

REQUEST FOR LEGISLATIVE ACTION


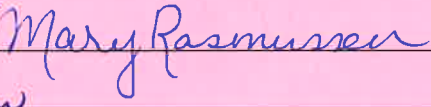

Completed by County Counselor's Office:

Res/Ord No.: 19228

Sponsor(s): Greg Grounds

Date: August 1, 2016

<p>SUBJECT</p>	<p>Action Requested <input checked="" type="checkbox"/> Resolution <input type="checkbox"/> Ordinance</p> <p>Project/Title: <u>Awarding a Contract for Professional Survey Services for Rock island Rail Corridor for the Public Works Department to Bartlett & West of Lee's Summit, Missouri under the terms and conditions of Request for Qualifications No. 47-16.</u></p>																																				
<p>BUDGET INFORMATION <i>To be completed By Requesting Department and Finance</i></p>	<table border="1"> <tr> <td>Amount authorized by this legislation this fiscal year:</td> <td></td> </tr> <tr> <td>Amount previously authorized this fiscal year:</td> <td>\$575,000.00</td> </tr> <tr> <td>Total amount authorized after this legislative action:</td> <td>\$575,000.00</td> </tr> <tr> <td>Amount budgeted for this item * (including transfers):</td> <td>\$575,000.00</td> </tr> <tr> <td>Source of funding (name of fund) and account code number: 014-3601-56790 Special Obligation Bond Capital Project Fund; Rock Island Rail Corridor Authority; Other Contractual Services</td> <td>\$575,000.00</td> </tr> </table> <p>* If account includes additional funds for other expenses, total budgeted in the account is: \$</p> <p>OTHER FINANCIAL INFORMATION:</p> <p><input type="checkbox"/> No budget impact (no fiscal note required) <input type="checkbox"/> Term and Supply Contract (funds approved in the annual budget); estimated value and use of contract: Department: Estimated Use: \$</p> <p>Prior Year Budget (if applicable): Prior Year Actual Amount Spent (if applicable):</p>	Amount authorized by this legislation this fiscal year:		Amount previously authorized this fiscal year:	\$575,000.00	Total amount authorized after this legislative action:	\$575,000.00	Amount budgeted for this item * (including transfers):	\$575,000.00	Source of funding (name of fund) and account code number: 014-3601-56790 Special Obligation Bond Capital Project Fund; Rock Island Rail Corridor Authority; Other Contractual Services	\$575,000.00																										
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<p>PRIOR LEGISLATION</p>	<p>Prior ordinances and (date): 4854, June 6, 2016 Prior resolutions and (date):</p>																																				
<p>CONTACT INFORMATION</p>	<p>RLA drafted by (name, title, & phone): Jessica Johnson, Senior Buyer, 881-3465</p>																																				
<p>REQUEST SUMMARY</p>	<p>The Public Works Department requires a qualified firm to provide Professional Survey Services for the Rock Island Rail Corridor. The survey company for the Rock Island Rail Corridor is required to perform a Boundary Survey and Topographical Survey in order to prepare for future engineering and design related activities. The Purchasing Department issued Request for Qualifications No. 47-16 to meet those requirements.</p> <p>A total of thirty-two (32) notifications were distributed and seven (7) responses were received, two (2) responses rejected and five (5) responses evaluated as follows:</p> <table border="1"> <thead> <tr> <th>Respondent and Location</th> <th>Qualifications & Experience 40%</th> <th>Knowledge & Understanding of Rail Corridors 25%</th> <th>References 10%</th> <th>Schedule Responsiveness 25%</th> <th>Weighted Total (1-10)</th> </tr> </thead> <tbody> <tr> <td>Anderson Survey Co Lee's Summit, MO</td> <td>7</td> <td>6.3</td> <td>6</td> <td>6</td> <td>6.5</td> </tr> <tr> <td>Bartlett & West Lee's Summit, MO</td> <td>8.3</td> <td>8.7</td> <td>8</td> <td>8.3</td> <td>8.4</td> </tr> <tr> <td>Olsson Associates Overland Park, KS</td> <td>8.3</td> <td>8.3</td> <td>7.6</td> <td>8.3</td> <td>8.3</td> </tr> <tr> <td>Surveying & Mapping LLC Overland Park, KS</td> <td>6.3</td> <td>7.3</td> <td>5.7</td> <td>5</td> <td>6.2</td> </tr> <tr> <td>Wilson & Company Kansas City, MO</td> <td>7.3</td> <td>7</td> <td>6.7</td> <td>9</td> <td>7.6</td> </tr> </tbody> </table>	Respondent and Location	Qualifications & Experience 40%	Knowledge & Understanding of Rail Corridors 25%	References 10%	Schedule Responsiveness 25%	Weighted Total (1-10)	Anderson Survey Co Lee's Summit, MO	7	6.3	6	6	6.5	Bartlett & West Lee's Summit, MO	8.3	8.7	8	8.3	8.4	Olsson Associates Overland Park, KS	8.3	8.3	7.6	8.3	8.3	Surveying & Mapping LLC Overland Park, KS	6.3	7.3	5.7	5	6.2	Wilson & Company Kansas City, MO	7.3	7	6.7	9	7.6
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	Pursuant to Section 1054.6 of the Jackson County Code, the Director of Finance and Purchasing recommends the award of a contract for Professional Survey Services for Rock Island Rail Corridor for the Public Works Department to Bartlett & West of Lee's Summit, MO as the best proposal received. After the selection of the best proposal, pricing was negotiated and is included in the Award Recommendation.	
CLEARANCE	<input checked="" type="checkbox"/> Tax Clearance Completed (Purchasing & Department) <input type="checkbox"/> Business License Verified (Purchasing & Department) N/A <input checked="" type="checkbox"/> Chapter 6 Compliance - Affirmative Action/Prevailing Wage (County Auditor's Office)	
ATTACHMENTS	Abstract of Bids Received, Award Recommendations Memorandum from Mr. Brian Gaddie, Director of Public Works Department and the pertinent pages of Bartlett & West's proposal.	
REVIEW	Department Director: 	Date: 7.26.2016
	Finance (Budget Approval): If applicable 	Date: 7/26/16
	Division Manager: 	Date: 7/28/16
	County Counselor's Office:	Date:

Fiscal Information (to be verified by Budget Office in Finance Department)

- This expenditure was included in the annual budget.
- Funds for this were encumbered from the _____ Fund in _____.
- There is a balance otherwise unencumbered to the credit of the appropriation to which the expenditure is chargeable and there is a cash balance otherwise unencumbered in the treasury to the credit of the fund from which payment is to be made each sufficient to provide for the obligation herein authorized.
- Funds sufficient for this expenditure will be/were appropriated by Ordinance # _____
- Funds sufficient for this appropriation are available from the source indicated below.

Account Number:	Account Title:	Amount Not to Exceed:

- This award is made on a need basis and does not obligate Jackson County to pay any specific amount. The availability of funds for specific purchases will, of necessity, be determined as each using agency places its order.
- This legislative action does not impact the County financially and does not require Finance/Budget approval.

RFQ: 47-16 DATE: 07/12/16 COMMODITY: Prof. Survey Services - Rock Island Rail Corridor Project		DESCRIPTION	UNIT	QTY	Anderson Survey Company AMOUNT	Surveying & Mapping LLC AMOUNT	Schmitz, King & Associates AMOUNT	Wilson & Company AMOUNT	TranSystems AMOUNT
. See Bid					see bid	see bid	see bid	see bid	see bid

CERTIFICATION OF BID OPENING
 BIDS WERE PUBLICLY
 OPENED AND RECORDED
 ON: July 12, 2016, BY
Mary Jo King
 CLERK OF THE LEGISLATURE
Grace M. King
 PURCHASING

ABSTRACT OF BIDS

Res. 19228

NO	DESCRIPTION	UNIT	QTY	Bartlett & West		Olsson Associates		AMOUNT	AMOUNT	AMOUNT
				AMOUNT	AMOUNT	AMOUNT	AMOUNT			
	RFQ: 47-16 DATE: 07/12/16 COMMODITY: Prof. Survey Services - Rock Island Rail Corridor Project									
	See Bid				<i>see bid</i>		<i>see bid</i>			

CERTIFICATION OF BID OPENING
BIDS WERE PUBLICLY
OPENED AND RECORDED

ON: July 12, 2016, BY
Harold D. ...
CLERK OF THE LEGISLATURE
Joice ...
PURCHASING



JACKSON COUNTY Public Works Department

Res. 19228

Jackson County Technical Center
303 West Walnut Street
Independence, Missouri 64050
jacksongov.org

(816) 881-4530
Fax: (816) 881-4448

Memorandum

To: Jessica Johnson, Senior Buyer, Purchasing
From: Brian Gaddie, PE, Director of Public Works
Date: July 25th, 2016
RE: Evaluation of Qualifications: 47-16 Rock Island Survey Services

The Department of Public Works, under the direction of the Rock Island Rail Corridor Authority, determined the need for extensive survey services on the Rock Island Rail Corridor. With the assistance of the Purchasing Department, the Request for Qualifications 47-16 was issued. Seven responses to the advertisement were received and deliberated in accordance with Executive Orders #94-24 and #07-16.

The qualification selection committee, comprised of County associates including individuals from County Administration, Public Works and the Rock Island Rail Corridor Authority, gathered immediately after the packages were opened and recorded on the afternoon of July 12th, 2016. After carefully examining the qualified respondents we each prepared our scoring matrix per the request of the Purchasing Department in confidence. The scoring matrix was comprised of four qualifying categories which included: qualification and experience, knowledge of similar projects, portfolio history and schedule responsiveness.

Five of the seven respondents had qualified and compliant responses. The five respondents were scored according to the above categories and ranked appropriately, as indicated below.

- 1 – Bartlett and West
- 2 – Olsson and Associates
- 3 – Wilson and Company
- 4 – Anderson Surveying
- 5 – Survey and Mapping

Rejected: TranSystems and Schmitz, King and Associates

Negotiations began on Tuesday, July 19th, 2016 with Bartlett and West to secure a reasonable fee and schedule based on the approach stated in the qualification. After several days of deliberation, it was determined that Bartlett and West would be able to satisfy the necessary scope items within the schedule requested. The fee for these services was negotiated at \$575,000.

It is the recommendation for the Department of Public Works to award this work to Bartlett and West for the above fee. It is our belief that they will best serve the County with their extensive knowledge of the Rock Island corridor and similar type projects and their historical work product and performance.

Thank you for your consideration with this selection process.

Frank White, Jr., County Executive

JULY | 12 | 2016

Res. 19228



STATEMENT OF QUALIFICATIONS

PROFESSIONAL SURVEY SERVICES FOR ROCK ISLAND RAILROAD CORRIDOR

JACKSON COUNTY, MO, DEPARTMENT OF PUBLIC WORKS

AN EMPLOYEE-OWNED COMPANY

DAVE & SONS



228 NW Executive Way
Lee's Summit, MO 64063
816.525.3562
www.bartwest.com

July 12, 2016

Jackson County Purchasing Department
Room G-1, Ground Floor
Jackson County Court House
415 East 12th Street
Kansas City, MO 64106

Re: Request for Qualifications for Professional Surveying Services No. 47-16

Dear Selection Committee:

Bartlett & West is proud to be Jackson County's on-call surveyor, and we have enjoyed the opportunity to serve you. We have been fortunate to work for the County on several past projects, and multiple Lee's Summit employee-owners live within your borders. By selecting Bartlett & West, you can be assured that you have a firm that is experienced in performing this work, will perform it efficiently, deliver it on schedule and will take pride in your project resulting in an accurate final product.

Bartlett & West has an unparalleled, intimate knowledge of the Rock Island Corridor within Jackson County. Our crews are quite possibly the only ones to have walked the entire length of this project from start to finish as part of our previous work for you. As your On-Call surveyors, Bartlett & West has completed two very recent and relevant surveys directly associated with the subject corridor. The first was an encroachment survey performed in 2015. Nine areas were surveyed and drawings delivered on time and under the proposed budget. This survey not only resulted in our crews being the railroad right-of-way, but also traversing the roadways and private properties to gain access to the right-of-way and the private structures necessary to understand the encroachments or nearby improvements.

The second survey, just recently in 2016, was to identify the centerline of the old railroad tracks through the corridor for property conveyance. This was a large survey for which Bartlett & West prepared 25 plat and legal descriptions of the centerline of the entire corridor. Dozens of the Public Land Survey corners were recovered and surveyed in establishing this centerline. Portions of the corridor boundary were analyzed to properly reestablish the railroad centerline. We know that this very recent experience will allow the Bartlett & West team of surveyors to complete the full boundary and topographic survey in the most efficient manner and on time when you need it so your project can proceed. We have also engaged the assistance of Taliaferro & Browne, Inc. as our MBE partner to add a survey crew with our team to advance the field work even faster than we had planned for earlier when we started on this work as your on-call surveyor.

The unparalleled familiarity with the land survey corners, nearby access issues, alignment, and vegetation or even bridge structure challenges will ensure that our team will have no learning curve and can get started immediately. In fact, we have already collected much of the boundary corner information in our previous work and your selection of Bartlett & West to complete this project will make the most of your prior investments.



We know to successfully complete this project, it is imperative that we understand the issues you face. We believe we have captured them in four themes:

1. Accurate and complete boundary corners.
2. Accurate and complete topographic survey suitable for the design and construction of the final project.
3. Accurate depiction of encroachments onto the County's property so these encroachments can be addressed promptly.
4. Deliverable provided on time and on budget so the final project can proceed as planned.

These themes are more fully explained in our Project Approach / Understanding.

PARTNERSHIP THROUGH SERVICE

Bartlett & West's mission, mindset, and values make us an excellent partner for the County. The reason our company exists is to lead our communities to a better tomorrow. We believe in this project and the opportunity it presents for Jackson County. We will be proud to have played a part in making the Rock Island Trail a reality for users in the County. Our guiding principles are provided in our Focus 5 statement. Our goal is to collaborate with our partners to deliver outstanding surveying and engineering projects that put people first, minimize operation and maintenance costs, minimize risks to the county and provide multiple benefits for every dollar invested.

When we collaborate with clients, our primary focus is always to listen. This is how we get to know the individuals involved with the projects, and develop a clear, accurate, and complete project to meet their needs.

The County can be confident that Bartlett & West will deliver on our promises. We have a documented track record with Jackson County and other clients of our successful history of adhering to budgets and schedules, while delivering excellent results to our Land Survey clients. We encourage you to reach out to our references.

Bartlett & West has the latest in land surveying tools, experience, and mindset to work with the County to deliver projects that will serve the County for years to come and improve the lives of its residents.

We look forward to continue working with you on this exciting and interesting project. If you have any questions concerning our proposal, or would like to discuss our approach in further detail, please call Dustin Kaiser (573-659-6724).

Sincerely,

Handwritten signature of Dustin Kaiser in black ink.

Dustin Kaiser, PLS
Project Manager

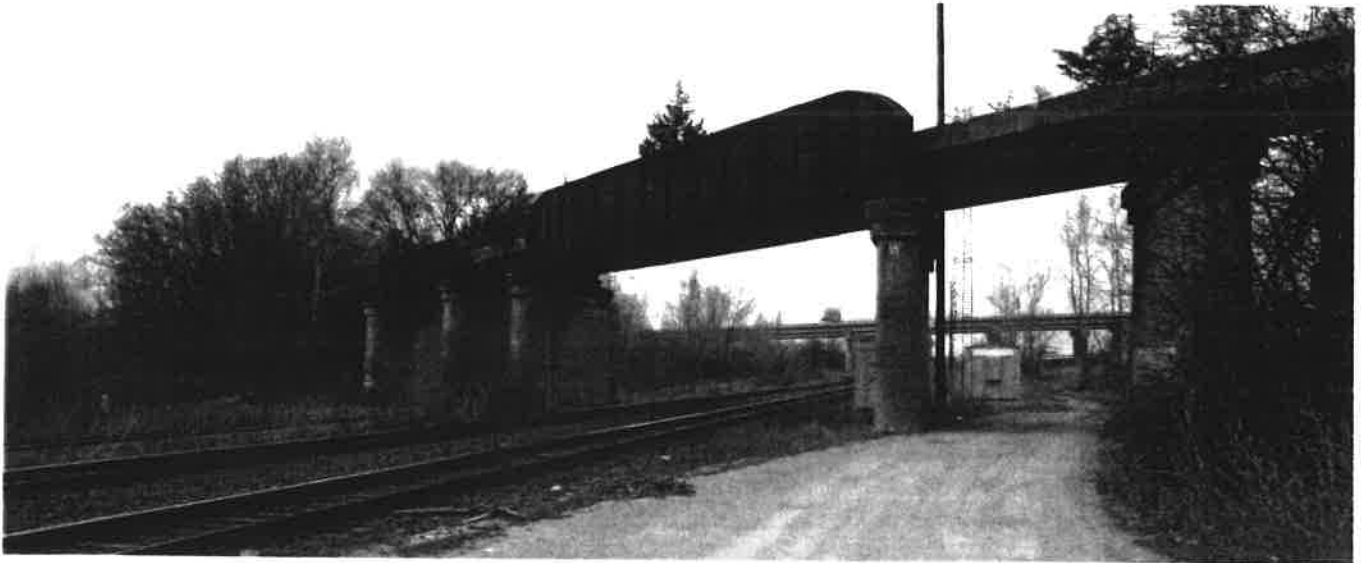
Handwritten signature of Kelly Sunderland in black ink.

Kelly Sunderland, PE
Principle In Charge

Handwritten signature of Steve Langlie in black ink.

Steve Langlie
Client Service Manager

METHOD AND APPROACH



OUR UNDERSTANDING/APPROACH

ACCURATE AND COMPLETE BOUNDARY CORNERS

Bartlett & West prides ourselves in having the latest technology of land surveying equipment. Our field crews are outfitted with Trimble R10 GPS units along with Trimble S6 robotic total stations to do the boundary survey work. Crews also have the availability to use LiDAR scanning technology either with a mobile or terrestrial unit for the topographic survey. With LiDAR scanning technology, field crews can provide highly accurate, reliable and cost effective data acquisition in a three dimensional format with high resolution calibrated digital photos.

We will continue to work with Jackson County GIS personnel Vincent Brice and Gary Bindley to acquire copies of warranty deeds for each tract and copies of subdivision plats that adjoin the Rock Island Railroad Corridor. With our previous experience and knowledge of working with them on the centerline survey and the encroachment surveys for the Rock Island Corridor our coordination with them will be seamless.

Bartlett & West field crews will utilize the Missouri Department of Transportation GPS Real Time Network for horizontal and vertical control for this project. The horizontal coordinate system will be Missouri State Plane (West Zone) to coordinate with our previous surveys. The vertical coordinate system will be NAVD 88. Geoid will be Geoid Model 12A. This will be the same coordinate system that was utilized for our previous work with Jackson County for the centerline and encroachment surveys for the Rock

Island Corridor.

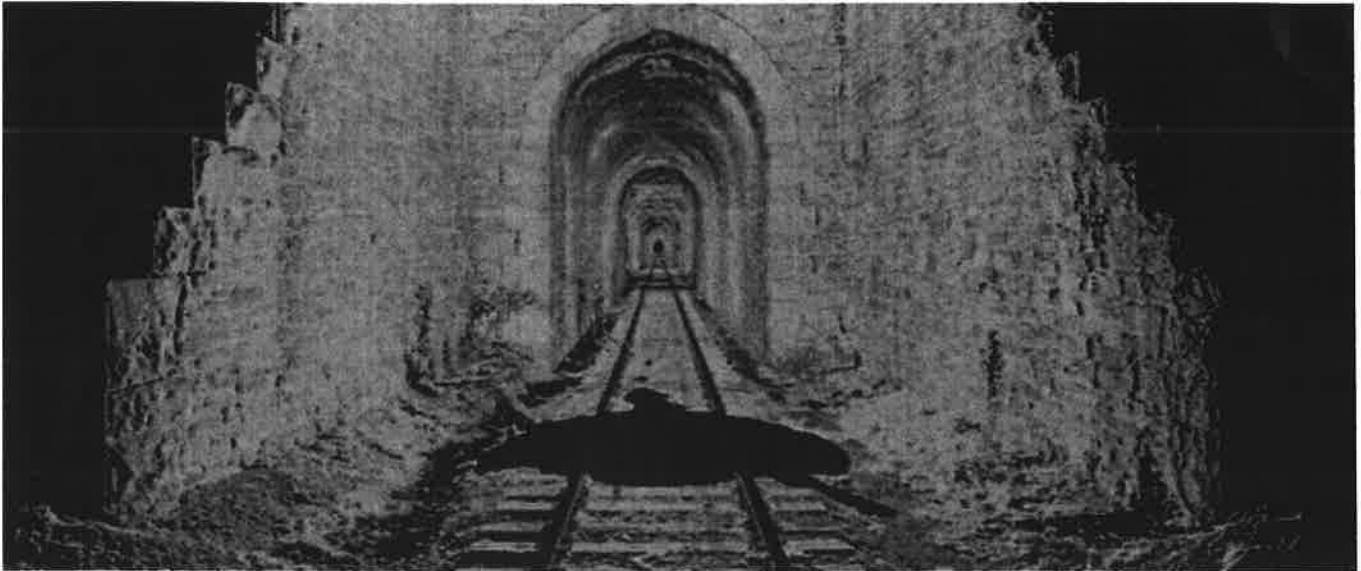
Field crews will field locate and verify the perimeter boundary corners of the recorded subdivision plats and unplatted tracts adjacent to the Rock Island Railroad Corridor. The survey data will then be downloaded so that boundary calculations can be performed based on the plats received and the public land corners previously acquired in our work on the centerline survey. Once boundary calculations have been completed Bartlett & West field crews will set a 5/8" rebar with aluminum cap at all corners of the boundary, unless an existing monument was found at the boundary corner.

ACCURATE AND COMPLETE TOPOGRAPHIC SURVEY SUITABLE FOR THE FOR DESIGN AND CONSTRUCTION OF THE FINAL PROJECT

Before the topographic survey would begin Bartlett & West would arrange a utility coordination meeting to notify utility companies of the impending survey. We will be notifying Missouri One Call to get their utility locations marked in the field so that our surveyors may locate the existing utility lines to aid in the design of this project. Field crews would set Horizontal and Vertical Benchmarks along the project corridor, approximately 1 per mile. We would use our previous horizontal and vertical control from previous work where possible.

Bartlett & West field crews will locate topographic features within the Rock Island Corridor and overlap onto adjoining properties by a minimum of 25 feet. Features to be picked up include the following: top and toes of slopes, ditches, creeks, edge of timber, storm and sanitary sewer structures, invert elevations, pipe sizes and material, edge

METHOD AND APPROACH



Previous LiDAR scan of railroad tunnel by Bartlett & West

of pavements, signs, buildings, fences, and utility poles. This does not include moveable items such as debris, abandoned cars, etc. Ground elevation shots will be taken at intervals sufficient to develop 1-foot contours for the project corridor.

Bridge structures over roadways, and the existing tunnel under Bannister Road will be surveyed using mobile and terrestrial LiDAR scanning survey equipment. This survey technology provides highly accurate, reliable and cost effective data acquisition in a three dimensional format with high resolution calibrated digital photos. These scans allow our office processing team to develop the topographic information, but will also be available in the future to the County and design team should more information about the bridges or tunnel be desired.

ACCURATE DEPICTION OF ENCROACHMENTS ON TO THE COUNTY'S PROPERTY SO THESE ENCROACHMENTS CAN BE ADDRESSED PROMPTLY

Bartlett & West will locate, identify and document any encroachments or man-made features within the boundary of the Rock Island Railroad Corridor or on personal property. We will be able to easily add these encroachments to the ones previously collected by our crews so the County has a comprehensive set of data regarding encroachments. This will assist the County in addressing any encroachments with property owners in a timely manner as the final project moves toward completion.

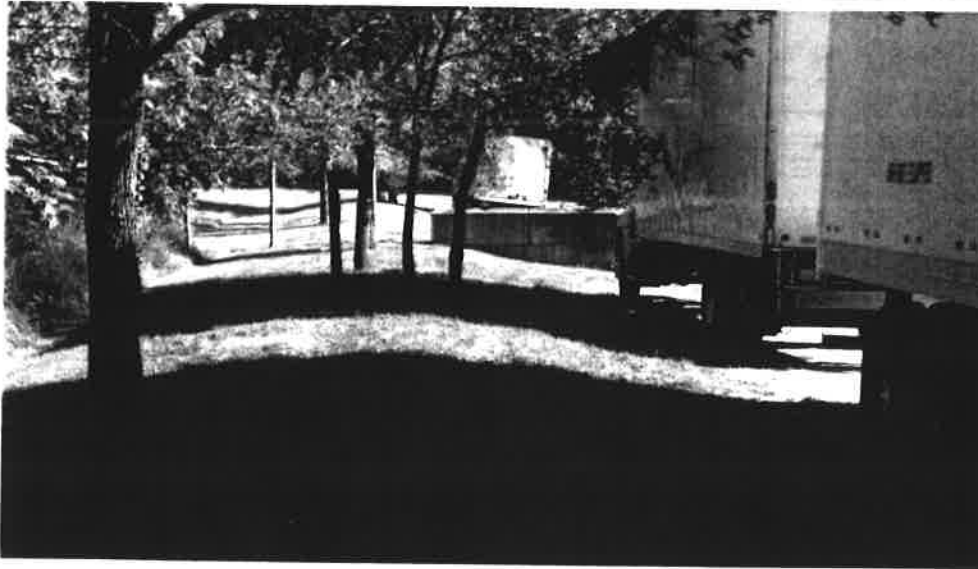
DELIVERABLE PROVIDED ON TIME AND ON BUDGET SO THE FINAL PROJECT CAN PROCEED AS PLANNED

Bartlett & West has already been working in this corridor as explained in the cover letter and this approach. In fact, Bartlett & West had already been working with County staff through our on-call contract to develop the boundary and topographic surveys with a due date of Oct. 1, 2016. With the decision to go out for request for proposals, we understand this timeline for deliverables is now Nov. 1, 2016. This will be no problem for our team as we were already mobilized for the earlier delivery. Also, we have added a crew from Taliaferro & Browne, Inc. to complete our MBE participation and this crew will add to our already robust survey capacity to complete this project on time. The final project will not be waiting on the Bartlett & West team to start their work. We know the delivery timeline and are very comfortable with the requirements. We also have proven that we can do this kind of work on time and under budget. The encroachment and centerline surveys we completed in this corridor in 2015 and 2016, we delivered both surveys early and came in under our upper limit, saving the County money.

DELIVERABLES

Bartlett & West CAD technicians will draft a plat of survey of the boundary of the Rock Island Railroad Corridor. The plat of survey will meet the Missouri minimum standards for a property boundary survey in the state of Missouri. A metes and bounds description will be written on the property for each quarter section that it passes through.

METHOD AND APPROACH



Left: Encroachment area in the Rock Island Corridor. Right: The Riegl VMX-450 Mobile Scanner.

The project corridor passes through approximately 40 quarter sections.

Bartlett & West will draft an exhibit for each parcel with identified encroachments showing the locations of the encroachments in relation to the railroad right-of-way. The exhibits will be signed and sealed by a Professional Land Surveyor licensed in Missouri.

Bartlett & West will submit to Jackson County a copy of the boundary survey, encroachment exhibits, legal descriptions, and topographic survey drawings to review and comment on. Once comments are received, Bartlett & West will review the comments and make the noted revisions before submitting the final version. The boundary survey will be taken to the Jackson County Recorder of Deeds Office to have recorded.

Bartlett & West would provide to Jackson County the following:

- Boundary Survey signed and sealed by a licensed surveyor in the State of Missouri.
- Encroachment Exhibits on 11 x 17 sheets signed and sealed by a licensed surveyor in the state of Missouri.
- Legal descriptions signed and sealed by a licensed surveyor in the state of Missouri.
- Topographic Survey signed and sealed by a licensed surveyor in the state of Missouri.
- Digital cad drawings of the Boundary Survey,

Encroachment Exhibits Legal Descriptions and Topographic Survey. A text file of the survey data, copies of field notes and field sketches.

SIMILAR EXPERIENCE



Bartlett & West has spent more than two decades delivering successful technology and infrastructure improvement projects to Class I Railroads. Our valued relationships with those rail companies began in the early 1990s and has continued today by deepening relationships and expanding our portfolio of services. Bartlett & West's passion for the rail industry and real solutions that the industry finds meaningful.

In the last eight years, Bartlett & West has invested heavily in new technology. Since 2007, we have implemented LiDAR (Light Detection and Ranging) technology to our field service offerings. This technology allows our field teams to collect millions of survey grade points per scan in a safe, cost-effective, and time saving manner. We capture this data quickly and without working in the foul of the track.

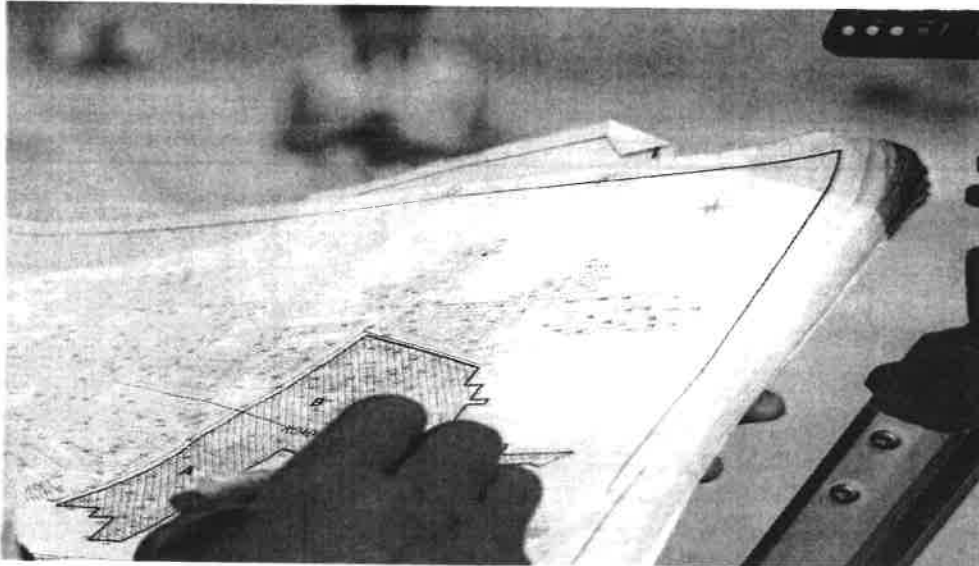
We take pride in being a solutions provider and trusted partner to rail industry. Followin are examples of our projects:

- **BNSF Hump Yards:** LiDAR collection for Argentine, Northtown, Barslow, Galesburg, Memphis, Pasco, Tulsa, and Balmer Hump Yards. Features, Alignment, grade, and geometry was provided for all the tracks in each yard.
- **Kirby Yard, Kirby TX:** LiDAR Design survey provided for the expansion of Kirby Yard Union Pacific.
- **Union Pacific, Neff Yard intermodal site, Kansas City, MO, Hanson Engineering:** LiDAR survey and topographic design survey provided for the pavement rehab project.

- **Argentine fast-track project, Kansas City, KS, Hanson Engineering:** LiDAR survey, topographic design survey, and construction layout provided for the BNSF Railway fast-track project.
- **KCS -Shreveport Terminal, Shreveport, LA:** Provided LiDAR scan of the entire Shreveport Terminal and feature extraction for engineering evaluation.
- **Jackson County On-Call Survey Services:** In the fall of 2014, Bartlett & West was awarded the Professional Survey Services contract for Jackson County. The following spring, we were asked to develop a scope and fee to complete encroachment surveys along the Rock Island Corridor. Jackson County officials identified and sent to Bartlett & West a list of 64 properties that had possible encroachment issues. The list of properties was then narrowed down from 64 to nine properties chosen by Jackson County to have encroachment surveys completed. On Aug. 10 we were given a notice-to-proceed for work to be completed by Aug. 31. We completed our assignment three days early.

In the winter of 2016, Bartlett & West was asked to develop a scope and fee to field locate and survey the centerline of the existing rails for the 17-mile Rock Island Corridor. As part of the scope Bartlett & West would draft a plat of survey and legal description of the centerline that would be tied down by bearings and distances to section and quarter section lines that the centerline crossed. Bartlett & West was issued a notice-to-proceed on Feb. 26 and was to have the survey completed by Apr. 18. Bartlett & West again

SIMILAR EXPERIENCE



completed and delivered the centerline survey three days before deadline.

In the spring of 2016, Jackson County and Bartlett & West held meetings discussing the boundary and topographic surveys of the Rock Island Corridor. Bartlett & West has submitted to Jackson County separate scope and fees for each survey as well as combining the surveys into one project.

- **Arkansas Department of Parks and Tourism:** In 2001, Bartlett & West provided a project for the Arkansas Department of Parks and Tourism that is similar to the project for this proposal. In our work for parks and tourism, we helped establish the centerline and right-of-way of an inactive rail roadway in Arkansas. The project was located near Rohwer, AR and stretched to the Missouri river crossing near Watson, AR. The project was approximately 17-miles long. Bartlett & West established the control, the centerline of the existing railroad roadway, the limits of the right-of-way, and provided a plat of survey showing the entire 17-mile corridor. Parks and Tourism used the information and data we provided to establish a public-use trail.
- **Positive Train Control LiDAR Collection, KCS:** In 2015, Bartlett & West provided LiDAR services to capture 3,000 miles of main track and PTC/engineering features throughout 10 states in the U.S. for Kansas City Southern Railway (KCS).

Positive Train Control (PTC) is a braking system to be used to enhance the safety of train operations in

the United States. Bartlett & West used mobile LiDAR system and a KCS hi-rail vehicle to collect the 3,000 miles of track in three months. The mobile LiDAR data was collected to a high level of accuracy. This accuracy requirement allowed KCS to leverage the data not only for PTC purposes, but also for energy management modeling and engineering design purposes.

From the LiDAR data all of the track centerline was collected. In addition to the track centerline 25 specific PTC features and 35 specific engineering features were collected. There was a total of 200,000 features collected and more than 3,000 miles of roadway collected. The centerline of the track and the features extracted were placed in a Microstation dgn file.

- **Highway 5 Mapping and Surveying, Lebanon, MO:** In November 2012, the Missouri Department of Transportation (MoDOT) presented Bartlett & West with the task of establishing horizontal and vertical survey control, survey utility locates, design survey of the project corridor and base mapping for a sidewalk project along Highway 5 in Lebanon, MO.

With a tight time frame, unknown weather delays, and a high traffic area, along with being in a developed urban area, Bartlett & West decided the design survey would be completed using a Terrestrial 3D Laser Scanner made by Riegl. The horizontal and vertical control would be set with GPS technology utilizing the MoDOT Global Positioning System Reference Station Network. The control points had a minimum of four hours in between occupation times. Utility

SIMILAR EXPERIENCE

locates were called in utilizing the Missouri One Call system. The utility mapping was completed using GPS technology and Robotic Total Stations. Field crews worked through the overnight hours to minimize traffic delays to the public, obstructions to the scanner, and to keep them out of harm's way.

This project was originally expected to be scanned via a LiDAR-equipped airplane. The project limits included multiple lanes of high density traffic through the main commercial street in Lebanon. Utilities such as water, waste water, telephone and signal conduit were all underground. Power and cable were suspended above ground. Aerial LiDAR required ground control and ground calibration, but would only take one flight pass to cover the entire project limits. The draft fee estimate was \$144,000.00 using aerial LiDAR which was above the \$100,000.00 limit set by MoDOT for on-call projects. Bartlett & West was able to substitute aerial with terrestrial LiDAR, bringing the fee down to \$70,000.

This project exemplifies how the use of smart technology can save clients both time and money, while keeping survey teams safe and capturing the most data points for an accurate scan.

- **Missouri Department of Transportation Statewide Aerial LiDAR Survey, Missouri:** This project was to furnish all the equipment, materials, and technical resources necessary to perform aerial photogrammetric services for the design and development of 14 specified highway projects. The list of projects was narrowed to eight locations for budgetary reasons by MoDOT. The services included analytics, compilation, and terrain modeling in addition to orthophoto imaging, ground targeting, aerial photography, LiDAR acquisition, and control surveying. The raw data collected was processed into data necessary for application in preliminary highway design.

The mapping accuracy ranged from Class A on projects located in urban areas with interstate type highway projects, to Class B for widening and resurfacing jobs. MoDOT provided the project locations and limits, the specifications for vertical aerial photography and access to the MoDOT Global Positioning System (GPS) Reference Station Network.

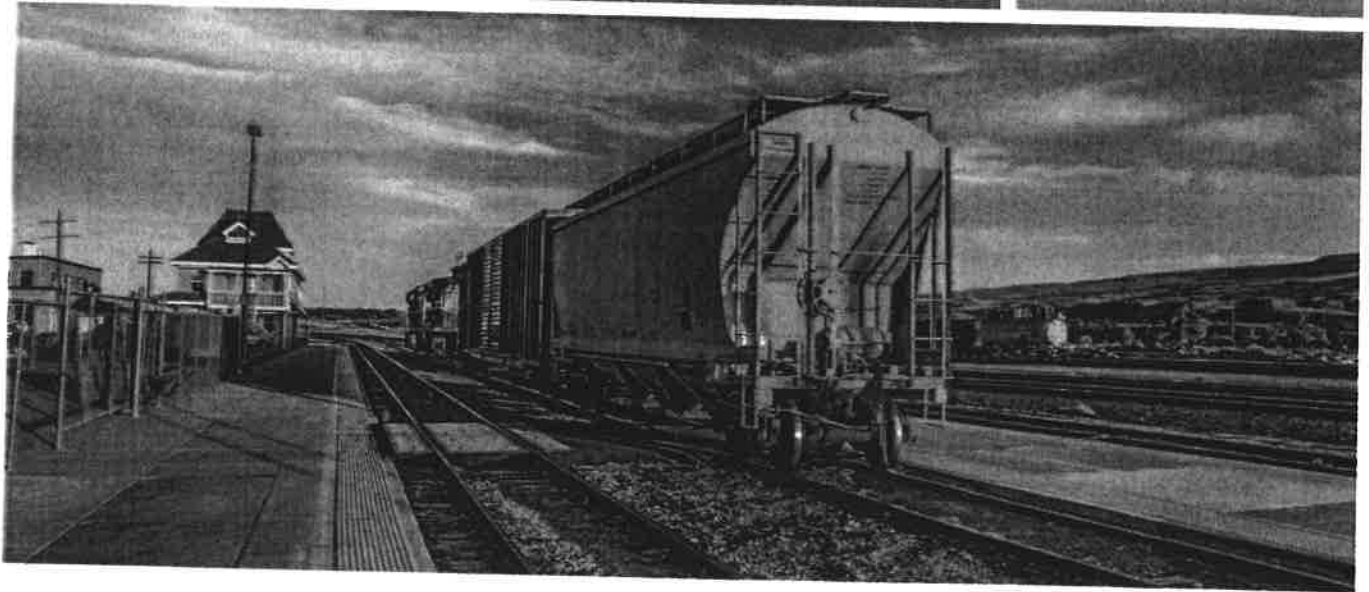
The Notice to Proceed was given in March 2014, which required the ground control and flights be coordinated very carefully so that targets and photo check points were set just prior to the flight. MBE requirements were met with MBE firms supplying survey crews in St. Louis and Kansas City. Aerial LiDAR data acquisition was by sub-consultant - Survey and Mapping, Inc. (SAM), Austin, TX. Each days' raw data was calibrated and orthophotos prepared for submittal to Bartlett & West's LiDAR processors.

Bartlett & West provided a team of trained LiDAR technicians who were assigned projects as calibrated data arrived each day from SAM. Using extraction software, LiDAR data was turned into detailed topographic mapping that featured ten technicians working at peak when work was progressing simultaneously on all eight projects with some in quality review roles. Contours and features such as lane and shoulder lines, structures, entrances, traffic signals, signing, curb lines, and sidewalks were distinguished from tree lines and building outlines. After all corrections were made, the data was packaged into the deliverable and went through an additional test by loading it into MoDOT's Geopak design software for a final review to simulate a MoDOT roadway designer opening the data for the first time.

- **Boundary Survey for Highway 350, Raytown, MO:** Bartlett & West was a sub consultant to CDM Smith and was to provide a boundary survey, topographic survey and digital base maps for the Highway 350 corridor from Westridge Road to East 69th Street in Raytown, Missouri to be used in rehabilitation of intersections to include a trail and pedestrian signals for the Missouri Department of Transportation. MoDOT had existing control and topography on the Raytown Road corridor from a previous project. Bartlett & West was to incorporate this data and control into the rest of the project to save on costs.

MoDOT provided Bartlett & West with copies of highway plans, right of way deeds and subdivision plats for the project corridor. Bartlett & West survey crews used this information to locate and verify property corners and right of way markers for the project. The survey data was then downloaded and reviewed to calculate the Highway 350 right-of-way. A Microstation drawing was created of the calculated right of way and centerline of Highway 350.

SIMILAR EXPERIENCE



Survey crews completed a topographic and utility survey of Highway 350 from Westridge Road to East 69th Street in Raytown. Bartlett & West notified Missouri One Call to have utilities marked in the field so that our field crews could locate the existing utility lines to aid in the design of this project. Topographic features that were picked up included the following: top and toes of slopes, ditches, curbs, edges of pavement, edge of timber, storm and sanitary sewer structures, invert elevations, pipe sizes and material, signs, sidewalks, fences, and utility poles. The survey data was then downloaded and put into a base map. Contours were developed using the survey data from Bartlett & West as well as the survey data that was given to Bartlett & West by MoDOT and integrated into one Microstation drawing. Copies of the survey crews field notes were given to CDMSmith as well as the Microstation drawing of the utilities, right of way and centerline, and topographic base to be used for design.

REFERENCES

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