#### OCTOBER 13, 2022



# CONTRACT FOR PAVEMENT DISTRESS DATA COLLECTION

STATEWIDE

CONTRACT NO. 4400025193

SUBMITTED TO



SUBMITTED BY





## DOTD FORM: 24-102

### PROPOSAL TO PROVIDE CONSULTANT SERVICES

Prime consultant shall complete the DOTD Form 24–102 without altering the Form's text; however, the instruction and/or guidance for Sections 12 through 23 can be removed but do not remove Section title and number.

ANY CONSULTANT FAILING TO SUBMIT ANY OF THE INFORMATION REQUIRED ON THE DOTD FORM 24-102, OR PROVIDING INACCURATE INFORMATION ON THE DOTD FORM 24-102, MAY BE CONSIDERED NON-RESPONSIVE.

Prime consultant should enter the firm name in the footer at the bottom of this page. (It will carry over to subsequent pages.)

1. Contract title as shown in the advertisement	PAVEMENT DISTRESS DATA COLLECTION
2. Contract number(s) as shown in the advertisement	4400025193
3. State Project Number(s), if shown in the advertisement	n/a
4. Prime consultant name (as registered with the Louisiana Secretary of State where such registration is required by law)	Michael Baker International, Inc.
5. Prime consultant license number (as registered with the Louisiana Professional Engineering and Land Surveying Board (LAPELS) if registration is required under Louisiana law)	E.F. 0000062 V.F. 0000010
6. Prime consultant mailing address	Michael Baker International, Inc. 2600 CitiPlace Drive, Suite 450 Baton Rouge, Louisiana 70808
7. Prime consultant physical address (existing or to be established, if location is used as an evaluation criteria)	Michael Baker International, Inc. 2600 CitiPlace Drive, Suite 450 Baton Rouge, Louisiana 70808
8. Name, title, phone number, and email address of prime consultant's contract point of contact	Daniel Thornhill, PE Associate Vice President / Transportation Department Manager 225.218.2846   daniel.thornhill@mbakerintl.com
9. Name, title, phone number, and email address of the official with signing authority for this proposal	Daniel Thornhill, PE Associate Vice President / Transportation Department Manager 225.218.2846   daniel.thornhill@mbakerintl.com

10. This is to certify that all information contained herein is accurate and true, and that the team pres- ently has sufficient staff to perform these services within the designated time frame. By submitting this proposal, proposer certifies that it is not engaged in a boycott of Israel and it will for the duration of its	Signature (shall be the same person as #9):	
contract obligations, refrain from a boycott of Israel. Proposer also certifies and agrees that the following information is correct: In preparing its response, the proposer has considered all proposals submitted from qualified, potential subcontractors and suppliers, and has not, in the solicitation, selection, or commercial treatment of any subcontractor or supplier, refused to transact or terminated business activities,	David Shohil	2
or taken other actions intended to limit commercial relations, with a person or entity that is engaging in commercial transactions in Israel or Israeli-controlled territories, with the specific intent to accomplish a	Date: October 13, 2022	
boycott or divestment of Israel. The proposer also has not retaliated against any person or other entity for reporting such refusal, termination, or commercially limiting actions. DOTD reserves the right to reject the response of the bidder or proposer if this certification is subsequently determined to be false, and to terminate any contract awarded based on such a false response.	<i>Addendum Acknowledged:</i> Addendum No. 1, October 4, 2022	
11. If a Disadvantaged Business Enterprise (DBE) goal has been set for this advertisement, indicate which firm(s) will be used to meet the DBE goal and each firm(s)' percentage.	<i>Firm(s):</i> APS Engineering and Testing, LLC *Precision Systems Inc.	Firm(s)' %: (Goal 4%) 9.6% 3.2%



#### 12. PAST PERFORMANCE EVALUATION DISCIPLINE TABLE:

As indicated in the advertisement, insert the completed table here. The percentages for the prime and sub-consultants must total 100% for each past performance evaluation discipline, as well as the overall total percent of the contract.

Sub-consultants are allowed to be used for this proposal. Fill in the table by identifying only those evaluation disciplines consistent with the approach and methodology proposed in Section 18 of the DOTD Form 24-102\*, the name of each firm that is part of the proposal, and the percentage of work in each past performance evaluation discipline to be performed by that firm. The percentage estimated for each evaluation discipline is for evaluation purposes only and will not control the actual performance or payment of the work. The percentages for the prime and sub-consultants must total 100% for each past performance evaluation discipline, as well as the overall total percent of the contract. (Add rows and columns as needed)

Evaluation Disciplines	% of Overall Contract	Michael Baker	APS Engineering and Testing	ARA	Firb		roctalan Systems, Inc.	Um .	Each Discipline must total to 100%
Data Collection	64%	65%	0%	14%	15%	0%	5%	1%	100%
Geotech	16%	10%	60%	0%	0%	30%	0%	0%	100%
Survey	20%	100%	0%	0%	0%	0%	0%	0%	100%
Identify the percentage of work for the <b>overall contract</b> to be performed by the prime consultant and each sub-consultant.									
Percent of Contract	100.00%	63.2%	9.6%	9.0%	9.6%	4.8%	3.2%	0.6%	

#### 13. FIRM SIZE

For all firms that are part of this team, indicate the approximate number of personnel to be committed to this contract, by DOTD Job Classification and the total number of personnel within the firm that could provide support, if needed. If a specialized job classification is required and not included on the DOTD job classification list, specify "Other (xxxx)" and include the classification title inside the parentheses. The DOTD Job Classification(s) to be used can be found at the following link:

http://wwwsp.dotd.la.gov/Inside\_LaDOTD/Divisions/Engineering/CCS/Job\_Qualification/Job%20Classifications%20with%20Descriptions.pdf

Firm name	DOTD Job Classification	Number of personnel committed to this contract	Total number of personnel available in this DOTD Job Classification (if needed)
	Engineer (Other)	2	20
Michael Baker	Principal	1	6
INTERNATIONAL	Professional	8	24
	Senior Technician	8	24
	Supervisor – Other	6	12
	Technician	24	80
	Accountant	2	12
	Administrative	2	6
APS Engineering and Testing	Engineer	1	3
<b>ARA</b>	Engineer	6	15
	Administrative	1	2
	Clerical	1	3
FILD	Engineering Intern	1	2
	Engineering - Other	1	2
	Technician	4	8

Firm name	DOTD Job Classification	Number of personnel committed to this contract	Total number of personnel available in this DOTD Job Classification (if needed)
	Principal	3	3
<b>DDI</b>	Supervisor – Engineer	6	6
RAW DATA, REFINED RESULTS.	Supervisor – Other	8	18
	Engineering – Aide	0	1
	Engineer – Other	1	3
	Engineer Intern	3	6
	Senior Technician	5	13
	Technician	1	5
	Computer Analyst	2	2
	Accountant	2	2
	Administrative	1	1
	Supervisor-Other	1	3
	Engineer-Other	1	5
Precision Systems, Inc.	Computer Analyst	2	8
	GIS Analyst	2	4
	Technician	5	12
	Administrative	1	1
SAFER ROADS.	Principal	1	1
SAVING LIVES.	Supervisor-Other	1	1
	Computer Analyst	1	3
	GIS Analyst	1	2
	Senior Technician	1	1
	Technician	3	6

#### **14. ORGANIZATIONAL CHART**

Provide an organizational chart showing ALL relevant prime consultant and sub-consultant (if applicable) personnel assigned to the contract, area of project responsibility for each, and reporting lines for the purposes of this contract. An individual's role does not necessarily have to match their DOTD job classification identified in Section 13.



Subconsultants: 1 APS Engineering and Testing, LLC • 2 Applied Research Associates, Inc. • 3 ARRB Group, Inc. 4 Bridge Diagnostics Inc. • 5 Precision Systems Inc. • 6 W.D.M. (USA) Limited \* DBE • ( ) Denotes Minimum Personnel Requirement (MPR) Reference Number • ◊ NCAT Certified

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#### **15. MINIMUM PERSONNEL REQUIREMENTS**

Use the table below to identify both prime consultant and sub-consultant staff designated to work on this contract meeting the Minimum Personnel Requirements (MPRs) specified in the advertisement. Ensure the résumé reflects the required experience stated in the MPR.

MPR No.	Personnel being used to meet the MPR	Firm employed by	Type of license / certification & number	State of license	License / certification expiration date
1	Aaron Morris, GISP	Michael Baker	Geographic Information Systems Professional (GISP)	n/a	59772 7/25/2024
	Nathan Kebede, PE	Michael Baker	PE	ТХ	140340 12/31/2023
	Nathan Kebede, PE	Michael Baker	PE	ТХ	140340 12/31/2023
	Vahid Ganji, PhD, PE	Michael Baker	PE	NY	94156 1/31/2023
2.	Kenny Contrisciane	Michael Baker	n/a	n/a	n/a
	Aaron Morris, GISP	Michael Baker	GISP	n/a	59772 7/25/2024
	Vahid Ganji, PhD, PE	Michael Baker	PE	NY	94156 1/31/2023
,	Kenny Contrisciane	Michael Baker	n/a	n/a	n/a
د	Jerry Daleiden, PE	Frrb	PE	ТХ	62456 6/9/2023
	Michael Richardson	<b>Furb</b>	n/a	n/a	n/a
	Grant Ervin, GISP	Michael Baker	GISP	n/a	90760 5/25/2023
4.	Kenny Contrisciane	Michael Baker	n/a	n/a	n/a
	Kevin McElwain	Michael Baker	n/a	n/a	n/a

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#### **16. STAFF EXPERIENCE**

Résumés shall be provided for all prime and sub-consultant personnel listed in Sections 14 and/or 15 of the proposal. Résumés of personnel not identified in Section 14 or Section 15 of the proposal should not be included and will not be evaluated. Résumés should be limited to 2 pages per person. Any certificates required by the advertisement are to be placed in Section 20.

Name       NATHAN KEBEDE, PE       Years of relevant experience with this employer       <1					
Title       National Practice Lead       Years of relevant experience with other employer(s)       12         Degree(s) / Years / Specialization       Certificate of Business / 2019 / University of Pennsylvania MS / 2012 / Civil Engineering, University of Illinois at Urbana-Champaign BS / 2010 / Civil Engineering, Jackson State University       12         Active registration number / state / expiration date       PE 140340 / TX       12					
Degree(s) / Years / Specialization       Certificate of Business / 2019 / University of Pennsylvania         MS / 2012 / Civil Engineering, University of Illinois at Urbana-Champaign       BS / 2010 / Civil Engineering, Jackson State University         Active registration number / state / expiration date       PE 140340 / TX					
Active registration number / state / expiration date PE 140340 / TX					
Year registered 2021 Discipline Civil					
Active registration number / state / expiration date PE 062.067463 / IL					
Year registered 2015 Discipline Civil					
Contract role(s) / brief description of responsibilities       Fulfills the roles of MPR 1 and 2. Project Manager. Mr. Kebede will be responsible between all disciplines of the project team along with contract management. He will directly with the DOTD point of contact.	for coordination Il coordinate				
Experience dates (mm/yy-mm/yy)Experience and qualifications relevant to the proposed contract; i.e., "designed drainage", "designed girders", "designed intersection", etc. Experience d the time specified in the applicable MPR(s).	lates should cover				
02/22 - 08/22 Annual Pavement Data Collection for Mississippi Department of Transportation (MDOT) (~ 5,000 miles), Annual Data Collection for New Jersey DOT (~ 650 miles), Annual Pavement Data Collection for West Virginia Department Transportation (WVDOT), Division of Highways (~ 3,000 miles). Project Principal. Nathan was ARRB Group, Inc. Principal for Pavement Distress Data Collection projects in Mississippi, New Jersey, and West Virginia as a sub-contra Baker International. He was responsible for the management of all disciplines of ARRB's. team and coordination with International's data collection project management team. Nathan's responsibilities included oversight of field techn collection vehicles, QA/QC, data transfer, and preliminary data processing. Pavement Distress Data collected by the Inc. and Michael Baker International team helped the Departments of Transportation in Mississippi, New Jersey, and meet state and federal transportation infrastructure condition reporting requirements as well as have sufficient info maintenance and rehabilitation planning.	ual Pavement ment of Project actor to Michael Michael Baker nicians, data ARRB Group, I West Virginia ormation for				
<b>08/21 - 09/22</b> New Mexico DOT Pavement Data Collection. Project Manager. Nathan served as the Project Manager for New Me 4-year supplemental Pavement Distress Data Collection project that started in 2021. Nathan's responsibilities includ of field technicians, data collection vehicles, QA/QC, data transfer, data processing, and delivery. Pavement Distress I by the ARRB Group, Inc. helped the DOT meet transportation infrastructure condition reporting requirements and h information for maintenance and rehabilitation planning.	<b>New Mexico DOT Pavement Data Collection.</b> Project Manager. Nathan served as the Project Manager for New Mexico DOT's 4-year supplemental Pavement Distress Data Collection project that started in 2021. Nathan's responsibilities included oversight of field technicians, data collection vehicles, QA/QC, data transfer, data processing, and delivery. Pavement Distress Data collected by the ARRB Group, Inc. helped the DOT meet transportation infrastructure condition reporting requirements and have sufficient information for maintenance and rehabilitation planning.				
08/21 - 04/22       Washington D.C. DOT Annual Pavement Distress Data Collection. Project Manager. Nathan served as the Project Washington D.C. DOT's Annual Pavement Distress Data Collection project that started for the 2021/2022 project cycle responsibilities included roadway network GIS map reviews, data collection route planning, oversight of field technic collection vehicles, QA/QC, data transfer, and data processing. Pavement Distress Data collected helped the DOT met HPMS reporting requirements and update the DOT's Pavement Management System.	Washington D.C. DOT Annual Pavement Distress Data Collection. Project Manager. Nathan served as the Project Manager for Washington D.C. DOT's Annual Pavement Distress Data Collection project that started for the 2021/2022 project cycle. Nathan's responsibilities included roadway network GIS map reviews, data collection route planning, oversight of field technicians, data collection vehicles, QA/QC, data transfer, and data processing. Pavement Distress Data collected helped the DOT meet Federal HPMS reporting requirements and update the DOT's Pavement Management System.				

08/21 - 04/22	<b>Kansas Turnpike Authority Annual Pavement Distress Data Collection.</b> Project Manager. Nathan served as the Project Manager for KTA's Annual Pavement Distress Data Collection project that started for the 2021/2022 project cycle. Nathan's responsibilities included roadway network GIS map reviews, data collection route planning, oversight of field technicians, data collection vehicles, QA/QC, data transfer, and data processing. Pavement Distress Data collected helped KTA update the DOT's Pavement Management System.
07/19 - 01/22	<b>Connecticut DOT Annual Pavement Distress Data Collection . Project Manager.</b> Nathan served as the Project Manager for the Connecticut DOT Supplemental Annual Pavement Distress Data Collection project that started for the 2021/2022 project cycle as a sub-contractor to the University of Connecticut. Nathan's responsibilities included roadway network GIS map reviews, data collection route planning, oversight of field technicians, data collection vehicles, QA/QC, data transfer, and data processing. Pavement Distress Data collected helped the DOT update the DOT's Pavement Management System.
03/20 - 10/20	Virginia DOT Pavement Data Collection on District Roads. Project Manager. Nathan served as the Project Manager for the Virginia DOT Annual Pavement Distress Data Collection on District roads for the 2020 project cycle. Nathan's responsibilities included roadway network GIS map reviews, data collection route planning, oversight of field technicians, data collection vehicles, QA/QC, data transfer, and data processing. Pavement Distress Data collected helped the various Districts make informed pavement maintenance and rehabilitation decisions.
01/21 - 12/21	Pavement Structural Evaluation With Traffic Speed Deflection Devices. Arkansas DOT - 250 miles; Idaho Transportation Department - 700 miles; Illinois DOT - 250 miles; Indiana DOT - 250 miles; Kansas DOT - 250 miles; Mississippi DOT - 600 miles; Michigan DOT - 250 miles; Montana DOT - 250 miles; New Mexico DOT - 1,000 miles; Nevada DOT - 500 miles; Texas DOT - 750 miles; Wisconsin - 577 miles. Project Principal. Nathan was responsible for the Federally approved Transportation Pooled Fund Study to perform pavement data collection utilizing Traffic Speed Deflection Devices during his previous employment. This project involved participants from 25 State and Federal transportation agencies, including the DOTD. Nathan's role included coordination with all State participants and communication with Virginia DOT and FHWA who were project administrators. He also oversaw mission planning, data collection, data processing, and data delivery of no less than 15,000 miles of annual pavement condition data collection per year. The innovative comprehensive pavement condition evaluation data collected as part of this project is greatly maximizing the impact of participating DOTs' pavement maintenance operations and enhancing their pavement management systems.
02/19 - 06/19	<b>Delaware DOT Pavement Evaluation of PCC Highways.</b> Project Manager. Nathan was the responsible for Delaware DOT's Pavement Distress Data Collection and structural evaluation of select PCC highways in the State. In his role, Nathan oversaw the coordination of all stakeholders, calibration and field data collection using LCMS (laser crack measurement system) and TSD (Traffic Speed Deflectometer) technologies, QA/QC, data processing, and final delivery. This project was performed as a subcontractor to AECOM, and the data gathered under Nathan's leadership facilitated Delaware DOT's maintenance decision-making for the State's PCC highway pavements.
04/21 - 05/21	<b>Pavement Profiling Verification Site Setup, Statewide, WY. Wyoming DOT. Program Manager.</b> Wyoming DOT utilizes a pavement profiler verification site to confirm the calibration of pavement profiling and pavement data collection vehicles before they collect data. Nathan was the Project Manager and was responsible for setting up the profiler verification site in Wyoming. Nathan's role included coordination with Wyoming DOT staff for site selection and traffic control, and oversight of the calibration of the reference profiler, profile data collection, data processing, and data delivery.
Mr. Kebede is a s experience in str	killed business operations leader and Professional Engineer experienced in the infrastructure management industry. He has proven rategy development and implementation, developing stake-holder buy-in, and program/project/team management.

Firm employe	d by	lichael Baker ternational					
Name	DANIEL T	HORNHILL, PE			Years of relevant experience with this employer	2	
Title	Office Exec	utive			Years of relevant experience with other employer(s)	22	
Degree(s) / Ye	ears / Specializa	tion		BS / 1997 / Civil Eng	ineering, Louisiana State University		
Active registra	ation number /	state / expiration date		PE.0032367 / LA / 09	9/30/2024		
Year registered	d	2006	Discipline	Civil			
Active registra	ation number /	state / expiration date		25136 / AL / 12/31/2	2021		
Year registere	d	2002	Discipline	Civil			
Active registra	ation number /	state / expiration date		04/2026			
		n/a		Traffic Control Tech	nician - LA State Specific		
		n/a		Traffic Control Supe	rvisor - LA State Specific		
Contract role(s) / brief description of responsibilities Principal in Charge. Mr. Thornhill will support and commit the necessary resource Manager Nathan Kebede, PE, to complete Pavement Distress Data Collection servi accountability for quality and timeliness. He will also ensure priorities are establish during execution of the project.			cessary resources Collection service ties are establishe	s to Project es, and provide ed before and			
Experience da (mm/yy—mm	rtes Vyy)	Experience and quality the time specified in t	fications relevant to the applicable MPR (	the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed intersec	tion", etc. Experience	dates should cover
10/22 –	10/22 – Ongoing IIJA OSBR District 07, Allen, Beauregard, Calcasieu, Cameron, and Jefferson Davis Parishes, LA. DOTD. Principal. Responsible for the development of Off-System Bridge program for the five parishes in District 07 of DOTD. Project entails developing a project matrix to determine bridge replacement program for off-system bridges along parish routes from a list of 73 eligible bridges. Mich Baker design team will select the structure to be replaced by meeting with Parish Officials and determining priority of the structure and number of bridges that can be replaced from a program budget of \$30.3 million dollars. Additional requirements will be to develop project implementation cost by creating construction cost estimates; utility relocation and right-of-way acquisition cost; environmental engineering and CE&L cost					I. Responsible ping a project pridges. Michael the structures will be to isition cost; and	
04/22 - Ongoing LA 30: EBR PL – I-10, East Baton Rouge, Iberville, and Ascension Parishes, LA. DOTD. Principal/Project Manager. Responsi for the oversight of the Environmental Assessment (EA) of the widening of LA 30 from a 2-lane roadway to 4-lane roadway. Additional responsibilities include coordination with local stakeholders, contract management, preparing monthly invoices, and executing contracts. Project is currently in Part 1 of the EA with the main focus on traffic count/study/analysis along with some environmental field screening, initial geometric improvements at existing 5 intersections, SUE services, and development of exist hydraulic flows for existing 6 bridge/culvert structures. Additional responsibilities include oversight of existing alignments along with existing right-of-way lines.					er. Responsible adway. nvoices, and with some early ment of existing ments along		
10/21 - Ongoing Responsible for development of alignment alternatives in Avondale area. Alternatives include railroad overpasses at two location to replace four at grade railroad crossings. Currently trains will block at grade railroad crossings for hours each day at the Avonce railyard. New overpasses meet both DOTD and railroad criteria. New alternatives include both roadway and bridge design.				<b>ject Engineer.</b> at two locations at the Avondale design.			

11/21 - Ongoing	<b>US 371: KCS RR Overpasses HBI, Webster Parish, LA. DOTD. Principal/Project Manager.</b> Responsible for the design and development of construction plans for the replacement of 3 bridges at two locations along US 371. Additional responsibilities include contract management, submitting monthly invoices, and executing contracts. First location is the replacement of a 3 span bridge over KCS Railroad in Sibley, LA. Project entails the development of new bridge alignment following DOTD and KCS Railroad requirements along with modifications of the existing road to accommodate the new bridge vertical alignment. Additional site requirements include developing a detour road/bridge alignment to construct the new bridge under traffic along with reconstruction of LA 164/US 371 intersection. Second location is the replacement of parallel bridges along US 371 at the Minden/I-20 interchange. Bridges will be replaced in phase construction to maintain traffic. Two new 3-span bridges will be constructed over KCS railroad meeting all the required DOTD and KCS design requirements as required at the Sibley bridge site.
05/16 – 01/18	Ham Reid Road at Lake Street (LA 3092) Intersection Improvement Project for Calcasieu Parish Police Jury. DOTD. Project Manager/Lead Design Engineer. Responsibilities included the development of construction plans for a new single lane roundabout at the intersection of Ham Reid Road and Lake Street (LA 3092). Project was studied as both a new signal and roundabout to provide traffic flow for land being developed along the southwest quadrant of the project. Through coordination with DOTD, it was determined a new single lane roundabout was the best alternative. The new roundabout would be a 4-leg roundabout that would connect to Spanish Mission Trail roadway of Trails Subdivision with one of roundabout legs to provide seamless connectivity with Ham Reid Road to eliminate a possible Z-intersection configuration with only a 3-leg roundabout. Mr. Thornhill's responsibilities included coordination with both Calcasieu Parish Project Manager, DOTD District 7 Engineers, and DOTD Project Permit Specialist; development of geometric layouts both horizontally and vertically, development of right-of-way taking lines and coordination of right-of-way maps with surveyor, and hydraulic analysis for both subsurface and storm water flow. Project was being done as a permit project for Calcasieu Parish through DOTD District 7.

Mr. Thornhill has over two decades of consulting experience in a variety of engineering projects including environmental assessment, roadway design, corridor/traffic operation concept analysis, bridge design, hydraulics design, subsurface drainage design, and sidewalk beautification projects.

Firm employe	ed by	chael Baker ernational					
Name	AARON MC	RRIS, GISP			Years of relevant experience with this employer	25	
Title	Vice Preside	nt and National G	eospatial Direc	tor	Years of relevant experience with other employer(s)	0	
Degree(s) / Ye	ears / Specializati	on		Master's Certificate BS / 1995 / Geograp	/ 2008 / Project Management, University of Pit phy and Urban Planning, Frostburg State Unive	ttsburgh ersity	
Active registra	ation number / st	ate / expiration date		59772 / 7/25/2024			
Year registere	d	2008	Discipline	Certified GIS Profes	sional		
Contract role(	′s) / brief descript	ion of responsibilities		Fulfills the role of responsible for lead project.	MPR 1 and 2. Pavement Distress Data Collect ing the team in collecting the Pavement Distres	<b>ion Lead.</b> Mr. Mo ss Data necessary	rris will be to complete the
Experience da (mm/yy—mm	ntes n/yy)	Experience and quali the time specified in	fications relevant to the applicable MPR	the proposed contract; i.e., (s).	"designed drainage", "designed girders", "designed intersect	tion", etc. Experience o	lates should cover
05/21 -	<sup>1</sup> <b>21 - Ongoing</b> Pavement Condition Survey & HPMS Data Collection, Statewide, MS. MDOT. National Data Collection Manager. Responsible for management, supervision, and quality assurance of all data collection activities for the capture of Pavement LCMS, IRI, Friction and imagery data encompassing the entire state. In the initial 2 (of 5) years of the contract, Michael Baker has provided LCMS, inertial profiler, friction testing, and panoramic image collection on 35,000 miles of state roadway, extending across seven distric and 82 counties. An additional ~40,000 miles of collections will be performed during years 3-5. The inventory uses Michael Baker innovative Network Survey Vehicles (NSV), which are equipped with an LCMS, Mosaic 51 spherical camera, inertial profiler for International Roughness Index (IRI), and four high-resolution ROW cameras.				<b>er.</b> Responsible AS, IRI, Friction ded LCMS, seven districts Vichael Baker's profiler for		
07/15	- 06/21	<b>Traffic Signal Asset Management System, Statewide, PA. Pennsylvania Department of Transportation (PennDOT), Central Office.</b> Program Manager. Responsible for management, supervision, and quality assurance of all data collection activities for the capture of Mobile LiDAR data and imagery. Michael Baker's fleet of Mobile LiDAR systems were simultaneously leveraged to shorten the collection cycle to a mere six months. Throughout the 180 days of collection, Michael Baker traveled more than 82,000 miles in the commonwealth. The Mobile LiDAR teams captured 13,600 signalized intersections and captured an astounding 18,000 miles of LiDAR data and extracted 26.5 million features. The 131 terabytes of collected data will support future planning, design, maintenance, and operation design, making by accurately evaluating equipment life cycles, budgets, and other factors.					<b>DOT), Central</b> activities for leveraged to ore than 82,000 ounding 18,000 ning, design, actors.
10/18	8 - 01/19	West Virginia Statewide Pavement Data Collection. WVDOT. Task Manager. Responsible for program management and oversigh of all mobile LiDAR activities (collection, processing, quality assurance, and product delivery). Michael Baker is performing statewide pavement data collection, including laser crack measurement system (LCMS) inventory and panoramic image collection on 28,000 miles of state roadway, extending across 10 districts and 55 counties in West Virginia. The inventory is being performed using Michae Baker's mobile data collection vehicle, which is equipped with a sensor-based LCMS. All pavement data collected is being spatially referenced and aligned with the 360-degree spherical imagery and downward facing pavement imagery from the LCMS and provide to the client via a web-based pavement data viewer application.					it and oversight ning statewide on on 28,000 d using Michael ing spatially MS and provided
11/21	- 04/22	<b>Pavement Management System and ADA Asset Inventory, Indio, CA. City of Indio. Program Manager.</b> Responsible for management, supervision, and quality assurance of all data collection activities for the capture of Mobile LiDAR and Pavement LCMS data encompassing the entire City of Indio. Michael Baker provided Mobile LiDAR mapping and LCMS data collection survey services in support of the City of Indio's refresh of the five-year pavement management plan successfully performed by Michael Baker in 2017. The plan augments their ongoing public works ADA asset management program activities. The project included					

	collection and processing of Mobile LiDAR data, LCMS pavement surface condition data, and 360° high-resolution spherical digital imagery on approximately 450 lane miles (222 centerline miles) of City-owned streets.
11/21 – 06/22	<b>Citywide Pavement Inspection and Roadway Repair Program, Turlock, CA. City of Turlock. National Data Collection</b> <b>Manager.</b> Responsible for management, supervision, and quality assurance of all data collection activities for the capture of Mobile LiDAR and Pavement LCMS data encompassing the entire City of Turlock. Michael Baker partnered with the City of Turlock for comprehensive road rehabilitation program utilizing Measure A tax revenue and other Public-Private-Partnership (P3) funding resources. The building blocks of Michael Baker's solution leveraged innovative remote sensing equipment to capture all 508 lane- miles of roadway throughout the city with both Mobile LiDAR and Pavement LCMS. The program included the capture of spherical imagery, 3D downward facing imagery, and pavement distresses - including transverse, longitudinal, and alligator cracking, as well as rutting and patching.
11/16 - 01/17	Pennsylvania Turnpike Pavement Condition Inventory, Statewide, PA. Pennsylvania Turnpike Commission (PTC). Task Manager. Mr. Morris was responsible for management and oversight of all Quality Assurance operations for Michael Baker's Mobile LiDAR Center of Excellence, including development of the Project Specific Quality Management Plan (PSQMP) for collections, processing. Michael Baker performed a comprehensive pavement and roadway imagery inventory of 1,066 lane miles of mainline and extensions and 440 interchange ramps comprising approximately 258 lane miles along the Pennsylvania Turnpike. Michael Baker provided mobile LiDAR data collection, geographic information system (GIS) layer development, GIS application development, and pavement condition analysis. Additional services included preparing a strategic plan for the Smart Belt Coalition, a regional connected and automated vehicle collaborative, and facilitating an automated equipment demonstration.
09/16 - 09/16	<b>DFW Asset Management Program, TX. Dallas/Fort Worth International Airport. Task Manager.</b> Mr. Morris was responsible for management and oversight of all Quality Assurance operations for Michael Baker's Mobile LiDAR Center of Excellence, including development of the Project Specific Quality Management Plan (PSQMP) for collections, processing, ground control, and visualizations. Michael Baker provided asset management and engineering services for the Dallas-Fort Worth International Airport's (DFW) infrastructure, including airside and landside pavement management and landside bridge inspections. Pavement management included data collection, software implementation, database customization, data analyses and reporting, and client staff training. Bridge inspections were categorized by the urgency of repair, the impact of the deficiencies, and the uniformity of the work, which reduced costs. Michael Baker also provided pavement evaluation services for the landside pavement network using the Laser Crack Measurement System and provided comprehensive training courses for DFW staff in Pavement Management Principles, Pavement Distress Identification and Measurement, and the use of the PAVER Software.
05/11 - 06/11	I-10 Mobile LiDAR Pavement Data Collection and Processing, Statewide FL. FDOT. Program Manager. Mr. Morris was responsible for management and oversight of all Mobile LiDAR activities (collection, processing, quality assurance, and product delivery). Michael Baker provided mobile Light Detection and Ranging (LiDAR) surveying services for approximately 10 miles along I-10 from the C.R. 276/I-10 overpass west to the Jackson-Washington County line. Michael Baker's services included data collection and processing, development of the LiDAR point cloud, and production of exhibits depicting pavement condition.

As the Director of Mobile LiDAR Operations during the program's initial years, Mr. Morris incubated Michael Baker's Mobile LiDAR Division from inception, to the nation's leading service provider. In addition to managing project logistics nationwide, he is an Executive Board Member and Treasurer for the national MAPPS organization.

Page 13 of 91 Prime Consultant Firm N

Firm employe	d by	ichael Baker Ernational				6
Name	GRANT ER	VIN, GISP			Years of relevant experience with this employer	4
Title	Vice Preside	nt / Geospatial Se	rvices Director	-	Years of relevant experience with other employer(s)	21
Degree(s) / Ye	ears / Specializat	ion		MS / 2001 / Geogra BS / 1996 / Geograp	phy, West Chester University bhy, Kutztown University	
Active registra	ation number / s	tate / expiration date		90760 / 5/25/2023		
Year registere	d	2015	Discipline	Certified GIS Profes	sional	
Contract role(	's) / brief descrip	tion of responsibilities		Fulfills the MPR rol collecting assets that	<b>e 4. Asset Collection Lead.</b> Mr. Ervin will be re at have been extracted.	sponsible for leading the team
Experience da (mm/yy—mm	ntes n/yy)	Experience and quality the time specified in	fications relevant to the applicable MPR(	the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed intersed	tion", etc. Experience dates should cove
10/17 - 03/22 Data Warehouse and Maintena application which is used to coll the past 18 years, Michael Baker Data & Safety, which maps all pu Diagram data warehouse and all need to maintain this database t investment decisions. The purpor process field data as pecessary a		ect road segment info has provided roadway blic roads in New Jers to support annual Fec to provide decision ma se of this project was nd to promote and as	profile for the rede ormation/attributes for New Jersey Department y data collection and database administration ey. This inventory and spatial data have been l deral Highway Administration reporting require akers with correct and current data upon which to continue diligent database management ar ssist with inter-agency contact and coordination	t of Transportation (NJDOT). Ov to the Bureau of Transportation oaded into to the Straight-Line ements. The client recognized t h to base strategic transportation administration, to collect and on.		
10/18 - 05/19       Turnpike On-Call Engineering Services, Statewide, New Jersey. New Jersey Turnpike Authority. Task Manage for management and oversight of all geospatial services and Survey123 application development. Michael Baker is construction management/construction inspection for emergency generator and HVAC upgrade installations at Inf facilities 13A, 14B, and 15E on the New Jersey Turnpike, and turnpike-wide highway lighting repairs or modification work includes selective demolition of existing equipment, mechanical/plumbing/electrical construction, utility coc			<b>y. Task Manager.</b> Responsible Vichael Baker is performing Istallations at Interchange toll or modifications. The scope of ction, utility coordination, testi			
04/19 -	03/2019	<ul> <li>Garden State Parkway Guide Rail Design, Statewide, New Jersey. New Jersey Turnpike Authority. Task Manager. Response for management and oversight of all geospatial services in support of guiderail installations. Michael Baker provided engineerir services for guide rail installation at seven critical locations along the Garden State Parkway. Michael Baker's services included fi assessment, warrant analysis, recommendation development, and final design.</li> </ul>			r <b>ity. Task Manager.</b> Responsib el Baker provided engineering el Baker's services included field	
12/17 - 12/18 Basin and Outfall Inventorying, that leverages ArcGIS Online's Su of Transportation (NJDOT). The te of the data using external GPS red for each location along with the of was collected during the process, stormwater basins and outfalls fo identify maintenance requirement downstream surface water quality Maintenance Facilities.			all Inventorying rcGIS Online's Su- n (NJDOT). The t along with the uring the process and outfalls f ance requirement face water quali- cilities.	g, Statewide, New Je urvey123 application eam is taking a paper eceiver for high accur creation of a detailed s. Michael Baker was s or assessment purpos nts and remedial acti ty. Michael Baker is al	<b>rsey. NJDOT. Technical Lead.</b> Responsible for to collect stormwater basin and outfall location r-based form and translating it into Survey123 acy mapping. The solution also requires the car report which is being built automatically bas selected by NJDOT Bureau of Environmental P ses. The primary goal of the project is to obtain ions to address issues including erosion and set lso responsible for compiling additional inform	r developing a mobile applicat ons for New Jersey Department to support the mobile collection pture of four digital images ed on the information that rogram Resources to inventory n and compile assessments to edimentation, which may affect nation for Region Central NJDC

06/19 - 11/22	Bridge Load Rating and Evaluation Engineering Services, South Carolina. South Carolina Department of Transportation (SCDOT). Task Manager. Responsible for management and oversight of all geospatial services as well as the implementation of Survey123/ArcCollector field applications. Michael Baker is providing bridge load rating and evaluation engineering services for state-owned, county-owned, and other municipality-owned structures throughout South Carolina. Tasks include project management, site assessments, data collection, agency coordination, quality assurance reviews, and training development. Michael Baker established this statewide program and oversees five other consultants performing bridge load ratings, assessments, load and material testing, oversize and overweight permitting, complex structure rating and maintenance manuals, development of custom AASHTOWare Bridge Management program, and quality assurance reviews.
06/19 - Ongoing	Asset Life Cycle Management (ALCM) Services Call-In Program, NY and NJ. Port Authority of New York/New Jersey. Deputy Project Manager/Technical Lead. Responsible for review and enhancements to the Authority's Asset Data Specification (ADS) and PA Hierarchal Model for the Office of Enterprise Asset Management. Managed development team that created iPad-based application to identify existing assets and GIS application utilized to perform field collection activities for the Authority's Marine Terminals. Existing and new assets have their characteristics captured in a digital form and photos are taken of the asset before it is labeled with an asset tag containing a barcode which is scanned at the conclusion of the survey. Developed a real time dashboard of data collection information utilizing a custom ArcGIS Online web application for internal performance management and monitoring by Authority staff. Responsible for data delivery to the Authority's Maximo implementation vendor at the conclusion of the collection involving multiple ETL data workflows.
02/17 - 10/20	Asset Management System and Data Warehouse (GeoLink Redevelopment), NJ. New Jersey Department of Transportation. Development Manager. Guided the re-development of Michael Baker's mobile GeoLink application used to collect roadway inventory data. Updated the user interface to decrease data capture times. Re-engineered workflow process with maps that updated in real time while reducing the frequency of updated data loads. Team members were also responsible for updating the back-end database to current release, photo capabilities and disconnected editing functionality.
01/21- Ongoing	<b>Railroad At-Grade Crossing Inventory and Condition Ratings System (RRAGS). Statewide, CT. Connecticut Department of Transportation. Solution Architect.</b> Responsible for architecting a cloud-based solution within ConnDOT's Enterprise GIS environment leveraging ArcGIS Enterprise, Portal for ArcGIS, SQL Server and Microsoft PowerBI. Field inventory is performed on At-Grade Railroad Crossings using a customized Survey123 application that is synchronized with the ArcGIS Data Store leveraging SQL Server. ConnDOT Rail staff QAQC the inventory using a custom editing interface that synchronizes back to the ArcGIS Environment nightly. A series of reports and dashboards in PowerBI leverage the inventory data which ultimately gets exported for submission to the Federal Railroad Administration (FRA).
01/19 - 05/19	<b>Drainage Maintenance Program, New Jersey. New Jersey Turnpike Authority. Project Manager.</b> Responsible for georeferencing CAD and paper engineering plans and digitizing information for the turnpike and Garden State Parkway. Features were attributed and stored in a versioned GIS central database being utilized by multiple editors simultaneously. Existing feature characteristics were field verified using Collector for ArcGIS along with collecting new features, photos, and drainage feature conditions. Performed data QAQC for loading into NJTA's central GIS data repository eGIS. Developed new data dictionaries for feature layers and provided data schema recommendations that were implemented in the eGIS data warehouse.

Mr. Ervin is the Geospatial Information Technology (GIT)/ Asset Management (AM) Department Manager at the Hamilton, New Jersey office. He is experienced in guiding and supporting GIS technology projects within city and county government as well as metropolitan planning organizations.

Firm employed by Michael Baker							
Name	KENNY CO	ONTRISCIANE			Years of relevant experience with this employer	21	
Title	Technical I	Nanager - Pavemer	nt Analytics		Years of relevant experience with other employer(s)	1	
Degree(s) / Y	/ears / Specializa	ition		BA / 2001 / Applied	Geography, Millersville University		
Active registr	ration number /	state / expiration date					
Year registere	ed		Discipline				
Contract role	(s) / brief descri	ption of responsibilities		Fulfills the roles of will be responsible f	MPR 2, 3 and 4. Pavement Distress Data Pre for leading the team in processing Pavement D	<b>Decessing Lead.</b> M Vistress data collec	1r. Contrisciane :ted.
Experience do (mm/yy—mn	ates n/yy)	Experience and quali the time specified in	fications relevant to the applicable MPR(	the proposed contract; i.e., (s).	"designed drainage", "designed girders", "designed intersed	tion", etc. Experience c	dates should cover
5/21 - Ongoing Pavement Condition Survey & the Project Manager for the four inventoried (inclusive of over 28 inertial profiler, friction testing, a and 82 counties. An additional ~ Baker's innovative Network Surv for International Poughness Ind			dition Survey & ager for the fou lusive of over 28 friction testing, . An additional ve Network Surv Roughness Ind	r-year statewide pave 8,000 miles of skid dat and panoramic image ~40,000 miles of colle vey Vehicles (NSV), wile ex (IRI), and four high	ement data collection project in which over 63 ta. In the initial 2 (of 4) years of the contract, N e collection on 35,000 miles of state roadway, ections will be performed during years 3 and 4 hich are equipped with an LCMS, Mosaic 51 sp n-resolution ROW cameras.	r. Kenny is currer 3,000 miles state r Aichael Baker has extending across 4. The inventory u oherical camera, in	ntly serving as routes will be provided LCMS, s seven districts ses Michael nertial profiler
02/15 - 12/20 Data Warehouse and Maintenarie relating to the maintenance of t This project involves GIS mainter video-based image data collect / GPS-based roadway data collect spatially geocoded in the SLD data geoprocessing techniques access collection and database administ This inventory and spatial data h Federal Highway Administration decision makers with correct and this project was to continue dilig to promote and assist with inter			e and Mainten naintenance of t olves GIS mainte age data collect dway data colle led in the SLD d echniques acce atabase admini nd spatial data l y Administration with correct an to continue dili assist with inter	ance, Trenton, NJ. N the enhanced centerl mance of previously of ion performed on a b ction, and county/loo atabase. Data is local ssible through the us stration to the Bureau nave been loaded int n reporting requirement d current data upon gent database manag- agency contact and	JDOT. Database Administrator. Responsible ine roadway network during the Data Wareho collected SLD attributes and feature database bi-annual basis for all Interstate, US, and State cal update process development. All collected ly maintained and managed through a combi- e of ArcSDE. Over the past 18 years, Michael E u of Transportation Data & Safety, which maps o to the Straight-Line Diagram data warehous ents. The client recognized the need to mainta which to base strategic transportation investr gement and administration, to collect and pro- coordination.	for the oversight ouse and Mainten . Maintenance stra Routes in New Jer data is linear refe ination of ArcGIS aker has provided all public roads i se and also suppo ain this database ment decisions. Th ocess field data as	of all activities ance project. ategies include rsey, Geolink erenced and and SQL Server d roadway data in New Jersey. ort annual to provide he purpose of a necessary, and
11/17	7 - 12/19	Pavement Invest management an data across 1,200 for Camden Cou processing, repo	ntory and Man ad oversight of s 0 lane miles of c anty, New Jersey ort preparation,	<b>agement, Camden (</b> cope, schedule and b ounty owned roads. <i>I</i> 7. Tasks included a roa and implementing ar	<b>County, NJ. City of Camden, NJ. Project Mar</b> Judget for the roadway inventory of pavement Michael Baker developed and implemented a Idway inventory, pavement surface and asset and deploying the PAVER pavement managem	ager. Responsibl condition and an pavement manag data collection, p ent system.	le for ncillary asset gement system pavement data

05/18 - 04/19	<b>Pavement Data Collection, Statewide, WV. WVDOT. Technical Manager.</b> Under Kenny's technical leadership, the Michael Baker- ARRB team has collected and delivered 28,000 miles of pavement condition, HPMS data and associated roadway, and downward facing imagery extending across 10 districts and 55 counties. Michael Baker is performing statewide pavement data collection, including laser crack measurement system (LCMS) inventory and panoramic image collection on 28,000 miles of state roadway, extending across 10 districts and 55 counties in West Virginia. The inventory is being performed using Michael Baker's mobile data collection vehicle, which is equipped with a sensor-based LCMS. All pavement data collected is being spatially referenced and aligned with the 360-degree spherical imagery and downward facing pavement imagery from the LCMS and provided to the client via a web-based pavement data viewer application.
09/16 - 05/17	<b>Pavement Condition Inventory, Statewide, PA. Pennsylvania Turnpike Commission (PTC). Task Manager.</b> Since 2016, served as the task manager of this project which entails a network-wide pavement condition data collection under a long-term general engineering contract. The inventory includes LCMS pavement data collection along 1,066 lane miles of highways including over 400 interchange ramps. In addition to LCMS data collection, this inventory includes the capture of ROW imagery, 3D downward facing imagery and ride quality (IRI) data. Kenny was an integral part of the team that aligned outputted LCMS data to PennDOT's Publication 336 (Automated Pavement Condition Survey Field Manual) schema. During his tenure, he also oversaw the development of a web-based Pavement Data Viewer application, delivery of HPMS formatted data each year to PennDOT (IRI, rutting, faulting, cracking) and delivery of over 2 million pavement & ROW imagery. Michael Baker performed a comprehensive pavement and roadway imagery inventory of 1,066 lane miles of mainline and extensions and 440 interchange ramps comprising approximately 258 lane miles along the Pennsylvania Turnpike. Michael Baker provided mobile LiDAR data collection, geographic information system (GIS) layer development, GIS application development, and pavement condition analysis. Additional services included preparing a strategic plan for the Smart Belt Coalition, a regional connected and automated vehicle collaborative, and facilitating an automated equipment demonstration.
01/22 - 08/22	<b>Pavement Management System, Treasure Island, FL. City of Treasure Island. Task Manager.</b> Responsible for management and oversight of LCMS processing and fully/semi-automated pavement distress selection activities. Michael Baker developed a pavement management system using cutting edge technology and a mobile van unit equipped with LCMS and inertial profiler. The pavement management system would allow the city to integrate and maintain an inventory, analyze condition data, track construction history, and conduct multi-year analyses to guide decisions concerning pavement maintenance and rehabilitation. Michael Baker surveyed 80 lane miles of the city's streets and parking lots. PAVER 7 software was used to analyze the information for developing recommended pavement strategies, which included milling and resurfacing, reconstruction, or a combination of tasks.
05/17 – 12/18	DFW Asset Management Program, Dallas/Fort Worth International Airport (DFW), Dallas-Fort Worth, TX. Dallas/Fort Worth International Airport. Task Manager. Responsible for management and oversight of LCMS processing and fully/semi-automated pavement distress selection activities. Michael Baker provided asset management and engineering services for the DFW infrastructure, including airside and landside pavement management and landside bridge inspections. Pavement management included data collection, software implementation, database customization, data analyses and reporting, and client staff training. Bridge inspections were categorized by the urgency and impact of deficiencies, and the uniformity of the work, which reduced costs.

Mr. Contrisciane is an experienced GIS project manager and transportation system integrator. He has served as the technical lead related to Michael Baker's innovative all-in-one collection system that included LCMS, Mobile LiDAR, GPR and spherical imagery.

Firm employed	d by	lichael Baker ternational						
Name	VAHID GA	ANJI, PHD, PE			Years of relevant experience with this employer	1 ton		
Title	Pavement	Scientist			Years of relevant experience with other employer(s)			
Degree(s) / Years / Specialization				PhD / 1996 / Geotechnical/Pavement Eng, Rutgers University MS / 1996 / Geotechnical/Pavement Eng, Rutgers University MS / 1996 / Geotechnical/Pavement Eng, Rutgers University MS / 1993 / Hydraulics and Structures, Sharif University of Technology, Tehran, Iran BS / 1990 / Civil Engineering, Ferdowsi University, Mashhad, Iran				
Active registra	ation number /	state / expiration date		094156 / NY				
Year registered	d	2014	Discipline	Professional Engine	er			
Active registra	ation number /	state / expiration date		NJ				
Year registered	d	2013	Discipline	Testing of Soil, Aggr	egate, Concrete and Hot Bituminous Surface M	aterials		
Contract role(	s) / brief descrij	otion of responsibilities		<b>Fulfills the roles of MPR 2 and 3. Pavement Distress Data Processing Manual Distress Rating</b> <b>Lead</b>   QA/QC. Mr. Ganji will be responsible for developing systems that aid in the collection and processing of Manual Distress Rating Data, as well as serving as the projects QA/QC.				
Experience da (mm/yy—mm	ites i/yy)	Experience and quality the time specified in t	fications relevant to the applicable MPR(	the proposed contract; i.e., 's).	"designed drainage", "designed girders", "designed intersectio	n", etc. Experience dates should cover		
09/18	- 08/19	<b>Pavement Management Plan Update, Napa County, CA. Napa County. Technical Specialist.</b> Responsible for leading pavement management system using StreetSaver. Michael Baker provided engineering services for the collection of LCMS pavement condition data and the update of a pavement management plan (PMP) in StreetSaver. This data included international roughness index (IRI), pavement condition index (PCI), rutting, patching, cracking, potholes, raveling, faulting, drop-off, and macrotexture for 840 lane miles of roadway. The PCI values for 570 management sections were updated in StreetSaver, as well. Michael Baker obtained roadway imagery using five high-definition cameras and collected distress data per ASTM D6433 and MTC StreetSaver standards. Using the data, Michael Baker performed a budgetary needs analysis for five different scenarios and offered treatment recommendations.						
05/18	<b>18 - 05/19</b> Pavement Data Collection, Statewide, WV. WVDOT. QC Manager. Responsible for oversight of auto/semi-auto pavement disselections, pavement analysis, and development of non-destructive pavement prescriptions. Michael Baker is performing statever pavement data collection, including laser crack measurement system (LCMS) inventory and panoramic image collection on 28 miles of state roadway, extending across 10 districts and 55 counties in West Virginia. The inventory is being performed using Michael Baker's mobile data collection vehicle, which is equipped with a sensor-based LCMS. All pavement data collected is be spatially referenced and aligned with the 360-degree spherical imagery and downward facing pavement imagery from the LCM and provided to the client via a web-based pavement data viewer application.							
11/17	- 12/19	Pavement Inventory and Management, Camden County, NJ. City of Camden, NJ. Project Manager. Responsible for developing a pavement management system for the city using LCMS data. Michael Baker developed and implemented a pavement management system for Camden County, New Jersey. Tasks included a roadway inventory, pavement surface and asset data collection, pavement data processing, report preparation, and implementing and deploying the PAVER pavement management system.						

06/17 - 10/17	<b>Pavement Management System, Treasure Island, FL. City of Treasure Island. QC Manager.</b> Reesponsible for oversight of auto/semi-auto pavement distress selections, pavement analysis, and development of non-destructive pavement prescriptions. Michael Baker developed a pavement management system using cutting edge technology and a mobile van unit equipped with Light Detection and Ranging and Laser Crack Measurement System. The pavement management system would allow the city to integrate and maintain an inventory, analyze condition data, track construction history, and conduct multi-year analyses to guide decisions concerning pavement maintenance and rehabilitation. Michael Baker surveyed 40 center lane miles of the city's streets and parking lots. PAVER 7 software was used to analyze the information for developing recommended pavement strategies, which included milling and resurfacing, reconstruction, or a combination of tasks.
01/22 - 08/22	<b>Pavement Management Program, Morris County, NJ. Morris County. QC Manager.</b> Responsible for oversight of auto/semi- auto pavement distress selections, pavement analysis, and development of non-destructive pavement prescriptions. Michael Baker conducted a pavement inventory and condition assessment of approximately 670 lane miles of county owned and or maintained routes and captured new right-of-way imagery, 3D downward facing imagery, and pavement distresses along the same routes. The completed inventory was performed using Michael Baker's mobile data collection vehicle, which is equipped with a sensor-based, laser crack measuring system (LCMS), manufactured by Pavemetrics. The vehicle also includes a sophisticated mobile LiDAR system capable of capturing highly accurate point cloud data used for 3D modeling and rendering, feature extraction, and topographic surveying. The team also provided pavement management system (PMS) implementation, setup, and configuration services and conducted multiple on-site training sessions to the county engineering staff who would be using the PAVER system to manage the roadway maintenance program.
05/17 – 12/18	DFW Asset Management Program, Dallas/Fort Worth International Airport (DFW), Dallas-Fort Worth, TX. Dallas/Fort Worth International Airport. Pavement Scientist. Responsible for oversight of all pavement data analysis including random sample testing, PCI evaluations and pavement prescriptions. Michael Baker provided asset management and engineering services for the DFW infrastructure, including airside and landside pavement management and landside bridge inspections. Pavement management included data collection, software implementation, database customization, data analyses and reporting, and client staff training. Bridge inspections were categorized by the urgency and impact of deficiencies, and the uniformity of the work, which reduced costs.

Dr. Ganji has extensive pavement evaluation and design experience using both empirical and mechanistic methods. Dr. Ganji has also published more than 10 technical papers in peer reviewed journals and proceedings and serves as an independent authority on non-destructive pavement evaluations.

Firm employe	ed by	chael Baker Ernational					
Name	STEVEN HE	NDERSON			Years of relevant experience with this employer	14	
Title	Field Operat	ions Lead			Years of relevant experience with other employer(s)	7	
Degree(s) / Ye	ears / Specializati	on		AS / 2001 / Drafting	and Design Technology, Hinds Community C	College	
Active registre	ation number / st	ate / expiration date		n/a			
Year registere	ed		Discipline				
Contract role(	(s) / brief descript	ion of responsibilities		Field Coordinator. Michael Baker's flee	Mr. Henderson will be responsible for daily op t of Pavement and Mobile LiDAR collection sys	erations and ma stems.	nagement of
Experience da (mm/yy—mm	ntes n/yy)	Experience and quality the time specified in the time specified in the spe	fications relevant to the applicable MPR(	the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed intersed	ction", etc. Experience	e dates should cover:
02/22 - Ongoing Statewide Pavement Data Coll oversight of all Pavement collect inventory and panoramic image Virginia. The inventory is being p based LCMS. All pavement data downward facing pavement ima			ment Data Coll Pavement collec anoramic image entory is being p pavement data g pavement ima	lection. WVDOT. Fie tion activities. Michae collection on 28,000 performed using Micl collected is being sp agery from the LCMS	Id Operations Lead. Mr. Henderson was resp el Baker is performing statewide pavement da ) miles of state roadway, extending across 10 hael Baker's mobile data collection vehicle, w atially referenced and aligned with the 360-d and provided to the client via a web-based p	onsible for daily ata collection, in districts and 55 hich is equipped egree spherical pavement data v	y operations and ncluding LCMS counties in West d with a sensor- imagery and viewer application.
02/22 - Ongoing Pavement Condition Survey & HPMS Date operations, supervision, and quality assura imagery data encompassing the entire stat profiler, friction testing, and panoramic ima 82 counties. An additional ~40,000 miles o innovative Network Survey Vehicles (NSV), International Boughness Index (IBI), and fo				HPMS Data Collect ality assurance of all o e entire state. In the ir oramic image collect 000 miles of collection cles (NSV), which are IRI), and four high-res	ion, Statewide, MS. MDOT. Field Operation data collection activities for the capture of Pa- nitial 2 (of 5) years of the contract, Michael Ba tion on 35,000 miles of state roadway, extend ns will be performed during years 3-5. The inv equipped with an LCMS, Mosaic 51 spherical solution ROW cameras.	s Lead. Respons vement LCMS, IF ker has provided ling across sever /entory uses Mic l camera, inertia	sible for daily RI, Friction and d LCMS, inertial n districts and chael Baker's Il profiler for
05/22 – Ongoing Data Warehouse and Maintenance, Trenton, NJ. NJDOT. Field Operations Lead. Responsible and oversight of all Pavement collection activities. Since 2016 Michael Baker has provided annu imagery capture for NJDOT's entire Off-state, National Highway System (NHS) network through and spatial data have been loaded into to the Straight-Line Diagram data warehouse and also s Administration reporting requirements. The client recognized the need to maintain this databas correct and current data upon which to base strategic transportation investment decisions. The continue diligent database management and administration, to collect and process field data a assist with inter-agency contact and coordination.				or daily operation Pavement LCMS t the State. This oport annual Feo to provide deciss urpose of this processary, and to	ons, supervision, 5 and ROW inventory deral Highway sion makers with roject was to o promote and		
05/22 – 09/22 Pavement Management System, Bryant, AR supervision, and quality assurance of all data c encompassing the entire City . Michael Baker d mobile collection unit that further facilitated re would allow the city to integrate and maintain year analyses to guide decisions concerning pa				<b>m, Bryant, AR. City</b> of the of all data collecti Aichael Baker develop ter facilitated roadwa e and maintain an inv o concerning paveme	of Bryant. Field Operations Lead. Responsib on activities for the capture of Pavement LCM ped a pavement management system using o y asset inventories throughout the City. The p rentory, analyze condition data, track constru- nt maintenance and rehabilitation.	ble for daily open 15, IRI and image cutting edge tec bavement mana ction history, an	rations, ery data :hnology and a gement system id conduct multi-

02/22 – 04/22	<b>Pavement Management System and ADA Asset Inventory, Indio, CA. City of Indio. Field Operations Lead.</b> Responsible for daily operations, supervision, and quality assurance of all data collection activities for the capture of Pavement LCMS and imagery data encompassing the entire City of Indio. Michael Baker provided Mobile LiDAR mapping and LCMS data collection surveys services in support of the City of Indio's refresh of the five-year pavement management plan successfully performed by Michael Baker in 2017. The plan augments their ongoing public works ADA asset management program activities. The project included collection and processing of Mobile LiDAR data, LCMS pavement surface condition data, and 360° high-resolution spherical digital imagery on approximately 450 lane miles (222 centerline miles) of City-owned streets.
02/22 – 06/22	<b>Citywide Pavement Inspection and Roadway Repair Program Turlock, CA. City of Turlock. Field Operations Lead.</b> Responsible for daily operations, supervision, and quality assurance of all data collection activities for the capture of Mobile LiDAR and Pavement LCMS data encompassing the entire City of Turlock. Michael Baker partnered with the City of Turlock for comprehensive road rehabilitation program utilizing Measure A tax revenue and other Public-Private-Partnership (P3) funding resources. The building blocks of Michael Baker's solution leveraged innovative remote sensing equipment to capture all 508 lane- miles of roadway throughout the city with both Mobile LiDAR and Pavement LCMS. The program included the capture of spherical imagery, 3D downward facing imagery, and pavement distresses - including transverse, longitudinal, and alligator cracking, as well as rutting and patching.
02/22 – 08/22	<b>Pavement Management System, Treasure Island, FL. City of Treasure Island. Field Operations Lead.</b> Responsible for daily operations, supervision, and quality assurance of all data collection activities for the capture of Pavement LCMS, IRI, Friction and imagery data encompassing the entire City. Michael Baker developed a pavement management system using cutting edge technology and a mobile van unit equipped with LCMS and inertial profiler. The pavement management system would allow the city to integrate and maintain an inventory, analyze condition data, track construction history, and conduct multi-year analyses to guide decisions concerning pavement maintenance and rehabilitation. Michael Baker surveyed 80 lane miles of the city's streets and parking lots. PAVER 7 software was used to analyze the information for developing recommended pavement strategies, which included milling and resurfacing, reconstruction, or a combination of tasks.
08/13 - 03/15	<b>Mobile LiDAR Scanning Project, Statewide, AL. Alabama Department of Transportation (ALDOT). GIT Analyst.</b> Responsible for QA/QC reviews of daily collections and compilation of topographic mapping and surface modeling. Michael Baker performed mobile Light Detection and Ranging services for a statewide highway contract for the ALDOT. Under the five-year contract, Michael Baker completed six task orders for four-lane interstates in six counties, totaling approximately 85 miles. Without disrupting traffic, Michael Baker collected and processed data for all road surfaces in the project areas, including ramps, overpasses, and rest areas. It also performed bare-earth classification, developed topographic mapping, and created digital terrain models. Finally, Michael Baker calibrated imagery captured by ALDOT in TopoDOT and delivered 3D roadway planimetrics, a GEOPAK triangulated irregular network, and 3D break lines and spot elevations.
02/13 - 08/13	One Lake Mobile LiDAR Data Collection and Finished Floor Elevations, Hinds, Madison and Rankin Counties, MS. Pearl River Vision Foundation. Team Leader. Provided quality assurance and quality control for the entire scope of the three-dimensional planimetrics that were extracted from mobile LiDAR data. Provided work for up to five employees and managed workflows. Provided quality assurance and quality control for all planimetric deliverables and provided the deliverables to the client. Michael Baker performed a detailed survey of approximately 8,000 structures to establish finished-floor elevations (FFE) using data acquired by Michael Baker's mobile Light-Detection and Ranging (LiDAR) system. Michael Baker's services included mobile LiDAR data collection, geographic information system (GIS) data processing, development of customized GIS tools, and analysis of available aerial LiDAR data.
Mr. Henderson has responsible for ma Static LiDAR.	an extensive background in LiDAR/Pavement Field Collections, GIS, and CAD Drafting. As the Field Operations Lead, he is Inagement, training and oversight of Michael Baker's entire fleet of innovative field collection technologies, including all Mobile and

Firm employed by		<b>Frib</b>	Errb					
Name	MICHAI	EL RICHARDSON			Years of relevant experience with this employer	2	(and)	
Title	Project I	Manager			Years of relevant experience with other employer(s)	16		
Degree(s) / Ye	ears / Specia	lization		BS / 2003 / Civil Eng BS / 2006 / Physics,	ineering, University of Wisconsin-La Crosse University of Wisconsin-La Crosse			
Active registro	ation numbe	er / state / expiration date		PE.43959-6 / WI / 07	//11/2023			
Year registere	ed 🛛	2006	Discipline	Civil Engineering				
Contract role(	(s) / brief des	scription of responsibilities		Field Coordinator. data collection.	Michael will be responsible for field coordination	on to aid in pave	ement distress	
Experience da (mm/yy—mm	ntes n/yy)	Experience and quality the time specified in	fications relevant to the applicable MPR(	the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed intersec	tion", etc. Experience	e dates should cover	
07/18 – 12/23 Pavement Structural Evaluation Project Manager of this project in collected as part of Pooled Fund 1 texture, Right-of-Way imagery, ar States since 2018.		n with Traffic Speed n partnership with Vire Study TPF-5(385). Dat nd continuous pavem	<b>Deflection Devices (TSDDs), Nationwide. Pr</b> ginia Tech Transportation Institute, for the com a includes pavement surface distress data, incl ent deflection data. Thousands of miles of road	oject Manager. pletion and deli luding rutting, ro ds have been co	Michael is the very of data, oughness, and illected in 25+			
04/19	9 - 10/19	<b>Network Data C</b> Prime (Michael B collection on We	<b>follection, State</b> aker) to comple st Virginia roads	ewide, WV. WVDOT. Project Manager. Michael was the Project Manager for ARRB's team with the ete pavement data collection surveys, including surface distress and continuous structural data s and highways in 2019 and 2022.				
04/21 - 10/24 Network Data Collection, State (Michael Baker) to complete pave on Mississippi roads and highwa		ewide, MS. MDOT. Pr ement data collection ys through 2024.	<b>oject Manager.</b> Michael is the Project Manager of surveys, including surface distress and contin	er for ARRB's tea nuous structural	Im with the Prime I data collection			
01/19 – 06/20 Comprehensive Pavement Asses partnership with Virginia Tech Tran data and continuous pavement de			Pavement Ass Virginia Tech Tra ious pavement	sessment, Statewide, TX. Texas DOT. Project Manager. Michael is the Project Manager, in ransportation Institute, for the completion and delivery of data, including pavement surface distress deflection data, collected on roads and highways in Texas.				
09/20 - 11/20 Maintenance Treatment Confirm ARRB's team with the Contract he surface distress and continuous s and 2021.			eatment Confir In the Contract h and continuous	mation, Statewide, older (University of To structural data collec	<b>TN. Tennessee DOT. Project Manager.</b> Micha ennessee - Knoxville) to complete pavement d tion on TDOT's roads and highways to confirm	el was the Proje ata collection su maintenance tr	ct Manager for urveys, including reatments in 2020	

Prior to joining ARRB, Michael worked for Mandli Communications as a Project Manager and Product Engineer, where he was involved in various aspects of pavement and roadway asset management data collection projects.

Firm employe	ed by	Aichael Baker					
Name	NATHAN	STEPHENSON			Years of relevant experience with this employer	3	
Title	Field Colle	ction Associate II			Years of relevant experience with other employer(s)	0	
Degree(s) / Ye	ears / Specializa	ition		BS / 2014 / Mathem	atics, California University of Pennsylvania		
Active registro	ation number /	state / expiration date		12648_1633732			
Year registere	d	2019	Discipline	OSHA 10-Hour Con	struction Outreach Training		
Degree(s) / Ye	ears / Specialize	ition	_	Transportation Wor	ker Identification Credential (TWIC)		
Year registere	d	2019	Discipline				
Contract role(	(s) / brief descri	ption of responsibilities		Mobile LiDAR Field logistics and mainte	l Operator Mr. Stephenson will be responsible mance of Pavement LCMS and Mobile LiDAR c	e for daily operation	on, routing ent.
Experience da (mm/yy—mm	ntes n/yy)	Experience and qual the time specified in	ifications relevant to the applicable MPR(	the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed interse	ction", etc. Experience	dates should cover
responsible for daily field logistic and imagery data encompassing technology and a mobile van un city to integrate and maintain ar guide decisions concerning pav and parking lots. PAVER 7 softwa included milling and resurfacing			daily field logisti ta encompassing a mobile van ur and maintain al concerning pav . PAVER 7 softwa and resurfacing	cs, route planning an g the entire City . Mic nit equipped with LCI n inventory, analyze c ement maintenance are was used to analy g, reconstruction, or a	d Pavement collection activities for the capt chael Baker developed a pavement manager MS and inertial profiler. The pavement manager condition data, track construction history, an and rehabilitation. Michael Baker surveyed 8 rze the information for developing recomme a combination of tasks.	ure of Pavement L nent system using gement system wo d conduct multi-y 0 lane miles of the nded pavement si	CMS, IRI, Friction cutting edge ould allow the ear analyses to e city's streets trategies, which
8/19 – 10/20 ADA and Sidewalk Inventory a Collection Specialist. Mr Steph activities for the capture of state facilities to support transition pl using Mobile LiDAR and terrestr collections were performed alor Real-time vehicle tracking and a comprising over 34,500 curb rar manual and automated OC proc			valk Inventory a cialist. Mr Steph capture of state port transition pl DAR and terrestre performed alor e tracking and a r 34,500 curb rar omated QC proc	and Compliance Ana nenson was responsib wide terrestrial LIDA anning for compliand ial spherical imagery ng more than 4,000 m n ArcGIS dashboard mp systems, 18,600 cm cesses to ensure com	alysis, Statewide, KY. Kentucky Transportation of for daily field logistics, route planning and R and imagery. Michael Baker performed a size with the ADA. State-owned and maintain where pedestrian facilities were believed to hiles of roadway, which included dense urban were used to track and report progress. With rosswalks, and more than 1,630 miles of side pleteness and accuracy.	tion Cabinet (KY d Mobile LiDAR co statewide invento ed rights of way v be located. Mobil n corridors to rura n more than 13,000 walk, each phase i	<b>TC). Field</b> Illection ry of pedestrian vere captured e LiDAR I, outlying areas. 0 intersections required both
11/20 - OngoingAncillary Structure Inventory a Specialist. Mr Stephenson was capture of statewide terrestrial L field inspection services in supple based spherical imagery for the TxDOT's 25 individual districts for overhead sign structures.		and Inspection, Stat responsible for daily LIDAR and imagery. N ort of a statewide inv inventory, is to devel or use in inspection a	tewide, TX. Texas Department of Transpor field logistics, route planning and Mobile LiE Aichael, under a 5-year, \$5 million contract, is ventory of ancillary structures. The project, w op a consistant and reliable relational databand nd long-term maintenance of High Mast Illur	tation (TxDOT). DAR collection act performing Mobi which uses LiDAR a ase of ancillary str mination Poles (HI	Field Collection ivities for the ile LiDAR and ind ground fuctures across MIP) and		

02/19 - Ongoing	<b>Pavement Data Collection, Statewide, WV. WVDOT. Field Collection Specialist.</b> Mr. Stephenson was responsible for daily field logistics, route planning and Pavement collection activities. Michael Baker is performing statewide pavement data collection, including LCMS inventory and panoramic image collection on 28,000 miles of state roadway, extending across 10 districts and 55 counties in West Virginia. The inventory is being performed using Michael Baker's mobile data collection vehicle, which is equipped with a sensor-based LCMS. All pavement data collected is being spatially referenced and aligned with the 360-degree spherical imagery and downward facing pavement imagery from the LCMS and provided to the client via a web-based pavement data viewer application.
05/21 - Ongoing	<b>Pavement Condition Survey &amp; HPMS Data Collection, Statewide, MS. MDOT. Field Collection Specialist.</b> Mr Stephenson was responsible for daily field logistics, route planning and Pavement collection activities for the capture of Pavement LCMS, IRI, Friction and imagery data encompassing the entire state. In the initial 2 (of 5) years of the contract, Michael Baker has provided LCMS, inertial profiler, friction testing, and panoramic image collection on 35,000 miles of state roadway, extending across seven districts and 82 counties. An additional ~40,000 miles of collections will be performed during years 3-5. The inventory uses Michael Baker's innovative Network Survey Vehicles (NSV), which are equipped with an LCMS, Mosaic 51 spherical camera, inertial profiler for International Roughness Index (IRI), and four high-resolution ROW cameras.
03/19 – Ongoing	<b>Data Warehouse and Maintenance, Trenton, NJ. NJDOT. Field Collection Specialist.</b> Mr Stephenson was responsible for daily field logistics, route planning and Pavement collection activities. Since 2016 Michael Baker has provided annual Pavement LCMS and ROW imagery capture for NJDOT's entire Off-state, National Highway System (NHS) network throughout the State. This inventory and spatial data have been loaded into to the Straight-Line Diagram data warehouse and also support annual Federal Highway Administration reporting requirements. The client recognized the need to maintain this database to provide decision makers with correct and current data upon which to base strategic transportation investment decisions. The purpose of this project was to continue diligent database management and administration, to collect and process field data as necessary, and to promote and assist with inter-agency contact and coordination.
05/22 – 09/22	<b>Pavement Management System, Bryant, AR. City of Bryant. Field Collection Specialist.</b> Mr Stephenson was responsible for daily field logistics, route planning and Pavement collection activities. Michael Baker developed a pavement management system using cutting edge technology and a mobile collection unit that further facilitated roadway asset inventories throughout the City. The pavement management system would allow the city to integrate and maintain an inventory, analyze condition data, track construction history, and conduct multi-year analyses to guide decisions concerning pavement maintenance and rehabilitation.
11/21 – 04/22	<b>Pavement Management System and ADA Asset Inventory, Indio, CA. City of Indio.</b> Field Collection Specialist Mr Stephenson was responsible for daily field logistics, route planning and Pavement collection activities for the capture of Pavement LCMS and imagery data encompassing the entire City of Indio. Michael Baker provided Mobile LiDAR mapping and LCMS data collection surveys services in support of the City of Indio's refresh of the five-year pavement management plan successfully performed by Michael Baker in 2017. The plan augments their ongoing public works ADA asset management program activities. The project included collection and processing of Mobile LiDAR data, LCMS pavement surface condition data, and 360° high-resolution spherical digital imagery on approximately 450 lane miles (222 centerline miles) of City-owned streets.
11/21 – 06/22	<b>Citywide Pavement Inspection and Roadway Repair Program, Turlock, CA. City of Turlock.</b> Field Collection Specialist. Mr. Stephenson was responsible for daily field logistics, route planning and Pavement collection activities for the capture of Mobile LiDAR and Pavement LCMS data encompassing the entire City of Turlock. Michael Baker partnered with the City of Turlock for comprehensive road rehabilitation program utilizing Measure A tax revenue and other Public-Private-Partnership (P3) funding resources.

Mr. Stephenson's employment experience has given him the opportunity to display his abilities in technology, adaptability, knowledge expansion, customer service, and promoting a positive team environment.

Firm employe	d by	Chael Baker	ael Baker				
Name		DAN			Years of relevant experience with this employer	<1	
Title	Field Collec	tion Associate II			Years of relevant experience with other employer(s)	10	
Degree(s) / Ye	ears / Specializat	ion		Coursework / 2021	/ Undergraduate Studies, Youngstown State U	niversity	
Active registro	ation number / si	tate / expiration date		n/a			
Year registere	d		Discipline				
Contract role(	's) / brief descrip	ion of responsibilities					
Experience da (mm/yy—mm	ntes n/yy)	Experience and quality the time specified in t	fications relevant to the applicable MPR(	the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed intersect	ion", etc. Experience c	lates should cover
11/20 - Ongoing for daily field logistics, route plan imagery. Michael, under a 5-year statewide inventory of ancillary is to develop a consistant and re inspection and long-term maint			jistics, route pla il, under a 5-yea ory of ancillary onsistant and re	nning and Mobile LiE r, \$5 million contract, structures. The proje liable relational data enance of High Mast	DAR collection activities for the capture of state is performing Mobile LiDAR and field inspecti ect, which uses LiDAR and ground based spher base of ancillary structures across TxDOT's 25 i Illumination Poles (HMIP) and overhead signs	ewide terrestrial on services in su ical imagery for t ndividual district structures.	IS responsible LIDAR and pport of a the inventory, ts for use in
08/21 -	Ongoing	<b>IDENTIFY and SET UP: IDENTIFY and SET UP:</b>					
05/18 -	Ongoing	<b>Pavement Data Collection, Statewide, WV. WVDOT. Field Collection Specialist.</b> Responsible for daily field logistics, route pla and Pavement collection activities. Michael Baker is performing statewide pavement data collection, including LCMS inventory panoramic image collection on 28,000 miles of state roadway, extending across 10 districts and 55 counties in West Virginia. Th inventory is being performed using Michael Baker's mobile data collection vehicle, which is equipped with a sensor-based LCM All pavement data collected is being spatially referenced and aligned with the 360-degree spherical imagery and downward fa pavement imagery from the LCMS and provided to the client via a web-based pavement data viewer application.					;, route planning inventory and /irginia. The based LCMS. wnward facing
05/21 - Ongoing Pavement Condition Survey & HPM responsible for daily field logistics, rou and imagery data encompassing the inertial profiler, friction testing, and p and 82 counties. An additional ~40,00 innovative Network Survey Vehicles (I International Roughness Index (IRI), a			lition Survey & laily field logisti a encompassin riction testing, An additional ork Survey Vehi ughness Index (	HPMS Data Collect cs, route planning an g the entire state. In t and panoramic image -40,000 miles of colle cles (NSV), which are IRI), and four high-re	ion, Statewide, MS. MDOT. Field Collection S ad Pavement collection activities for the captur the initial 2 (of 5) years of the contract, Michael e collection on 35,000 miles of state roadway, e ections will be performed during years 3-5. The equipped with an LCMS, Mosaic 51 spherical o solution ROW cameras.	Specialist. Mr. Jo e of Pavement Lo Baker has provid extending across inventory uses M camera, inertial p	rdan was CMS, IRI, Friction ded LCMS, seven districts Vichael Baker's profiler for

03/19 – Ongoing	<b>Data Warehouse and Maintenance, Trenton, NJ. NJDOT. Field Collection Specialist.</b> Mr. Jordan was responsible for daily field logistics, route planning and Pavement collection activities. Since 2016 Michael Baker has provided annual Pavement LCMS and ROW imagery capture for NJDOT's entire Off-state, National Highway System (NHS) network throughout the State. This inventory and spatial data have been loaded into to the Straight-Line Diagram data warehouse and also support annual Federal Highway Administration reporting requirements. The client recognized the need to maintain this database to provide decision makers with correct and current data upon which to base strategic transportation investment decisions. The purpose of this project was to continue diligent database management and administration, to collect and process field data as necessary, and to promote and assist with inter-agency contact and coordination.
05/22 – 09/22	<b>Pavement Management System, Bryant, AR. City of Bryant. Field Collection Specialist.</b> Mr. Jordan was responsible for daily field logistics, route planning and Pavement collection activities. Michael Baker developed a pavement management system using cutting edge technology and a mobile collection unit that further facilitated roadway asset inventories throughout the City. The pavement management system would allow the city to integrate and maintain an inventory, analyze condition data, track construction history, and conduct multi-year analyses to guide decisions concerning pavement maintenance and rehabilitation.
11/21 – 04/22	<b>Pavement Management System and ADA Asset Inventory, Indio, CA. City of Indio. Field Collection Specialist.</b> Mr. Jordan was responsible for daily field logistics, route planning and Pavement collection activities for the capture of Pavement LCMS and imagery data encompassing the entire City of Indio. Michael Baker provided Mobile LiDAR mapping and LCMS data collection surveys services in support of the City of Indio's refresh of the five-year pavement management plan successfully performed by Michael Baker in 2017. The plan augments their ongoing public works ADA asset management program activities. The project included collection and processing of Mobile LiDAR data, LCMS pavement surface condition data, and 360° high-resolution spherical digital imagery on approximately 450 lane miles (222 centerline miles) of City-owned streets.
11/21 – 06/22	<b>Citywide Pavement Inspection and Roadway Repair Program, Turlock, CA. City of Turlock. Field Collection Specialist.</b> Mr. Jordan was responsible for daily field logistics, route planning and Pavement collection activities for the capture of Mobile LiDAR and Pavement LCMS data encompassing the entire City of Turlock. Michael Baker partnered with the City of Turlock for comprehensive road rehabilitation program utilizing Measure A tax revenue and other Public-Private-Partnership (P3) funding resources. The building blocks of Michael Baker's solution leveraged innovative remote sensing equipment to capture all 508 lane- miles of roadway throughout the city with both Mobile LiDAR and Pavement LCMS. The program included the capture of spherical imagery, 3D downward facing imagery, and pavement distresses - including transverse, longitudinal, and alligator cracking, as well as rutting and patching.
01/22 – 08/22	<b>Pavement Management System, Treasure Island, FL. City of Treasure Island. Field Collection Specialist.</b> Mr. Jordan was responsible for daily field logistics, route planning and Pavement collection activities for the capture of Pavement LCMS, IRI, Friction and imagery data encompassing the entire City. Michael Baker developed a pavement management system using cutting edge technology and a mobile van unit equipped with LCMS and inertial profiler. The pavement management system would allow the city to integrate and maintain an inventory, analyze condition data, track construction history, and conduct multi-year analyses to guide decisions concerning pavement maintenance and rehabilitation. Michael Baker surveyed 80 lane miles of the city's streets and parking lots. PAVER 7 software was used to analyze the information for developing recommended pavement strategies, which included milling and resurfacing, reconstruction, or a combination of tasks.

Mr. Jordan serves as Michael Baker's lead operator for Mobile LiDAR collections, and is responsible for complete and detailed data collections per DOT/client specifications.

Firm employed	d by	<b>Frrb</b>									ar.
Name	KEITH SOU	DER							7		100
Title	GIT Technic	al Specialist/ Asset	Management/	Department	Manager				7		
Degree(s) / Ye	ars/Specializat	ion		n/a							A Martin
Active registra	ntion number / s	tate / expiration date									
Year registered	d		Discipline								
Contract role(	s) / brief descrip	tion of responsibilities		Field System Operator and Fleet Manager. Mr. Souder will perform duties as a field operator to assist in pavement data collection.							
Experience da (mm/yy—mm,	tes /yy)	Experience and quality the time specified in t	fications relevant to he applicable MPR(	the proposed co. (s).	ntract; i.e., "designe	d drainage", "d	lesigned girde	ers", "designed i	ntersection", etc. E	Experience da	tes should cover
07/18 – 12/23 Pavement Structural Evaluation with Traffic Speed Deflection Devices (TSDDs). Nationwide. Field System Operator of this project in partnership with Virginia Tech Transportation Institute, for the completion a collected as part of Pooled Fund Study TPF-5(385). Data includes pavement surface distress data, including rutting, texture, Right-of-Way imagery, and continuous pavement deflection data.					em Operat etion and d utting, roug	or. Keith is the lelivery of data, ghness, and					
04/19 - 10/19 Network Data Collection, Statewide, WV. WVDOT. Field System Operator. Keith was the Field System with the Prime (Michael Baker) to complete pavement data collection surveys, including surface distres data collection on West Virginia roads and highways in 2019 and 2022.				eld System Op ce distress anc	erator for d continuo	ARRB's team ous structural					
04/21	- 10/24	<b>Network Data Collection, Statewide, MS. MDOT. Field System Operator.</b> Keith is the Field System Operator for ARRB's team with the Prime (Michael Baker) to complete pavement data collection surveys, including surface distress and continuous structural data collection on Mississippi roads and highways through 2024.									
01/19	- 06/20	<b>Comprehensive Pavement Assessment, Statewide, TX. Texas DOT. Field System Operator.</b> Keith is the Field System Operator, in partnership with Virginia Tech Transportation Institute, for the completion and delivery of data, including pavement surface distress data and continuous pavement deflection data, collected on roads and highways in Texas.									
09/20 - 11/20 Maintenance Treatment Confirmation, Statewide, TN. Tennessee DOT. Field System Operator. Keith was the Field System Operator for ARRB's team with the Contract holder (University of Tennessee - Knoxville) to complete pavement data collection surveys, including surface distress and continuous structural data collection on TDOT's roads and highways to confirm main treatments in 2020 and 2021.						System Ilection maintenance					

Keith served in the U.S. Navy from 1990 to 1998 with three tours of duty in Desert Shield and Desert Storm. Before joining ARRB, Keith was an Overthe-Road truck driver and he has traveled through all of the 48 states in the U.S. mainland. He also worked in the local asphalt industry as a driver and operator.

Firm employe	ed by	Frrb							(2=)
Name	BRIAN	SERZEGA					4	4	See
Title	Lead Fie	Lead Field Surveyor					4	4	
Degree(s) / Y	'ears / Specia	lization		n/a					
Active registr	ration numb	er / state / expiration date		n/a					
Year registere	ed		Discipline						
Contract role	(s) / brief de	scription of responsibilities		Field System assistance in t	<b>Field System Operator and Fleet Manager.</b> Mr. Serzega will be responsible for providing assistance in the pavement data collection process as a field operator and surveyor.				
Experience do (mm/yy—mn	ates n/yy)	Experience and qualit the time specified in t	fications relevant he applicable MP	to the proposed contra R(s).	ct; i.e., "designed drainag	ge", "designed girders",	"designed intersection",	etc. Experient	ce dates should cover
07/18 – 12/23 Pavement Structural Evaluatio Lead Field Surveyor of this project collected as part of Pooled Fund texture, Right-of-Way imagery, an States since 2018.			ion with Traffic S ect in partnership d Study TPF-5(385 and continuous p	peed Deflection De with Virginia Tech T 5). Data includes pav avement deflection	ransportation Inst rement surface dis data. Thousands	<b>ationwide. Lead F</b> titute, for the comp stress data, includir of miles of roads ha	<b>Field Surve</b> oletion and ng rutting, r ave been co	<b>yor.</b> Brian is the delivery of data, oughness, and ollected in 25+	
04/19	9 - 10/19	<b>Network Data C</b> the Prime (Micha collection on We	<b>Network Data Collection, Statewide, WV. WVDOT. Lead Field Surveyor.</b> Brian was the Lead Field Surveyor for ARRB's team we the Prime (Michael Baker) to complete pavement data collection surveys, including surface distress and continuous structural collection on West Virginia roads and highways in 2019 and 2022.					RRB's team with s structural data	
04/21	l - 10/24	<b>Network Data C</b> Prime (Michael B collection on Mis	<b>Network Data Collection, Statewide, MS. MDOT. Lead Field Surveyor.</b> Brian is the Lead Field Surveyor for ARRB's team with th Prime (Michael Baker) to complete pavement data collection surveys, including surface distress and continuous structural data collection on Mississippi roads and highways through 2024.						's team with the ructural data
01/19	9 – 06/20	<b>Comprehensive</b> partnership with data and continu	<b>Comprehensive Pavement Assessment, Statewide, TX. Texas DOT. Lead Field Surveyor.</b> Brian is the Lead Field Surveyor, in partnership with Virginia Tech Transportation Institute, for the completion and delivery of data, including pavement surface distress data and continuous pavement deflection data, collected on roads and highways in Texas.						
09/20 - 11/20 Maintenance Treatment Confir for ARRB's team with the Contrac including surface distress and co treatments in 2020 and 2021.			firmation, Statev act holder (Unive continuous struct	vide, TN. Tennessee rsity of Tennessee - ural data collection	<b>e DOT. Lead Field</b> Knoxville) to com on TDOT's roads a	<b>Surveyor.</b> Brian v plete pavement da and highways to co	vas the Lea ata collectic onfirm mair	d Field Surveyor on surveys, ntenance	

Prior to joining ARRB, Brian worked for Chester County, Pennsylvania as a Telecommunicator II. He was responsible for taking calls, dispatching the appropriate County employees, and providing updates to all stakeholders.

Firm	em	plo	ved	by
	~	P	,	~ ,



	·							200		
Name	PAUL	DALBEY, PE				1	8	Link		
Title	Senior	Engineer	neer							
Degree(s) / Years / Specialization				MS / 2003 / Civil Enginee BS / 2002 / Civil Enginee	ring, University of Illinois ing, University of Illinois					
Active registi	ration num	ber / state / expiration date		062059909 / IL /11/30/20	)62059909 / IL /11/30/2023					
Year register	red	2007	Discipline	Civil Engineering						
Contract role(s) / brief description of responsibilities				<b>Continuous Friction Tes</b> friction testing equipment	<b>Continuous Friction Testing Technician.</b> Mr. Dalbey will be responsible for all aspects of the friction testing equipment, including maintenance, training, scheduling, and testing operations.					
Experience d (mm/yy—mr	lates m/yy)	Experience and qualit the time specified in	fications relevant the applicable Mł	to the proposed contract; i.e., "designers" PR(s).	ned drainage", "designed girders", "des	signed intersection",	etc. Experienc	e dates should cover		
06/13	- Ongoin	<b>Statewide Frict</b> been the project and delivery of c contract to conti several of the da	ion Testing, S manager for lata to MoDO nue providing ta collection e	tatewide, MO. Missouri Dep statewide friction testing for l , often on very short time co , this valuable data to the Sta fforts and processed a signifi	<b>artment of Transportation (</b> MoDOT since 2013. As such, he estraints. Under his efforts, AR e. Prior to becoming the projection cant amount of the data.	( <b>MoDOT). Proje</b> the has been respo RA was rehired fo ject manager, Mr	<b>ct Manage</b> onsible for t or an additic . Dalbey wa	r. Mr. Dalbey has he collection al three-year is involved in		
05/22	2 – 09/22	<b>Statewide Frict</b> entire State of M multiple teams t all data was anal schema.	<b>ion Testing, S</b> lississippi high o complete th yzed and deli	tatewide, MS. MDOT. Proje way network in 2022. With o le field testing in under 10 way vered in a format that was co	<b>ct Manager.</b> Mr. Dalbey was t ver 14,000 miles of state-main eeks. He was also in charge of mpatible with MDOT's existin	the project mana ntained highway f coordinating da ng pavement ma	ager for fric ys, Mr. Dalb ata analysis inagement	tion testing of the ey coordinated teams to ensure systems and data		
04/13	3 - 10/20	<b>Network Frictio</b> all roads under t lane in each dire of interchange r	on Testing, Sta he jurisdiction oction of all roa amps under P	atewide, PA. PTC. Lead Field of the Pennsylvania Turnpik ads, approximately 1,200 land TC jurisdiction, a total of app	Engineer. Mr. Dalbey is the le e Commission. Testing consist miles of testing. In 2017 and roximately He is also responsi	lead field engine sts of ribbed and 2018, Mr. Dalbe ible for data redu	eer for the f smooth tir ey also over uction and	riction testing of e testing of one saw the testing all quality control.		
04/11-	- Ongoin	g Network-level I annual network- of pavement usi tasks to ensure h	<b>Network-level Friction Testing, Statewide, IL. Illinois Tollway. Lead Field Engineer.</b> Mr. Dalbey has been in charge of the bi- annual network-wide friction testing on the Illinois Tollway since 2011. Under his management, ARA staff has tested nearly 600 miles of pavement using both daytime and nighttime operations. Mr. Dalbey has overseen the data reduction and report efforts of these tasks to ensure high-quality, useful data is recorded and delivered to the client.							
02/15	- Ongoin	ng North Tarrant E led several pave ARA has execute IH-820, and Texa similar services o reporting.	xpress/LBJ E ment friction ed multiple co s State Highw on the I-635/L	<b>Apress Pavement Friction E</b> testing projects on the recent ntracts for testing of manage ay 183. Beginning in 2019, A BJ Express north of Dallas. Mu	valuation, North Fort Worth Ily completed North Tarrant E d lanes, general purpose lane A also executed contracts wi Dalbey has overseen all field	<b>h, TX. Lead Field</b> Express north of es, ramps, and fro vith LBJ Infrastruc d testing operation	Fort Worth, Fort Worth, ontage road cture Group ons, data ar	Mr. Dalbey has Texas, since 2015. ds along IH-35W, to preform nalysis, and		
Mr. D Chan	Dalbey is a npaign, ll	a Senior Engineer in 18 Ilinois office. He has lea	years of pave ARA's annua	ment engineering experiend I network pavement evaluat	e and leads the Engineering on of the Indiana Toll <u>Road si</u>	Consulting Servince 2012.	/ices Group	in ARA's		

Firm employe	ed by	up.			6			
Name	RYLAN	D POTTER	TTER					
Title	Vice Pre	sident		0				
Degree(s) / Years / Specialization			MPP / 2009 / Public Policy, University of Texas-Austin BS / 2004 / Business Management, Case Western Reserve Uni	iversity				
Active registre	ation numb	er / state / expiration date	n/a					
Year registere	ed 🛛	Discipline						
Contract role(s) / brief description of responsibilities			<b>Continuous Friction Testing Manager.</b> Ryland will collaborate with the LA DOTD and Michael Baker teams to scope and deliver a continuous friction data collection and data quality assurance program, identify research needs and deliverables, oversee analysis efforts, and serve as the primary point of contact for WDM USA.					
Experience da (mm/yy—mm	ntes n/yy)	Experience and qualifications relevant to the time specified in the applicable MPR	o the proposed contract; i.e., "designed drainage", "designed girders", "designed int (s).	tersection", etc. Experie	nce dates should cover			
07/20 – Ongoing Network-Level Continuous Fri was Project Manager of this proj contract management for ~15,0 annually. Currently in Year 3 of a		<b>9</b> Network-Level Continuous Fri was Project Manager of this proj contract management for ~15,0 annually. Currently in Year 3 of a	ction Measurement. Statewide, KY. Kentucky Transportation ject, which included program development, data collection oper 100 lane miles of SCRIM continuous friction, macrotexture, IRI, geo 6-year contract.	a <b>Cabinet. Project</b> rations manageme ometrics, and vide	<b>Manager.</b> Ryland ent, and overall o data delivery			
11/20 – 12/21 Continuous Pavement Friction Manager. Ryland was Project M contract management for conti		Continuous Pavement Friction Manager. Ryland was Project N contract management for conti	n Measurement and Pavement Friction Management for Saf lanager of this project, which included SCRIM data collection an nuous friction collection efforts across four states.	ety, Multiple Stat Id delivery manag	tes. FHWA Project ement and overall			
06/20	0 – 07/20 Horizontal Curve Evaluation, Statewide, IA. Iowa Department of Transportation. Project Manager. Ryland was Project.							
09/19	- 12/19	9 Surface Material Differentiation Testing, TX. Transtec Group. Project Manager. Ryland was Project Manager of this project, which included planning and managing SCRIM data collection to provide Transtec and a private sector partner with detailed material characterization data on in-service pavements in Texas.						
09/19	- 10/19	<b>District-Level Continuous Fric</b> Ryland was Project Manager of lane miles of roads in two of Vir Transportation Institute, and th Project (https://www.virginiado	tion Measurement, Statewide VA. Virginia Department of Tr this project, which included scoping, planning, and managing S ginia's largest urban areas. This project was completed as a sub- e data were ultimately included in VDOT's Pavement Friction Ma t.org/vtrc/main/online_reports/pdf/22-R14.pdf).	CRIM data collecti contract to the Vir anagement Progra	<b>oject Manager.</b> ion on ~2,500 ginia Tech m Demonstration			

In her role, Ryland has developed and delivered continuous friction-based pavement evaluation and management programs in multiple states and is the primary project manager on WDM's contract to collect 15,000 miles of SCRIM continuous friction data annually for the KY Transportation Cabinet.
Firm employed by



Firm employe	ea by	RAW DATA. REFINED RESULTS.							
Name	THOMAS	WEINMANN			Years of relevant experience with this employer	3			
Title	Vice Presid	ent – Testing, Moni	toring, and Eng	ineering	Years of relevant experience with other employer(s)	41			
Degree(s) / Ye	'ears / Specializa	tion		BS / 1988 / Civil Eng	jineering				
Active registre	ration number / s	state / expiration date		n/a					
Year registere	ed		Discipline						
Contract role	(s) / brief descrip	ntion of responsibilities		<b>Pavement Instrumentation and Testing Subject Matter Expert.</b> Mr. Weinmann will be in charge of handling operation efforts for ground penetrating radar, testing, and performance monitoring.					
Experience dates (mm/yy-mm/yy)Experience and qualifications relevant to the propositive the time specified in the applicable MPR(s).				the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed interse	ction", etc. Experien	nce dates should cover		
06/2:	2-06/22	Pavement Test F University of Albo was funded by th included asphalt remote system w	Road Instrumer erta to design a ne National Rese strain gages, so vith data posted	ntation Installation, pavement monitoring arch Council and the il pressure cells, temp to a web-based data	Edmonton, Canada. Instrument Designer. N g instrumentation layout to capture the respon intent was to evaluate repair designs for distre- perature sensors, and soil moisture probes. Dat management system.	Ir. Weinmann w nse of pavemen essed pavement a collection was	rorked with the at overlay. This work ts. Instrumentation s from a roadside,		
05/22-06/22 Tensar Geogrid Performance Evaluation, ERDC, Vicksburg, MS. Project Manager/Supervisor/Trainer. Mr. Weinmann we under contract with Tensar at the ERDC/USACE facility in Vicksburg to evaluate pavement performance utilizing geogrid to er reduction of base course thickness. This was accomplished using BDI's proprietary Multi-Depth Deflectometer (MDD) placed i existing pavement to measure sub-surface deformation of soil support layers under heavy vehicle simulated (HVS) loads.						inmann worked eogrid to enable DD) placed into the ) loads.			
08/1	8-07/19	Dallas Fort Wor with Diversified I specification, de loadings. The pu for Airport-wide	existing pavement to measure sub-surface deformation of soil support layers under heavy vehicle simulated (HVS) loads. <b>Dallas Fort Worth Airport Service Road Pavement Instrumentation, DFW Airport TX. Project Manager.</b> Under contract with Diversified Electrical Solutions and the Paving Contractor, Mr. Weinmann provided the development of instrumentation specification, design of sensor layout, and system design for pavement evaluation on test sections through load testing and traffic loadings. The purpose of the program was to instrument three different rigid pavement designs to evaluate the best-suited design for Airport-wide surface road reconstruction.						
05/18	<b>B-08/19</b> I-69 Test Pavement Instrumentation Study, Indianapolis, IN. Lead Instrumentation Engineer (IE) Under Contract with Reith- Riley, the Paving Contractor, Mr. Weinmann was the Lead Instrumentation Engineer (IE) for installation training and oversight for installation and QA of 44 soil pressure cells, 44 soil moisture gages, 26 temperature sensors, 10 concrete, and 180 asphalt strain gages in 22 separate test pavement sections on the reconstruction of I-69, North of Indianapolis.								
06/16-09/19 Honolulu Airport Taxiway, Honolulu, HI. Project Manager. Under contract with Kaikor the Paving Contractor, Mr. Weinmanr worked with HIDOT to develop a pavement instrumentation specification to measure pavement response in HMA resurfacing distressed pavements on airport taxiways. Work included the design of taxiway instrumentation and remote monitoring system using asphalt strain gages (ASG), thermocouples (TC), and triggered cameras for the capture of aircraft wheel configuration an location over pavement sensor array to aid in refined modeling of pavement response.							Ir. Weinmann resurfacing of itoring systems figuration and		

Mr. Weinmann has been responsible for the design and implementation of a full line of pavement sensors for unique pavement instrumentation applications for the FAA, FHWA, NCAT, MnRoad projects, and other accelerated test pavement facilities throughout the world.

Firm employe	d by	+ Engineering and Testing						
Name	SERGIO A	AVILES, PE			Years of relevant experience with this employer	10	201	
Title	President				Years of relevant experience with other employer(s)	10		
Degree(s) / Ye	ears / Specializ	ration		BS / 2001 / Civil Eng	jineering & Geotechnical			
Active registro	ation number ,	/state/expiration date		0033571/LA/03/3	1/2024			
Year registere	Year registered 2007 Discipline		Civil					
Contract role(s) / brief description of responsibilities				Pavement Coring associated traffic co	Lead. Mr. Aviles will oversee all pavement cori ontrol.	ing operation	s including all	
Experience dates (mm/yy-mm/yy)Experience and qualifications relevant to the propose the time specified in the applicable MPR(s).			fications relevant to he applicable MPR(	the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed intersec	tion", etc. Experie	nce dates should cover	
<b>09/19 - Present</b> <b>Project No. H.004100: I-10 Widening LA 415 to Essen LN., Baton Rouge, LA. DOTD. Project Manager.</b> APS was tasked th DOTD geotechnical retainer to drill and sample a total of 85 deep borings that included land (77) and over water borings (8) at the Washington Exit and ending at the Acadia Exit. A P S performed all the laboratory testing per ASTM standards to facilit geotechnical design. Soil classification tests such as, natural moisture contents, liquid and plastic limits, unit weight, grain-siz and specific gravity were performed. Additionally, 1000 Triaxial Compression tests (Unconsolidated Undrained) were perform determine the soil strength. All laboratory testing was performed at our accredited Laboratory.					; tasked thru our orings (8) starting Is to facilitate the t, grain-size analyses ere performed to			
08/16	5-10/16	<ul> <li>Project No. H.012422: I-10/I-110 Interchange Modification at Terrace Ave., Baton Rouge, LA. DOTD. Project Manager. APS was tasked thru our DOTD geotechnical retainer to drill and sample a total of six (6) deep borings for the design of the Terrace Ave exit ramp. A P S performed all the laboratory testing per ASTM standards to facilitate the geotechnical design. Soil classification tests such as, natural moisture contents, liquid and plastic limits, unit weight, grain-size analyses and specific gravity were performed. Additionally, 100 Triaxial Compression tests (Unconsolidated Undrained) were performed to determine the soil strength. All laboratory testing was performed at our accredited Laboratory.</li> </ul>						
11/1	7-2/18	Project No. H.01 was tasked thru US 61 over Thom classification test analyses. All labo	Project No. H.013193 US 61 Thompson Creek Bridge Replacement., West Feliciana Parish, LA. DOTD. Project Manager. APS was tasked thru our DOTD geotechnical retainer to drill and sample a total of eight (8) deep borings for the replacement bridge at US 61 over Thompson Creek. A P S performed all the laboratory testing per ASTM standards to facilitate the geotechnical design. Soil classification tests such as, Unconsolidated Undrained, natural moisture contents, liquid and plastic limits, unit weight, and grain-size analyses. All laboratory testing was performed at our accredited Laboratory.					
1/19-12/20Project No. H.002273, H.000710, LA 67 and LA 19., East Baton Roug to drill and sample a total of 12 dee the laboratory testing per ASTM state contents, Unconsolidated Undrained All laboratory testing was performed				<b>0, and H.001352 Co ouge Parish, LA. DO</b> deep borings for the r standards to facilitat ined, liquid and plast med at our accredite	mite River Diversion Bridge at LA 67, LA 19 TD. Project Manager. APS was tasked thru ou new replacement bridges at Highway 19, 67, and e the geotechnical design. Soil classification te cic limits, unit weight, grain-size analyses and s d Laboratory.	and LA 19 Ra r DOTD geotee nd 964. A P S p sts such as, na pecific gravity	ailroad Bridge chnical retainer performed all atural moisture / were performed.	

Mr. Aviles, P.E. complted NHI certifications Courses of Design & Implementation of Erosion & Sediment Control, Driven Pile Foundation Inspection and Design, Drilled Shaft Inspection, Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, and Design of Drilled Shafts Foundation.

Firm employe	ed by	ichael Baker				
Name	KEVIN MC	ELWAIN		Years of relevant experience with this employer	23	
Title	GIS Project	Manager		Years of relevant experience with other employer(s)	2	
Degree(s) / Y	ears / Specializat	ion	BS / 2010 / Busines AS / 1999 / Mechar	s Management, DeVry Institute of Technology nical Engineering Technology, The Pennsylvani	a State Universit	y
Active registr	ration number / s	tate / expiration date	n/a			
Year registere	ed	Discipline				
Contract role(s) / brief description of responsibilities			Fulfills the MPR ro for collecting assets	le 4. Asset Collection. Mr. McElwain will be res that have been extracted.	ponsible for will	be responsible
Experience do (mm/yy—mn	ates n/yy)	Experience and qualifications relevant to the time specified in the applicable MPR	the proposed contract; i.e., (s).	"designed drainage", "designed girders", "designed intersec	tion", etc. Experience	dates should cover
02/15 - 12/18 Data Warehouse and Mainten 18 years, Michael Baker has prov Safety, which maps all public ro data warehouse and also suppor continue diligent database mar with inter-agency contact and			ance, Trenton, NJ, NJ ided roadway data co ids in New Jersey. This rt annual Federal High agement and adminis pordination.	<b>DOT. Project Manager.</b> Responsible for project offection and database administration to the Bu is inventory and spatial data have been loaded i hway Administration reporting requirements. The stration, to collect and process field data as nec	t management. ( reau of Transport nto to the Straigh he purpose of thi essary, and to pro	Over the past ation Data & nt-Line Diagram s project was to omote and assist
11/18 - 12/18 PID Case Inventory Field Surve of public information displays (P work-order management system management system for the NJ			<b>ey, NJ. New Jersey T</b> PID) for New Jersey Tr n. NJT requested cons transit commuter and	ransit Corporation. Project Manager. Michae ansit (NJT)-owned stations and developed an i sulting services to develop source data necessa d light rail systems.	l Baker performe nventory manag ary to maintain tl	d in-field survey ement and he PID inventory
07/17	7 - 07/18	<b>NJT Mapping and Graphics Pr</b> engineering and planning servic Michael Baker supplied an expe including rail station area maps,	oject, Newark, NJ. N ces to support the cre rienced GIS professio conceptual bus servi	ew Jersey Transit Corporation. Project Mana eation of transit map displays of New Jersey Tra nal to perform design, layout, editing, and prin ces maps, transit guides, and station directory	ager. Michael Bal Insit (NJT) bus an Iting of various m maps.	ker provided d rail services. ap products
01/07	7 - 07/07	I-78 Local and Express Roadwa of roadway and spatial data. Pro provided engineering services for Irvington and Newark.	ay Improvement Provided QAQC support or the rehabilitation of	<b>oject, Union and Essex Counties, NJ. NJDOT.</b> for draft reports and revisions. Also served as o of Route I-78 in Union and Hillside townships, U	QA/QC. Respons GIS Analyst. Mich Jnion County, and	ible for analysis ael Baker d the cities of
09/15 - 10/15 Pavement Management Survey, Cleveland, OH. City of Cleveland. Technical Advisor. Responsible for provided pavement, sidewalk, and curb data survey; data provided pavement, sidewalk, and curb data survey; data provided pavement, sidewalk, and curb data survey; data provided pavement is identification; staff training; RoadManager updates; and a resurfacing work plan for the City's Pavement project. The purpose was to update the current pavement management database system, identify reasons and for unacceptable pavement conditions, provide City staff with the necessary training to rate pavement conditions and develop a resurfacing/capital improvement plan that evaluates the possibility for achieving an acceptable rating (PCR) on all roadways within 20 years.						tup and g; pavement nagement Surve termeasures the future, ment condition
Mr.	cElwain is a ta orks and attril	ask manager of GIS based projects outes. He has recently accomplish	s and traffic data colle ed assisting NJDOT i	ection. He is responsible for database mainten n reporting of local roads based on high-spee	ance and analysi d profiling of the	is of roadway roadways.
aae 33 of 91		Prime Consultant Firm Name: Michael B	aker International.	Inc.		12/5/3 5/D.

Firm employe	ed by	chael Baker					96
Name	ROB DIBIAS	SE			Years of relevant experience with this employer	5	
Title	GIS Task Mai	nager			Years of relevant experience with other employer(s)	3	
Degree(s) / Ye	ears / Specializati	on		BS / 2014 / Environ	mental Studies/Geography, Keene State Colleg	ge	
Active registr	ration number / st	ate / expiration date		n/a			
Year registere	ed		Discipline				
Contract role	(s) / brief descript	ion of responsibilities		Asset Collection. N	Ir. DiBiase will be responsible for compiling ass	ets that have beer	n extracted.
Experience dates (mm/yy-mm/yy)Experience and qualifications relevant to the proposed contract; i.e., "designed drainage", "designed girders", "designed intersection", etc. Experience dates sho the time specified in the applicable MPR(s).						lates should cover	
05/20 - 07/20 Data Warehouse and Maintenance, Trenton, NJ. NJDOT. Project Manager. Responsible for project management. Over the pass 18 years, Michael Baker has provided roadway data collection and database administration to the Bureau of Transportation Data 8 Safety, which maps all public roads in New Jersey. This inventory and spatial data have been loaded into to the Straight-Line Diage data warehouse and also support annual Federal Highway Administration reporting requirements. The client recognized the need to maintain this database to provide decision makers with correct and current data upon which to base strategic transportation investment decisions. The purpose of this project was to continue diligent database management and administration, to collect a process field data as necessary, and to promote and assist with inter-agency contact and coordination.						ver the past ation Data & t-Line Diagram ed the need portation to collect and	
05/19	9 - 05/19	Process field data as necessary, and to promote and assist with inter-agency contact and coordination. Pavement Data Collection, Statewide, WV. WVDOT. GIT Associate. Reviewed pavement sections and perform visual distress analysis along concrete sections. Michael Baker is performing statewide pavement data collection, including laser crack measurement system (LCMS) inventory and panoramic image collection on 28,000 miles of state roadway, extending across 10 districts and 55 counties in West Virginia. The inventory is being performed using Michael Baker's mobile data collection vehicle, which is equipped with a sensor-based LCMS. All pavement data collected is being spatially referenced and aligned with the 360-degree spherical imagery and downward facing pavement imagery from the LCMS and provided to the client via a web-based pavement data viewer application.					
02/19	9 - 04/19	pavement data viewer application. Turnpike On-Call Engineering Services, Statewide, NJ. New Jersey Turnpike Authority. GIT Associate. Assisted in the digitization of various utility networks and facilities along the New Jersey Turnpike and Garden State Parkway. These networks were created using engineering plans provided by the NJTA. All geospatial work was developed in a geodatabase and provided to the New Jersey Turnpike Authority. Michael Baker is performing construction management/construction inspection for emergency generator and HVAC upgrade installations at Interchange toll facilities 13A, 14B, and 15E on the New Jersey Turnpike, and turnpike-wide highway lighting repairs or modifications. The scope of work includes selective demolition of existing equipment, mechanical/plumbing/electrical construction, utility coordination, testing and commissioning, and Department of Community Affairs coordination.					
01/19 - 02/19 Garden State Parkway Guide Rail Design, Statewide, NJ. New Jersey Turnpike Authority. GIT Associate. Responsible for digitizing as-builts and engineering drawings of drainage utilities for the NJTA. Michael Baker provided engineering services guide rail installation at seven critical locations along the Garden State Parkway.						sible for services for	
Rece pede moto	ntly involved i estrian factors or vehicles.	in a project creatil surrounding ever	ng a pedestrian y U.S. and New	safety management Jersey roadway whicl	system, Mr. DiBiase ran a series of spatial anal h ultimately revealed the most susceptible are	ysis on a diverse l eas to pedestrians	ist of s being hit by

Firm employe	ed by	Michael Baker Nternational						
Name	MARK AN	DERSON			Years of relevant experience with this employer	16	a finite of	
Title	LiDAR Pro	duction Manager			Years of relevant experience with other employer(s)	0		
Degree(s) / Ye	ears / Specializ	ation		MS / 2005 / Geography/Geographic Information Systems, Indiana University of Pennsylvania BA / 2003 / Criminal Justice, Indiana University of Pennsylvania				
Active registro	ation number,	/state / expiration date		n/a				
Year registere	ed		Discipline					
Contract role(s) / brief description of responsibilities				LiDAR Extraction. spherical imagery c	<b>LiDAR Extraction.</b> Mr. Anderson will be responsible for LiDAR processing, feature extraction, spherical imagery compilation, and underheight clearance validations.			
Experience datesExperience and qualifications relevant(mm/yy-mm/yy)the time specified in the applicable MP			fications relevant to the applicable MPR	the proposed contract; i.e., (s).	"designed drainage", "designed girders", "designed intersec	tion", etc. Experience o	dates should cover	
for management, supervision, and q Pavement LCMS data encompassing road rehabilitation program utilizing building blocks of Michael Baker's so throughout the city with both Mobil downward facing imagery, and pave patching. The building blocks of Mic miles of roadway throughout the city imagery, 3D downward facing imager rutting and patching.				nd quality assurance of sing the entire City of zing Measure A tax re is solution leveraged obile LiDAR and Pave pavement distresses - Michael Baker's solut e city with both Mobi magery, and pavemen	of all data processing activities following the ca Turlock. Michael Baker partnered with the City evenue and other Public-Private-Partnership (P3 innovative remote sensing equipment to capture ment LCMS. The program included the capture including transverse, longitudinal, and alligato ion leveraged innovative remote sensing equip le LiDAR and Pavement LCMS. The program inc t distresses - including transverse, longitudinal,	pture of Mobile Li of Turlock for com 3) funding resource are all 508 lane-mi of spherical imagor cracking, as well oment to capture aluded the capture , and alligator crac	DAR and nprehensive :es. The iles of roadway gery, 3D as rutting and all 508 lane- of spherical cking, as well as	
02/20	02/20 – 04/22 I-10 Corridor Express Lanes Project, San Bernardino County, CA. Lane-Security Paving Joint Venture. LiDAR Analys Responsible for management, supervision, and quality assurance of all data processing activities following the capture of I LiDAR data and imagery, including constraint to ground control, SBET calculation, LiDAR boresights, planimetric/topograp mapping, and DTM surface compilation. Michael Baker is providing design and engineering services as the lead designer Interstate 10 Corridor Express Lanes project. This design-build project aims to reduce traffic congestion, increase throughp enhance regional mobility. As part of the project, Michael Baker will perform roadway design, structural engineering, drair maintenance of traffic for two of the four design segments, as well as intelligent transportation systems services, tolling designals, lighting, landscape architecture, and survey activities for the entire corridor.						Analyst. Ture of Mobile pographic asigner on the roughput, and g, drainage, and lling design,	
07/15 – 06/21 Traffic Signal Asset Manager Office. LiDAR Analyst. Respon the capture of Mobile LiDAR da shorten the collection cycle to miles in the commonwealth. Th miles of LiDAR data and extract maintenance, and operation de				ent System, Statewi sible for managemen ta and imagery. Mich mere six months. Th e Mobile LiDAR team ed 26.5 million featur cision-making by acc	de, Pennsylvania. Pennsylvania Department, supervision, and quality assurance of all data ael Baker's fleet of Mobile LiDAR systems were roughout the 180 days of collection, Michael is captured 13,600 signalized intersections and res. The 131 terabytes of collected data will supervised evaluating equipment, life cycles, bud	nt of Transportat a processing active simultaneously l Baker traveled mod d captured an asto pport future pland lgets, and other fa	t <b>ion, Central</b> vities following leveraged to ore than 82,000 ounding 18,000 ning, design, actors.	

08/19 – 10/20	<b>ADA and Sidewalk Inventory and Compliance Analysis, Statewide, KY. KYTC. LiDAR Analyst.</b> Responsible for management, supervision, and quality assurance of all data processing activities following the capture of Mobile LiDAR data and imagery, including constraint to ground control, SBET calculation, LiDAR boresights, planimetric/topographic mapping, and DTM surface compilation. Michael Baker performed a statewide inventory of pedestrian facilities to support transition planning for compliance with the ADA. State-owned and maintained rights of way were captured using Mobile LiDAR and terrestrial spherical imagery where pedestrian facilities were believed to be located. Mobile LiDAR collections were performed along more than 4,000 miles of roadway, which included dense urban corridors to rural, outlying areas. Real-time vehicle tracking and an ArcGIS dashboard were used to track and report progress. With more than 13,000 intersections comprising over 34,500 curb ramp systems, 18,600 crosswalks, and more than 1,630 miles of sidewalk, each phase required both manual and automated QC processes to ensure completeness and accuracy.
05/17 – 12/18	DFW Asset Management Program, Dallas/Fort Worth International Airport (DFW), Dallas-Fort Worth, TX. Dallas/Fort Worth International Airport. LiDAR Analyst. Responsible for management, supervision, and quality assurance of all data processing activities following the capture of Mobile LiDAR data and imagery, including constraint to ground control, SBET calculation, LiDAR boresights, planimetric/topographic mapping, and DTM surface compilation on all data on the airside and landside areas at DFWIA. Coordinated LiDAR processing activities and provided guidance on deliverables. Prepared presentations to demonstrate the data captured and its use for management. Michael Baker provided asset management and engineering services for the DFW infrastructure, including airside and landside pavement management and landside bridge inspections. Pavement management included data collection, software implementation, database customization, data analyses and reporting, and client staff training. Bridge inspections were categorized by the urgency and impact of deficiencies, and the uniformity of the work, which reduced costs.
11/17 – 06/18	<b>5G Fiber Design-Build, California, Illinois, North Carolina, Various National Telecommunications Providers. LiDAR Analyst.</b> Responsible for management, supervision, and quality assurance of all data processing activities following the capture of Mobile LiDAR data and imagery, including, SBET calculation, LiDAR boresights, planimetric/topographic mapping, and DTM surface compilation. As a consultant to several for the nation's largest Telecommunications providers and part of our national One Touch Make Ready (OTMR) program, Michael Baker performed several simultaneous Mobile LiDAR collection projects within four (4) metropolitan markets within California, Illinois, and North Carolina. Over the course of six (6) months, Michael Baker's LiDAR team captured ~8,000 miles of Mobile LiDAR data throughout Charlotte, Chicago, San Diego, and the San Francisco Bay Area – with 4,000 miles of the collection occurring in California alone. In aggregate for all Mobile LiDAR collections, the team was able to complete all collections in less than six (6) months from notice to proceed. Following field collections, the team processed all LiDAR and spherical imagery and hosted the data on a secure web portal that was accessible to the client and design engineers located worldwide.
06/15 – 05/16	<b>Statewide Asset Inventory (2-County Pilot), Rankin and Scott Counties, MS. MDOT. LiDAR Analyst.</b> Responsible for management, supervision, and quality assurance of all data processing activities following the capture of Mobile LiDAR data and imagery, including constraint to ground control, SBET calculation, LiDAR boresights, planimetric/topographic mapping, and DTM surface compilation encompassing nearly 3,000 miles of roadway in Rankin and Scott Counties (central MS). The data collection included every public right of way in the two counties and provided a cross-section of roadways that would be encountered Statewide. Oversaw all LiDAR and imagery processing activities related to development of a complete inventory of roadway features for HPMS reporting. Developed custom application to perform various calculations including slope, grade and super elevation of paved surfaces and shoulders.

Mr. Anderson has LiDAR experience includes processing mobile, aerial, and static data from a myriad of systems. As Production Manager, Mr. Anderson is responsible for resource allocation, supervision, training and quality control on all LiDAR projects.

Firm employe	ed by	chael Baker					
Name	MIKE SIMO	NS			Years of relevant experience with this employer	3	
Title	Geospatial S	Systems Develope	r		Years of relevant experience with other employer(s)	13	
Degree(s) / Y	/ears / Specializati	on		BS / 2005 / Mathem	atics, Villanova University	•	
Active registr	ration number / st	ate / expiration date					
Year registere	ear registered Discipline						
Contract role(s) / brief description of responsibilities				Pavement Distress for processing Paver	Data Processing   Historical Data Conversion ment Distress Data collected, as well as aid in t	<b>n.</b> Mr. Simons wi he conversion of	ll be responsible historical data.
Experience de (mm/yy—mn	ates n/yy)	Experience and quality the time specified in t	fications relevant to the applicable MPR(	the proposed contract; i.e., ;).	"designed drainage", "designed girders", "designed intersec	ction", etc. Experience	dates should cover
04/19 - 05/19 Pavement Data Collection, Stat Way image, and IRI data so that it milepost. This is done using Pyth posting, loading IRI, and building up our processing. When there an posting information difficult but building of the final deliverable t			<b>Collection, Sta</b> IRI data so that done using Pyth IRI, and buildin g. When there a tion difficult but nal deliverable	tewide, WV. WVDO it is properly loaded in non and SQL scripts t g the final deliverable ire routes that overla developed a series of table once the process	<b>F. GIT Technician.</b> Responsibilities included p nto the SQL Server Database and assigned to hat were developed for the purpose. Develop e table. These scripts have added a level of au p and intersect each other it can make the pro- of SQL Scripts that help identify and resolve an ssing and distress selection has completed.	processing all LCN the appropriate bed the Python so tomation that ha ocessing of the ro ny issues. Also re	1S, Right-of- route and :ripts for mile as helped speed oute and mile sponsible for the
05/19 - 06/19 Pavement Inventory and Management, C processing all LCMS, Right-of-Way image, al the appropriate route and milepost. This is are routes that overlap and intersect each o developed a series of SQL Scripts that belo				agement, Camden C ay image, and IRI data ost. This is done usin sect each other it car s that help identify an	<b>County, NJ. City of Camden, NJ. GIT Technic</b> a so that it is properly loaded into the SQL Ser g Python and SQL scripts that were develope n make the processing of the route and milep nd resolve any issues.	<b>ian.</b> Responsibili rver Database an ed for the purpos posting information	ties included d assigned to e. When there on difficult but
11/20 - 05/21       Data Warehouse and Maintenance         mile posting for all the LCMS, Image and database administration to the inventory and spatial data have bee Highway Administration reporting r and administration, to collect and p			e and Mainten all the LCMS, Im ministration to patial data have stration reporti on, to collect ar	ance, Trenton, NJ. N. agery, and IRI data. C the Bureau of Transp been loaded into to t ng requirements. The Id process field data a	JDOT. GIT Technician. Responsible for setting Over the past 18 years, Michael Baker has provortation Data & Safety, which maps all public the Straight-Line Diagram data warehouse an e purpose of this project was to continue dilig as necessary, and to promote and assist with i	g up the process vided roadway da roads in New Jer d also support a lent database ma inter-agency con	es to generate ata collection sey. This nnual Federal inagement itact and
12/19 - 12/19 Automated Pavement Condition Organization (SJTOP). GIT Techni the LCMS points. Michael Baker is p with data needed to make informe The Michael Baker Team is collectir City of Vineland. This project is prov Counts "Pavement Preservation" in				on Data Collection F nnician. Responsible is piloting a low-cost med programing dec ting pavement cond roviding the ground ' initiative.	<b>Pilot Project, South, NJ, South Jersey Trans</b> for setting up, running, and validating the pr automated pavement data collection methor isions, and that can be replicated on future pl ition data on approximately 320 centerline m work to implement the Federal Highway Adm	portation Plann ocess that assign d to provide SJTF rojects across the niles of municipal ninistration (FHW	ing ied routes to all 20 subregions 2 SJTPO region. 1 roadways in the /A) Every Day
Mr. Si datab	imons is a Geo bases and pro	ospatial Informatic cesses for Paveme	on Technology ( nt data collectio	GIT) Systems Develop on projects. He also h	per with GIS and SQL Server Database experie as experience with web-based mapping app	ence developing lications, and ana	and managing alysis collection.

Firm employ	ved by	chael Baker ERNATIONAL							
Name	JEFFREY CF	RAGLE		Years of relevant experience with this employer	1				
Title	GIS Associat	e		Years of relevant experience with other employer(s)	0				
Degree(s) / Y	Years / Specializati	on	MPA / 2017 / Urban MA / 2016 / Geogra BA / 2012 / Geograp	MPA / 2017 / Urban Planning/GIS, Marshall University MA / 2016 / Geography, GIS and Remote Sensing, Marshall University 3A / 2012 / Geography, Marshall University					
Active regist	ration number / st	ate / expiration date	n/a	n/a					
Year register	ear registered Discipline								
Contract role(s) / brief description of responsibilities			Pavement Distress Distress Data collect	Data Processing. Mr. Cragle will be responsib ed.	ble for processing	Pavement			
Experience dates (mm/yy-mm/yy)Experience and qualifications relevant to the time specified in the applicable MPR			the proposed contract; i.e., ).	"designed drainage", "designed girders", "designed intersed	ction", etc. Experience	dates should cover			
imagery and LCMS data for pavement data collection, ir miles of state roadway, exte Michael Baker's mobile data spatially referenced and alig and provided to the client v			n Distress Selector ar ling laser crack meas g across 10 districts a ection vehicle, which with the 360-degree web-based pavemen	nd Pavement Data Viewer application. Michae urement system (LCMS) inventory and panor and 55 counties in West Virginia. The inventor is equipped with a sensor-based LCMS. All p spherical imagery and downward facing pay t data viewer application.	el Baker is perforn ramic image colle ry is being perforn avement data col vement imagery f	ning statewide ction on 28,000 med using llected is being from the LCMS			
01/2	2 - 12/22	Turlock CIP and Design of 15 S LiDAR and LCMS data for pavem pavement condition survey, ana plan, and project prioritization. F were prepared for bid.	treets, Turlock, CA. ent condition survey lysis of street networ ifteen streets were id	<b>City of Turlock. Data Processing Lead.</b> Resp. . Michael Baker provided citywide LiDAR and ks and evaluation of updated City StreetSave dentified for rehabilitation, and plans, specific	ponsible for proce LCMS data collec r PCI, preparatior cations, and estim	essing collected tion, visual of a 5-year nates packages			
05/2	2 - 07/22	were prepared for bid. <b>Richmond Regional Transit Vision Plan, Richmond, VA.Virginia Department of Rail and Public Transportation. Lead GIS</b> <b>Analyst.</b> Responsible for GIS data collection and analysis for the Statewide Grade Crossing Evaluation Study. Michael Baker provided planning consulting services to develop the Richmond Regional Transit Vision Plan, a multi-county regional vision for transit service in 2040. Michael Baker's services included project management, stakeholder and public involvement, data collectio and analysis, transit demand model development, transit system coordination, and alternatives development and analysis							
06/2	2 - 03/23	<b>City of Treasure Island Transpo</b> Responsible for processing colle services under the current five-y Under this agreement, Michael E services, environmental science, construction administration.	ortation Master Agre cted Pavement Distre ear master agreemen Baker is providing pro transportation engin	eement, Treasure Island, FL. City of Treasuress Data. Michael Baker has been providing d t since 2019 and has been serving the City o bject management, design, management of g neering, and structural engineering services, a	re Island. Lead G lesign and engine f Treasure Island s geotechnical and as well as cost est	IS Analyst. eering since 2011. survey imating, and			
Mr. C GIS v	Cragle, a GIS As with urban pla	ssociate, has a background in perf nning services, pavement data co	orming GIS for variou llection and processi	is successful DOT projects, utilizing his divers ng to deliver efficiently processed pavement	e experience witł data.	h Geography,			

Firm employ	red by	chael Baker					
Name	STEPHEN F	ORNEY			Years of relevant experience with this employer	9	
Title	GIS Associat	e			Years of relevant experience with other employer(s)	3	
Degree(s) / \	Degree(s) / Years / Specialization			MS / 2021 / Environ BS / 2015 / Biology,	mental Science, Villanova University Wilkes College		
Active regist	ctive registration number / state / expiration date			NJ			
Year register	lear registered Discipline		2.3.1 Wetland Deline	eation			
Contract role	e(s) / brief descript	ion of responsibilities		Pavement Distress Distress Data collect	Data Processing. Mr. Forney will be responsil ted.	ble for processing	g Pavement
Experience d (mm/yy—mi	lates m/yy)	Experience and qualit the time specified in t	fications relevant to he applicable MPR(	the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed intersed	ction", etc. Experience	e dates should cover
05/19 - 08/22 Philadelphia International Air Aviation. Lead environmental environmenta				port On-Call Planni offorts for the on-call that have been assign ts as well as the Taxiw ation.	ng Consulting Services, Philadelphia, PA. C contract to provide various services related to ed to date requiring environmental services i vay P relocation project. These task orders rec	<b>City of Philadelg</b> o the safe and ef nclude the Runv quired FAA NEPA	<b>phia, Division of</b> ficient operations way 17-35 Review, PGC
09/1	9 - 10/19	<b>Schuylkill Coun</b> the NEPA FAA en exclusion listed u	<b>ty Airport (ZEF</b> vironmental dc under Order 10!	<b>R) Perimeter Fence C</b> ocumentation for the 50.1F, Paragraph 5-6.4	ATEX, Schuylkill County, PA. Schuylkill Cou installation of a new perimeter wildlife fence 4 (f) for the construction of fences to meet feo	u <b>nty Airport Au</b> at ZER. Utilized t deral NEPA requi	I <b>thority.</b> Lead the categorical irements.
06/1	6 - 07/22	07/22 2015, 2017 & 2019 Airport Engineering Consultant Atlantic City International Airport (ACY), Atlantic City, NJ. South Jersey Transportation Authority. 2019 Provided environmental assistance on the on-call contract to provide various services related to the safe and efficient operation of the Authority's facilities. The task orders that have been assigned to date requiring environmental services include Runway 13-31 Repaving, Gates 5&9 Apron Rehabilitation, 2019 Wind Cone Replacement Project, Wildlife Fence Replacement Project and the 2020 Land Use Plan update. Responsible for completing environmental documentati for FAA NEPA Review. 2017 Provided Environmental assistance on the on-call contract to provide various services related to the safe and efficient operation of the Authority's facilities. 2015 Provided Environmental assistance on the on-call contract to provide various services related to the safe and efficient operation of the Authority's facilities. 2015 Provided Environmental assistance on the on-call contract to provide various services related to the safe and efficient operation of the Authority's facilities. 2015 Provided Environmental assistance on the on-call contract to provide safe and efficient operation of the Authority's facilities. 2015 Provided Environmental assistance on the on-call contract to provide various services related to the safe and efficient operation of the Authority's facilities.					
03/16 - 08/16 Airport Runway 4-22 Blast Pad Reconstru assistance provided for this blast pad recon entire pavement box, installation of new th engineering and planning for removing the included designing the blast pad in accorda 200' long blast pad. Construction inspection orders, reviewing submittals, responding to contractor monthly pay applications with o				d Reconstruction, A t pad reconstruction n of new threshold line moving the existing d in accordance with n inspection included sponding to Request tions with certified page	<b>CY, Atlantic City, NJ. South Jersey Transpor</b> project that included removing existing degr ghting, underdrains and new striping. Michae degraded pavement at the RW 4-22 Blast Pad FAA AC 150/5300-13A. RW 4-22 is a category d reviewing schedule updates, reviewing extr for Information (RFIs), as-built plan preparation ayrolls.	tation Authorit raded pavement el Baker led the a l The aviation en r C-IV and require ra work items, pr on, final quantiti	y. Environmental and replacing viation gineering es a 200' wide by eparing change ies and approving
Mr. F data	orney brings a for further int	unique combinat erpretation came	ion of field and from working fo	laboratory experient or NJDEP and an NSF	ce to the office. His skills in collecting and ana funded study in the past year.	alyzing geospatia	al environmental

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Firm employed	rd by	Frrb					
Name	NATE BE	CH, EIT			Years of relevant experience with this employer	7	Sex !
Title	Data Ma	nager			Years of relevant experience with other employer(s)	5	
Degree(s) / Years / Specialization				BS / 2015 / Civil Eng MS / 2018 / Civil Eng	ineering, University of Pittsburgh gineering, University of Pittsburgh		
Active registra	ation numbe	r / state / expiration date		PA ET 022656			
Year registered	d	2016	Discipline	Civil Engineering			
Contract role(	's) / brief des	cription of responsibilities		Senior Data Manag	<b>Jer.</b> Mr. Bech will perform the role of pavement	distress data p	rocessing.
Experience dates (mm/yy-mm/yy)Experience and qualifications relevant to the time specified in the applicable MPI			fications relevant to a here applicable MPR (s	the proposed contract; i.e., ;).	"designed drainage", "designed girders", "designed intersec	tion", etc. Experienc	e dates should cover.
07/18 – 12/23 <b>Pavement Structural Evaluation</b> Senior Data Manager of this pro- collected as part of Pooled Func- texture, Right-of-Way imagery, a			<b>tural Evaluation</b> ager of this proje of Pooled Fund Way imagery, ar	<b>n with Traffic Speed</b> ect in partnership wit Study TPF-5(385). Dat nd continuous pavem	<b>Deflection Devices (TSDDs), Nationwide. Se</b> h Virginia Tech Transportation Institute, for the ra includes pavement surface distress data, incl ent deflection data.	nior Data Man completion and uding rutting, r	<b>ager.</b> Nate is the d delivery of data, oughness, and
04/19	- 10/19	<b>Network Data C</b> the Prime (Micha collection on We	<b>ollection, State</b> el Baker) to com st Virginia roads	wide, WV. WVDOT. plete pavement data and highways in 201	Senior Data Manager. Nate was the Senior Da a collection surveys, including surface distress 9 and 2022.	ata Manager for and continuous	<sup>r</sup> ARRB's team with s structural data
04/21	- 10/24	<b>Network Data C</b> the Prime (Micha collection on Mis	ollection, State el Baker) to com sissippi roads au	wide, MS. MDOT. Se aplete pavement data and highways through	enior Data Manager. Nate is the Senior Data A a collection surveys, including surface distress 2024.	Nanager for ARF and continuou:	RB's team with s structural data
01/19 – 06/20 Comprehensive Pavement Assessment, Statewide, TX. Tex partnership with Virginia Tech Transportation Institute, for the data and continuous pavement deflection data, collected on				, <b>TX. Texas DOT. Senior Data Manager.</b> Nate i e, for the completion and delivery of data, inclu cted on roads and highways in Texas.	is the Senior Da uding pavemen	ita Manager, in it surface distress	
09/20	- 11/20	Maintenance Tre Manager for ARR surveys, including treatments in 202	eatment Confir B's team with th g surface distres 20 and 2021.	<b>mation, Statewide,</b> le Contract holder (Ui ss and continuous str	<b>TN. Tennessee DOT. Senior Data Manager.</b> N niversity of Tennessee - Knoxville) to complete uctural data collection on TDOT's roads and hi	late was the Ser pavement data ghways to conf	nior Data a collection îrm maintenance

Nate is well-experienced in using 3D pavement scanning technology and right-of-way cameras to collect and process roadway condition data for municipal clients. He has actively participated in such pavement evaluation projects for clients such as Jefferson County, CO; Paradise, CA; and Raleigh, NC.

Firm employe	ed by	lichael Baker ternational							
Name	KRANTI B	ANDI, CSM, PMP			Years of relevant experience with this employer	13			
Title	National A	pplications Develo	pment Director		Years of relevant experience with other employer(s)	4			
Degree(s) / Ye	ears / Specializa	tion		MS / 2007 / Compu BA / 2005 / Comput	MS / 2007 / Computer Science, Governors State University BA / 2005 / Computer Science and Engineering, Jawaharlal Nehru Technological University				
Active registro	ation number /	state / expiration date		364375 / PA					
Year registered Discipline		Certified ScrumMa	ster® (CSM)						
Active registration number / state / expiration date		3023034 / PA	3023034 / PA						
Year registere	d		Discipline	Project Manageme	nt Professional (PMP)				
Contract role(s) / brief description of responsibilities				Pavement Distress systems that aid in t	<b>Software Developer.</b> Mr. Bandi will be respon he collection of Pavement DIstress data.	nsible for develo	ping software		
Experience dates (mm/yy-mm/yy)Experience and qualifications relevant to the time specified in the applicable MPR			fications relevant to the applicable MPR(	the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed intersed	ction", etc. Experience	e dates should cover		
05/10 - 05/10Appalachian Corridor H Enviro Architect. Responsible for tech Supplemental EIS study for the A Interstate 81 in Northwestern Vir10/19 - 03/21CBP FM&E PMO GIS Training a Architect. Serves as the lead so Geographic Information System		nmental Impact Stat ical support Corridor ppalachian Corridor H ginia through the rug nd Support, Southe ftware developer for (GIS) for the Departr	tement, Appalachian Highlands Region, Elk H web application. Michael Baker is preparing H, a 100-mile proposed four-lane highway inte ged, mountainous terrain of West Virginia's Ap rn U.S. U.S. Customs and Border Protection the FITT and CTIMR WMS web applications. M nent of Homeland Security under the Secure	tins, WV. WVDO the tiered Corrid nded to provide palachian Highla n. Lead and Prin Aichael Baker dev Border Act. The	I. Software lor H access from ands Region. hcipal Software veloped a project includes				
01/18	8 - 02/18	several key data of fence along tl Open-End Envi Responsible pro impact statemen Michael Baker p	layers, includin ne southern U.S ronmental Serv viding environm nt, an environm rovided environ	g the project footprin border. <b>vices for Public Tran</b> nental management ental assessment, a co mental management	sportation Projects, Statewide, PA. PENND services for public transportation projects that ategorical exclusion evaluation, or other envi services for public transportation projects that	OT. Software An at require an env ronmental cleara nat require an en	re than 700 mile rchitect. 'ironmental ance documents vironmental		
		impact statement Michael Baker's related to plann track upgrades.	impact statement, an environmental assessment, a categorical exclusion evaluation, or other environmental clearance documents. Michael Baker's services included preparing work order proposals and assisting with the management of environmental issues related to planning, construction, or maintenance activities for capital improvements, such as relocated passenger rail stations and track upgrades.						
01/19 - 03/19 Ride Traffix Site Maintenance, M Responsible for providing continu CMS version upgrades, content up ecommerce integration. Website of operating systems during develop support included CMS hot fix upport arrangements, site transition, and		<b>Aeasure J Traffic Con</b> ued website support for ploads, design change design and functional pment. Michael Baker lates, CMS version upp ecommerce integration	gestion Relief Agency (TRAFFI), San Ramon, or the client's CMS based site. Standard support es, functional enhancements, hosting arrangem ity was tested against a variety of browser confi provided continued website support for the cli- grades, content uploads, design changes, functi on.	<b>CA. Software Ar</b> included CMS ho ents, site transitio gurations for des ent's CMS based s onal enhanceme	chitect. ot fix updates, on, and ktop and mobile site. Standard ents, hosting				
Mr. Ba syster	andi is a Mic m/software a	rosoft Certified Pro architectures and c	fessional Softwa leveloping appl	are Architect and Cert ications. As an expert	tified Scrum Master with over 15 years of exp in Agile development, he provides technical	erience designin leadership to ot	ig numerous her Agile teams		
age 41 of 91		Prime Consultant Firm	Vame: Michael B	aker International, I	nc.	W. Constraint	STATES STATES		

Firm employe	ed by	chael Baker					
Name	JOEL WILSO	N			Years of relevant experience with this employer	5	
Title	Software Sys	stems Developer			Years of relevant experience with other employer(s)	35	
Degree(s) / Y	/ears / Specializati	on		n/a			
Active registr	Active registration number / state / expiration date n			n/a			
Year registere	ed		Discipline				
Contract role	(s) / brief descript	ion of responsibilities		<b>Pavement Distress</b> systems that aid in t	<b>Software Developer.</b> Mr. Wilson will be respo he collection of Pavement DIstress data.	onsible for develop	ping software
Experience de (mm/yy—mn	ates n/yy)	Experience and quality the time specified in t	fications relevant to the applicable MPR (	the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed intersed	ction", etc. Experience	dates should cover
05/18 - 05/19 Pavement Data Collection, Statew developer and database support for is performing statewide pavement image collection on 28,000 miles of being per-formed using Michael Ba data collected is being spatially refe imagery from the LCMS and provide				tewide, WV. WVDO t for liquid chromato ent data collection, in s of state roadway, ex Baker's mobile data referenced and aligne vided to the client via	<b>T. Database Administrator.</b> Responsible for sigraphy-mass spectrometry (LCMS) processing cluding laser crack measurement system (LCI stending across 10 districts and 55 counties in collection vehicle, which is equipped with a sed with the 360-degree spherical imagery an a web-based pavement data viewer application vehicle.	serving as primary g and application MS) inventory and n West Virginia. Th sensor-based LCN d downward facin tion.	y applica-tion s. Michael Baker d panoramic 1e inventory is 1S. All pavement ng pavement
03/18	B/18 - 07/19 Pavement Inventory and Management, Camden County, NJ. City of Camden, NJ. Database Administrator. Responsible providing technical and programming support. Michael Baker developed and implemented a pavement management system for Camden County, New Jersey. Tasks included a roadway inventory, pavement surface and asset data collection, pavement processing, report preparation, and implementing and deploving the PAVER pavement management system.					sponsible for ient system pavement data	
11/16	6 - 04/22	<ul> <li>processing, report preparation, and implementing and deploying the PAVER pavement management system.</li> <li>Data Warehouse and Maintenance, Trenton, NJ. NJDOT. Programmer. Primary programmer and database administrator. Over the past 18 years, Michael Baker has provided roadway data collection and database administration to the Bureau of Transportation Data &amp; Safety, which maps all public roads in New Jersey. This inventory and spatial data have been loaded into to the Straight-Line Diagram data warehouse and also support annual Federal Highway Administration reporting requirements. The client recognized the need to maintain this database to provide decision makers with correct and current data upon which to base strategic transportation investment decisions. The purpose of this project was to continue diligent database management and administration, to collect and process field data as necessary, and to promote and assist with inter-agency contact and coordination.</li> </ul>					
11/16 - 12/17 Pennsylvania Turnpike Connected Veh database support for liquid chromatogra engineering services for the Connected V and mobility for customers and the work Additional services included providing gu technical advisor.				cted Vehicle Roadm matography-mass sp nected Vehicle Road the workforce. Micha widing grant applicat	<b>ap, PA. PTC. Applications Developer.</b> Prima bectrometry (LCMS) processing and application map to develop and deploy connected vehic el Baker oversaw the document developmen ion support, providing project management	ry application dep ons. Michael Bake le applications to t and provided te support, and serv	veloper and r provided improve safety chnical input. ving as lead
Mr. V broa	Vilson is a full- d base of expe	stack .NET Web De erience working cl	eveloper with ov losely with stake	ver 20 years of experi pholders to provide th	ence in software development, design/archit ne best solutions using the latest tools and te	ecture, and leade chnologies.	ership. He has a

Firm employe	ed by	Michael Baker Nternational					36		
Name	JIBREEL	RANA			Years of relevant experience with this employer	16	-		
Title	Civil Asso	ciate - Pavement			Years of relevant experience with other employer(s)	0	August 1		
Degree(s) / Years / Specialization				MSCE / 2016 / Civil Champaign BE / 2011 / Civil Eng Pakistan	Engineering/Transportation Engineering, University	ersity of Illinois at	Γechnology,		
Active registre	ration number	/state/expiration date		69GAJRKZHHZ9 / IL					
Year registere	ed	2020	Discipline	Microsoft Office Spe	ecialist				
Contract role(	(s) / brief desc	ription of responsibilities		Pavement Distress processing and ratir	<b>5 Data Processing Manual Distress Rating.</b> M ng the Pavement Distress Data collected.	r. Rana will be respons	sible for		
Experience da (mm/yy—mm	ates n/yy)	Experience and qualit the time specified in t	fications relevant to the applicable MPR(	the proposed contract; i.e., 's).	"designed drainage", "designed girders", "designed intersection of the sector of the s	ion", etc. Experience dates s	hould cover		
12/18	8-02/19	types, severity, e ta. Michael Baker and panoramic in The inventory is LCMS.	xtent, and iden r is performing mage collection being performe	tification. Additionall statewide pavement on 28,000 miles of s ed using Michael Bake	y performed quality checks on selected distres data collection, including laser crack measurer tate roadway, extending across 10 districts and er's mobile data collection vehicle, which is equ	staff on pavement di ses on thousands of r nent system (LCMS) ir 155 counties in West uipped with a sensor-	s-tress miles of da- nventory Virginia. -based		
03/19	9 - 12/19	<b>Pavement Inver</b> distress selectior asset inventory in and analyzed GP New Jersey. Task preparation, and	ntory and Man n and QC work o n GIS along with R data. Michael s included a roa implementing	<b>nagement, Camden County, NJ. City of Camden, NJ. Civil Associate.</b> Responsibilities included c on pavement surface and asset data collected on the City network. Worked on preparing the City ith breaking into uniform sections based on surface type, construction history, pavement condition el Baker developed and implemented a pavement management system for Camden County, padway inventory, pavement surface and asset data collection, pavement data processing, report og and deploying the PAVER pavement management system.					
preparation, and implementing11/18 - 01/19Pavement Management Plan I selection on collected high spect as well as budget and cost estim standards. Michael Baker provid a pavement management plan ( index (PCI), rutting, patching, cra PCI values for 570 management high-definition cameras and col parformed a budgetary people of the parformed a budgetar				Update, Napa Count ed LCMS image data a nates. Additionally wo ed engineering servi (PMP) in StreetSaver. acking, potholes, rave sections were updat lected distress data p nalysis for five differe	<b>EXP, CA. Napa County. Civil Associate.</b> Response as well as working on inventory data, maintena orked as a QC engineer to ensure distress analy ces for the collection of LCMS pavement condi This data included international roughness ind eling, faulting, drop-off, and macrotexture for 8 ed in StreetSaver, as well. Michael Baker obtain over ASTM D6433 and MTC StreetSaver standard ent scenarios and offered treatment recommen	ibilities included dist ince and rehabilitatio sis as in conformation tion data and the upo lex (IRI), pavement co 340 lane miles of road ned roadway imagery ls. Using the data, Mic idations.	ress n plan n with date of ondition lway. The using five chael Baker		

Mr. Rana has specialized experience in evaluation, design, rehabilitation, and management systems of pavement structures. He has managed various pavement evaluation, design, rehabilitation, and management projects.

Firm employed	by Mi	chael Baker ERNATIONAL					60			
Vame	BENJAMIN	NEFF			Years of relevant experience with this employer	5	121			
Title	Civil Associa	te			Years of relevant experience with other employer(s) 0					
Degree(s) / Yea	ırs / Specializati	on		BSCE / 2016 / Civil E	Engineering, University of New Hampshire					
Active registrati	tion number / st	ate / expiration date								
Year registered Discipline										
Contract role(s)	) / brief descript	ion of responsibilities		Pavement Distress processing and ratir	s Data Processing Manual Distress Rating. In ng the Pavement Distress Data collected.	Mr. Neff will be re	esponsible for			
Experience date (mm/yy—mm/y	es (yy)	Experience and qualit the time specified in t	fications relevant to the applicable MPR (	the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed intersed	ction", etc. Experience	e dates should cover			
05/18 - 05/18 Facilities Improvement Program Final Des for the redevelopment of the GeoLink applic Department of Transportation (NJDOT). Over administration to the Bureau of Transportation data have been loaded into to the Straight-Li reporting requirements. The client recognize current data upon which to base strategic tra					vices, NJ. New Jersey Turnpike Authority. To nich is used to collect road segment informati at 18 years, Michael Baker has provided roadw & Safety, which maps all public roads in New ram data warehouse and also support annual eed to maintain this database to provide decise ation investment decisions.	echnical Lead. I ion/attributes fo vay data collectio Jersey. This inve I Federal Highwa sion makers with	Responsible or New Jersey on and database ntory and spatial ay Administration n correct and			
11/17 -	- 12/19	<b>Pavement Inver</b> and implemente pavement surfac PAVER pavement	ntory and Mana d a pavement n e and asset data t management s	agement, Camden C nanagement system a collection, paveme system.	<b>County, NJ. City of Camden, NJ</b> . <b>Technical Le</b> for Camden County, New Jersey. Tasks include nt data processing, report preparation, and in	ead. Michael Bal ed a roadway in nplementing an	ker developed ventory, d deploying the			
07/18 -	- 12/18	Pavement Data imagery. Michae inventory and pa Virginia. The inve based LCMS. All downward facing	<b>Collection, Sta</b> I Baker is perfor anoramic image entory is being p pavement data g pavement ima	tewide, WV. WVDO ming statewide pave collection on 28,000 performed using Mic collected is being sp agery from the LCMS	<b>T. Reviewer.</b> Part of team to evaluate road contement data collection, including laser crack m o miles of state roadway, extending across 10 where the set of state roadway, extending across 10 where a state mobile data collection vehicle, where the set of the set	nditions by revie easurement sys districts and 55 hich is equipped egree spherical avement data vi	ewing LCMS tem (LCMS) counties in West d with a sensor- imagery and iewer application.			
07/17 - 09/17 Pavement Management System, Treasure Island, FL. City of Treasure Island. CADD Coordinator. Responsible f CAD drawing, organizing LCMS photos, and creation of viewports. Pulled in the Google map image of the city into A inputted all necessary layers. Organied the LCMS photos helped determine the condition levels of the streets. Helpe project look presentable. Michael Baker developed a pavement management system using cutting edge technolog van unit equipped with Light Detection and Ranging and Laser Crack Measurement System. The pavement manage would allow the city to integrate and maintain an inventory, analyze condition data, track construction history, and year analyses to guide decisions concerning pavement maintenance and rehabilitation. Michael Baker surveyed 40 miles of the city's streets and parking lots.						e for creating o AutoCAD and ped make the ogy and a mobile gement system d conduct multi-				

Firm employe	ed by	Michael Baker				
Name	STEPHEN	HOLT			Years of relevant experience with this employer	16
Title	Pavement	Distress Data Proce	ssing Software	Development	Years of relevant experience with other employer(s)	0
Degree(s) / Years / Specialization				MPS / 2018 / Home University Post-B.S Certificate BS / 2014 / Geospa	land Security-Geospatial Intelligence, The Per / 2015 / Geographic Information Systems, Virg tial Science-Geoinformatics, Radford Universit	nnsylvania State ginia Commonwealth University ty
Active registr	ration number /	'state / expiration date	_	n/a		
Year registere	ed		Discipline			
Contract role	(s) / brief descri	iption of responsibilities		Pavement Distres processing and rational states and the second states and the second states and the second states and the second states are second states and the second states are second state	s Data Processing Manual Distress Rating. In ng the Pavement Distress Data collected.	Nr. Holt will be responsible for
Experience de (mm/yy—mn	ates n/yy)	Experience and qualit the time specified in t	fications relevant to he applicable MPR(	the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed intersed	tion", etc. Experience dates should cover:
		development, sp database admini and spatial data Administration ro correct and curre continue diligen assist with inter-	atial editing, ar stration to the l have been load eporting requin ent data upon w t database man agency contact	Id SQL validations. O Bureau of Transporta ed into to the Straigl ements. The client re hich to base strateg agement and admin and coordination.	ver the past 18 years, Michael Baker has provi tion Data & Safety, which maps all public road ht-Line Diagram data warehouse and also sup cognized the need to maintain this database ic transportation investment decisions. The pu istration, to collect and process field data as n	ded roadway data collection and ls in New Jersey. This inventory port annual Federal Highway to provide decision makers with urpose of this project was to necessary, and to promote and
10/18 - 03/19 QC, training s a python scrip interactive rep performing st image collect being perform data collected		Pavement Data QC, training staff a python scripts interactive repor performing state image collection being performed data collected is imagery from the	<b>Collection, Sta</b> , and creating a to automate pro- ts using Power wide pavemen on 28,000 mile d using Michael being spatially e LCMS and pro-	tewide, WV. WVDO web mapping appli e-processing of the L BI to track data collection, inci t data collection, inci s of state roadway, e Baker's mobile data referenced and align vided to the client vi	<b>T. GIS Specialist.</b> Responsible for LCMS data p cation in ArcGIS Online to track data collection .CMS data, training and managing staff on dat ction, processing, and manage the data extrace luding laser crack measurement system (LCMS xtending across 10 districts and 55 counties in collection vehicle, which is equipped with a so red with the 360-degree spherical imagery an a web-based pavement data viewer applica	processing, overseeing QA/ n progress. Mr. Holt developed a extraction, and creating ction staff. Michael Baker is 5) inventory and panoramic n West Virginia. The inventory is ensor-based LCMS. All pavement d downward facing pavement tion.
11/18 - 11/19 Pavement Management Plan services for the collection of LCM This data included international raveling, faulting, drop-off, and updated in StreetSaver, as well. data per ASTM D6433 and MTC different scenarios and offered t				<b>Jpdate, Napa Coun</b> AS pavement conditi roughness index (IR macrotexture for 840 Michael Baker obtair StreetSaver standard reatment recommer	<b>ty, CA. Napa County. GIS Specialist.</b> Michael ion data and the update of a pavement manage I), pavement condition index (PCI), rutting, par I) lane miles of roadway. The PCI values for 570 ned roadway imagery using five high-definition Is. Using the data, Michael Baker performed a indations.	Baker provided engineering gement plan (PMP) in StreetSaver. tching, cracking, potholes, management sections were n cameras and collected distress budgetary needs analysis for five
Mr. H editir	lolt has exte ng, data coll	nsive experience ind ection and processi	clude spatial an ng, cartography	alysis, temporal anal , geoprocessing, geo	ysis, spatial statistics, linear referencing, remotoreferencing, and database design.	te sensing, digitization, spatial

Prime Consultant Firm Name: Michael Baker International, Inc.

Firm employed	d by	recision Systems, Inc.					2E						
Name	JIANWEIW	ANG, PhD			Years of relevant experience with this employer	16							
Title	Senior Proje	ect Manager & Vice	President		Years of relevant experience with other employer(s)	5							
Degree(s) / Years / Specialization				PhD / 2003 / Civil Er BS / 1999 / Civil Eng	ngineering (Transportation)/Tsinghua Univer ineering (Structure)/Tsinghua University, Ch	sity, China ina							
Active registration number / state / expiration date				n/a	n/a								
Year registered	d		Discipline										
Contract role(	s) / brief descrip	tion of responsibilities		<b>Project Manager.</b> D Data collected.	r. Wang will be responsible for Manual Distre	ss Rating for Paver	ment Distress						
Experience da (mm/yy—mm	ites i/yy)	Experience and qualit the time specified in t	fications relevant to a here applicable MPR (s	the proposed contract; i.e., ;).	"designed drainage", "designed girders", "designed interse	ection", etc. Experience	dates should cover						
09/21– Ongoing <b>FY21 Roadway Assessment, Washin</b> for approximately 2,100 lane miles. Ov (QA/QC) processes. Adapted existing of tool and data collection and extraction with stakeholders.				<b>Ashington, DC. Proje</b> es. Oversaw data extra ting databases, mana action methods, imple	<b>ct Manager.</b> Led multiple teams for citywide action and multi-phase and independent Qua ged field data collection teams, developed we emented QA/QC processes trainings for data	roadway pavemer Ility Assurance/Qu eb-based project r verification team, a	nt data collection ality Control management and coordinated						
11/11-	Ongoing	Americans with Oversaw data co in DC. Developed LiDAR data and r processes across	Disabilities Act llection and extra web-based ass nake data availa multiple teams.	t (ADA) Asset Invent raction of over 39,000 set management soft ble quickly after colle	ory and Compliance Evaluation System, W ) unique ADA assets across 1,495 miles of side ware that featured interactive mapping and i ection and provide advanced query and repo	<b>ashington, DC. P</b> ewalk and over 7,1 ntegration to extra rting tools. Manac	<b>roject Manager.</b> 154 intersections act data from ged QA/QC						
05/17	7-03/18	Alley Inventory distresses on 8,92 assessment of all data extraction a determining mai	and Condition 35 alley segmen ey conditions. D pplication, that ntenance priorit	Survey, Washington ts across 366 miles of Developed web-based featured interactive C ties. Developed QA/Q	<b>p, DC. Project Manager.</b> Led data extraction falley in DC. Adapted ASTM D6433 Pavement asset management system, as well as mobil GIS mapping and dashboard analysis and rep of processes.	team identifying c t Condition Index e field data collect orting tools. Assis	over 35,000 (PCI) for tion and ted client in						
02/13	02/13-02/14 Multiple Citywide Sidewalk and Retaining Wall Condition Surveys and Inventories, Washington, DC. Project Manager. Led two citywide condition assessment and inventory contracts for over 50,000 sidewalk and retaining wall assets across DC. Adapted ASTM D6433 PCI for assessment of sidewalk conditions. Supervised initial data collection procedures and led extraction efforts. Developed web-based asset management system featuring interactive GIS mapping and reporting tools. Assisted client in determining and selecting maintenance priorities. Developed QA/QC processes.												
02/06 - 02/07 Highway Sign and Sign Structure Asset Management System, Washington, DC. Project Manager. Led the development of sign structure database and asset management system for over 160,000 signs across all 8 DC Wards using high-resolution images and G Developed Sign Management System to enable upload of field GPS locations, collected data, and photographs of signs. Assessed signs based on physical condition, retroreflectivity, and legibility.													
His ex	opertise cove	rs a variety of tran	sportation-relat	ed data collection an	d extraction, asset and data management. G	JS/inventory data	base						

development, and software development.

Firm employed by		Michael Baker					
Name	<b>RICH K</b>	AMMER		Years of relevant experience with this employer	30		
Title	GIS Spe	cialist		Years of relevant experience with other employer(s)	0		
Degree(s) / Years /	Specializati	on	AST / 1991/ Specialized	Technology/Computer Graphics/Architectura	I		
			CADD / 1991 / Pittsburg	h Technical College			
Active registration	number / st	ate / expiration date	n/a				
Year registered		Discipline					
Contract role(s) / b	rief descript	ion of responsibilities	Pavement Distress Dat processing and converti	ta Processing Historical Data Conversion. M ng historical Pavement Distress Data collected.	Ir. Kammer will k	be responsible for	
Experience a (mm/yy—mr	lates n/yy)	Experience and qualifications relevent time specified in the applicable MP	ant to the proposed contract; i.e., R(s).	"designed drainage", "designed girders", "designed intersect	tion", etc. Experience	e dates should cover the	
	11/18 - 12/18 Pavement Managemen translating, and performi sidewalk, and curb data so resurfacing work plan for management database so with the necessary training evaluates the possibility Baker used the Ohio Dep		g quality control tasks using ArcGIS and Python Scripting langue. Michael Baker provided pavement, irvey; data processing; pavement distress identification; staff training; RoadManager updates; and a he City's Pavement Management Survey project. The purpose was to update the current pavement stem, identify reasons and countermeasures for unacceptable pavement conditions, provide City staff g to rate pavement conditions in the future, and develop a resurfacing/capital improvement plan that or achieving an acceptable pavement condition rating (PCR) on all roadways within 20 years. Michael rtment of Transportation (ODOT) Local Pavement Assessment Tool (LPAT) application to collect inventory niles of city roadways.				
11/20 - 12/20 CBP FM&E PMO GIS Train included creating and upo performing construction r at Interchange toll facilitie modifications. The scope of construction, utility coord		<b>CBP FM&amp;E PMO GIS Traini</b> included creating and upda performing construction m at Interchange toll facilities modifications. The scope of construction, utility coordin	ning and Support, Southern U.S. U.S. Customs and Border Protection. GIT Specialist. Responsibilities dating customized tools for ArcGIS using Python, ArcPY, and GeoProcessing tools. Michael Baker is management/construction inspection for emergency generator and HVAC upgrade installations es 13A, 14B, and 15E on the New Jersey Turnpike, and turnpike-wide highway lighting repairs or of work includes selective demolition of existing equipment, mechanical/plumbing/electrical dination, testing and commissioning, and Department of Community Affairs coordination.				
03/20 - 03/20 Responsibilities included preliminary and final desi Michael Baker's services in investigations, traffic sign agency coordination		ransportation Plan, Alle upporting the team with A n services for the reconstru- lude geometric and roady design, utility relocation,	<b>gheny County, PA. Port Authority of Allegh</b> Michael Baker's Portal for ArcGIS services. Mich uction and widening of 3.5 miles of C.R. 530, a way design, culvert design, right-of-way plans signing and pavement marking plans, stormy	eny County. Gl 1ael Baker is pro 1 urban arteria 1 hazardous ma vater managem	<b>T Specialist.</b> widing I roadway. terial tent plans, and		

Mr. Kammer's responsibilities include programming, GIS data processing, file format translations, data analysis, data manipulation, thematic output generation, and quality control. His software skills include the use of ArcGIS Desktop, ArcGIS Enterprise, ArcGIS Mobile, SQL Server, and AutoCAD.

Firm employed	d by	<b>F</b> rrb							
Name	JERRY DAL	EIDEN, PE			Years of relevant experience with this employer	5			
Title	Principal En	gineer			Years of relevant experience with other employer(s)	35			
Degree(s) / Ye	ears / Specializati	on		BS / 1981 / Civil Eng MS / 1983 / Civil Eng	jineering, University of Illinois gineering, University of Illinois				
Active registra	ation number / st	ate / expiration date		PE.62456 / TX / 06/0	9/2023				
Year registered	d	1987	Discipline	Civil Engineering					
Contract role(	's) / brief descript	ion of responsibilities		Principal Engineer, conversion.	Mr. Daleiden will assist with quality assurance	/quality control for historical data			
Experience da (mm/yy—mm	ntes n/yy)	Experience and quali the time specified in	fications relevant to the applicable MPR (	the proposed contract; i.e., s).	"designed drainage", "designed girders", "designed intersec	tion", etc. Experience dates should cover:			
07/18	- 12/23	Pavement Struc Principal Engine collected as part texture, Right-of States since 2018	<b>etural Evaluatio</b> er of this project of Pooled Fund -Way imagery, an 3.	<b>n with Traffic Speed</b> in partnership with V Study TPF-5(385). Dat nd continuous pavem	<b>Deflection Devices (TSDDs), Nationwide. Pr</b> irginia Tech Transportation Institute, for the co ta includes pavement surface distress data, inc ient deflection data. Thousands of miles of road	<b>incipal Engineer.</b> Jerry is the mpletion and delivery of data, luding rutting, roughness, and ds have been collected in 25+			
04/19	- 10/19	<b>Network Data C</b> the Prime (Micha collection on We	<b>Collection, State</b> ael Baker) to con est Virginia roads	<b>ewide, WV. WVDOT. Principal Engineer.</b> Jerry was the Principal Engineer for ARRB's team with mplete pavement data collection surveys, including surface distress and continuous structural data is and highways in 2019 and 2022.					
04/21	- 10/24	<b>Network Data (</b> (Michael Baker) t on Mississippi ro	<b>Collection, State</b> to complete pav ads and highwa	ewide, MS. MDOT. Pr rement data collection sys through 2024.	rincipal Engineer. Jerry is the Principal Engine n surveys, including surface distress and contin	eer for ARRB's team with the Prime nuous structural data collection			
01/19 – 06/20 Comprehensive Pavement Assessment with Virginia Tech Transportation Institut continuous pavement deflection data, or				essment, Texas DOT, Statewide. Principal Engineer. Jerry is the Principal Engineer, in partnership Institute, for the completion and delivery of data, including pavement surface distress data and data, collected on roads and highways in Texas.					
09/20	- 11/20	Maintenance Tr ARRB's team with surface distress a and 2021.	eatment Confir h the Contract h and continuous	<b>irmation, Tennessee DOT, Statewide. Principal Engineer.</b> Jerry was the Principal Engineer for holder (University of Tennessee - Knoxville) to complete pavement data collection surveys, including s structural data collection on TDOT's roads and highways to confirm maintenance treatments in 2020					

As a Project Engineer for the Federal Highway Administration (FHWA) Long Term Pavement Performance Program (LTPP), Jerry has coordinated the identification, selection, verification, construction, and monitoring of test sections for this study.



# **17. FIRM EXPERIENCE**

Identify the team's project experience most relevant to the scope in the advertisement. The projects should be limited to a total of 20, with no more than 5 projects being represented by the prime consultant and with no more than 3 projects represented by each sub-consultant on the team. If more than 5 projects are identified for the prime consultant, all projects identified after the first 5 will not be evaluated. If more than 3 projects are identified for a single sub-consultant, all projects identified after the first 3 from that sub-consultant will not be evaluated. Include no more than one page per project. Projects identified shall only include work performed by firms on the team. The projects identified do not necessarily need to have been DOTD projects.

Firm Name	Michael Baker				Past Performan	ce Evaluation Discipline(s)*	Data Collection
Project Name	<b>Pavement Condition</b>	Survey		Firm responsibility (prime or sub?) Prim			Prime
Project Number	n/a		Owner's Name	Mississip	Mississippi Department of Transportation		
Project Location	Statewide, Mississippi			Owner's Project Manager Cindy Smith, P.E.		Cindy Smith, P.E.	
Owner's address, phone,	email	401 N. West Street,	Jackson, MS 39	201 601.3	59.7648   cjsmitł	n@mdot.ms.gov	
Services commenced by t	by this firm (mm/yy) 05/21 Total co			ıl consultant contract cost (\$1,000's)			\$5,679
Services completed by th	is firm (mm/yy)	Cost of consultant	t of consultant services provided by this firm (\$1,000's)			\$3,718	

#### Michael Baker (Prime) is providing LCMS, inertial profiler inventory and panoramic image collection on 35,000 miles of state roadway, extending across seven districts and 82 counties for Mississippi DOT's five-year program. Additionally, Skid/Friction testing is performed on over 14,000 state-owned roads in both 2022 and 2024.

The inventory is performed using Michael Baker's innovative DCV, which is equipped with a sensor-based, LCMS, Mosaic 51 spherical camera, and four high-resolution ROW cameras. **The LCMS provides three-dimensional** 

**pavement imaging and automated detection of pavement distresses and ride quality.** Michael Baker's LCMS equipment uses advanced hardware and software technologies to automate the process of identifying detailed pavement distresses, including raveling and weathering, transverse cracks, longitudinal cracks, alligator cracks, potholes, patches, sealed cracks, rutting, and drop-offs, as well as surface macrotexture and ride quality.

The vehicle is equipped with a modern scanning laser inertial profiling system to measure ride quality (as International Roughness Index – IRI) for both left and right wheel paths. Both systems can collect full pavement condition information at posted speed limits, minimizing the need for traffic control and maximizing crew safety. **Michael Baker is also supporting the state in their annual HPMS reporting submission by providing accurate IRI, rutting, faulting and cracking percent aligned with the HPMS Field Manual and 23 CFR 490.** 

Michael Baker leverages ArcGIS online for mission planning and route-based tracking. This assists with field crew coordination and provides real-time vehicle tracking. After the roadway data collection is performed, pavement data is post-processed using automated pavement distress identification software that measures pavement crack width, length, depth, and orientation with millimeter accuracy. Additional pavement condition data is collected through a custom manual distress application where the cracks are classified based on user-specified criteria. **Our team calculates and reports on various pavement indices describing the pavement condition at 0.10-mile intervals with linear segmentation** aligning to the MDOT's GIS roadway network. All pavement data collected

will be spatially referenced and aligned with the 360° spherical imagery and downward facing pavement imagery from the LCMS and provided to MDOT via a web-based Pavement Data Viewer application. This application provides MDOT with the ability to quickly query and access pavement details collected to support subsequent project prioritization, roadway maintenance, and other business decisions based on pavement condition.



# Multi-year pavement data collection

- » HPMS formatted data delivery (IRI, Rutting, Faulting, Cracking)
- » Delivery of a web-based Pavement Data Viewer with integration of historical imagery & data
- » Delivery of 2+ million pavement & ROW imagery
- » Network-wide skid testing performed in accordance with ASTM E-274
- » GIS Integration

# Proposed staff who worked on this project:

- Kenneth
   Contrisciane
- Steven
   Henderson
   Joel Wilson

Stephen Holt

- Vahid Ganji
- Aaron Morris Michael Simons
- Nathan Kebede
- Jibreel Rana

Page 50 of 91 Prime Consultant Firm Name: Michael Baker International, Inc.

Firm Name	Michael Baker			Past Performan	ce Evaluation Discipline(s)*	Data Collection	
Project Name	STATEWIDE PAVEME	ENT DATA COLLECT	ION		Firm responsibility (prime or sub?) Prime		
Project Number	n/a		Owner's Name	West Virgi	Vest Virginia Department of Transportation, Department of Highwa		
Project Location	Statewide, West Virgir	nia		Owner's Project Manager Michael Troyan, PE			
Owner's address, phone, email Building 5, Room A-350 190 michael.o.troyan@wv.gov				awha Boule	vard East, Charle	eston, WV 25305   305.55	58.9432
Services commenced by	es commenced by this firm (mm/yy) 05/18 To			tal consultant contract cost (\$1,000's)			\$6,339
Services completed by this firm (mm/yy) Ongoing Cos			Cost of consultan	t services provi	ded by this firm (\$1,0	000's)	\$1,065

Michael Baker is currently performing a 5-year, statewide pavement condition data collection for WVDOT. Michael Baker's team has successfully collected, processed, and delivered 28,000-miles of pavement condition data throughout multiple collection cycles, including over 13,500-miles of roadways in 2019 alone. As part of the inventory, our team is capturing ROW imagery, 3D downward facing imagery, IRI data, and pavement distresses (transverse, longitudinal, and alligator cracking, as well as rutting and patching).

Our team includes ARRB to support the physical data capture with their identically-configured fleet of pavement DCVs and equipment to ensure we meet and/or exceed the technical

requirements and goals of this project. In 2019, ARRB conducted a structural pavement assessment on WVDOT-DOH's entire Interstate system (~1,100 miles) using their advanced Intelligent Pavement Assessment Vehicle (iPAVe) data collection system. which provides continuous pavement deflection testing and was deployed for WVDOT-DOH during the contract cycle. The iPAVe technology is distinctly unique in its ability to collect both structural and functional pavement condition data in a continuous manner at normal highway speeds.

A new tracking workflow process was developed as a result and included web-based dashboards and interactive mapping to support the data delivery from multiple format types and frequencies. Each vehicle is equipped with a LCMS (manufactured by Pavemetrics). In addition to the LCMS system, each vehicle is equipped with Class 1 certified inertial profilers for capturing ride quality in the form of IRI, and multiple camera configurations to capture forward and rear roadway images. Each system features a high-accuracy GPS coupled with an inertial measuring unit (IMU) for positional corrections. All pavement data collected is being spatially referenced and aligned with the 360-degree spherical imagery and downward facing pavement imagery from the LCMS and provided to the client via a web-based pavement data viewer application.

Michael Baker developed custom workflows and procedures to load each collected data set into a single standardized enterprise relational database system for unified processing and quality control. We

# Multi-year pavement data collection on 28,000+ miles of state highways

- » HPMS formatted data delivery (IRI, Rutting, Faulting, Cracking)
- » Delivery of a web-based Pavement Data Viewer with integration of historical imagery & data
- » Delivery of 30+ million pavement & ROW imagery to date
- » GIS Integration

# Proposed staff who worked on this project:

- Kenneth
  - Contrisciane
- Vahid Ganji
- Aaron Morris
- Michael Simons
- Nathan Kebede
- Steven Henderson
- Joel Wilson
- Jibreel Rana Jerome

Stephen Holt

- Daleiden Michael
- Richardson
- Nate Bech
- Brian Serzega Keith Souder

leverage advanced GIS techniques and tools to align captured data to WVDOT-DOH's standard Linear Reference System (LRS) so that positioning of condition details remains uniform from year to year to support historical analysis. Additionally, **Michael Baker developed a custom web-based pavement distress** extraction tool for manually classifying pavement distress information using the images and distress delineation captured by the data collection vehicles. This unified tool allows extractors to see not only the pavement images, but the corresponding forward images and geolocation of the data collection vehicle on a map. Collected data is being delivered to DOH as a unified single delivery type incorporated into their PMS and used to support the federal HPMS requirements.

Firm Name	Michael Baker				1	Past Performand	e Evaluation Discipline(s)*	Data Collection
Project Name	TRAFFIC SIGNAL AS	T SYSTEM		Firm responsibility (prime or sub?)			Prime	
Project Number	n/a	Owner's Name	Pennsylv	Pennsylvania Department of Transportation				
Project Location	Statewide, Pennsylvar	nia		Owner's Pro	oject M	lanager	Daniel Farley	
Owner's address, phone,	email	400 North Street, 7	th Floor, Harris	burg, PA 17	7120	717.787.283	88   dfarley@pa.gov	
Services commenced by t	nced by this firm (mm/yy) 07/15 Tota			otal consultant contract cost (\$1,000's)			\$9,458	
Services completed by th	rvices completed by this firm (mm/yy) 06/21 Cost			nt services prov	vided b	by this firm (\$1,0	00's)	\$5,458

The passage of Pennsylvania Act 89, the first of its kind in over 20 years in Pennsylvania, identified sustainable transportation funding to catalog signalized intersections across the Commonwealth as one of the cornerstone transportation assets. Pennsylvania is unique in that the approximately 13,100 signalized traffic intersections identified during the course of this project are owned and maintained by Commonwealth municipalities and not the Pennsylvania Department of Transportation (PennDOT). This dynamic has resulted in decades of varying standards of care for the maintenance and operation of traffic signals. PennDOT established the Green Light-Go (GLG) Program to manage the dedicated traffic signal funding, implement traffic signal maintenance and operations projects, and to undertake overarching

activities to enhance the state's position with respect to traffic signal management. A byproduct of PennDOT's GLG Program is the conceptualization and implementation of the PennDOT Traffic Signal Asset Management System (TSAMS).

Michael Baker led the management, data collection, data extraction and coordination with PennDOT Central Office. Two and occasionally three of our fleet of Mobile LiDAR systems were simultaneously leveraged to shorten the collection cycle to a mere 6 months. Throughout the 180 days of collection our teams traveled over 82,000 miles in the Commonwealth. The Mobile LiDAR teams averaged the capture of nearly 30 signalized intersections per day and captured an astounding 18,000 miles of LiDAR data. The 131 Terabytes of collected data will support future planning, design, maintenance, and operation decision making by accurately evaluating equipment, life cycles, budgets and other factors.

The program implementation was comprised of three major phases:

- 1. Develop a statewide web-enabled management system accessible and usable by all traffic signal stakeholders including municipalities, planning partners, PennDOT districts, contractors, and consultants.
- 2. Conduct an initial inventory of traffic signal assets and populate the TSAMS database, which now contains approximately 26.5 Million entries. Key facets of the inventory included: Mobile LiDAR field data capture; field inspection of signal control cabinets using Michael Baker's custom Mobile Information Capture Tool (MICap); Data Integration Plan to migrate disparate datasets into TSAMS; and Data Sustainability Plan to promote downstream flexibility.
- 3. Develop and integrate a TSAMS maintenance module to be used by maintenance stakeholders to document and track maintenance activities, which resulted in the identification and collection of 242,000 documents.



## Inventoried traffic signal assets across 18,000-miles of LiDAR collections and populated TSAMS database with approximately 26.5 million entries

- » Database development
- » Asset management system development
- » Asset inventory and data collection
- » Mobile LiDAR data collection
- » Data extraction and processing
- » User application development
- » Project reports
- » Quality control
- » Stakeholder presentations

# Proposed staff who worked on this project:

- Aaron Morris Mark Anderson
  - Contrisciane

Kenneth

Steven Henderson

Firm Name	Michael Baker				Past Performa	nce Evaluation Discipline(s)*	Data Collection
Project Name	PAVEMENT CONDIT	ION INVENTORY			Firm responsibility (prime or sub?)		Prime
Project Number	n/a	Owner's Name					
Project Location	Statewide, Pennsylvar	nia		Owner's Pro	ject Manager	Pam Worley	
Owner's address, phone,	email	700 S. Eisenhower I	3lvd, Middletow	vn, PA 170	57   717.831.712	3   pamela.worley@patu	mpike.com
Services commenced by t	this firm (mm/yy)	Total consultant co	ıl consultant contract cost (\$1,000's)			\$5,791	
Services completed by th	is firm (mm/yy)	06/17	Cost of consultant	services prov	ided by this firm (\$	,000's)	\$5,791

Michael Baker performed a network-wide, annual pavement condition data collection and processing under a 6-year program. The inventory included LCMS pavement data collection along 1,324 lane miles of highways with over 400 interchange ramps (additional 258-miles). In addition to LCMS data collection, this inventory involved the capture of ROW imagery, 3D downward facing imagery and ride quality (IRI) data.

In preparation for this multifaceted data collection

effort, Michael Baker developed numerous GIS data layers to support mission planning and data collection. Leveraging the turnpike's linear reference centerline geometry, the GIS data included access gate locations; interchange locations; and comprehensive ramp geometry, including direction of travel, ramp nomenclature, and mile posting. Michael Baker used this data to develop an efficient data collection methodology. Michael Baker developed a web-based Esri Operation Dashboard to report on daily progress and tracking.

Inventoried data was collected, processed and pavement distresses where rated according to the Pennsylvania Department of Transportation's (PennDOT) Publication 336 (Automated Pavement Condition Survey Field March 25, 2021 Related Work - 4 PAVEMENT AND ASSET DATA COLLECTION Manual). Michael Baker also coordinated closely with both PennDOT and PTC to deliver pavement distress data according to HPMS and federal reporting requirements.

Additionally, distress data was aggregated and aligned to PTC's historical project sections. Pavement skid data, was also inventoried, processed, and delivered to the Commission by Michael Baker. **Michael Baker developed PTC's Data Quality Management Plan (DQMP), per federal guidelines, which was eventually approved as** 

part of PennDOT's overarching statewide DQMP. Over the course of this contract, Michael Baker has and continues to support the pavement engineering division on LRS topics relating to the Commission's ongoing transition to ESRI Roads and Highways. Michael Baker also developed a web-based Pavement Data Viewer for PTC that enables users to view detailed distress data in conjunction with downward-facing views of the pavement and ROW imagery.



## Multi-year pavement data collection on ~1,300+ miles of Commission owned highways & 258-miles of ramps

- » HPMS formatted data delivery (IRI, Rutting, Faulting, Cracking)
- » Delivery of a web-based Pavement Data Viewer with integration of historical imagery & data
- » Delivery of 2+ million pavement & ROW imagery
- » Network-wide skid testing performed in accordance with ASTM E-274
- » GIS Integration

#### *Proposed staff who worked on this project:*

- Kenneth
- Contrisciane
  - Vahid Ganji •
  - Michael Simons Joel Wilson

Mark Anderson

Stephen Holt

Aaron Morris

Firm Name	Michael Baker				Past Performa	nce Evaluation Discipline(s)*	Data Collection
Project Name	DATA WAREHOUSE	Έ		Firn	n responsibility (prime or sub?)	Prime	
Project Number	n/a	Owner's Name	New Jersey Department of Transportation				
Project Location	Trenton, New Jersey			Owner's Pro	ject Manager		
Owner's address, phone,	email	30 Fenway Rd, Tren	ton, NJ 08620	609.963.1	384   don.perry@	odot.nj.gov	
Services commenced by a	ced by this firm (mm/yy) 01/15 Total consult			consultant contract cost (\$1,000's)			\$9,004
Services completed by th	es completed by this firm (mm/yy) 07/22 Cost			t of consultant services provided by this firm (\$1,000's)		000's)	\$7,926

Michael Baker has been selected by NJDOT's Bureau of Transportation Data & Safety through multiple multiyear awards to provide collection of inventory data and mapping all public roads in New Jersey over the course of two decades. This inventory and spatial data have been loaded into the Straight-Line Diagram (SLD) data warehouse and also supports annual Federal Highwa y Administration (FHWA) reporting requirements. NJDOT recognized the need to maintain this database to provide decision makers with the correct and current data upon which to base strategic transportation investment decisions.



# Delivery of 50+ million ROW images to date

- Multi-year pavement data collection on ~650 miles (annually) of NHS Routes across the state
- » HPMS formatted data delivery (IRI, Rutting, Faulting, Cracking)
- Delivery of a web based Video log with integration of historical imagery & data
- » LRS & GIS Integration

## Proposed staff who worked on this project:

- Kevin McElwain
  - Kenneth
- Vahid Ganji Mark Anderson
- Contrisciane Jo Aaron Morris

Mark Andersc
 Joel Wilson

Michael Baker has been assisting NJDOT in collecting pavement distresses, including IRI, rutting, faulting, percent crack data along ~650 miles of NHS off-state network roadways using **Michael Baker's "One-Van" March 25**, **2021 Related Work - 5 PAVEMENT AND ASSET DATA COLLECTION solution**, which leveraged the LCMS, mobile LiDAR, four (4) standard cameras and one (1) spherical 360-degree camera. Pavement data was processed to

provide IRI, rutting, faulting, and crack percentages compliant with HPMS reporting requirements. Processed data was also aligned to NJDOT's LRS and HPMS network. Annual pavement inventory data is combined with NJDOT's on-state pavement data inventory and included in NJDOT's official HPMS submittal each reporting year.

Over the course of this project, Michael Baker has mapped nearly every public road in the state. As part of this agreement, Michael Baker built a web-based videolog that contains ROW imagery of state and county-owned dating back to 2004.

Firm Name	APS Engineering and Testing					Past Performant	re Evaluation Discipline(s)*	Geotech
Project Name	I-10 WIDENING LA 4			Firm responsibility (prime or sub?)			Prime	
Project Number	H.004100	Owner's Name	DOTD					
Project Location	Baton Rouge, Louisiar	าล		Owner's Project Manager Kristy Smith, P.E			Kristy Smith, P.E	
Owner's address, phone,	email	1201 Capitol Acces	s Rd., Baton Rou	uge, LA 708	82-4	438   225.379	.1016   kristy.smith2@la	.gov
Services commenced by this firm (mm/yy) 09/09 Tota			Total consultant c	otal consultant contract cost (\$1,000's)				n/a
Services completed by this firm (mm/yy) Ongoing Cost			Cost of consultant	st of consultant services provided by this firm (\$1,000's)		00's)	\$400	



Similarities to professional **Geotechnical Services IDIQ** 

- Geotechnical Exploration (GE)
- Geotechnical Design (GD)
- Geotechnical Construction (GC)
- Laboratory Testing
- Contract Management (CM)
- Constructability

*Proposed staff who worked on this project:* 

Geotechnical Investigation to provide client with the necessary information for planning and design I-10 widening. APS was tasked thru our DOTD geotechnical retainer to drill and sample a total of 85 deep borings that included land (77) and over water borings (8) starting at the Washington Exit and ending at the Acadia Exit. APS performed all the laboratory testing per ASTM standards to facilitate the geotechnical design. Soil classification tests such as, natural moisture contents, Unconsolidated Undrained, liquid and plastic limits, unit weight, grain-size analyses, consolidations, and specific gravity were performed. All laboratory testing was performed at our accredited Laboratory. Additionally, 1000 Triaxial Compression tests (Unconsolidated Undrained) were performed to determine the soil strength. All laboratory testing was performed at our accredited Laboratory.

Firm Name	APS Engineering and Testing				F	Past Performan	ce Evaluation Discipline(s)*	Geotech
Project Name	I-10 CALCASIEU RIV			Firm responsibility (prime or sub?)			Prime	
Project Number	H. 00391 Owner's I			DOTD				
Project Location	Calcasieu Parish, Louis	siana		Owner's Project Manager Kristy Smith, P.E.			Kristy Smith, P.E.	
Owner's address, phone,	email	1201 Capitol Acces	s Rd., Baton Rou	uge, LA 708	82-44	138   225.379	0.1016   kristy.smith2@la	.gov
Services commenced by t	this firm (mm/yy)	06/21	Total consultant contract cost (			0's)		n/a
Services completed by th	is firm (mm/yy)	firm (mm/yy) 11/21 Cost of consulta			rided by	y this firm (\$1,0	100's)	\$257K

Geotechnical Investigation to provide client with the necessary information for planning and design a new I-10 Calcasieu bridge. APS was tasked thru our DOTD geotechnical retainer to drill and sample a total of 26 deep borings. APS performed all the laboratory testing per ASTM standards to facilitate the geotechnical design. Soil classification tests such as, natural moisture contents, Unconsolidated Undrained, liquid and plastic limits, unit weight, grain-size analyses, consolidations, and specific gravity were performed. All laboratory testing was performed at our accredited Laboratory.



# Similarities to professional Geotechnical Services IDIQ

- » Geotechnical Explorations (GE)
- » Laboratory Testing
- » Contract Management (CM)

# Proposed staff who worked on this project:

Sergio Aviles

Firm Name	APS Engineering and Testing					Past Performan	ce Evaluation Discipline(s)*	Geotech
Project Name	I-10 LOYOLA INTERCHANGE IMPROVEMENTS					Firm	responsibility (prime or sub?)	Prime
Project Number	H.011670 Owner's Nar			DOTD				
Project Location	Jefferson Parish, Louis	siana		<i>Owner's Project Manager</i> Kristy Smith, P.E.			Kristy Smith, P.E.	
Owner's address, phone,	email	1201 Capitol Acces	s Rd., Baton Rou	uge, LA 708	32-4	438   225.379	0.1016   kristy.smith2@la	.gov
Services commenced by t	this firm (mm/yy)	06/18	Total consultant contract cost (\$1,00			00's)		n/a
Services completed by th	is firm (mm/yy)	10/18	Cost of consultant	services prov	services provided by this firm (\$1,000's)			\$300

**Geotechnical investigation to provide client with the necessary information for planning and design a new Interchange to connect to the new airport terminal. A total of 33 borings were completed.** APS performed all the laboratory testing per ASTM standards to facilitate the geotechnical design. Soil classification tests such as, natural moisture contents, Unconsolidated Undrained, liquid and plastic limits, unit weight,

grain-size analyses, consolidations, and specific gravity were performed. All laboratory testing was performed at our accredited Laboratory. DOTD tasked this project to APS with accelerated program to meet their bidding deadline. A P S was successful to meet DOTD ahead of their deadline and under budget to help keep the project on track.

# Similarities to professional Geotechnical Services IDIQ

- » Geotechnical Explorations (GE)
- » Laboratory Testing
- » Contract Management (CM)

# *Proposed staff who worked on this project:*

Sergio Aviles



Firm Name	<b>ARA</b>					Past Performan	ce Evaluation Discipline(s)*	Data Collection
Project Name	MISSISSIPPI STATEWIDE FRICTION TESTING, 20				Firm responsibility (prime or sub?)			Sub
Project Number	n/a Owner's Name			Mississip	Mississippi Department of Transportation			
Project Location	Statewide, Mississippi			Owner's Pro	Owner's Project Manager Cindy Smith, P.E.			
Owner's address, phone,	email	401 N. West Street,	Jackson, MS 39	201   601.3	359.	.7648   cjsmith	@mdot.ms.gov	
Services commenced by t	this firm (mm/yy)	04/22	ontract cost (	ontract cost (\$1,000's)			\$426	
Services completed by th	is firm (mm/yy)	09/22	Cost of consultan	t services prov	vided	by this firm (\$1,0	000's)	\$426

ARA provided locked-wheel pavement friction testing services to the State of Mississippi on over 14,000 miles of pavements as a subconsultant to Michael Baker. Testing involved two teams covering all roads under MDOT jurisdiction within a nine-week testing window. Each team utilized testing rigs in compliance with ASTM E-274 with both ASTM E-501 ribbed tires and ASTM E-524 smooth testing tires. Results were delivered in two databases – one with detailed point-by-point test information and one with summary results for each pavement analysis section. Testing and delivery of data were completed ahead of schedule.

- Over 14,000 miles of statemaintained highways
  - » Pavement friction testing
  - » Delivery of testing results in multiple databases

#### Proposed staff who worked on this project:

Peter Dalbey



Firm Name	ARA					Past Performan	ce Evaluation Discipline(s)*	Data Collection
Project Name	WISCONSIN STATEW		Firm responsibility (prime or sub?) Prime			Prime		
Project Number	n/a Owner's Name			Wisconsi	Wisconsin Department of Transportation			
Project Location	Statewide, Wisconsin			Owner's Project Manager Ali Arabzadeh			Ali Arabzadeh	
Owner's address, phone,	email	3502 Kinsman Blvd,	Madison, WI 5	3704   608.246.5327   ali.arabzadeh@dot.wi.gov			bzadeh@dot.wi.gov	
Services commenced by	this firm (mm/yy)	06/16	ontract cost (\$1,000's)				\$272	
Services completed by th	l by this firm (mm/yy) Ongoing Cost of consu			services prov	ided	by this firm (\$1,0	000's)	\$272

ARA has provided locked wheel skid testing in compliance with ASTM E-274 and ASTM E -501 on up to 92 test sections throughout Southern and Central Wisconsin since 2016. Testing has included testing at an interval of 20 skids per mile at 40 mph in both urban and rural locations in and around Milwaukee, Madison, La Crosse, Eau Claire, and Wausau. Test data was processed and delivered to WisDOT in tabular and graphical formats in Microsoft Excel along with geo-located results presented in a Google Earth .KMZ file.

## Performed wheel skid testing on more than 90 test sections statewide Wisconsin.

- » ASTM E-274 compliance
- » ASTM E-501 compliance

## Proposed staff who worked on this project:

Peter Dalbey



Firm Name	<b>Firb</b>				Past Performa	nce Evaluation Discipline(s)*	Data Collection
Project Name	PAVEMENT STRUCT DEFLECTION DEVIC	IC SPEED	Firm	responsibility (prime or sub?)	Sub		
Project Number	n/a	n/a Owner's Name			lighway Admini:		
Project Location	Nationwide			Owner's Pro	ject Manager	Nadarajah Sivaneswar	an
Owner's address, phone,	email	6300 Georgetown	Pike, McLean, V	A 22101   202.493.3147   nadarajah.sivaneswaran@			dot.gov
Services commenced by t	this firm (mm/yy)	07/18	Total consultant c	ontract cost (\$1,000's)			\$3,500
Services completed by th	is firm (mm/yy)	Ongoing	Cost of consultant	t services prov	ided by this firm (\$1,	000's)	\$3,500

Participant Agencies – Eastern Federal Lands and Departments of Transportation from the states of AR, CA, CO, GA, ID, IL, IN, KS, KY, LA, MI, MS, MO, NV, NM, NC, OK, PA, SC, TN, TX, VR, VA, WI.

ARRB is an early adopter and the only North American operator of high-speed pavement data collection devices that integrate 3D laser technology (for identification of pavement surface defects) and Traffic-Speed Deflectometer (for continuous pavement structural monitoring). ARRB was selected to provide comprehensive pavement data collection services through a Federal Pooled Fund Study Project, because ARRB's innovative data collection solution was identified as key to overcome existing data collection shortfalls. ARRB is currently under contract to provide multi-year comprehensive pavement evaluation services to participating State and Federal agencies.

ARRB uses the intelligent Pavement Assessment Vehicle (iPAVe) to collect functional and structural data on pavements at traffic speeds. Collected data includes sub meter positioning, road geometry, cracking, IRI, rutting, texture, right-o f-way imagery, and continuous deflection. ARRB collects pavement data on approximately **20,000 – 25,000 miles of Interstate**, US, and State highway networks for participant agencies annually. The data ARRB collects and delivers are used for paving project selection and integration into DOTs' pavement management systems.

The iPAVe has also been used to collect pavement surface and structural data at locations where other means of data collection would not have been feasible. One example is the recently completed evaluation of the roads surrounding the National Mall in Washington, D.C. ARRB coordinated with local and federal authorities

Besides making comprehensive pavement condition data available to participant State DOTs, the results of this project are expected to significantly improve the extent and quality of data DOTs will routinely use as part of their pavement management and maintenance operations.

### Proposed staff who worked on this project:

- Nathan Kebede
- Jerome
- Daleiden
- Michael
- Nate Bech Brian Serzega Keith Souder

Richardson

Keith Souder

and deployed iPAVe to collect surface distress and pavement deflection data on the identified roads. The data were used to quickly and accurately identify locations where the underlying concrete pavement joints had deteriorated.



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Prime Consultant Firm Name: Michael Baker International, Inc.

Firm Name	<b>Firb</b>				Past Performan	ce Evaluation Discipline(s)*	Data Collection
Project Name	VIRGINIA DOT IPAV	E COMPREHENSIVE	E PAVEMENT		Firm	responsibility (prime or sub?)	Prime
	ASSESSMENT						
Project Number	n/a Owner's Name			Virginia D	epartment of Tra		
Project Location	Statewide, Virginia			Owner's Pro	ject Manager	Brian Diefenderfer	
Owner's address, phone,	email	530 Edgemont Rd,	Charlottesville,	VA 22903	434.293.1944   b	orian.diefenderfer@VDO	T.Virginia.gov
Services commenced by	this firm (mm/yy)	04/19	Total consultant co	ontract cost (\$	\$1,000's)		\$660
Services completed by th	is firm (mm/yy)	10/19	Cost of consultant	services provi	ided by this firm (\$1,0	000's)	\$600

Historically, Virginia Department of Transportation (VDOT) undertook network-level structural assessments of its pavements using a Falling Weight Deflectometer (FWD). An FWD is a stationary testing device, requiring extensive and high-risk traffic control and covers no more than 25 miles per day. Although it only assessed a small portion of Virginia's entire roadway system, it took nearly three years to complete. Therefore,



ARRB's data upload to Hawkeye Insight enabled VDOT VTTI easy access and visualization of the data for analysis and further research.

### Proposed staff who worked on this project:

- Nathan Kebede 🔹 Keith Souder
- Jerome
- Daleiden

network-wide structural assessment is not particularly feasible utilizing this device. This method proved to be excessively inefficient and expensive and more importantly, very high risk from a safety perspective. That meant

DOT's primary and secondary road network, which represent a majority of the lane mileage on Virginia's highway system, had no recent structural information available.

ARRB Group, Inc. performed a comprehensive pavement inventory of 4,400 lane miles of mainline pavements along the Virginia DOT Road Network in 2019. The project's goal was to conduct a scaled-up pilot project to determine the ranges of structural parameters that can be generated from a more comprehensive assessment. ARRB used the intelligent Pavement Assessment Vehicle (iPAVe) to gather continuous pavement deflection data as pavement surface distress data using the integrated 3D LCMS sensors. ARRB was responsible for performing pre and post validations, quality checks on the collected and processed data.

Firm Name	Frrb				Past Performan	ce Evaluation Discipline(s)*	Data Collection
Project Name	NEW MEXICO DOT IPAVE COMPREHENSIVE PAVE			ТИ	Firm responsibility (prime or sub?)		Prime
	ASSESSMENT						
Project Number	n/a	n/a Owner's Name			ico Department	of Transportation	
Project Location	Statewide, New Mexic	:0		Owner's Pro	ject Manager	Rais Rizvi	
Owner's address, phone,	email	7315 Cerrillos Rd, Sa	anta Fe, NM 87	507   505.4	67.9243   Rais.Ri	zvi@state.nm.us	
Services commenced by	this firm (mm/yy)	07/21	ontract cost (\$1,000's)			\$500	
Services completed by th	this firm (mm/yy) Ongoing Cost of consultan			services prov	ided by this firm (\$1,	000's)	\$500
The second se	10.10 A						



ARRB Group, Inc. was awarded a 4-year contract by New Mexico Department of Transportation to collect Comprehensive Pavement Assessment data collection using the intelligent Pavement Assessment Vehicle (iPAVe) after successfully completing data collection roads for NMDOT in 2019 and 2020 as part of Federal Highways Administration (FHWA) Pooled Fund Study TPF-5(385), Pavement Structural Evaluation with Traffic Speed Deflection Devices (TSDDs).

The iPAVe utilizes innovative traffic speed deflectometer technology, right-of-way cameras, and 3D LCMS integrated with the Hawkeye operating system, enabling comprehensive road surface and structural condition assessment.

Doppler lasers monitor the response of a pavement to the application of a rolling load, providing data that includes continuous pavement deflection profiles, from which bearing capacity indices can be derived and pavement fatigue estimated.

The high accuracy and resolution of the iPAVe enables engineers to pin-point areas where the pavement has structural deficiencies and could be subject to failure. Roughness, rutting, texture, geometry, and automated cracking are measured along with several high-definition cameras to collect asset and 3D pavement imagery, with the Hawkeye Platform fully synchronizing all data streams.

Firm Name					Past	st Performanc	e Evaluation Discipline(s)*	Data Collection Bridge
Project Name	IDIQ CONTRACT FOR STRUCTURES STATE	N OF		Firm re	Prime			
Project Number	4400015262/4400017	163	Owner's Name	DOTD				
Project Location	Statewide, Louisiana			Owner's Pro	Owner's Project Manager Haylye Brown, PE			
Owner's address, phone,	email	1212 East Highway	Drive, Baton Ro	ouge, LA 70	, LA 70802   225.379.1500   haylye.brown@la.c			vo
Services commenced by t	this firm (mm/yy)	06/19	06/19 Total consultant contract cost (\$1,			)		\$3,875
Services completed by th	is firm (mm/yy)	Ongoing	Ongoing Cost of consultant			his firm (\$1,0	\$3,467	

BDI is contracted to perform statewide NDE of structures for DOTD under this contract and has performed 13 Task Orders (TO) in the last three and a half years. BDI is familiar with the TO process and works with DOTD to assist in scope development to ensure solutions are met by the assigned objectives and scope activities such that DOTD can better manage their assets with improved data provided by the services as part of this contract.

Scope items typically include testing of bridge decks, pavement roadways and bridge overlays, concrete substructures, steel elements such as welds and pin and hanger assemblies, unknown foundations, tunnels, culverts, and other highway transportation infrastructure.



A trusted service provider, BDI is currently engaging in a successful contract with the DOTD, providing nondestructive evaluation of structures for the entire state of Louisiana.

Proposed staff who worked on this project:

• Tom Weinmann

Firm Name						Past Performan	ce Evaluation Discipline(s)*	Data Collection Bridge Road
Project Name	USACE/ERDC/TENSA	ER		Firm	responsibility (prime or sub?)	Sub		
Project Number	n/a		Owner's Name	US Army	Cor	ps of Enginee	ers – ERDC	
Project Location	Vicksburg, Mississippi			Owner's Pro	Owner's Project Manager Tommy Carr			
Owner's address, phone,	email	3903 Halls Ferry Rd,	3903 Halls Ferry Rd, Vicksburg MS 39180   60				ld.T.Carr@usace.army.m	vil
Services commenced by	this firm (mm/yy)	05/22	ontract cost (\$1,000's)				\$17,800	
Services completed by th	is firm (mm/yy)	m (mm/yy) 6/22 Cost of consulta			services provided by this firm (\$1,000's)			\$17,800

Bridge Diagnostics, Inc. (BDI) provides a complete line of pavement instrumentation and data acquisition system for the measurement of pavement and subsurface response. This instrumentation is used by accelerated test pavement facilities, universities, and contractors to help validate pavement design performance and measure in-situ pavement distress.

Most recently, BDI worked under contract with Tensar Corp. at the U.S. Army Engineer Research and Development Center (ERDC) pavement testing facility in Vicksburg, MS to evaluate pavement performance utilizing geogrid to enable reduction of base course thickness. This was accomplished using BDI's proprietary Multi-Depth Deflectometer (MDD) placed into the existing pavement to measure the sub-surface deformation of soil support layers under heavy vehicle simulated (HVS) loads.



BDI's tool, the Multi-Depth Deflectometer, which is used by various entities in collecting pavement performance information, facilitates accurate measuring of sub-surface soil layers.

Proposed staff who worked on this project:Tom Weinmann

Firm Name	Precision Systems, Inc.				P	Past Performan	ce Evaluation Discipline(s)*	Data Collection Planning
Project Name	DDOT FY21 ROADW	Firm responsibility (prime or sub?) Prime			Prime			
Project Number	n/a	Owner's Name	District of Columbia Department of Transportation			n		
Project Location	Washington, DC			Owner's Pro	Owner's Project Manager Edward Carpenter			
Owner's address, phone,	email	250 M Street SE, Wa	shington, D.C.	20003   20	2.671	1.4685   ddot	@dc.gov	
Services commenced by t	this firm (mm/yy)	07/22	Total consultant c	ontract cost (\$1,000's)				\$2,400
Services completed by th	is firm (mm/yy)	Ongoing	services provided by this firm (\$1,000's)			\$1,400		

PSI conducted DC's annual pavement condition assessment and inventory for the District's entire 2,100 lane-mile roadway network. PSI used the ASTM D6433 Pavement Condition Index (PCI) method, the HPMS method, and developed a web accessible pavement management software system to inventory, classify, score distresses, and help the city optimize its available budget to deliver the greatest overall improvement.

PSI collected data in a state-of-the-art and wellequipped pavement evaluation vehicle using DDOT's

GIS LRS network data. Photogrammetric methods were used to perform the distress measurements for the PCI calculations. Visible distresses were documented and measured in-office for categorical values and linear measurements. This method was most cost-effective and efficient due to managed data size and complexity. All applicable pavement surface distress data were processed to produce the PCI, and then it was provided to DDOT. The profile data were collected with an Inertial Laser Profiler meeting ASTM and AASHTO standards for continuous measurement of profile, roughness/IRI, and texture.

The team also reviewed existing inventory and conditions data from DDOT and used the firm's extensive GIS and data management experience and familiarity with DDOT standards to ensure the production of the PCI shapefile, **Project Highlights** 

- **Condition Assessment**
- Pavement management Software
- Asset Inventory
- Assessment »
- Data Collection 33
- QA/QC Assurance »
- Planning & Reporting »
- Data Management »

### Proposed staff who worked on this project:

- Jianwei Wang
- Nathan Kebede
- Jerome
- Daleiden Michael
- Brian Serzega Keith Souder

Nate Bech

Richardson

data export to PAVER, uploads to Mapillary, provision of the ESRI ArcGIS database extension for images and attributes, and other data management tasks.

PSI provided an accurate inventory of pavement condition data for DDOT to schedule and budget needed pavement repairs and proactively address highpriority areas before they became the subject of public complaints. PSI also assisted DDOT on HMPS report to FHWA. Additionally, PSI's internal QA/QC team and traffic engineers ensured that both real-time field collection guality checks and the in-office QA/QC protocol included reasonable threshold values for identifying outliers on all measurements, based on engineering judgment for the range of reasonable values on DC's urban pavements. PSI ensured that guality was maintained for all project tasks, including data collection, visual processing, data entry, and inventory database development.

Firm Name	Precision Systems, Inc.				Past Performan	ce Evaluation Discipline(s)*	Data Collection Planning
Project Name	DDOT MOBILE PAVE	MENT MARKING R	ETROREFLECT	Ινιτγ	Firm	responsibility (prime or sub?)	Prime
	MEASUREMENT AN	D DATA COLLECTIO	)N				
Project Number	n/a		Owner's Name	District of	<sup>r</sup> Columbia Depa	rtment of Transportatio	n
Project Location	Washington, DC			Owner's Pro	iect Manager	Ogechi Elekwachi, Ph.(	Э.
Owner's address, phone,	email	7250 M Street SE, W	/ashington, D.C	. 20003   202.369.7483   ogechi.elekwachi@dc.gov			
Services commenced by	this firm (mm/yy)	08/22	Total consultant co	ontract cost (\$	1,000's)		\$720
Services completed by th	is firm (mm/yy)	Present	Cost of consultant	services provi	ded by this firm (\$1,	000's)	\$420

For this contract, PSI led a team with two subcontractors and was in charge of collecting citywide pavement marking data for both asphalt and concrete paved streets in the District of Columbia. The pavement marking data was collected and processed for use in DDOT Roads and Highways software, and then it was added to an existing DDOT database.

All applicable pavement marking data was provided to DDOT and loaded into DDOT's recommended database. The measurements were processed for viewing in a GIS-based Asset Management Imaging System and for use in an ArcGIS extension that facilitated review and analysis.



## Project Highlights

- » Data Collection
- » GIS Asset Management System
- » Pavement management Software
- » Assessment
- » QA/QC Assurance
- » Planning & Reporting
- » Data Management

Proposed staff who worked on this project:

🦞 🛛 Jianwei Wang

PSI consulted with the stakeholders and DDOT-GIS team to design a datastore that supported the functional requirements and specifications, and metadata information provided. The preferred datastore option leveraged DC Government and other cloud-hosted data storage capabilities to house and allow for easy retrieval of existing ROW images and their associated metadata (e.g., route, date collected, latitude, and longitude).

PSI designed and developed an application that provided access to the datastore. The application used RESTful APIs to provide connectivity to both the ArcGIS Extension and the Web-based application.

The PSI team collected data using DDOT's GIS Linear Referencing System (LRS) network file. Data was collected based on the Route ID and associated From and To measures. The PSI team conducted independent QA/QC review to ensure that quality pavement data was delivered to DDOT.
Firm Name	Precision Systems, Inc.				Past Performan	ce Evaluation Discipline(s)*	Data Collection Planning
Project Name	DDOT CITYWIDE SIDEWALK AND RETAINING WALL CONDITION SURVEYS				Firm	responsibility (prime or sub?)	Prime
Project Number	n/a		Owner's Name	District of Columbia Department of Transportation			n
Project Location	Washington, DC			Owner's Proj	ect Manager	Edward Carpenter	
Owner's address, phone,	email	250 M. Street SE, W	ashington, D.C.	20003, 202	.671.4685, edwa	ard.carpenter@dc.gov	
Services commenced by t	rvices commenced by this firm (mm/yy) 02/13		Total consultant c	Total consultant contract cost (\$1,000's)			\$835
Services completed by this firm (mm/yy) 02/14 Cos		Cost of consultant	Cost of consultant services provided by this firm (\$1,000's)			\$680	

In 2004-2005, PSI conducted field inspection of the DC's sidewalks and retaining walls and provided a physical condition score and prioritization system for maintenance for this DDOT project. In 2013-2014, PSI created a web-based, interactive GIS asset management system that inventoried the sidewalk network and retaining walls, and re-conducted field inspection, scoring, and prioritization, this time with a custom automated data collection method that included a photograph archive of the entire surveyed area. Over 50,000 sidewalks and retaining walls were analyzed.



# Project Highlights

- » Field Inspection
- » GIS Asset Management System
- » Scoring
- » Prioritization
- Survey
- » QA/QC Assurance
- » Planning Assistance
- » Analysis
- » Data Collection

Proposed staff who worked on this project:

Jianwei Wang

PSI developed a formula to rate sidewalks and retaining walls based on the type and quantity of physical distresses they showed. These distresses were directly related to the safety and strength of the assets, and

included: missing/present, cracking, separation, settlement, patching, scaling, tree damage, and tilted retaining walls. The numerical formula for rating kept condition scores consistent and objective.

PSI also created a priority rank system that provided asset management planners with more details than the physical condition. Ten years apart, the recollection of condition data twice enabled PSI to provide condition trending, and identify areas that had deteriorated more rapidly than others.

Additionally, PSI developed a multi-tier, cross-team QA/QC program, where PSI, DDOT, and a sub consultant each were involved in the inspection process. PSI and RAMS, our sub-contractor, divided the inspection effort. The complete photoset for an asset was inspected and distresses were documented. Samples of inspected assets were reviewed within the company before being passed for review to the other company and DDOT. At each stage, there were opportunities for comments and revisions. This ensured that any inconsistencies in inspection procedures were discovered and corrected.

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Firm Name	Upn				P	Past Performand	e Evaluation Discipline(s)*	Data Collection
							1 ()	
Project Name	KYTC PAVEMENT FRICTION MANGEMENT PROGRAM					Firm ı	responsibility (prime or sub?)	Prime
Project Number	n/a	Owner's Name	КҮТС	КҮТС				
Project Location	Statewide, Kentucky		Owner's Project Manager Mike Vaughn					
Owner's address, phone, email 200 Mero Street, Fr		200 Mero Street, Fra	ankfort, KY 40601  502.564.3020   mike.vaughn@ky.gov					
Services commenced by	d by this firm (mm/yy) 07/20		Total consultant co	tal consultant contract cost (\$1,000's)			\$1,700	
Services completed by this firm (mm/yy) Ongoing		Cost of consultant	st of consultant services provided by this firm (\$1,000's)			\$450		

In 2020, the Kentucky Transportation Cabinet (KYTC) contracted with WDM USA to help KYTC establish a cost-effective, data-led pavement friction management program. The contract specified: Data Collection on approximately 15,000 lane miles of KYTC-maintained Interstate, Parkway, State Primary, and State Secondary routes and ramps annually, and Data Analysis/Data Management Technical Assistance, including analyses and advisory services to fast-track KYTC's learning process, demonstrate the value of pavement friction management, and accelerate program implementation.

Now in Year 3 of the contract, WDM USA collects and delivers all GPS-linked SCRIM data, including: continuous friction, texture, roughness, roadway geometrics (grade, curvature, cross-slope), and forward-facing video in accordance with AASHTO TP 143 (Standard Method of Test for Continuous Measurement of Sideway-Force Friction Number for Highway Pavements).

To ensure the quality of SCRIM data collection, WDM USA has implemented an ongoing equipment validation and calibration program featuring daily, weekly, and monthly checks against benchmarked data. WDM USA has also instituted a robust data quality control process with a series of independent quality checks, a secure chain of custody, and multiple failsafes. SCRIM data are stored in the cloud and shared through WDM's analytics software, SCRIM System for Analysis and Friction Evaluation or SCRIM-SAFE, as well as delivered directly by GeoJSON spatial files for integration with KYTC's enterprise database and pavement management systems.

1 (5,000 miles), 2 (5,000 miles for a State DOT), 3 (multiple cycles), and 4

All Project Management, Analyst, and Technician roles included in the DOTD proposal have also performed work on this project.

Proposed staff who worked on this project: • Ryland Potter

In addition to Data Collection/Delivery, KYTC asked WDM USA to identify ways to "shortcut" the learning process to achieving accelerated results from its proposed pavement friction management program. To that end, WDM USA developed a Data Analysis Technical Assistance (DATA) Roadmap with parallel Data Analysis and Data Management Plans. The DATA Roadmap outlined a set of analyses and deliverables that increased in sophistication as data became available.



Firm Name	up .					Past Performan	ce Evaluation Discipline(s)*	Data Collection
Project Name	SCRIM AND HIGH-SI	ONDITION SU	RVEYS	YS Firm responsibility (prime or sub?)		Prime		
Project Number	n/a	Owner's Name	Waka Kot	Waka Kotahi New Zealand Transport Agency				
Project Location	New Zealand (Nationa		Owner's Project Manager Barry O'Shea					
Owner's address, phone,	email	Private Bag 11777,	Palmerston Nor	th 4442, N	lew Z	Zealand   +64	06 953 6991   Barry.OS	hea@nzta.govt.nz
Services commenced by this firm (mm/yy) 01/07		Total consultant co	otal consultant contract cost (\$1,000's)			\$2,300		
Services completed by this firm (mm/yy) Ongoing C		Cost of consultant	st of consultant services provided by this firm (\$1,000's)			\$875		
Owner's address, phone, emailPrivate Bag 1172Services commenced by this firm (mm/yy)01/07Services completed by this firm (mm/yy)Ongoing		Private Bag 11777, 01/07 Ongoing	Palmerston Nor Total consultant co Cost of consultant	th 4442, N ontract cost ( services prov	lew	Zealand   +64 0's) by this firm (\$1,0	06 953 6991   Barry.OS	hea@nzta.govt.nz \$2,300 \$875

This project represents the fourth contract awarded to WDM by the WK-NZTA. The contract specifies the collection of 24,000 lane km (15,000 lane miles) of GPS-linked SCRIM continuous friction, texture, rutting, and transverse profile data and forwardfacing videos for the state highway network. Testing is performed in line with WK-NZTA's T10 Specification for State Highway Skid Resistance Management. WDM originally used one SCRIM vehicle to complete the State Highway data collection but added a second SCRIM vehicle in 2013 to facilitate earlier completion of survey work and service a growing demand for survey work from local authorities.

In this contract, WDM provides data on rolling basis through a process called "exception reporting."



 1 (5,000 miles), 2 (5,000 miles for a large organization/ agency), 3 (multiple cycles), and 4 (all deliverables outlined in Attachment A).

Several Project Management, Analyst, and Technician roles included in the DOTD proposal have also performed work on this project.

Proposed staff who worked on this project:

Ryland Potter

Exception reports give authorities early warning of sites with low skid resistance and allows them to program projects that can deliver immediate safety improvement benefits without having to wait for an additional funding cycle. Through a long-established commitment to innovation, WDM and WK-NZTA have also partnered

on a number of technical assistance initiatives, including: trials to determine the localized effect of temperature on skid resistance measurements, research on the effects of binder tracking and flushing on stopping distance, and maintenance prioritization and scheduling best practices in response to weather emergencies/disasters. WDM's site categorization process, calculation of "Investigatory Levels," and work correlating site category and crash risk have all directly informed the friction demand/supply standards set out in WK-NZTA's national friction policy. Lastly, WDM and WK-NZTA partnered to develop a worldclass equipment validation and calibration process that has been adopted by other countries.



#### **18. APPROACH AND METHODOLOGY**

Provide a description of how the work will be performed and provide the proposed project schedule. Include any additional information or description of unique resources that are planned to be used to produce the deliverables. In addition, document existing Data Collection Vehicle Inventory (DCV) using the table provided below. Include any proprietary technologies, methods or approaches that will be used on this project to improve quality or efficiency. This section shall be limited to four pages. If more than four pages are included, all pages after the fourth page will not be evaluated. If the consultant has information, it believes is proprietary, label it accordingly.

With one of the largest roadway network and pavement management programs in the nation, Michael Baker recognizes that the Louisiana Department of Transportation and Development (DOTD) places a high priority on completing the annual Pavement Distress Data Collection effort on schedule and that it is critical the DOTD has access to reliable pavement condition data to meet reporting requirements and make informed infrastructure investment and pavement management decisions. Michael Baker understands the DOTD is a national leader in utilizing technologically advanced methods of collecting high-quality Pavement Distress Data and values robust QA/QC programs that deliver repeatable results. Over the last 20 years, Michael Baker has developed forward-looking asset, roadway characteristics, and pavement data collection processes to meet the growing needs of Department of Transportation (DOT) requirements for the provision of reliable pavement management data. We offer the DOTD a proven partner comprised of experts within each required discipline that will deliver on all aspects of this important program. As a responsible steward of Louisiana tax dollars, we have also bolstered our team's local resources with two highly gualified DBE firms and reaffirmed our commitment to triple the DOTD's 4% DBE participation goal with a total anticipated DBE participation of 12.8%.

As a national, full-service civil and transportation engineering firm with experienced in-house pavement evaluation and pavement management capabilities, Michael Baker will deliver high guality Pavement Distress Data Collection solutions with insight into how this data can best support DOTD efforts to continually improve the **quality**, safety, and efficiency of Louisiana's roadway infrastructure. Michael Baker is one of the foremost experts in the application of Remote Sensing technology for cataloging information on our nation's critical infrastructure. The geospatial sciences have been at the core of our offerings since our founding, which has led an innovative spirit and numerous industry-firsts including patenting GPS mapping technology (1990), ISO 9001:2008 certification of Mobile LiDAR collection and processing, and FHWA certification of LCMS for pavement condition assessments (2016), among others. Michael Baker has been providing pavement management services to transportation agencies for over two decades, and our teaming partner, ARRB has been leading the profession internationally for over 60-years.

Our innovative solutions collect exacting information on pavement, roadways, bridge clearances, ADA/pedestrian facilities and all assets important to the DOTD. In addition to our proven excellence in data collection, the development of data standards and leveraging GIS and Linear Referencing Systems (LRS) has been a core focus for the past 40 years. Since 1984 we have been a continuous Silver-level (or above) Business Partner with Esri for GIS services, and we collaborated with the FHWA to develop the All Road Network of Linear Referenced Data (ARNOLD) Reference Manual in 2014, which was pivotal to our successful completion of the nation's first statewide Model Inventory of Roadway Elements (MIRE) project. Our past accomplishments have been instrumental to the ongoing successful performance of several statewide Pavement Condition inventory projects in Mississippi, New Jersey, and West Virginia, as well as recent statewide Mobile LiDAR asset inventories in Kentucky, Pennsylvania and Texas.

After thoroughly reviewing DOTD's Request for Proposal, Pavement Distress Identification Protocols, and Pavement Data Collection QMP, we have tailored our project methodology, approach, and work plan to exceed the DOTD's expectations and deliver timely, repeatable, and defensible results each of the six years. We have the expertise, available resources (personnel, equipment, tools, and infrastructure), and comprehensive project plan to deliver on all fronts for the DOTD.



To view a complete listing of Technical Detail Response items please see the Tables in Section 21 - QA/QC. (see page 86)

#### PROPOSED METHODOLOGY

Quality Assurance / Quality Control (QA/QC): Quality management is a trademark of Michael Baker's commitment to our customers. We have developed and implemented a comprehensive company-wide Quality Management System (QMS) that will be utilized to ensure that all project work is assigned, carried out, and reviewed to meet or exceed the DOTD's requirements and professional standards for technical quality. Our commitment to quality is further referenced by our past investment in ISO 9001:2008 certification (2012), with a focus on Geospatial Information Technologies. Additionally, Michael Baker has aided DOT clients at the state level with the development of federally mandated Data Quality Management Plans (DQMP), relating to pavement data collection as required by the Federal MAP-21 program. Our team will maintain a thorough Quality Control Plan (QCP) that is adapted to unique DOTD specifications – see Section 21 of this proposal - that documents the quality management practices and responsibilities our team will use for pavement data collection and extraction.

Project Delivery Schedule: To best manage the multiple tasks associated with both phases of the project cycle, Michael Baker will finalize a detailed data collection, processing, QA/QC, and delivery schedule with the DOTD during the Preliminary Activities & Initial Pilot task. We will finalize all other work items included in the Preliminary Activities & Initial Pilot task before Baseline Calibration and general data collections begin. To facilitate frequent communications between the DOTD and Michael Baker project teams, bi-weekly meetings and regular status report cycles will be established from the contractual Notice-to-Proceed (NTP) through project completion; however, the DOTD will also have realtime access to all collection and production mileages through a custom project dashboard. Michael Baker acknowledges that delivery timelines for Task 2 through Task 9 cannot be adjusted due to Federal deadlines and requirements and is committed to making timely submissions. Task 2 through Task 11 deliverables for Phase A and Phase B will be submitted on a bi-weekly basis throughout the performance period.

We are prepared to begin both Task 12 and Task 18 immediately upon receiving DOTD approval and will submit deliverables bi-weekly. To ensure a reasonable workload for DOTD staff, Michael Baker will deliver Task 13 and Task 19 bi-weekly, starting from the initiation of Task 12 and Task 18, but no later than May 1st, and will complete delivery before September 30th for Phase A performance years. Michael Baker's approach will additionally deliver Tasks 14, 15, 20, and 21 between March 1st and September 30th of Phase B performance years.

In the rare event that any results or deliverables are deemed to be unacceptable by the DOTD, Michael Baker will resolve any deliverable anomalies flagged by the DOTD following submission review (if any), including any necessary recollection and/or reprocessing within 14 calendar days.

#### **PROJECT APPROACH AND WORK PLAN**

Our comprehensive technical approach is based on the project goals and our ability to provide added benefits to the DOTD through the latest pavement data collection technology, data analysis, and visualization from Michael Baker's local office in Baton Rouge, LA. Key features of our approach include:

Preliminary Activities and Initial Pilot

- Kickoff Meeting: Within two (2) weeks of receiving NTP, our team will schedule a project kickoff meeting to address (at a minimum):
  - » Introduction of key project team members and their roles and establish lines of communication
  - » Confirmation of project scope, deliverables, methods, technical requirements, procedures, schedule, and budget
  - » Review and confirmation of deliverables, data acceptance standards and QA/QC plan
  - » Review and verification of the Baseline roadway network GIS\LRS files

In addition to the Project Kickoff meeting, Michael Baker will hold kickoff meetings at the start of each annual Phase to review all requirements, Michael Baker's approach and resources, and deliverable timeline(s).

# Deliverables: Meeting minutes and related material will be provided within one (1) week of the kickoff.

- Bi-weekly Meetings: Michael Baker will setup continuous bi-weekly meetings with DOTD throughout the term of the contract to facilitate effective communication and information sharing.
- Project Setup: We will execute our Standard Operating Procedures (SOP) for initializing the pavement distress data collection project, including

(but not be limited to): finalization of the Project Delivery Schedule, calibration and validation of Data Collection Vehicles (DCV) per the QA/ QC plan, project database initialization and configuration, configuration of our custom Distress Selector (DS) application, initialization and DOTD access to our innovative Pavement Data Viewer (PDV)service, review and loading of GIS Baseline network into our web-based tracking system, setup of project SharePoint site, and launch of our regimented manual rater training program.

# Deliverables: Project Delivery Schedule, confirmation of vehicle calibrations, confirmation of PDV and DS app setup, Access to webbased data collection tracking system.

 Initial Pilot: Upon DOTD approval, our team will mobilize to perform Baseline calibrations and begin the Initial Pilot project on a subset of the network to be selected by DOTD. The pilot will allow our team to validate data collection, calibration, and data import procedures into the dTIMS<sup>®</sup> database and assure DOTD that our results and deliverables meet project expectations. The deliverables of the Initial Pilot will be submitted on DOTD-approved media. The Initial Pilot task will be performed at the start of each project Phase where data collection is required.

Deliverables: Confirmation of Initial Pilot data collection completion, raw data from pilot data collection sites through PDV and DS apps, processed data from pilot data collection sites through Pavement Data Viewer and Distress Selector, processed pilot data formatted per project requirements, upload of pilot data into DOTD's dTIMS<sup>®</sup> database.

#### **DATA COLLECTION**

As the operator of the nation's largest fleet of engineering-grade Mobile LiDAR systems since 2009, and the subsequent addition of a fleet of DCVs, Michael Baker understands the complexity, safety, logistics, and communication aspects to successfully deliver this important program. We capture tens-of-thousands of miles of roadway data annually across the nation and have done so with no lane closures or unnecessary delay to motorists; and **all without a single safety incident.** 

Mission Planning: After successful completion of Pilot, including satisfactory submission of pilot data deliverables, Michael Baker will mobilize for full-scale production inventory. Robust mission planning is a critical element to our data collection methodology to ensure our team efficiently collects accurate data for all requested collection services each cycle - Pavement Condition, Mobile LiDAR, Friction/Skid, Ground Penetrating Radar (GPR), and Coring; we will closely coordinate with the DOTD during each Phase A and B collection cycle to promote efficiency, coordinate concurrent collections, manage access to water, and identify localized conditions that may impact operations to the team or the DOTD. A main component of our mission planning task is to obtain GIS maps of all data collection routes from the DOTD and perform a review of maps for consistency and completeness. We will request a list of any known current street maintenance activities (such as construction, road closures) to aid our team in the formation of an effective mission plan. It is part of our SOP to create a web-based field tracking map within the ArcGIS Online (AGOL) platform. <u>As an added</u> <u>value, we will provide DOTD with access to our online data collection</u> <u>tracking map to facilitate real-time DOTD monitoring of team</u> <u>progress. The mission planning task will be performed in parallel to</u> <u>the initial pilot for each Phase of the project where data collection is</u> <u>required.</u>

#### Deliverables: Finalized data collection route map through the webbased tracking system.

 Data Collection: Our team's fleet of proven DCVs are similarly configured and utilize the most-advanced 3D, GPS, and remote sensing technologies to collect accurate and repeatable pavement and roadway right-of-way data. Each DCV is equipped with four 9MP high-definition right-of-way (ROW) cameras, LCMS 3D pavement surface scanners, Gocator linelaser profilers, Distance Measuring Instruments, Differential-GPS, and an inertial measurement unit (IMU). DCVs are certified annually (AASHTO R-56) at the National Center for Asphalt Technology (NCAT) and have a pavement scanning resolution of 1mm x 1mm (longitudinal x transverse). The DCVs are fully integrated and capture synchronized data streams for all sensors. The Michael Baker team has 5 DCVs immediately available for collection and as standby contingency.

Data collection is only performed on dry pavement surfaces under adequate daylight conditions to allow for optimal ROW imagery capture. Each van will be staffed by two (2) collection experts to promote safety and efficiency. For consistent data collection, field operators follow well-defined SOPs that have been developed over many years of performing complex, large-scale projects and are leveraged across our entire team. The Michael Baker team includes strategic and exclusive partners to present the DOTD with best services for all phases of collection. **ARRB** is our trusted DCV vendor and globally renowned pavement data collection service provider that has previously provided advanced pavement data collection services to the DOTD and joins the team to bolster (and add standby) collection capacity. We have partnered with ARRB for three previous statewide pavement projects, and all with successful completions. Bridge Diagnostics, Inc. (BDI), located in Metairie, LA currently serves as the DOTD's on-call non-destructive-evaluation (NDE) and GPR services provider and will provide the same for this program. **APS** Engineering and Testing, LLC (APS), Michael Baker's DBE-certified partner, will provide the required pavement coring services to compliment the GPR surveys. Precision Systems, Inc. (PSI) - is DBE-certified in other states and currently in the process of completing the DBE certification with DOTD complements our team and adds capacity for manual pavement distress rating and LiDAR data processing. Additionally, following successful teaming on similar statewide programs, we have partnered with **Applied Research** Associates, Inc. (ARA) to provide friction data collection services, and scaling our friction collection services with W.D.M. (USA) Limited (WDM) to provide continuous friction measurement services, if required/preferred by the DOTD. Lastly, Michael Baker's in-house Mobile LiDAR fleet, which is based

in neighboring Jackson, MS and regularly performs statewide inventory projects, is available to acquire Vertical Bridge Clearance or other roadway characteristic inventory (RCI) data for the DOTD with the highest precision lasers to generate accurate and defensible measurements.

Michael Baker utilizes various control measures to ensure that project QA/ QC objectives are met and deliverables are comprehensive, consistent, and performed to exacting detail. Michael Baker's DCVs will leverage control verification sites throughout the state to perform validation collections on a weekly basis to ensure consistent results. Michael Baker will perform monthly DMI calibration on control sites identified in Louisiana, or if tire pressures fall outside of normal operating tolerance. DCV staff will also perform daily startup and end-of-day checks with our innovative field app according to Michael Baker's proven SOPs and QA/QC plan. In the rare event that any DCV or other pavement data captured by Michael Baker's team is determined to be outside our exacting standards, Michael Baker will recollect any/all affected data with no additional charge to the DOTD.

This year, Michael Baker's team has collected over 30,000 miles of pavement condition data (with remaining standby capacity to capture nearly double that mileage), and over 14,000 miles of pavement friction data within a 3-month time-frame; all data was collected ahead of schedule. We are confident in our ability successfully deliver this project to the DOTD on schedule and on budget.

Deliverables: Pavement distress data collection, GPR data collection, pavement coring, pavement friction data collection

#### DATA ANALYSIS AND DELIVERY

Data Transfer: To meet the DOTD's expected bi-weekly data delivery schedule, Michael Baker's field crew will regularly send copies of inventoried data on cataloged portable hard-drives to our cloud data center on a twice-weekly schedule. A regimented sign-in, validation and tracking system documents the movement of all data (from field to cloud), and sends automated notifications when external, re-usable drives can be safely reformatted. Our data servers are all securely hosted and backed-up nightly. They are also covered by a full Disaster Recovery plan and provisions. This approach has resulted in no recollections due to loss or corruption of data for any statewide collection project.

#### Deliverables: Confirmation of successful data transfers; access/ delivery of raw data to the DOTD

Data Processing: Once the data transfer is completed and verified, we leverage our innovative elastic cloud computing environment to multi-thread processes across an auto-scaling bank of virtual servers, enabling a magnitude increase in production capacity. **Pavemetrics' LCMS Road Inspect** software is used to process raw pavement distress data contained in raw FIS files. This software will be carefully configured to account for the specific distresses (and severity levels) that will be required to be reported. Imagery, GPS, and International Roughness Index (IRI) data will be proceeded through the Hawkeye software that is part of our integrated DCV platform. Once processed, data will be loaded into our designated project database (MS SQL Server) and available for additional post-processing. Since our DCVs are fully integrated and collect synchronized data sets, pavement condition data can be processed at intervals as small as 0.001 miles.

Pavement condition rating will strictly follow the Louisiana Distress Identification Protocols and will be performed by trained and certified raters using our DS app. The innovative DS application is Michael Baker's custom pavement rating software that is used to augment and refine the pavement distresses that are automatically detected by our LCMS equipment. DS also provides real-time synchronization between ROW imagery and LCMS 3D pavement imagery and integrates intuitive color coding and additional visual cues to rapidly identify the existence and type of distress directly overlaid on the data. The rater identification and productivity monitoring features of the DS provide Michael Baker the capability to quantify and review the ratings of all personnel for ongoing consistency testing and data quantification review. <u>Michael Baker will make the DS</u> <u>application available to the DOTD throughout the term of the contract to aid</u> <u>in your QA/QC initiatives. GPR, LiDAR, and pavement friction data will also be</u> <u>processed according to the requirements of the RFP and in consultation with</u> <u>the DOTD.</u>

Michael Baker will undertake the historical data conversion effort during this task. Data from the three previous cycles (if available) will be uploaded into our open-architecture PDV app to provide DOTD staff access to all data in a single environment. The PDV app and historical data conversion process has been successfully leveraged by other state DOTs to display historical proprietary data/imagery from previous service provides.

#### Deliverables: Delivery of pavement distress data for dTIMS® upload, delivery of pavement images, historical data conversion, delivery of ROW images, delivery of GPR data, delivery of pavement friction data, delivery of asset inventory extraction data.

SCHEDULE		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Phase A & B	Preliminary Activities				
	Mission Planning				
	Data Collection				
	Data Processing				
	QA/QC				
	Data Delivery				
Collection Services	2023				
	2024	time or the or t			
	2025				
	2026			I	
	2027		ř.		
	2028				
Collection Technology		Friction	Mobile GP	Coring	

Prime Consultant Firm Name: Michael Baker International, Inc.

# (DCV) DATA COLLECTION VEHICLE INVENTORY

Vehicle ID	Vehicle Configuration Details	Owned By	Make	Model	Year
MBI DCV 1	LCMS, four 9MP asset cameras, Hawkeye line laser longitudinal profiler and texture laser, Mosaic 51 75MP Spherical camera, GIPSI-TRAC IMU, DGPS, DMI	Michael Baker	Mercedes	Sprinter	2019
MBI DCV 2	LCMS, four 9MP asset cameras, Hawkeye line laser longitudinal profiler and texture laser, Mosaic 51 75MP Spherical camera, GIPSI-TRAC IMU, DGPS, DMI	Michael Baker	Mercedes	Sprinter	2020
ARRB DCV 2	LCMS, four 9MP asset cameras, Hawkeye line laser longitudinal profiler and texture laser, Mosaic 51 75MP Spherical camera, GIPSI-TRAC IMU, DGPS, DMI	ARRB Group, Inc.	Mercedes	Sprinter	2019
ARRB DCV 3	LCMS, four 9MP asset cameras, Hawkeye line laser longitudinal profiler and texture laser, Mosaic 51 75MP Spherical camera, GIPSI-TRAC IMU, DGPS, DMI	ARRB Group, Inc.	Mercedes	Sprinter	2020
ARRB DCV 4	LCMS, four 9MP asset cameras, Hawkeye line laser longitudinal profiler and texture laser, GIPSI-TRAC IMU, DGPS, DMI	ARRB Group, Inc.	Mercedes	Sprinter	2020
ARRB DCV 5	LCMS, four 9MP asset cameras, Hawkeye line laser longitudinal profiler and texture laser, GIPSI-TRAC IMU, DGPS, DMI, TSD	ARRB Group, Inc.	Volvo	VNL	2016
MBI LIDAR 1	Teledyne-Optech Lynx SG1 dual laser, dual-antenna GNSS, IMU, DMI, FLIR Ladybug 5 spherical camera, and four prepositional cameras	Michael Baker	Ford	F250	2019
MBI LIDAR 2	Teledyne-Optech Lynx SG1 dual laser, dual-antenna GNSS, IMU, DMI, FLIR Ladybug 5 spherical camera, and four prepositional cameras	Michael Baker	Ford	F250	2020
MBI LIDAR 3	Teledyne-Optech Lynx SG1 dual laser, dual-antenna GNSS, IMU, DMI, FLIR Ladybug 5 spherical camera, and four prepositional cameras	Michael Baker	Ford	F250	2020
MBI LIDAR 4	Teledyne-Optech Lynx SG1 dual laser, dual-antenna GNSS, IMU, DMI, FLIR Ladybug 5 spherical camera, and four prepositional cameras	Michael Baker	Ford	F350	2009



### 19. WORKLOAD

For all contracts where a firm on the team is a prime consultant or sub-consultant and where a) the consultant selection was made by DOTD, and b) a contract was executed by the consultant and the contracting entity by the date the advertisement for this proposal was posted, list all work meeting the following criteria:

1) one of the team's firms is responsible for the performance of the work;

2) authorization to perform the work has been provided, as provided in the contract between the consultant and the contracting entity;

3) the work has not yet been performed and invoiced; and

4) the work is not currently suspended for an indefinite period of time.

For indefinite delivery/indefinite quantity (IDIQ) contracts, list open Task Orders individually. List only the portion of the fees attributable to firms on the team.

Firm(s)	Past Performance Evaluation Discipline(s)*	State project number	Project Name	Remaining Unpaid Balance**
Michael Baker	CE&I/OV	Contract No. 4400014845 Task Order No. H.012018.6 S.P. No. H.012018.6 F.A.P. No. H012018	Adaptive Traffic Signal and Implementation, Lafayette Parish	\$364,841
	CE&I/OV	Contract No. 440001485 Task Order No. H.0003184.6 S.P. No. H.003184.6	IDIQ Contract for Construction Engineering and Inspection Services with majority of work in District 07, I-10: Texas State Line - E. of Coone Gully, Calcasieu Parish	\$646,248
	CE&I/OV	Contract No. 4400013851 Task Order No. H.013271.6 S.P. No. H0.013271.6 F.A.P. No. H.013271	IDIQ Contract for Construction Engineering and Inspection Services for Safety Projects (CE&I), Statewide Tangipahoa PH Local Road Safety Upgrade, Tangipahoa Parish	\$75,9715
	CE&I/OV	Contract No. 4400013851 Task Order No. H.013271.6-2 S.P. NO. H.013271.6-2 F.A.P. No. H013271	IDIQ Contract for Construction Engineering and Inspection Services for Safety Projects (CE&I) Tangipahoa PH Local Road Safety Upgrade, Tangipahoa Parish	\$19,226
	CE&I/OV	Contract No. 4400013851 Task Order No. H.013271.6-3 S.P. NO. H.013271.6-3 F.A.P. No. H013271	IDIQ Contract for Construction Engineering and Inspection Services for Safety Projects (CE&I) Tangipahoa PH Local Road Safety Upgrade, Tangipahoa Parish	\$6,125
	CE&I/OV	Contract No. 4400013841 Task Order No. H.012473.6 S.P. No. H.012473.6 F.A.P. No. H012473	IDIQ Contract for Construction Engineering and Inspection Services for Safety Projects (CE&I), Statewide Marconi Dr. Shared-Use Path	\$8,083

Firm(s)	Past Performance Evaluation Discipline(s)*	State project number	Project Name	Remaining Unpaid Balance**
Michael Baker	CE&I/OV	Contract No.4400013851 Task Order No. H.009308.6 S.P. No. H.009308.6 F.A.P. No. H009308	IDIQ Contract for Construction Engineering and Inspection Services for Safety Projects (CE&I), Statewide New Orleans DPW SRTS Sidewalk Project	\$98,063
	CE&I/OV	Contract No.4400013851 Task Order No. H.012527.6 S.P. No. H.012527.6 F.A.P. No. H012527	Local Road Safety Upgrade (W. Feliciana) West Feliciana Parish	\$133,153
	CE&I/OV	Contract No.4400013851 Task Order No. H.013082.6 S.P. No. H.013082.6 F.A.P. No. H013082	Bootlegger Road Sidewalks St. Tammany Parish	\$112,443
	CE&I/OV	Contract No. 4400015166 S.P. No. H.007288.6 (CE&I) F.A.P. No. H007288	Montgomery St. (LA 34 – I-20), City of West Monroe, Ouachita Parish	\$58
	ITS	Contract No. 4400011253 S.P. No. H.011500.6	Retainer Contract for Intelligent Transportation Systems (ITS), Lake Charles ITS Phase 3	\$6,864
	Road Bridge	Contract No. 4400021519 S.P. No. H.012030.5 F.A.P. No. H012030	US 371: KCS RR Overpasses HBI	\$274,360 \$274,360
	Road Bridge Environmental	Contract No. 4400019379 S.P. No. H.013797 F.A.P. No. H013797	LA 30: EBR PL-I-10	\$107,285 \$51,325 \$199,243
	Environmental	S.P. No. H.005168 F.A.P. No. DE-9208 (500)	NORG-Jefferson Highway EA, New Orleans, Louisiana Supplemental Agreement	\$753,297
	Environmental Road	S.P. No. H.005168	NORG – Avondale PEL Study, New Orleans, Louisiana Supplemental Agreement	\$781,426 \$95,500
	Other	Contract No. 4400017092 Task Order No. 2	Collection of Existing Watershed Datasets, Models, and Studies; and Proposition of Modeling Design Approach, Schedule and Costs, Region 6	\$876,983

Firm(s)	Past Performance Evaluation Discipline(s)*	State project number	Project Name	Remaining Unpaid Balance**
Michael Baker	Other	Contract No. 4400017092 Task Order No. 3	Collection of Existing Watershed Datasets, Models, and Studies; and Proposition of Modeling Design Approach, Schedule and Costs, Region 6	\$1,818,178
	Other	Contract No. 4400017090 Task Order No. 2	Collection of Existing Watershed Datasets, Models, and Studies; and Proposition of Modeling Design Approach, Schedule and Costs, Region 4	\$1,030,653
	Other	Contract No. 4400017090 Task Order No. 3	Collection of Existing Watershed Datasets, Models, and Studies; and Proposition of Modeling Design Approach, Schedule and Costs, Region 4	\$191,438
	Other	Contract No. 4400017067 Task Order No. 1	Collection of Existing Watershed Datasets, Models, and Studies; and Proposition of Modeling Design Approach, Schedule and Costs, Region 1	\$1,906,516
	Other	Contract No. 4400019130 Task Order No. 1	IDIQ Contract for Statewide Aviation Program Update – Phase II Statewide	\$40,906

Firm	1(s)	Past Performance Evaluation Discipline(s)*	State project number	Project Name	Remaining Unpaid Balance**
+ APS	Engineering and Testing	Geotech	H.004100	Retainer Contract for Geotechnical Services	\$233,952
	Geotech	440019336	Rural Bridges Replacement Initiative Phase II	\$443,715	
		Geotech	440019337	Rural Bridges Replacement Initiative Phase II	\$276,680

Firm(s)	Past Performance Evaluation Discipline(s)*	State project number	Project Name	Remaining Unpaid Balance**
BUI	Bridge	H.009730.5 44-17163	Retainer for Non Destructive Evaluation of Structures Task Order 1 General Services BDI1904004	\$14,397
RAW DATA. REFINED RESULTS.	Bridge	H.009730.5 44-17163	Retainer for Non Destructive Evaluation of Structures Task Order 7 Bonnet Carre Spillway 2006002	\$24,903
	Bridge	H.009730.5 44-17163	Retainer for Non Destructive Evaluation of Structures Task Order 8 I-10 Atchafalaya Floodway (EB&WB) and I-10 Over Whiskey Bay Pilot Channel	\$60,341
	Bridge	H.014703.5 44-17163	Retainer for Non Destructive Evaluation of Structures Task Order 9 Non-Destructive Evaluation of Structures Calcasieu Parish	\$4,085
	Bridge	H.009730.5 44-17163	Retainer for Non Destructive Evaluation of Structures Task Order 10 Non-Destructive Evaluation of Structures Structures 300333-612404500700651, 300335-612404500700652, and 300330-612404500700141	\$8,310
	Bridge	H.009859.5 44-02791	Bridge Monitoring System Maintenance	\$25,952
	Bridge	H.009730.5 44-17163	Retainer for Non Destructive Evaluation of Structures Task Order 11 Non-Destructive Deck Evaluation of Structures Structures 623030, 621450, 623040, 620248, 623060, 623070, 621460, 623050, 620249, and 623020	\$414,510
	Bridge	H.009730.5 44-17163	Retainer for Non Destructive Evaluation of Structures Task Order 12 Deck Evaluation of I-10 Atchafalaya Basin Bridges District 03	\$268,031
	Bridge	H.009730.5 44-17163	Retainer for Non Destructive Evaluation of Structures Task Order 13 NBI Inspection of I-10 Bonnet Carre Spillway Bridges District 02	\$76,272
	Bridge	H.009859.5 44-02791	Bridge Monitoring System Maintenance	\$25,952
	Bridge	H.010603.6 44-17263	Mississippi Bridge at Vicksburg GPS Monitoring	\$109,063
<b>ARA</b>	n/a	n/a	n/a	n/a
<b>KING</b>	n/a	n/a	n/a	n/a
Precision Systems, Inc.	n/a	n/a	n/a	n/a
um.	n/a	n/a	n/a	n/a

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Prime Consultant Firm Name: Michael Baker International, Inc.



### 20. CERTIFICATIONS/LICENSES

*IF THE ADVERTISEMENT REQUIRES SUBMISSION OF LICENSES AND/OR CERTIFICATES, INCLUDE THEM HERE. OTHERWISE, LEAVE THIS SECTION BLANK.* 

Required certifications not applicable to this submittal; however, the Michael Baker team will provide certifications at the request of DOTD.



### 21. QA/QC PLAN AND/OR WORK PLAN

The prime consultant must submit a QA/QC plan document specifically developed for this contract as part of the DOTD Form 24-102. DOTD requires the consultant and all subconsultants to develop a Quality Assurance/Quality Control (QA/QC) program in order to provide a mechanism by which all deliverables will be subject to a systematic and consistent review. The consultant shall address in its plan the review of all sub-consultant work and deliverables. Consultants must ensure quality and adhere to established DOTD policies, procedures, standards and guidelines in the preparation and review of all deliverables. DOTD may provide limited input and technical assistance to the consultant. Any deliverables to be transmitted by the consultant shall be transmitted with a DOTD Quality Assurance/Quality Control Checklist, and a certification that the deliverables meet DOTD's quality standards. If Attachment A includes specific QA/QC requirements that contradict those set forth above, the requirements in Attachment A control.

This Quality Assurance (QA), Quality Control (QC), and Quality Management Plan (QMP) documents the quality management practices and responsibilities that Michael Baker utilizes for pavement data collection provided for the DOTD. This plan includes quality management processes and protocols for the following items:

- » Equipment calibration and certification measures
- » Data collection
- » Data processing and manual distress data collection
- » Pre- and post-production data quality control measures
- » Data sampling/review practices
- » Error resolution, and acceptance criteria
- » The QA/QC activities documented will ensure that:
- » Data meets defined quality standards and requirements for acceptance
- » Data collection and processing are performed in a consistent and logical manner
- » Data quality issues are identified, and appropriate corrective actions are applied

The QA/QC measures identified in this plan were developed specifically for the DOTD Pavement Distress Data Collection Project and were prepared in consideration of the DOTD Data Quality Management Program.

With quality data, analyses from pavement management systems will provide more reliable results for decision-making processes. Standardized protocols will provide assurance that any variability in pavement condition data between years reflect actual changes in pavement quality. This will allow for better compliance with data and reporting requirements, informed treatment plans and methods, reliable projections of future pavement conditions, work prioritization, resource allocation, overall cost-savings, and reliable decision support for managers.

The Michael Baker team has developed efficient pavement data collection and post-processing procedures to translate raw pavement data into highly detailed pavement condition data and information products. Our experienced team has built and continues to improve upon a streamlined data processing and project delivery system with focus on high standards of quality, efficiency, and innovation. This document outlines those procedures, in accordance with 23 CFR 490.319(c)(1) and DOTD requirements.

We acknowledge the importance of quality to this project and understand the scale to which quality must be managed. Our company policy recognizes quality and commitment to customer satisfaction as not just a process, but also an attitude. We strive to build a culture of excellence and focus on careers, not jobs. We work as a cohesive team to meet the expectations of clients/partners and continue to buck the status-quo. Our philosophy also focuses on our attention to detail and committing to the Five Knows: know your client, know your team, know your business, know your math, and NO COMPLACENCY!

Accordingly, each of the discrete data collection approaches (LCMS, Mobile LiDAR, Friction, GPR, and Coring) is supported by comprehensive QA/QC and Project Specific Quality Management Plans (PSQMP) to ensure all collection, processing, and QA activities are performed to our exacting standards. Each individual plan will be available to the DOTD for review upon request.

The table below includes descriptions of the equipment and sensors found on the Data Collection Vehicles (DCV) that Michael Baker will use on the DOTD project.

Sensor Type	Purpose
Laser Crack Measurement System (LCMS)	Captures 3D scans of the pavement surface at traffic speeds. Scans are used to determine pavement surface distresses including cracking, rutting, and potholes.
Right-of-way Camera	Five (5) high-definition area-scan cameras oriented to capture scale-calibrated right-of-way imagery at traffic speeds; images are used as a perspective view, to conduct linear measurements, and to conduct asset collection.

Digital Laser Inertial Profiler	Two (2) digital line-laser longitudinal profilers capture the longitudinal profile in the wheel-path; profile data is used to determine International Roughness Index (IRI) and other profile indices.
Distance Measuring Instrument (DMI)	One (1) rugged wheel mounted DMI measures precise longitudinal distance and is used to reference all collected data to the DOTD LRS.
DGPS	Two (2) GPS antennas connect with an array of twenty-four (24) satellites to gather differentially corrected location and spatial data used for GPS and LRS referencing of all collected sensor data.
Inertial Navigation and Measuring System (IMU/INS)	One (1) high-precision inertial navigation, measurement, and guidance system used to further enhance spatial, orientation, and location data for asset extraction and pavement distress location.

Below is a summary of Michael Baker's QC activities, followed by detailed discussion of Michael Baker's QA/QC efforts.

Quality Control Activity	Frequency
Pavement DCV Certification	Per NCAT certification schedule
Pavement DCV Operator Certification	Per NCAT certification schedule
Friction equipment certification	Annually
Equipment calibration & validation	Annually prior to project mobilization
<b>Operator Training</b>	Annually prior to project mobilization
Pavement DCV Baseline site testing	Monthly – Central District sites for DMI, GPS, elevation, sensor data, and post-processed data outputs
	Weekly – local sites within active collection Districts for DMI and sensor data
Startup Checks	Daily – all components, sensors (profiler, GPS, cameras, LCMS, etc.), and computers are checked for proper functionality.
Image and Data Stream checks	Daily – operators will monitor all imagery and data stream quality in real-time.

Quality Control Activity	Frequency
End of day Checks	Daily – data integrity and completeness checks are performed by field operators at the end of data collection for the day
Pavement and Right- of-way Image Quality Checks	Weekly – all LCMS pavement images and right- of-way images are checked to make sure images are clear and free of distortions.
Pavement Data Quality	Weekly – systematic and sampling-based data quality checks are performed weekly on an on- going basis.
Asset Inventory Quality	Weekly - systematic and sampling-based data quality checks are performed weekly on an on- going basis.
Database Integrity	Weekly – systematic integrity and logic checks are performed weekly on an on-going basis.

#### **1. Data Collection Equipment Certification**

- **a. Pavement Data Collection Vehicle:** All DCVs to be used for DOTD's Pavement Distress Data Collection project must maintain NCAT certification.
- **b. Friction:** The Friction measuring system must maintain the annual certification of calibration and correlation conducted at a nationally recognized/certified friction measuring system evaluation site.
- **c. GPR:** GPR measuring systems must maintain annual certification of equipment calibration according to the manufacturers recommended exercise.
- **d. LiDAR:** LiDAR measuring systems must maintain annual certification of equipment calibration according to the manufacturers recommended exercise.
- **e. Coring:** Pavement coring systems must maintain annual certification of equipment calibration according to the manufacturers recommended exercise.

#### 2. Data Collection Equipment Calibration and Validation

Before mobilization, all DCVs used for DOTD must undergo calibration and validation protocols. These protocols are in addition to any equipment certification required for DCVs as discussed in prior sections of this QA/QC plan. The calibration and validation protocols include the following activities:

- **a. DMI calibration and validation:** Calibrate DMI on a 1,000-foot section and validate that DMI measurement complies with manufacturer accuracy limits.
- **b. Right-of-way camera:** Calibrate the camera images according to the equipment manufacturers direction. Each camera will be calibrated individually. DCV will be stationary on level ground during camera calibrations. Camera mounting and positioning will be determined and finalized before camera calibration process begins.
- **c. Inertial profiler:** Block and Bounce tests will be performed to verify that results are within the manufacturers recommendation and in accordance with applicable standards. The DCV will collect data on control sections to compare collected profile data with historical profile data. Statistical analysis will be used to determine that the profile and IRI data collected on the control sections is consistent.
- **d. LCMS:** The LCMS units are regularly calibrated and tested through the annual maintenance program Michael Baker has with the manufacturer. Michael Baker will follow manufacturer recommended protocols to calibrate the LCMS units. Data will be collected on control sections to validate LCMS data. Data items checked for validation include Rutting, Faulting, Cracking, and Potholes.
- e. GPS and Inertial Navigation: GPS, INS, and IMUs will undergo full manufacturer recommended calibrations. GPS, INS, and IMU data will be recorded on control section surveys and reviewed to validate that all calibration factors have been correctly applied.
- **f. LiDAR:** LiDAR sensors will be calibrated according to the manufacturer recommended calibration process. Point-cloud data will be recorded on control sections and reviewed to validate calibration factors. Control sites will include locations with bridges so that DOTD-required vertical clearance measurements can be validated.
- **g. GPR:** GPR antennas will be calibrated according to the manufacturer recommended calibration process. Radar data will be recorded on control sections and reviewed to validate calibration factors.
- h. Friction: Friction systems will be calibrated according to the manufacturer recommended calibration process. Skid data will be recorded on control sections and reviewed to validate calibration factors. Validation will also include checks for all friction sub-systems, including water tank, spray component, braking systems, and skid tire systems.

#### 3. Equipment Operator Training

All equipment operators must be sufficiently trained and certified before undertaking any project work for the DOTD. All Operators that will drive any vehicle as part of the DOTD project must have the appropriate Driver's License acceptable in the State of Louisiana.

Michael Baker has an Operator Training program for DCV, LiDAR vehicle, and GPR vehicle operations. All operators will take their respective Operator Training programs and satisfy the requirements for Operator Certification before undertaking project work for DOTD. Michael Baker's DCV operators are also routinely certified by NCAT. All sub-consultants and sub-contractors providing services that require equipment or vehicle operations must institute Operator Training programs and provide documentation to Michael Baker before undertaking work for DOTD.

#### 4. Data Processing, Asset Extraction, and Manual Pavement Rater Training

Michael Baker has training programs in place for all staff that perform Data Processing, Asset Extraction, and Manual Rating on data collected by DCVs and LiDAR vehicles. All staff working on these tasks must undergo their respective training programs and satisfy all program training requirements before working on DOTD projects. All sub-consultants and sub-contractors providing Data Processing, Asset Extraction, and Manual Pavement Rating services must institute training programs and provide documentation to Michael Baker before undertaking work for the DOTD.

#### **5. Quality Control Prior to Data Collection**

All calibration, validation, and certification processes for DCVs, equipment, and associated staff assigned to the DOTD project must be completed prior to the commencement of data collection. These activities must be done annually for each phase of the DOTD project. All sub-consultants and subcontractors must also complete their respective calibration, validation, and certification on an annual basis before they can take part in the DOTD project. Sub-consultants and sub-contractors must confirm to Michael Baker in writing of their completion of these QC activities prior to data collection.

#### 6. Quality Control During Operations

a. Startup checks: Startup checks are required before DCVs or other equipment begin work for the day. Michael Baker's custom application must be used to record outcomes of the Startup checks every day. Michael Baker's Survey Supervisor routinely monitors the application to make sure all equipment has its respective Startup check forms completed. Daily equipment startup checks include:

- » Camera
- » LCMS
- » GPR
- » Lidar
- » Coring rig
- » DMI
- » Laser profiler
- » GPS
- » INS
- » Data acquisition and control computers
- » Vehicle safety
- » Employee safety
- **b. Progress tracking:** Michael Baker's custom GIS-based Field Tracking application is used by all field staff to monitor project progress. Field staff identify routes and sections they complete in real-time so that the Survey Supervisor and Project Manager can track progress in real-time. The Survey Supervisor and Project Manager are also able to identify issues in real-time and implement corrective actions.
- **c. Data monitoring:** Field Technicians will visually monitor real-time data flows to ensure that the data being collected is within the reasonably expected range for the data type being measured. This includes sensor data as well as imagery live feeds.
- **d. End-of-day Checks:** End-of-day checks are required before DCVs or other equipment complete their data collection activities for the day. Michael Baker's custom application must be used daily to record outcomes of the End-of-day checks after all survey activities for the day have been completed. Michael Baker's Survey Supervisor routinely monitors the application to make sure all equipment has its respective forms completed.
- e. Baseline Calibration: Michael Baker will conduct a Baseline calibration of DCVs at the DOTD calibration sites prior to the start of the project. All sensors and data are calibrated/validated during the Baseline Calibration exercise.

**f. Weekly Calibration:** Michael Baker will establish a calibration site within each District and conduct data collection on these sites on a weekly basis. All calibration reports are submitted to DOTD monthly.

# 7. Data Transfer and Integrity

Data must be handled appropriately such that it can be collected and transferred to Data Centers securely and without corruption. Field Technicians must perform field data checks to validate that all collected data is corruption/error free, follow data-backup protocols daily before completing data collection activities, and follow the data-transfer protocols to ship data to Michael Baker Data Centers weekly or twice-weekly. Additional data integrity checks must be performed on all data once uploaded into the Data Centers; if data integrity errors are identified, Field Technicians must recollect all affected data.

### 8. Data Processing Quality Control

Data processing is done following process settings established by DOTD, applicable industry standards, or Michael Baker. DOTD established settings have priority over all other guidance and standards. Three layers of QA/QC are implemented in this phase and are discussed below:

- a. Rater/Processor Training: All personnel (at Michael Baker or other subconsultants/sub-contractors) must have completed the Rater/Processor training satisfactorily before performing tasks on the DOTD project.
- **b.** Systematic Checks: 100% of processed data is subject to systematic checks to identify any system-wide issues. Checks include screening data to filter values outside the normally expected range, checks on file sizes and file health to identify corrupt or incomplete files, review of the rater logs to confirm that only approved raters/processors completed the tasks, and rater consistency.
- **c. Manual Quality Checks:** 10% of all distress and asset extraction data is manually reviewed to confirm data accuracy. If the manual quality checks do not meet the required standard, corrective actions such as reprocessing or recollection must be completed.

# 9. Data Acceptance Criteria and Error Resolution

Data Type	Acceptance Criteria (percent within limits)	Acceptance Test	Frequency	Corrective Actions
Distance	99%	99% of inspected mileage within 5% of the LRS and segment start/end locations	Daily	Reconfigure and reprocess DMI and GPS data; investigate if issue is systemic and can be resolved through systemic means; if systemic correction is not possible, recollect all affected data
GPS	99%	99% of inspected mileage has full GPS coverage on all segments	Daily	Investigate the issue to determine if post-processing can resolve loss of coverage; if post-processing is not an option, recollect all affected data
Right-of-way Images	98%	15% sample test; no more than 2% of images have distortions; no more than 3 consecutive images may be missing or distorted	Weekly	Recollect affected data
Pavement Images	98%	15% sample test; no more than 2% of images have distortions; no more than 3 consecutive images may be missing or distorted	Weekly	Recollect affected data
Pavement Distress	98%	15% sample test; distress quantities and severities are within 5% of sampled QA checks	Weekly	Investigate the issue to determine root-cause; reprocess all affected data; if the raw data is found to be defective
Roughness	99%	IRI values are present and within acceptable ranges for 99% of inspected mileage	Weekly	Investigate field-crew comments, pavement images, and right-of-way images to identify if IRI values are missing or outside of acceptable ranges for a valid reason; report reasoning to DOTD; if valid reason is not found, recollect affected data
Faulting	98%	15% sample test; automated joint identification has identified joints within 5% of manual QA checks; corresponding faulting measurements are present and within 5% of the acceptable range	Weekly	Investigate field-crew comments, pavement images, ROW images, and automated processing settings to identify why joints or faulting measurements missing or defective; reprocess data affected data; if raw data is defective, recollect all affected data
Rutting	99%	Rutting values are present and within acceptable ranges for 99% of inspected flexible pavement mileage	Weekly	Investigate field-crew comments, pavement images, and ROW images to identify if Rutting values are missing or outside of acceptable ranges for a valid reason; report reasoning to DOTD; if valid reason is not found, recollect affected data
High/Low shoulders	98%	15% sample test; no more than 5% shoulder elevation difference values are missing or outside acceptable ranges	Weekly	Investigate field-crew comments, pavement images, and ROW images to identify if elevation values are missing or outside of acceptable ranges for a valid reason; report reasoning to DOTD; if valid reason is not found, recollect affected data

Data Type	Acceptance Criteria (percent within limits)	Acceptance Test	Frequency	Corrective Actions
Macrotexture	99%	Macrotexture values are present and within acceptable ranges for 99% of inspected mileage	Weekly	Investigate field-crew comments, pavement images, and ROW images to identify if Macrotexture values are missing or outside of acceptable ranges for a valid reason; report reasoning to DOTD; if valid reason is not found, recollect affected data
Pavement Grade	99%	Grade values are present and within acceptable ranges for 99% of inspected mileage	Weekly	Investigate field-crew comments, pavement images, and ROW images to identify if grade values are missing or outside of acceptable ranges for a valid reason; report reasoning to DOTD; if valid reason is not found, recollect affected data
Vertical Curve Horizontal Curve	99%	Curve values are present and within acceptable ranges for 99% of inspected mileage	Weekly	Investigate field-crew comments, pavement images, and ROW images to identify if Curve values are missing or outside of acceptable ranges for a valid reason; report reasoning to DOTD; if valid reason is not found, recollect affected data
Friction	98%	15% sample test; no more than 5% of friction values are missing or outside acceptable ranges	Weekly	Investigate field-crew comments, pavement images, and ROW images to identify if Friction values are missing or outside of acceptable ranges for a valid reason; report reasoning to DOTD; if valid reason is not found, recollect affected data
GPR/Pavement Thickness	98%	15% sample test; no more than 5% of thickness values are missing or outside acceptable ranges	weekly	Investigate field-crew comments, pavement images, and ROW images to identify if GPR measurements are missing or outside of acceptable ranges for a valid reason; report reasoning to DOTD; if valid reason is not found, recollect affected data

# **Technical Detail Response**

Requirement	3D Equipment & Sensors	Specifications & Features
Distance Measuring Instrument (DMI)	SICK DFS60 high resolution incremental encoder	<ul> <li>Complies with ASTM E-950 as Class-1 instrument per ASTM E1656</li> <li>2,000 pulse per revolution</li> <li>0.1 mm (0.00033 ft) resolution</li> <li>Integrated to GPS and INS signals and all sensor data through a 64-bit primary key</li> <li>Less than 0.1% error at 70 miles per hour</li> </ul>
Global Positioning System (GPS)	Trimble DGPS System	<ul> <li>24 channel receiver with Realtime DGPS corrections</li> <li>Supported Navigation Systems</li> <li>GPS L1, L2, L5</li> <li>GLONASS L1, L2</li> <li>GALILEO E1, E5</li> <li>BeiDou B1, B2</li> <li>Supported SBAS Systems WAAS</li> <li>EGNOS</li> <li>MSAS</li> <li>GAGAN</li> <li>QZSS</li> <li>Omnistar HP/XP/G2</li> <li>Update Rate 20 times per second</li> <li>Hot Start First Fix 3 seconds</li> <li>Cold Start First Fix 30 seconds</li> <li>Integrated to DMI and INS signals and all sensor data through a 64-bit primary key</li> </ul>
Inertial Navigation System	Hawkeye GIPSI-Trac 2	<ul> <li>Combined capability of global navigation satellite system (GNSS) and inertial navigation system (INS)</li> <li>INS uses advanced 3-axis gyroscopes, 3-axis accelerometers, and distance sensor</li> <li>Dual GNSS antennas</li> <li>Uses dead reckoning to record and report position data in tunnels, under bridges, and at locations with no GNSS coverage</li> <li>Sub-meter accuracy</li> <li>Horizontal position accuracy with post processing: 0.008m (0.026ft)</li> <li>Vertical position accuracy with post processing: 0.015m (0.049ft)</li> <li>Output rate of 250 per second</li> </ul>

Requirement	3D Equipment & Sensors	Specifications & Features				
Forward-facing and right-facing right-of-way cameras	BASLER acA4096-11 ACE Series Area Scan Cameras	>> >> >> >> >> >> >> >> >> >> >> >> >>	<ul> <li>» Includes 4-camera configuration to acquire forward, left, right, and rear perspectives</li> <li>» The best available high-speed asset camera for DOT applications</li> <li>» Calibrated for scale to allow length and height measurements as well as asset feature extraction</li> <li>» 10mm image position accuracy</li> <li>9 megapixels; 4096 X 2168 pixels resolution per camera; 4 cameras total</li> <li>» 12mm lens</li> <li>» 240-degree of combined Field-of-View; 60-degrees of field of view per camera</li> <li>» 12 frame per second</li> <li>» Capable of 5m (16.5ft) trigger interval at 60 miles per hour</li> <li>» Sony 1 inch CMOS progress scan full color sensor</li> <li>» Software trigger, free-run, or hardware trigger</li> </ul>			
Longitudinal Profile and International Roughness Index (IRI)	Hawkeye Digital Laser Profiler with 2 Gocator Line Lasers	» » »	<ul> <li>» Class 1 per ASTM E950</li> <li>» 1mm (0.04in) longitudinal sampling rate</li> <li>» +/- 0.5mm (0.0016 in) longitudinal and transverse profile accuracy</li> </ul>			
Pavement Images	Laser Crack Measurement System (LCMS-2)	>> >> >> >> >> >> >> >> >> >>	<ul> <li>High-speed camera, optics, laser line projectors used to capture intensity and range values for each scan</li> <li>Produces high-resolution 3D profiles of the road surface</li> <li>Produces pavement-view images in JPEG format</li> <li>Provides 100% coverage of the pavement surface up to 14 ft lane width</li> <li>Can operate during day or night</li> <li>Not affected by sun-angle or shadows</li> <li>Can acquire 3D scans and images of asphalt, concrete, chips seal, gravel, brick, and other surface types</li> <li>Operates at 5 to 65 miles per hour</li> </ul>			
Distress and Crack Identification	Pavemetrics Road Inspect, ARRB Hawkeye Processing Toolkit	» » »	<ul> <li>» 28,000 profiles per second</li> <li>» 1mm (0.04in) longitudinal resolution</li> <li>» 1mm (0.04in) transverse resolution</li> <li>» 0.25mm (0.0009 in) vertical accuracy</li> </ul>			
	Distress		Unit of Measure	3D Method	3D Accuracy	
	Longitudinal Cracki	ng	Linear ft	Automated	+/- 0.039" (1mm)	
	Transverse Cracking		Linear ft	Automated	+/- 0.039" (1mm)	
	Alligator (fatigue) Crac	cking	Square ft	Automated	+/- 0.039" (1mm)	
	Patching		Square ft and count	Semi-automated	+/- 0.5%	
	Pothole		Square ft and count	Semi-automated	+/- 0.5%	
	Blowups		Square ft and count	Semi-automated	+/- 0.5%	

Requirement	3D Equipment & Sensors	Specifications & Features
Rutting	Laser Crack Measurement System (LCMS-2)	<ul> <li>» 28,000 profiles per second</li> <li>» 4,300 transverse points per profile</li> <li>» Full lane (14ft) coverage</li> <li>» 1mm (0.04in) longitudinal resolution</li> <li>» 1mm (0.04in) transverse resolution</li> <li>» 0.25mm (0.0009 in) vertical accuracy</li> </ul>
Fill Quantities	Laser Crack Measurement System (LCMS-2)	<ul> <li>» 28,000 profiles per second</li> <li>» 4,300 transverse points per profile</li> <li>» Full lane (14ft) coverage</li> <li>» 1mm (0.04in) longitudinal resolution</li> <li>» 1mm (0.04in) transverse resolution</li> <li>» 0.25mm (0.0009 in) vertical accuracy</li> </ul>
High/Low Shoulder	Laser Crack Measurement System (LCMS-2)	<ul> <li>» 28,000 profiles per second</li> <li>» 4,300 transverse points per profile</li> <li>» Full lane (14ft) coverage</li> <li>» 1mm (0.04in) longitudinal resolution</li> <li>» 1mm (0.04in) transverse resolution</li> <li>» 0.25mm (0.0009 in) vertical accuracy</li> </ul>
Faulting	Laser Crack Measurement System (LCMS-2)	<ul> <li>28,000 profiles per second</li> <li>4,300 transverse points per profile</li> <li>Full lane (14ft) coverage</li> <li>Faulting detected and reported for full width of the wheel path</li> <li>1mm (0.04in) longitudinal resolution</li> <li>1mm (0.04in) transverse resolution</li> <li>Automated joint detection with manual validation</li> <li>0.25mm (0.0009 in) vertical accuracy</li> </ul>
Macrotexture	Laser Crack Measurement System (LCMS-2)	<ul> <li>» 28,000 profiles per second</li> <li>» 4,300 transverse points per profile</li> <li>» Meets ASTM E1845-15</li> <li>» Full lane (14ft) coverage</li> <li>» Macrotexture detected and reported for full width of the wheel path</li> <li>» 1mm (0.04in) longitudinal resolution</li> <li>» 1mm (0.04in) transverse resolution</li> <li>» 0.25mm (0.0009 in) vertical accuracy</li> </ul>
Roadway Geometry	Hawkeye Roadway Geometry System	<ul> <li>» Grade: &lt;0.2% (0.1 degrees)</li> <li>» Cross slope: &lt;0.2% (0.1 degrees)</li> <li>» Horizontal position accuracy: 1.2 m; 0.5m with SBAS</li> <li>» Vertical position accuracy: 2.0 m; 0.8m with SBAS</li> <li>» Horizontal position accuracy with post processing: 0.008 m</li> <li>» Vertical position accuracy with post processing: 0.015 m</li> </ul>

Requirement	3D Equipment & Sensors	Specifications & Features
Skid Resistance Testing	ICC SFT5042 Locked Wheel Skid Tester	<ul> <li>» 425-gallon water tank</li> <li>» ASTM E-274 compliant</li> <li>» Can use both ASTM E-501 and ASTM E-524 test tires</li> <li>» Can perform 375 discrete tests per tank of water</li> </ul>
	SCRIM continuous friction tester	<ul> <li>» IP67 rated 5,000 pulse per revolution distance measurement instrument</li> <li>» Side-force-coefficient continuous skid measurement system</li> <li>» Customizable skid resistance reporting interval ranging from 3.3ft to 66ft</li> <li>» 0.4m accuracy Differential GPS</li> <li>» Macrotexture laser</li> <li>» Forward-facing 30FPS color camera</li> <li>» Temperature sensors for air, tire, and pavement surface temperature recording</li> </ul>
Ground Penetrating Radar (GPR)	Kontur ANT-DX2429; Geoscope Mk IV 3D-Radar	<ul> <li>» Traffic-speed GPR data collection</li> <li>» Integrated GPS</li> <li>» Step Frequency Continuous Wave radar antenna array</li> <li>» 40 MHz to 3,000 MHz bandwidth</li> </ul>
Mobile Light Detection and Ranging (Mobile LiDAR)	Teledyne-Optech Lynx SG1	<ul> <li>» Dual 600-kHz sensors for survey/engineering grade precision</li> <li>» POSPac &amp; TopoDOT compatible</li> <li>» 1.2 million measurements per second</li> <li>» 5mm (0.2in) laser precision</li> <li>» Integrated FLIR LadyBug 5 with 30MP spherical camera array</li> <li>» 200 Hz IMU</li> <li>» Four 5 MP positional cameras</li> </ul>
Pavement Coring	Acker Core Drill 1200E	<ul> <li>Can be used on both Asphalt and Concrete pavements</li> <li>Includes built-in water swivel and core barrel guide</li> <li>Gasoline operated pump</li> <li>Dual-speed operation</li> <li>3,450 RPM for heavy-duty operations</li> <li>Trailer-mounted for easy operation and mobility</li> </ul>



# 22. SUB-CONSULTANT INFORMATION

If one or more sub-consultants will be used, provide the name, address, point of contact and phone number for each. Otherwise, leave this section blank.

Firm Name (as registered with Louisiana's Secretary of State)	Address	Point of Contact and email address	Phone Number
APS Engineering and Testing, LLC	1645 Nicholson Drive Baton Rouge, LA 70802	Sergio Aviles, PE sergio@aps-testing.com	225.456.5714
Applied Research Associates, Inc.	9800 Airline Highway, Suite 105 Baton Rouge, LA 70816	Salil Gokhale, PE sgokhale@ara.com	352.281.9654
ARRB Group, Inc.*	77770 Pennsylvania Drive, Suite 112 Exton, PA 19341	Eric Botting Eric.botting@arrbsystems.com	610.321.8300 x1
Bridge Diagnostics, Inc.	4300 S 1-10 Service Rd. W, Suite 210 Metairie, LA 70001	Shane Boone, PHD shaneb@bditest.com	303.494.3230
Precision Systems, Inc.	99 M Street, SE, Suite 750 Washington, DC 20003	Jianwei Wang, Ph.D. psi@dcpsi.com	202.686.8225
W.D.M. (USA) Limited	5721 Charles City Circle Richmond, VA 23231	Ryland Potter ryland.potter@wdm-int.com	804.277.9510

\*ARRB Group, Inc's registration renewal has been submitted to the State for review.

# 23. LOCATION

If location is an evaluation criterion for this advertisement and the prime consultant intends to establish a local presence, describe the plan for doing so. Otherwise, leave this section blank.

n/a



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