MoDOT PROJECTS
2008 APPLICATION FORM
(required for each entry)

Job No. J4I1402 **Route** I-70 **County** Jackson

STIP Description (Scoping or Construction, state which STIP)

Construction STIP(yr. 06-10):

J4I1402 – Replace bridge and reconstruct interchange with a single point urban diamond design at Noland Road in Independence. Project involves bridge L976R.

J4I1744 – Replace the Union Pacific Railroad bridge (I-975) over I-70

Is the submittal for the entire project or just a portion of the project? Please explain: Entire Project.

Project Manager (could have both) **MoDOT** Mary Miller **Consultant** Earl Harrison Jr. (DRG)

Key core team members as approved by the MoDOT PM (may include consultants) (limit of 9)

Susan Nelson – TPD	Ron Temme - br	Dave MacDonald – 4tr
Kerri Lewis – 4pi	Laura Ruman - de	Matt Killion - 4re
Mike Stelzleni - de	Angelo Mannino - DRG	Joe Rishmany - DRG

Project Contacts: District Susan Nelson (D4) **Consultant** Earl Harrison Jr. (DRG)

Project Budget:

Conceptual budget $ N/A **Initial STIP Budget** $ 33,363,000

Final STIP budget $12,864,000 **Award amount** $ 9,264,133.38

Other :

Value Engineering study during design? yes ☒ no ☐ (if yes) **Project Stage** Conceptual

Total VE savings implemented $ 5.09 million **VE Contact Person** Tom Allen

Construction-stage VE (VECP)? yes ☐ no ☒ (if yes) **Explain**

Total VECP savings $ N/A **VECP Contact Person** N/A

What would make this entry stand out from the rest of the entries when considering MoDOT's practical design philosophy? (In layman's terms - 100 words or fewer) Utilizing Practical Design, we've provided a product that exceeds the project's initial goals, efficiently uses taxpayer funds, and utilizes innovative structural design techniques. Our design minimizes the impacts to motorists and surrounding communities by implementing techniques that promote construction time reductions, improves traffic flow and safety, and provide a tremendous cost savings to MoDOT and Missouri Taxpayers. This project was reduced from an initial $33 million price tag to $7.5 million through great team work and collaboration.

Send entries to: MoDOT Design Division, ATTN: Jay Bestgen
1320 Creek Trail Dr., Jefferson City, Missouri 65109

ALL ENTRIES MUST BE RECEIVED NO LATER THAN CLOSE OF BUSINESS ON DECEMBER 15, 2007.

Delich,
Roth &
Goodwillie, P.A.
Engineers

December 13th, 2007

Mr. Jay Bestgen, PE
MoDOT Design Division
1320 Creek Trail Dr.
Jefferson City, Missouri 65109

Re: Practical Design 2008 Awards for Excellence
I-70 & Noland Road Interchange, J4I1402
MoDOT District 4

Dear Mr. Bestgen:

Please accept our application for the MoDOT/ACEC Practical Design 2008 Awards for Excellence. The application for the I-70 & Noland Road Interchange has been attached for your review.

MoDOT project **J4I1402** is an excellent example of the application and spirit of the Practical Design philosophy. Because of the Practical Design efforts, MoDOT, its consultant, Delich, Roth & Goodwillie, and the rest of the core team have developed a design that is dramatically less expensive than the 2006-2010 STIP. Our design meets the purpose and need of the project, utilizes innovative methods of construction, minimizes the impacts to motorists and surrounding community and improves traffic flow and safety, all at tremendous cost savings to MoDOT and the taxpayers of Missouri.

The team discovered, through Practical Design, that a cascading cost savings effect resulted from the selection of the Tight Urban Diamond. The team determined that if the new innovative bridge type (***1st in this region***) could be designed to minimize the impacts to the existing Noland Road vertical profile, the existing ramp right turn movements could be maintained during construction and the railroad bridge would not need immediate replacement. Initially, the public was resistant to the closure of the existing bridge crossing for a short period, but through extensive public outreach, the community agreed that the closure of the structure would have minimal overall impact to the traveling public and area businesses along Noland Road.

Project Scope:
The original scope called for the rehabilitation or replacement of the existing Noland Road bridge structure over Interstate 70 that had become seriously deteriorated from corrosion of the structural reinforcing of the voided slab deck. Along with the bridge replacement, the design must maintain compatibility with future I-70 lane configuration(s). Also, the adjacent railroad to the west was to be replaced due to its proximity to the interchange improvements recommended in the I-70 FTEIS.

A. Scope Comparison:

Prior to Practical design, the Union Pacific RR bridge west of the I-70 & Noland Road interchange would require replacement due to the proposed ramp configurations associated with the original SPUI concept. Also, a longer Noland Road Bridge structure and additional right-of-way property would have been required. Under the final design concept, Tight Urban Diamond Interchange (TUDI), the railroad bridge replacement was avoided, a shorter Noland Road bridge structure accommodating future I-70 lanes was implemented and "NO" additional right-of-way was required for this project.

B. Purpose and Need:

The purpose and need for the project was to replace or rehabilitate the existing Noland Road bridge. Rehabilitation was researched by performing deck tests on the existing structure, and these tests indicated that the deck was so badly deteriorated that it could not be repaired. Cost analyses by DRG showed that a deck replacement was almost as costly as a total bridge replacement. Therefore, the purpose and need of replacing the structure was met in the most economical, safe, and effective manner possible.

C. Innovative Practical Design Techniques:

Several iterations of practical design had been completed throughout the project, including a value engineering study. The follow techniques were implemented as part of this project.

1. The utilization of a precast, prestressed voided concrete box beams bridge structure. The required depth of these non-traditional structural elements was the only practical way of minimizing the profile grade impacts to Noland Road, while still maintaining clearance over I-70. The box beams are fabricated off-site and can be quickly erected, which makes the shortened closure time requested by the public more cost effective.
2. An alternate bridge design was provided to give the contractor the option of using the newly designed 6'-0" wide box girder. This option reduces the number of girders required for the bridge, thus reducing the expense of delivery and erection times.
3. By utilizing steeper slopes, rock backfilling, and the utilization of MSE retaining walls along I-70 and Noland Road, right-of-way acquisition was totally avoided. Also, a box culvert extension under Noland Road was eliminated with the use of MSE retaining walls
4. MSE retaining walls allow the future I-70 template width to be reduced, thus reducing the length of the proposed Noland Road Bridge.
5. A design exception allowed more spread flow on Noland Road and thus reduced the bridge width by five feet on each side.
6. One left-turn lane in southbound direction was removed for the bridge, thus reducing the overall bridge width.
7. Eleven-foot lanes were utilized on both the Noland Road bridge structure and Noland Road approach roadways, thus avoiding any right-of-way acquisition for the improvements on Noland Road itself.
8. Bridge approach slabs were removed from the standard bridge design.
9. Reuse of existing portions of all four ramps allowed for faster ramp construction, less ramp improvement costs, and in the future most of the newer pavement from this project can be utilized in-place with future I-70 widening improvements. Also, the need to replace the railroad bridge west of the interchange was avoided with the utilization of the existing ramps.

D. Cost Saving:

- Original STIP: $33.36 million
- Conceptual (Pre-VE costs): $13.04 million
- VE costs: $7.95 million
- VE cost savings: $5.09 million
- Final costs: $7.49 million ("no" right-of-way)
- Final STIP: $12.86 million
- Award: $9.26 million

See **Exhibit V** for further details related to project costs.

E. Roadway User Expectations:

This project minimizes delays to the public by keeping all the ramps open during the bridge closure. The bridge construction schedule is to be accelerated to meet a three month bridge construction time allotment. Also, the ramp improvements have been reduced, shortening the construction time with minimal impact to motorists. Any closures required for demolition, temporary paving, or other design elements along I-70 or the ramps will only occur on weekends and at late night hours.

Please contact me at (816) 221-4222 if you need any additional details on the practical design of this project.

Sincerely,

Earl Harrison Jr., PE
Project Manger
Delich, Roth & Goodwillie, P.A.

ROUTE	STATE	DISTRICT	SHEET NO.
I-70	MO	4	

JOB NO. J4I1402

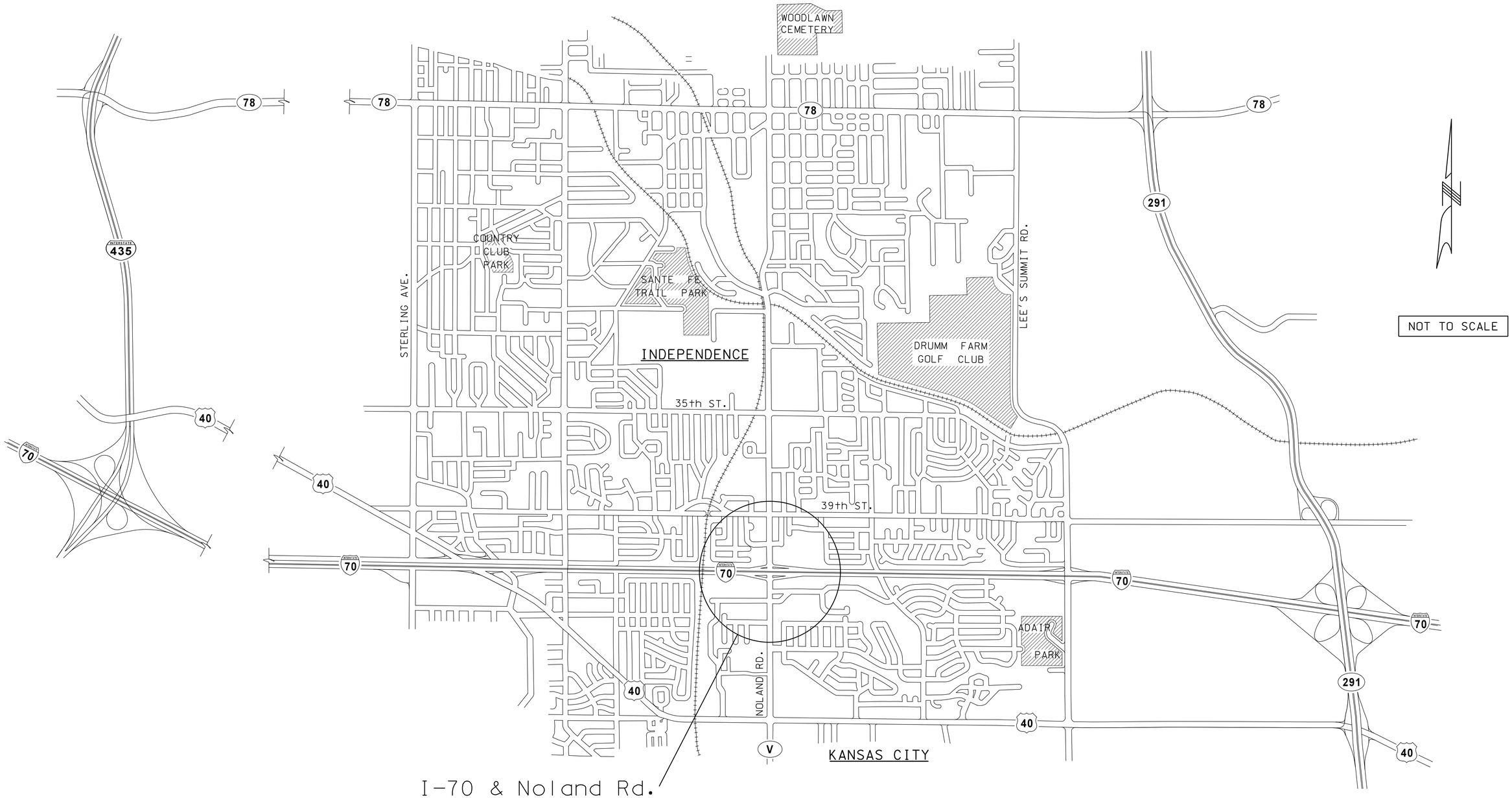
CONTRACT ID.

PROJECT NO.

COUNTY JACKSON

DATE

DELICH ROTH & GOODWILLIE, P.A. ENGINEERS



Practical Design 2008 Awards for Excellence
I-70 & Noland Road Interchange, J4I1402
MoDOT, District 4

EXHIBIT I
PROJECT LOCATION

Noland_Aerial.dgn

ROUTE	STATE	DISTRICT	SHEET NO.
I-70	MO	4	

JOB NO. J4I1402

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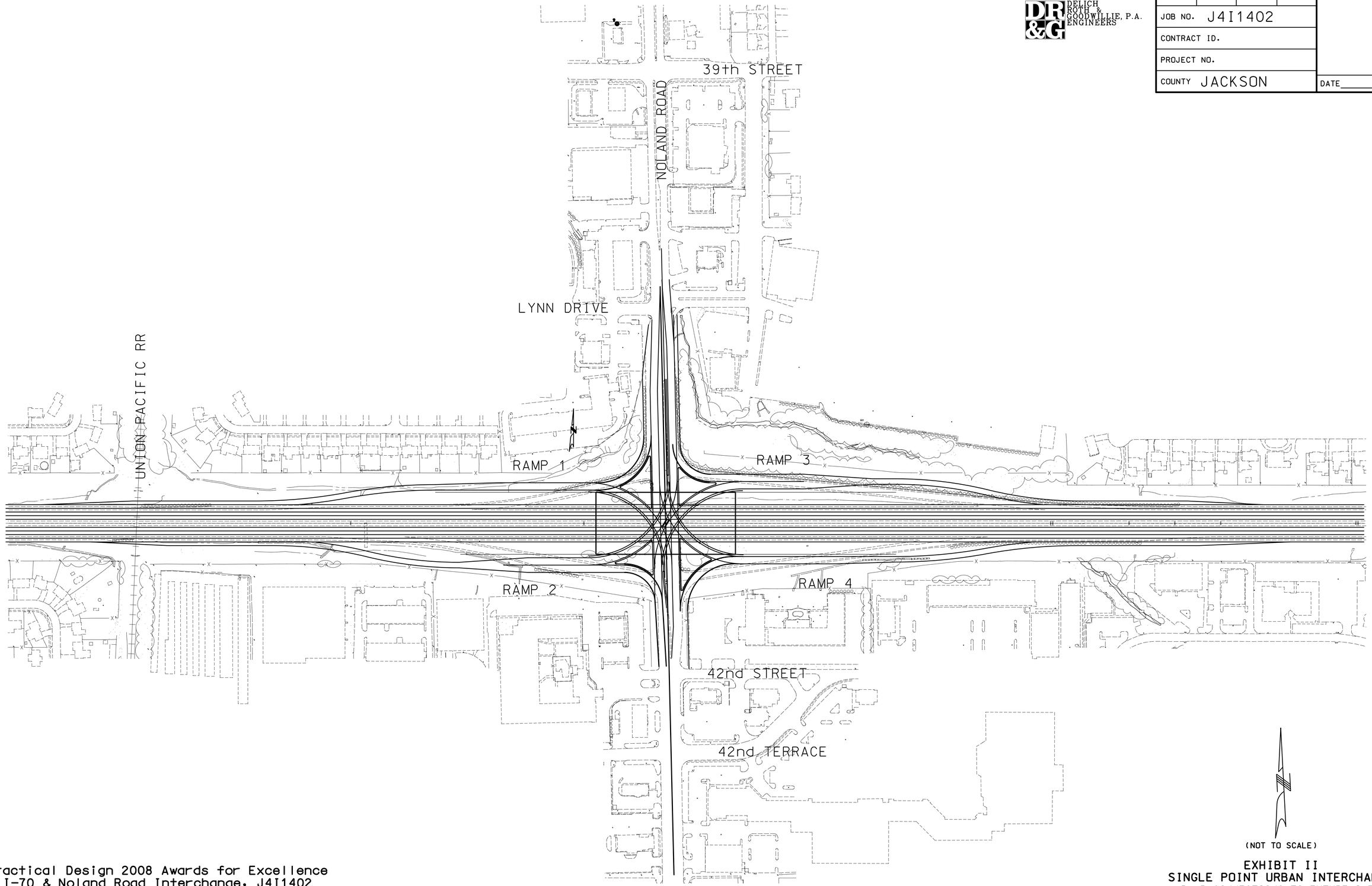
DATE

DELICH ROTH & GOODWILLIE, P.A. ENGINEERS



Practical Design 2008 Awards for Excellence
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MoDOT, District 4

EXHIBIT II
SINGLE POINT URBAN INTERCHANGE
RAMP CONNECTIONS TO FUTURE I-70

ROUTE	STATE	DISTRICT	SHEET NO.
I-70	MO	4	

JOB NO. J4I1402

CONTRACT ID.

PROJECT NO.

COUNTY JACKSON

DATE

DELICH ROTH & GOODWILLIE, P.A. ENGINEERS

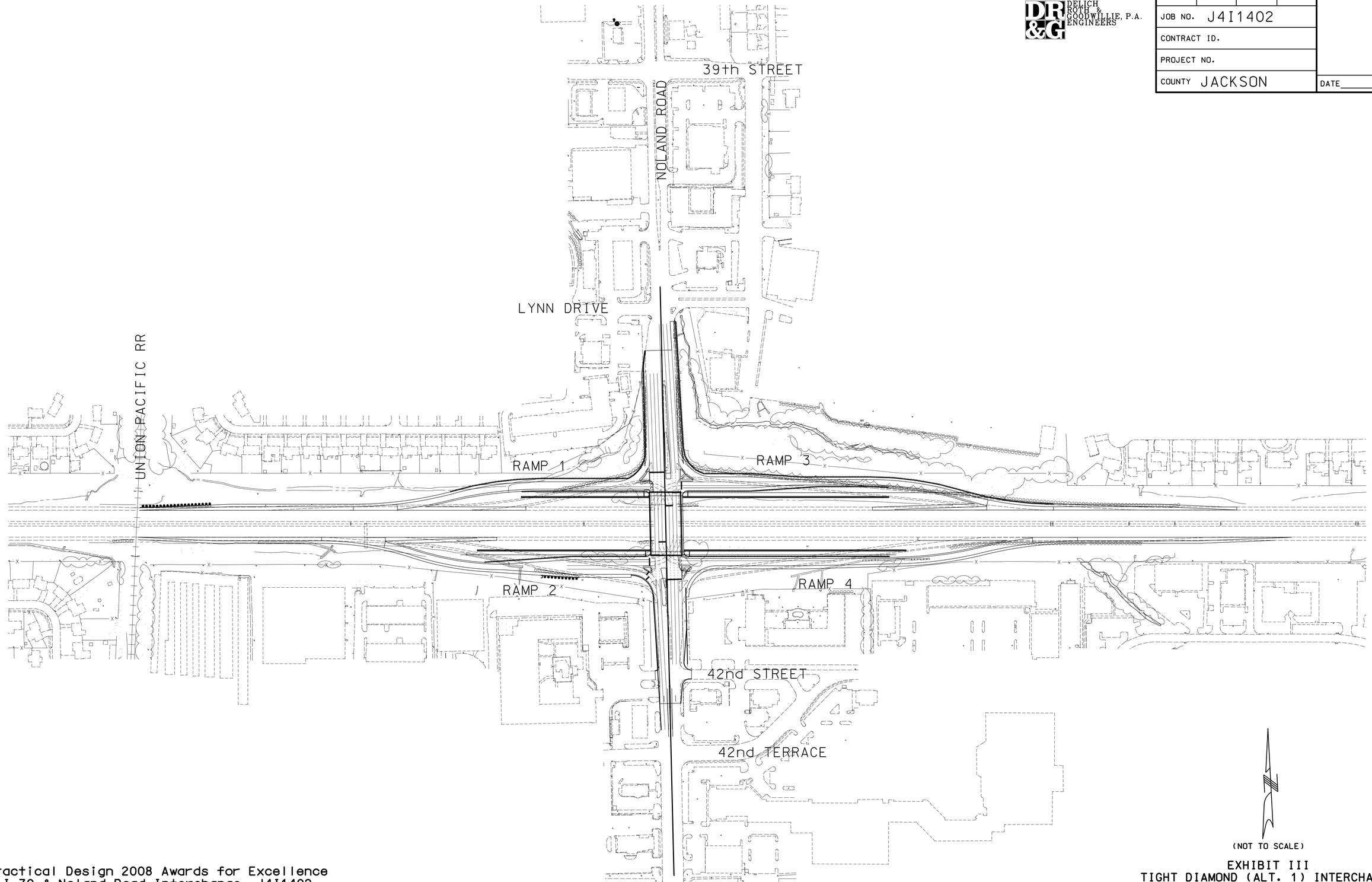


EXHIBIT III
TIGHT DIAMOND (ALT. 1) INTERCHANGE
RAMP CONNECTIONS TO EXISTING I-70

Practical Design 2008 Awards for Excellence
I-70 & Noland Road Interchange, J4I1402
MoDOT, District 4

I1_existing_i150.dgn

ROUTE	STATE	DISTRICT	SHEET NO.
I-70	MO	4	

JOB NO. J4I1402

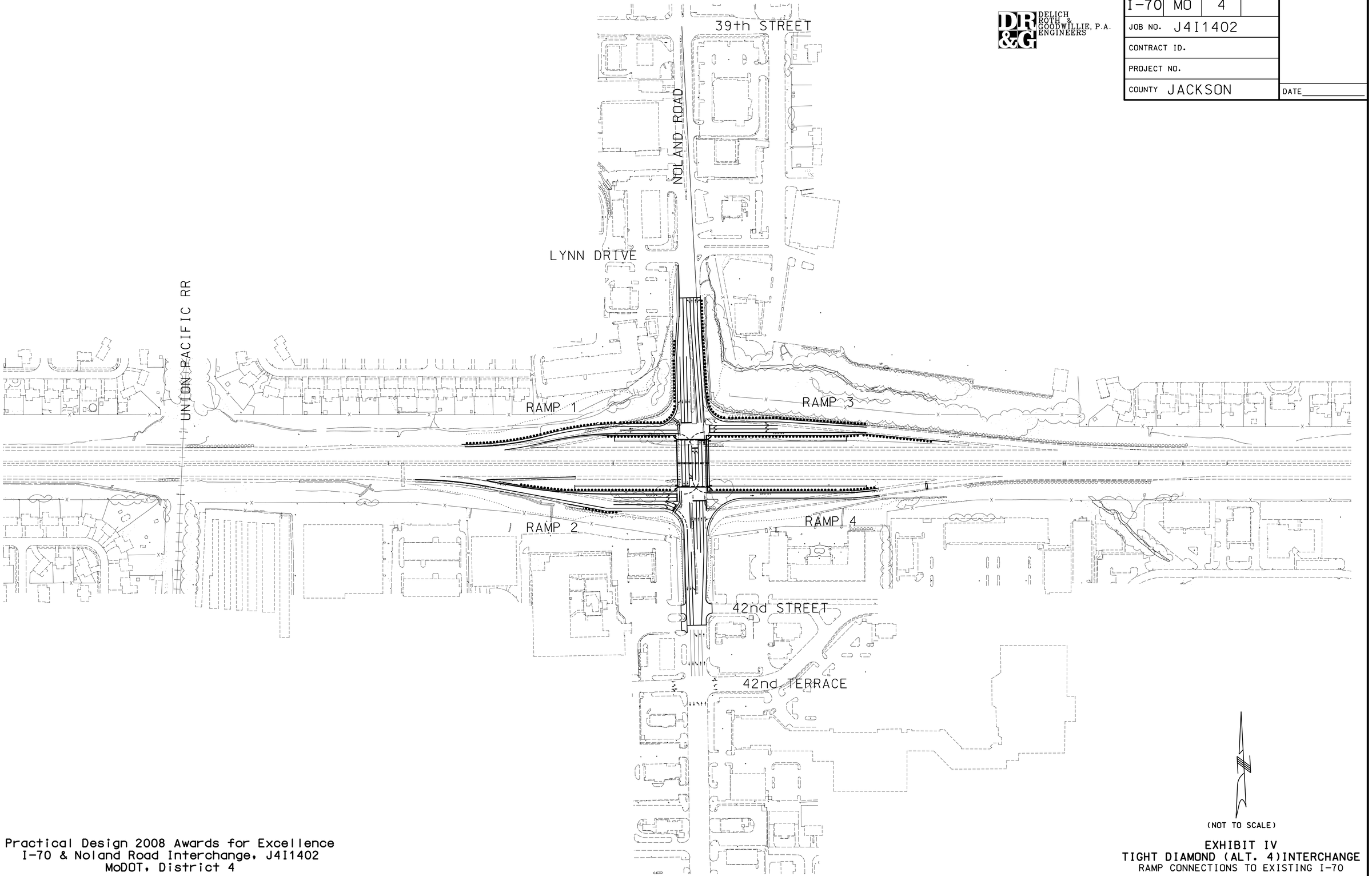
CONTRACT ID.

PROJECT NO.

COUNTY JACKSON

DATE

DELICH ROTH & GOODWILLIE, P.A. ENGINEERS



Practical Design 2008 Awards for Excellence
I-70 & Noland Road Interchange, J4I1402
MoDOT, District 4

EXHIBIT IV
TIGHT DIAMOND (ALT. 4)INTERCHANGE
RAMP CONNECTIONS TO EXISTING I-70

Practical Design 2008 Awards for Excellence Exhibit V
I-70 & Noland Road Interchange, J4I1402
MoDOT, District 4

Project Costs:

Single Point Urban Interchange (SPUI) + UP Railroad Bridge:

	SPUI [1]	Union Pacific Railroad Bridge [1]
R/W ($M)	$3.48	-
Construction ($M)	$15.37	$14.51
Subtotal ($M)	$18.85	$14.51
Total Project ($M)	$33.36	

[1] Based on 2006-2010 MoDOT STIP

Tight Urban Diamond Interchange (Alt.1):

	Tight Urban Diamond
R/W ($M)	$3.48
Construction ($M)	$9.56
Total Project ($M)	$13.04

Tight Urban Diamond Interchange (Alt. 3):

	Tight Urban Diamond
R/W ($M)	$0.4
Construction ($M)	$7.55
Total Project ($M)	$7.95

Tight Urban Diamond Interchange (Alt. 4):

	Tight Urban Diamond
R/W ($M)	$0.0
Construction ($M)	$7.49
Total Project ($M)	$7.49

LEFT TURN SIGNAL