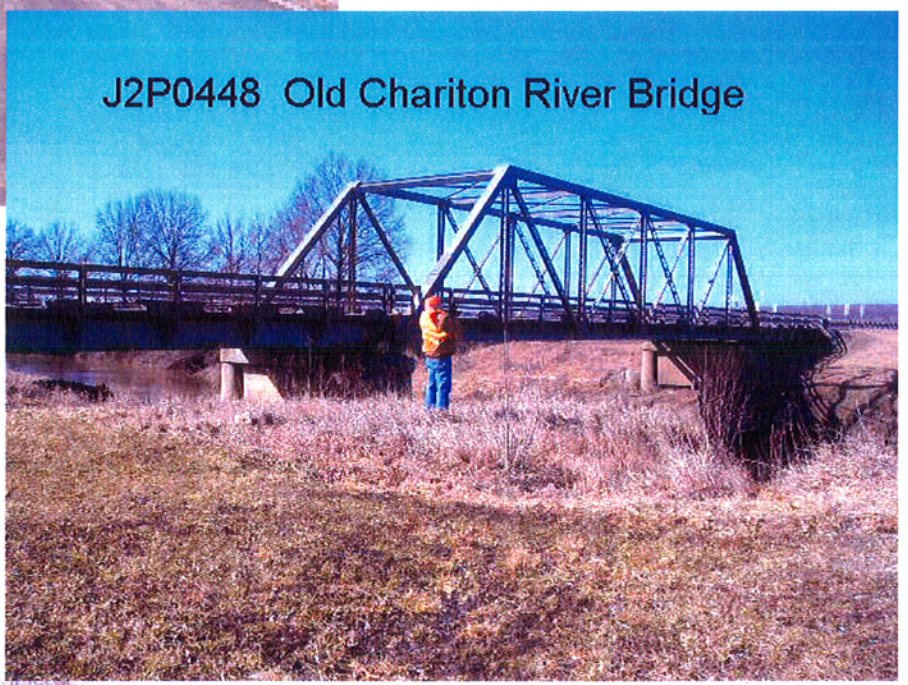
APPARENT LENGTH 3455.38 FEET

EQUATIONS AND EXCEPTIONS:
STA. 20001+30.00 TO STA. 20013+40.42
STA. 20019+72.93 TO STA. 20025+72.51

| | | |
|---|---|---|
| TOTAL CORRECTIONS | -1810.00 | FEET |
| NET LENGTH OF PROJECT | 1645.38 | FEET |
| STATE LENGTH | 0.312 | MILES |
| FEDERAL LENGTH | 0.312 | MILES |

REV.

# Before.....

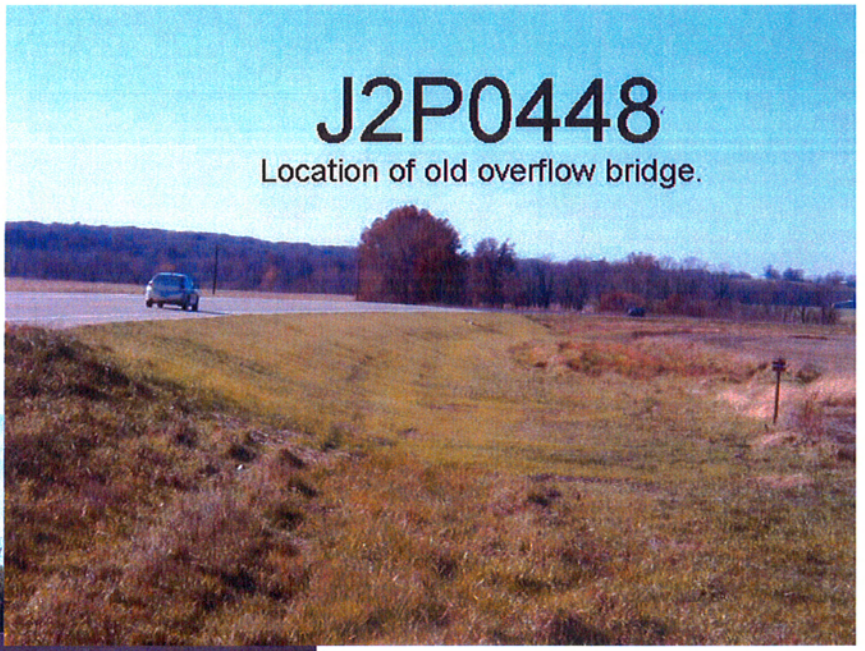


**Three narrow, deficient bridges within a 0.7 mile corridor.**

# During.....

# After.....

**One Bridge removed.**



**One Bridge replaced with a box culvert.**