ATTACHMENT A

PROJECT DESCRIPTION

This Project shall require the Consultant to provide all necessary engineering, GIS, technology and related services required to collect forward facing perspective images, right facing right-of-way images, pavement images, pavement distress data and pavement management data necessary to digitally quantify the Network Level Condition of the State and Federal roadways in Louisiana.

The Consultant will also be required to capture and deliver data, imagery and assets for a defined length of the local jurisdiction public road network not maintained by DOTD, as defined in this RFQ.

The Consultant shall provide the requirements outlined in this RFQ, for one (1) mandatory two (2) year collection cycle, and at DOTD's option, two (2) subsequent two (2) year collection cycles.

This Project will initiate DOTD's (11^{th}) eleventh digital pavement data collection cycle, with each previous collection cycle spanning (2) two years. This significant investment in data collection has resulted in a Pavement Management System with advance data inventory histories and pavement deterioration curves. It is incumbent upon the Consultant to prove that their submittal shall not compromise, or place at risk, this significant investment by insufficient or inferior data or imagery collection, by inadequate data analysis, or by inadequate software.

The Consultant will identify their capabilities with both 2D and 3D data collection technology to deliver the requirements outlined in this RFQ. DOTD will reserve the right to initially select 2D technology during the 1^{st} collection cycle and change to 3D technology in subsequent collection cycles or to select 3D technology in the 1^{st} collection cycle or to require delivery of both 2D and 3D in the 1^{st} collection cycle.

DOTD acknowledges that 3D data could result in differences from past 2D data, but expects the Consultant to make every possible effort to align the results of their data capture and analysis effort with the historical trends for cracking, crack severities, faulting, IRI and various calculated indexes. This is intended to retain the value of DOTD's existing performance curves.

The Consultant will be required to convert or configure the past three (3) data collection cycles to a format that allows their proposed software solutions to access and display this data and imagery in conjunction with the data and imagery the Consultant will capture for this RFQ.

SCOPE OF SERVICES

The services to be rendered for this Project shall consist of the following:

1.0 Tasks and Services

1.1 General Information

A. The Consultant shall document in their proposal if they can deliver all of the requirements and deliverables identified in this RFQ, and how they plan to do so. This includes providing the various items and deliverables, identified in this section, which will reasonably allow DOTD to access the Consultant's ability to successfully complete this Project.

B. The Consultant shall collect forward facing perspective images, right facing right-of-way images, pavement images and pavement distress data necessary to digitally quantify all of the requirements specified for this Project.

C. The Consultant shall document their existing (DCV) Data Collection Vehicle Inventory via the format identified in the table provided below. Listing a vehicle in this table does not compel the Consultant to use the vehicle on this project.

(DCV) Data Collection Vehicle Inventory

Vehicle ID	Vehicle Configuration Details	Owned By	Make	Model	Year

Vendor is expected to identify their complete existing vehicle inventory

Vehicle ID - contractor ID assigned to vehicle to appear in weekly, monthly, or final report

Vehicle Configuration Details - current sensor configurations or current functional capabilities /deliverables .

Vehicle Owner - identify if Lease, Rental, or Owned and by who; Vehicles that have been ordered, but not received, must be clearly marked as such in this column

Make, Model & Year of Vehicle

D. The Project Task List is provided in the table below. It is provided to serve as a basis for the Project schedule/work plan and the initial pricing submittal.

1. Each cycle is comprised of 2 years, for a total of 3 cycles lasting 6 total years, 72 months.

2. Each year runs from July 1 to June 30.

3. Task 1 shall be performed at the start of each cycle.

4. Task 26 shall be performed at the end of each cycle.

5. Task 2 through 11, along with task 22, are required each year, by the given due dates.

6. Task 12 through 21 will occur on alternating years, as shown below, and are required by the given due date for those years.

7. Tasks 23, 24, and 25 are "one time only" tasks.

8. Task 27 is an optional task and may not occur.

9. For Tasks identified as "Data Collection," the Consultant shall generally submit the raw data capture files, or data that has not been processed, forward facing perspective image, right facing right-of-way image capture, etc.

10. For Tasks identified as "Data Delivery," the Consultant shall generally submit all other processed data files, the processed pavement images, etc.

Project Task List		Due Date	Cycle						Miles
Task	Task Description		1A	1B	2A	2B	3A	3B	
1	Preliminary Activities & Initial Pilot		yes		yes		yes		
2	Interstate - Data Collection	Oct 15	yes	yes	yes	yes	yes	yes	1852
3	Interstate - Data Delivery	Nov 15	yes	yes	yes	yes	yes	yes	1852
4	Non-Interstate National Highway System (NHS) - Data Collection	Nov 1	yes	yes	yes	yes	yes	yes	3522
5	Non-Interstate National Highway System (NHS) - Data Delivery	Nov 15	yes	yes	yes	yes	yes	yes	3522
6	Non-Interstate National Highway System (NHS) - ROW Image Only Collection	Nov 1	yes	yes	yes	yes	yes	yes	731
7	Non-Interstate National Highway System (NHS) - ROW Image Only Delivery	Nov 15	yes	yes	yes	yes	yes	yes	731
8	Local - National Highway System (NHS) - Data Collection	Nov 1	yes	yes	yes	yes	yes	yes	874
9	Local - National Highway System (NHS) - Data Delivery	Nov 15	yes	yes	yes	yes	yes	yes	874
10	(HPMS) Highway Performance Monitoring - Data Collection	Nov 1	yes	yes	yes	yes	yes	yes	13976
11	(HPMS) Highway Performance Monitoring - Data Delivery	Nov 15	yes	yes	yes	yes	yes	yes	13976
12	State Systems - Data Collection - Primary Direction	March 31	yes		yes		yes		13632
13	State Systems - Data Delivery - Primary Direction	March 31	yes		yes		yes		13632
14	State Systems - Image Collection - Secondary Direction	July 15		yes		yes		yes	689
15	State Systems - Image Delivery - Secondary Direction	July 15		yes		yes		yes	689
16	Ramps - Data Collection	March 31		yes		yes		yes	459
17	Ramps - Data Delivery	March 31		yes		yes		yes	459
18	Frontage/Service Roads - Data Collection - Primary Direction	March 31	yes		yes		yes		459
19	Frontage/Service Roads - Data Delivery - Primary Direction	March 31	yes		yes		yes		459
20	Frontage/Service Roads - Image Collection - Secondary Direction	July 15		yes		yes		yes	1940
21	Frontage/Service Roads - Image Delivery - Secondary Direction	July 15		yes		yes		yes	#N/A
22	Skid Testing	April 30	yes	yes	yes	yes	yes	yes	#N/A
23	Historical Data Conversion	Nov 1	yes						
24	Local Road - Data Collection	March 31	yes						18000
25	Local Road - Asset Inventory Delivery	March 31	yes						18000
26	Final Cycle Documentation	Jun 1		yes		yes		yes	
27	Optional - Data Conversion of Local Road Data		yes						

1.2 System Description

The highway system in Louisiana is not a static system and is always changing. The analysis lane miles are a static snapshot of the initial mileage for this Project. These mileage totals can

also be affected by the addition of divided highway sections, which subsequently become part of the data capture requirements. Additionally Interstate 49 is being extended and will result in the transfer of some NHS mileage to Interstate mileage as some point.

Should additional miles be added or discovered within a system, that exceeds the analysis lane miles shown below, DOTD expects the Consultant to capture and deliver this additional mileage at no additional charge, so long as the total additional mileage does not exceed 0.5%, or one half of one percent, of the total analysis miles for the contract cycle. Should the added mileage exceed the 0.5%, DOTD reserves the right to equivalently reduce the analysis lane miles in Task 22 to compensate for the increased mileage in other areas, to prevent the overall cost of the Project from exceeding the funds available for this Project.

The approximate analysis lane miles of pavement included in the study are as follows:

System Description

Interstate Highway System	**1852** analysis lane miles
Non-Interstate National Highway System (NHS)	**3522** analysis lane miles
Local National Highway System (LNHS)	**203** analysis lane miles
Highway Performance Monitoring System (HPMS)	**874** analysis lane miles
State Systems	**13976** analysis lane miles
Ramps	**689** analysis lane miles
Frontage/Service Roads	**459** analysis lane miles
Local Roads (1 time, 1 cycle only)	**18000** analysis lane miles

A. The (IHS) Interstate Highway System, task 2 and 3, consists of approximately 926 centerline miles, with approximately 1,852 analysis lane miles. This system is divided into 56 control sections of which 39.1% or approximately 724 analysis lane miles are classified as urban.

1. For the IHS, The Consultant shall collect forward facing perspective images, right facing right-of-way images, pavement images and pavement distress data necessary to digitally quantify all of the requirements specified for this Project for approximately 1,852 analysis lane miles which represents both directions of the Interstate Highway System.

B. The (NHS) Non-Interstate National Highway System, task 4, 5, 6, and 7, consists of approximately 2,127 centerline miles, with approximately 3,522 analysis lane miles. This system is divided into 384 control sections of which 49% or approximately 1,726 analysis lane miles are classified as urban.

1. For the NHS, The Consultant shall collect forward facing perspective images, right facing right-of-way images, pavement images and pavement distress data necessary

to digitally quantify all of the requirements specified for this Project for approximately 3,522 analysis lane miles.

C. The (LNHS) Local National Highway System, task 8 and 9, consists of approximately 107 centerline miles, with approximately 203 analysis lane miles. This system is not a state maintained system, and 100% of the analysis lane miles are classified as urban.

1. For the LNHS, The Consultant shall collect forward facing perspective images, right facing right-of-way images, pavement images and pavement distress data necessary to digitally quantify all of the requirements specified for this Project for approximately 203 analysis lane miles.

D. The (HPMS) Highway Performance Monitoring System, task 10 and 11, consist of sections or portions of roads found within approximately 874 miles of roadways. While the HPMS sections are approximately 484 miles of pavement within these 874 miles of roadway, the Consultant will capture and analyze the data and images for all of the approximately 874 miles.

1. For the HPMS, The Consultant shall collect forward facing perspective images, right facing right-of-way images, pavement images and pavement distress data necessary to digitally quantify all of the requirements specified for this Project for approximately 874 miles of the HPMS sections.

2. MAP-21 may change the data collection requirements for HPMS. The Consultant is expected to provide a per mile estimate for this requirement that handles all legitimate minor changes. Should legitimate major changes occur, at DOTD's sole discretion, DOTD may negotiate a price per mile change with the Consultant. This price per mile change could result in DOTD reducing the Task 20 miles accordingly since this price change cannot cause the total price of the contract to exceed the Consultant's bid total.

E. The State System, task 12, 13, 14 and 15, consists of approximately 13,976 analysis lane miles, which includes primary direction miles and secondary direction divided highway miles. The secondary direction mileage for this effort is approximately 13,288 miles. This system is divided into 2,492 control sections of which 16.1% or approximately 2,255 analysis lane miles are classified as urban.

1. For approximately 13,976 analysis lane miles on the State System, the Consultant shall collect forward facing perspective images, right facing right-of-way images, pavement images and pavement distress data necessary to digitally quantify all of the requirements specified for this Project.

2. For approximately 13,288 secondary direction miles on the State System, the Consultant shall collect and provide forward facing perspective images and right facing right-of-way images.

F. Louisiana has approximately 2,663 Ramps, task 16 and 17, that comprise a total of approximately 689 analysis lane miles. The ramps can be found in the following systems:

Ramps		
System	**Count**	**Miles**
Interstate	2088	537
NHS	530	133
State	45	19

1. For approximately 689 analysis lane miles of Ramps, the Consultant shall collect forward facing perspective images, right facing right-of-way images, pavement images and pavement distress data necessary to digitally quantify all of the requirements specified for this Project.

2. All Ramps will be collected in the primary direction of travel only.

G. Louisiana has approximately 459 analysis lane miles of Frontage/Service Roads, task 18, 19, 20 and 21.

1. For approximately 459 analysis lane miles of Frontage/Service Roads, the Consultant shall collect forward facing perspective images, right facing right-of-way images, pavement images and pavement distress data necessary to digitally quantify all of the requirements specified for this Project.

2. For approximately 459 secondary direction miles of Frontage/Service Roads, the Consultant shall collect and provide forward facing perspective images and right facing right-of-way images.

H. The distribution of the approximate Analysis Lane miles, by district, is shown in the following table.

Analysis Lane Miles

System	Totals	District 02	District 03	District 04	District 05	District 07	District 08	District 58	District 61	District 62
Interstate	**1852**	137	213	336	237	159	227		176	368
Non-Interstate NHS	**3522**	515	322	338	348	308	631	315	555	190
Local NHS	**203**	147	22	1	1	2	1		26	4
HPMS Entire Roadway	**874**	233	85	183	94	81	16	1	75	105
State Systems - Primary Direction	**13976**	953	2198	1770	1735	985	2135	1199	1447	1554
State System - Secondary Direction - Image Only	**13632**	833	2141	1725	1726	972	2082	1199	1421	1533
Ramps	**689**	146	76	116	60	49	60		94	88
Frontage/Service Roads - Primary Direction	**459**	65	127	27	27	63	26		55	69
Frontage/Service Roads - Secondary Direction - Image Only	**459**	65	127	27	27	63	26		55	69

Non-Interstate NHS & State System - Includes some divided highway analysis lane miles in the secondary direction

I. DOTD will also require the one time collection of 18,000 analysis lane miles of local jurisdiction roads, task 24 and 25, in Cycle 1A.

1. For the 18,000 analysis lane miles of Local Roads, the Consultant shall collect forward facing perspective images and right facing right-of-way images necessary to capture the assets identified in this Project.

J. DOTD will require the Consultant to convert the past (3) three cycles of historical data, task 23, not to include local jurisdiction public roads, into the format necessary to access and use this data in their proposed software solutions.

K. DOTD will seek an optional task 27 estimate to convert existing local jurisdiction public roads data/images for viewing in proposed "Software Viewing Tool".

1.3 Project Delivery Schedule:

The Consultant shall develop and present a Project Delivery Schedule for all tasks identified in Cycles 1A and 1B of the proposal.

Under no circumstances will the Consultant be allowed to back load the deliveries of the Tasks, or deliver significant portions of the Task, late in the identified Cycle A or B. All Tasks are expected to be evenly delivered during the appropriately identified Cycle A or B, unless otherwise noted.

The Project Delivery Schedule shall, at a minimum, account for the following:

A. The delivery of all tasks outlined in Project Task List table.

1. For yearly (Cycle A & B) Tasks 2 through 11, the Consultant is expected to provide the data collection and data delivery submittals as needed to comply with the delivery due dates. These deliveries are expected on a bi-weekly basis. Federal deadlines eliminate options for timeline adjustments for task 2 through 9.

2. For Cycle A, Task 12 and 18 (data collection), the Consultant is expected to provide early bi-weekly deliveries of task 12 and 18 as soon as they are approved to start capturing data.

3. For Cycle A, Task 13 and 19 (data deliveries), the Consultant is encouraged to provide bi-weekly deliveries as soon as possible, and is required to start bi-weekly deliveries no later than December 9th, and to complete those bi-weekly deliveries no later than March 31st.

a. This will allow for a reasonable work load for the DOTD staff charged with QA/QC review and the delivery's final acceptance. The Consultant will be allowed to capture and deliver these data/images in any reasonable order that fulfills the deliverables and will no longer be required to sequentially capture these data/images in a district by district manner.

b. The data/image submittals must still have district identification information to allow separation by district in all data tables.

4. For Cycle B, Tasks 14, 15, 20 and 21, the Consultant shall provide the deliverables as early as July 15th, but no later than August 15th, at the start of Cycle B.

a. This basically requires the Consultant to capture these deliverables in Cycle A, but for budget purposes DOTD cannot provide payment for these items in Cycle A. DOTD expects this also proves to be a more efficient collection approach for the Consultant.

5. For Cycle B, Tasks 16 and 17, the Consultant is expected to provide bi-weekly delivery submittals in a manner that will allow for the most reasonable work load for the DOTD staff charged with QA/QC review and the delivery's final acceptance.

a. The Consultant will be allowed to capture and deliver these tasks in any reasonable order that fulfills the deliverables.

B. All data, data analysis, and image delivery, necessary to meet the requirements of the Project Task List, the analysis deliverables, and the documented requirements outlined in this Project.

C. Data collection cannot begin before contractual notice to proceed.

D. The "Preliminary Activities & Initial Pilot" will be completed and accepted before general data collection can begin.

E. The Project Delivery Schedule will be finalized and approved during preliminary activities.

1. Preliminary Activities includes a review and acceptance of (SOP) Standard Operating Procedures, integrated with the QA/QC Plan.

2. Data cannot be captured until the specific SOP and the QA/QC Plan are approved by DOTD.

F. The Consultant's submittals will require completed QA/QC reviews and acceptance of deliverables for invoice approvals.

1. The Consultant will be advised if the submitted deliverables are accepted.

2. If some percentage of a deliverable is not accepted, DOTD will advise the Consultant of the specific problems, and the expected problem resolution. Once advised of such a need to resolve a problem, the Consultant is expected to resolve problem, at no additional cost to the DOTD, within fourteen (14) calendar days.

2.0 Scope of Work Elements

The scope of this Project shall cover all necessary engineering, GIS, technology and related services, including Quality Assurance and Quality Control, required to collect and analyze pavement distress data, various pavement attributes, pavement images, and forward facing perspective and right facing right-of-way images for other asset data inventory.

This data and image collection and analysis is primarily intended to provide, at a minimum, all the necessary information to access current pavement conditions and to assist in projecting future pavement conditions in Louisiana to support both State and Federal Pavement Management and Asset Management requirements.

The following table provides an outline of the various Pavement Condition Measures.

Asphalt & Composite Pavements
Pavement Condition Measures

Asphalt Pavement Distress Types	Composite Pavement Distress Types	Units of Measure
Fatigue (Alligator) Cracking		Sq.Ft. (Wheelpath)
Longitudinal Cracking	Longitudinal Cracking	Linear Ft.
Transverse Cracking	Transverse Cracking	Linear Ft.
Patch\Patch Deterioration	Patch\Patch Deterioration	Sq. Ft. & Count
Potholes	Potholes	Sq. Ft. & Count
Rutting	Rutting	Inches
IRI	IRI	Inches / Mile
	Blowups	Sq. Ft. & Count
Fill Quantities	Fill Quantities	Cu. Ft.
High/Low Shoulder	High/Low Shoulder	Inches
Macrotexture	Macrotexture	Inches

Jointed & Continuously Reinforced Concrete Pavements
Pavement Condition Measures

Jointed Concrete Pavement Distress Types	Continuously Reinforced Pavement Distress Types	Units of Measure
Longitudinal Cracking	Longitudinal Cracking	Linear Ft.
Transverse Cracking	Transverse Cracking	Linear Ft
Patch\Patch Deterioration	Patch\Patch Deterioration	Sq. Ft. & Count
Blowups	Blowups	Sq. Ft. & Count
IRI	IRI	Inches / Mile
Faulting		Inches
	Punchouts	Sq. Ft. & Count
High/Low Shoulder	High/Low Shoulder	Inches
Macrotexture	Macrotexture	Inches

These condition measures will be configured and supplied in various DOTD supplied ranges or severity levels by the Consultant.

In addition to these measures, various condition indexes will be generated from these measures and severity levels. These condition indexes would include, but are not limited to, indexes for fatigue (alligator) cracking, longitudinal cracking, transverse cracking, random cracking, rutting, roughness, patching and performance indexes.

2.1 Functional Requirements

This Project is designed to provide the necessary information to support both State and Federal Asset Management and Pavement Management requirements. DOTD is issuing this Project to continue its ongoing efforts to obtain all relevant information necessary to meet these requirements.

Quality Control is a mandatory requirement for MAP-21. Under no circumstances will the Consultant be permitted to submit finalized summary data, where the raw data was not or could not be evaluated and validated by DOTD. Fully automated or black box generated final data will not be accepted.

2.2 Technical Requirements

The Consultant shall complete the "Technical Detail Response" table with sufficient details, information, data, etc. to allow DOTD to determine if they proposed 2D & 3D technology will meet the following requirements.

It is expected that the required 2D proposals might not be able to meet some of these requirements. In those cases, the Consultant shall note that the requirement cannot be met, and indicate the actual measure that the proposed 2D solution could meet.

The Consultant shall note in their response in the table, the lowest measurement that can be theoretically achieved and the lowest measure that can be practically or reasonably achieved with the 2D & 3D technology.

The Consultant is encouraged to take every opportunity to identify special or proprietary differentiating characteristics, capabilities, functionality, etc. unique to their offering, within their Technical Detail Response and within their general response. Duplication of this effort, in both the Technical Detail Response and general response, is encouraged.

Technical Detail Response

Requirement	2D Equipment (Ust Sensors, etc.)	2D Specifications & Features (Provide All Informative Detoils)	3D Equipment (List Sensors, etc.)	3D Specifications & Features (Provide AI Informative Detolls)
Distance Measurement Instrument (DMI)		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for this technology		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for this technology
Global Positioning System (GPS)		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for this technology		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for this technology
Inertial Navigation System		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for this technology		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for this technology
		Post Process·mg software= ??		PostProcessing software= ??
		Post Process·mg software accuracies achieved are ??feet in real-f1me and approximately?? inches with post process·mg.		PostProcessing software accuracies achieved are ?? feet in real-time and approximately?? inches with post processing.
Forward facing perspective images, right facing right-of way images		Describe All Technical details of proposed lenses		Describe All Technical details of proposed lenses
		Describe All Technical details of proposed camera		Describe All Technical details of proposed camera
		Resolution pixels=?? X??		Resolution pixels = ?? X??
		Field of view=?? Degrees		Field of view=?? Degrees
		Free-running frame rate of?? frames per second {fps)		Free-running frame rate of?? frames per second {fps)
Longitudinal Profile International Roughness Index (IRI)		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for 2D sensor technology		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for 3D sensor technology
		Validation of low speed measurements down to= ??mph		Validation of low speed measurements down to= ??mph
		Meets all AASHTO standards and are ASTM Class 1 profilers {ASTM E-950) =Yes or No		Meets all AASHTO standards and are ASTM Class 1 profilers {ASTM E-950) =Yes or No
Pavement Images		Describe Technical details of lighting system for 2D technology		Describe Technical details of lighting system for 3D technology
		Describe Technical details of pavement image collection for 2D technology		Describe Technical details of pavement image collection for 3D technology
Distress crack Identification		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for 2D sensor technology This section could be itemized for various cracking deliverables is this provides a more robust response		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for 3D sensor technology This section could be itemized for various cracking deliverables is this provides a more robust response
Rutting		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for 2D sensor technology		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for 3D sensor technology
Faulting		Describe All Technical details, specifications, **accuracies} resolutionsminimum measures}** etc. for 2D sensor technology		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for 3D sensor technology
Macrotexture		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for 2D sensor technology		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for 3D sensor technology
		Meets ASTM E1845-09 standard = Yes or No		Meets ASTM E1845-09 standard= Yes or No
Roadway Geometry		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for 2D sensor technology		Describe All Technical details, specifications, **accuracies} resolutions} minimum measures}** etc. for 3D technology
Skid Resista nee Testing		Describe All Technical details, specifications, accuracies, resolutions, etc. for this technology		Describe All Technical details, specifications, accuracies, resolutions, etc. for this technology
		Meets all requirements of ASTM E274, ASTM E501, ASTM E524 =Yes or No		Meets all requirements of ASTM E274, ASTM E501, ASTM E524 =Yes or No

20 Equipment= itemize the sensors, devices, equipment, technology, etc. that supply the requirement
3D Equipment= itemize the sensors, devices, equipment, technology, etc. that supply the requirement
20 Specifications & Features =provide as much detail as possible to describe deta"ls, specifications, accuracies, resolutions, etc.
3D Specifications & Features =provide as much detail as possible to describe deta"ls, specifications, accuracies, resolutions, etc.
Forward facing & ROW cameras must be high definition, broad cast quality, 3 CCD cameras
For 3D detai Is, describe your ability to narrow the sensor to a smaller size, such as wheel path width for Faulting & Macrotexture

A. Equipment, Technology & Software Tool Requirements

1. Inertial Navigation System

a. The Consultant shall identify all equipment and technical details included in the DCV that will provide accurate and synchronized spatial location reference for the DCV.

b. This includes all devices and technology such as real time kinematic Global Positioning System (GPS) technology, inertial measurement units (accelerometers, gyroscopes), distance measuring instruments, etc. required to provide roadway geometry (cross slope, super elevation(slope), grade, vertical curve, etc.), pavement elevations, stationing, latitude/longitude coordinates, pavement images, forward facing perspective images, right facing right-of-way images, pavement distress measures, etc.

This plan shall identify the technical details, procedures and methodology demonstrating how this equipment is configured and integrated to allow the field collected data, pavement imagery, and forward facing perspective images and right facing right-of-way images to be linked, synchronized and geo-referenced.

c. The plan shall identify how the Consultant will deal with GPS signal loss and satellite outages.

d. This plan shall identify how the Consultant will deal with driver introduced bias.

e. The Consultant shall collect the most accurate GPS coordinates possible.

1. The Consultant shall reference the Louisiana Transportation Research Center's Final Report 539 "DOTD Standards for GPS Data Collection Accuracy" found at https://www.ltrc.lsu.edu/pdf/2015/FR_539.pdf

2. X and Y coordinates will be reported in decimal degrees to six (6) decimal places. i.e. Latitude = 29.682063, Longitude = -91.006403

3. Z coordinates will be reported in feet to two (2) decimal places. i.e. 5.62 feet

4. The Consultant shall use the LSU Center for Geo-Informatics' (C4G) CORS network which is the vertical control standard for the State of Louisiana via the statewide Real Time Kinematic (RTK) Virtual Reference Station (VRS) service or Real-Time Network (RTN). The website for the C4G is http://c4gnet.lsu.edu/

5. The Consultant shall acquire C4G's RTN services, which are automatically tied into the National Spatial Reference System (NSRS) and Louisiana's Vertical Geodetic Control throughout the entire State while receiving Real-Time Network GPS/GNSS positions.

6. The Consultant shall use the CORS network, and all the base stations making up the network, for the post processing and correction of the differential GPS calculations.

7. The Consultant shall adhere to all specifications and subscription requirements of the LSU's Louisiana Spatial Reference Center needed to ascertain the GPS calculations.

f. All accuracies which are expected to be achieved by the proposed devices/equipment will be defined, in appropriate places throughout the plan document and then

summarized in the "Technical Detail Response" table. The plan will also identify the accuracies for the data output by these devices/equipment when acquisition of the output data relies on multiple devices with different accuracies. This shall include both real time data capture accuracies and post processed data accuracies.

2. Synchronization of Data & Images with Global Positioning System (GPS); Geographic Information System (GIS); & Location Reference System (LRS)

a. The Consultant shall provide details for all aspects of data/image collection and reporting with respect to location reference and data/image synchronization.

b. All required deliverable data, pavement images, forward facing perspective images and right facing right-of-way images shall include all necessary location reference information data per this section.

This plan shall identify the technical details, procedures and methodology demonstrating how the field collected data, pavement imagery, and forward facing perspective images and right facing right-of-way images shall be captured, linked/synchronized and referenced to GPS, and the LRS using GIS technology DOTD standard Esri Arc GIS v10.3 or later file geo-database.

1. The Location Reference System (LRS) is a Control Section, log mile based system that includes starting and ending descriptive information.

2. DOTD is in the process of transitioning from a corridor based Control Section system to a LRS_ID base system that provides a unique identifier for each segment of roadway within the control section corridor. For a multilane divided highway with service roads and ramps, each direction of travel, each service road and each ramp will have a unique LRS_IDs within a given control section corridor. The complete LRS will be provided to the Consultant.

3. The Consultant is required to report both the Control Section and LRS_ID location information in the first cycle of the contract data and image delivery.

c. The plan shall identify what data/images are synchronized in real time during data/image capture and what data/images are synchronized in a post processed method. This shall be identified for all data/image collection requirements, including optional items defined in this document.

d. This plan shall identify the procedures and methodologies for identifying data/image start and stop locations, lead-ins/lead-outs and under runs/over runs. These procedures and methodologies must receive approval from DOTD before use to submit data or images.

e. This plan shall identify expected positional accuracies for the synchronized locations either in this section or in the Inertial Navigation Section.

f. Special provisions with respect to this requirement, not specified here, can be offered by the Consultant. If DOTD feels that these special provisions provide a valid capability that enhances or improves this requirement, DOTD reserves the right to consider this extra functionality relevant in the selection process.

g. The Consultant shall be required to provide a software viewing tool that allows DOTD to perform both QA/QC on the data/image synchronization as well as to use this viewing tool for later data analysis.

3. Forward Facing Perspective & Right Facing Right-of-way Image Camera Requirements

a. The Consultant shall provide details for all aspects of forward facing perspective and right facing right-of-way color image collection and reporting.

b. The Consultant shall use two motion picture quality cameras with three (3) EXMOR Full HD CMOS sensors, or DOTD approved equals. The lens package shall include auto focus and auto iris adjustment capabilities for varying light conditions due to underpasses and tree canopied areas. The SOP will include the Consultant's proposed cameras for this requirement.

It is preferred that the forward facing perspective and right facing right-of-way cameras be mounted in an environmentally secure enclosure(s) above the DCV cabin to afford maximum visibility for the driver. Camera enclosures shall have temperature control devices or other means to eliminate fogging and condensation on both the enclosure and the camera lens. In addition, camera lens and enclosures shall be cleaned regularly to prevent a buildup of road debris and bugs.

c. The forward facing perspective camera shall be angled to optimize the view of the entire roadway, shoulders and overhead roadway signs.

1. This camera will have a sky to pavement ration of sky 45% / pavement 55%.

2. This camera will have a left to right ratio of left 60 % / right 40%

d. The right facing right-of-way camera shall be angled to optimize roadside asset inventory collection.

1. The final angle of this camera shall be approved by DOTD.

e. Cameras are to be calibrated and aligned to meet DOTD requirements for this Project. Once camera positioning and angle are accepted by DOTD, they must be maintained for the course of the Project. Any deviation of the accepted camera positioning and alignment may result in re-collection of affected LRS-ID at the Consultants expense.

1. The Consultant shall validate continuous camera alignment in calibration reporting.

f. The forward facing perspective and right facing right-of-way camera images shall be collected at DMI intervals sufficient to provide the optimum image, and image quality, for asset image identification and collection.

1. The images are expected to represent a 0.004 miles (21.12 feet) segment length.

2. These images shall be delivered in a JPEG format.

g. All image locations shall be identified to the nearest thousandth (0.001) mile increment (5.28 feet) or better in the data submittals.

h. All image locations shall also be identified by their GPS coordinates in the data submittals.

1. All JPEG images shall also be either geocoded or geotagged with GPS coordinates.

i. The resolution of the collected images shall not be less than 1920 pixels x 1080 pixels or as approved by DOTD.

j. The Consultant shall collect and deliver the forward facing perspective and right facing right-of-way digital color images, in JPEG format, on external hard drives (USB 2.0) or on other pre-approved storage media.

k. Upon approval and acceptance of images by DOTD, the Consultant shall add "Header Information" to the final JPEG image submittals identifying the district, the parish, the LRS-ID, the direction of travel, the route, the direction of travel chainage, the primary direction chainage, the vehicle speed, the collection date and the DOTD Logo for image source reference. A sample image is provided below for reference.

1. The "Header Information" will represent, except for collection date, the QA/QC approved final data, not the raw data collected in the field.

2. DOTD reserves the right to require additional and/or different "Header Information" not identified above, from other captured data in the Raw Data File.

3. "Header Information" is required to assist field staff in locating pavement or asset issues and to identify the source of the image.

4. Pavement Data and Image Capture Requirements

a. The Consultant shall provide details for all aspects of downward pavement data and image collection and reporting.

b. The Consultant shall specify both 2D and 3D sensor technology in "Technical Detail Response" table, sufficient to allow DOTD to determine if they provide these requirements.

1. Appropriate compression technology should be used to reduce data and image storage capacity requirements.

c. The system shall capture clear, high resolution digital pavement images, in JPEG format, that represent the width of transverse road section, including the shoulder and pavement edge for high/low shoulder measures.

d. The imaging system shall be configured to allow for the optimum contrast and visibility of transverse and longitudinal cracks via laser lighting to eliminate shadows and variations in ambient lighting.

e. The resolution of pavement images should be sufficient, under optimal conditions, to identify cracks of 0.04 inch (1 mm) width in both the transverse and longitudinal directions when traveling at survey speeds, or to the lowest measure that can be practically or reasonably achieved with the final selected 2D or 3D technology.

1. The Consultant shall document both the ideal condition minimum crack width measurement and the reasonable minimum crack width measurement in the "Technical Detail Response" table.

2. The Consultant shall process these images in a manner that shall synchronize, properly overlap and fuse or stitch together these images into one uninterrupted continuous pavement JPEG image for the section length of approximately 0.004 miles (21.12 feet).

   The Consultant shall use a semi-automated solution to quantify pavement cracking, or rate the pavement distresses, with manual assistance as necessary, per the Louisiana Distress Identification Protocols.

f. The Consultant shall generate color coded digital line work and grids representing the various distress types and severity. This rating shall be indicated on the stitched pavement images identified in this section which will be submitted for QA/QC purposes.

1. Pavement images shall be used to measure line work, grids, etc, so they must be of sufficient quality to allow this to occur.

2. DOTD will have final approval over size, shape, color, patterns, etc. for this line work.

g. For QA/QC purposes, all pavement distress data and pavement management data shall be synchronized and linked to the pavement images, forward facing perspective images and right facing right-of-way images for viewing and data analysis purposes, via the Software Viewing Tool identified in this Project.

h. The Consultant shall furnish the stitched and rated images on external hard drives (USB 2.0) or on other pre-approved storage media.

i. Pavement Images shall not be collected during times when the visibility of cracking and other distress forms are continuously obstructed by road conditions. This includes, but is not limited to, water on the pavement surface and either sand or mud on the pavement surface, etc. Locations with unacceptable pavement image quality shall be collected again at no additional cost to DOTD.

j. All image start locations shall be identified to the nearest thousandth (0.001) mile increment (5.28 feet) or better and also include GPS coordinates.

k. All pavement JPEG images should also be either geocoded or geotagged with GPS coordinates.

5. Software Viewing Tool

a. The Consultant shall provide an application, preferably web based, that provides a user customizable workspace that will allow simultaneous viewing of synchronized pavement images and/or forward facing perspective images and/or right facing right-of-way images with either QA/QC level data for high level "super" users or with selected distress data and/or pavement management data summarized to tenth (0.100) mile segments for general user.

1. The Consultant shall provide all necessary software licenses (if applicable).

2. The pavement images, forward facing perspective images and right facing right-of-way images for this viewing tool shall be in thumbnail format and shall approximately be 243 x 397 pixels or as approved by the DOTD. When DOTD staff decides to investigate a point of concern, the ability to easily pull up the full size image, represented by the thumbnail image, is required to view more extensive details.

b. The Consultant shall provide extensive details outlining all capabilities of this software viewing tool. This will include the most recent version of the training manual.

1. The Consultant may be required to demonstrate this solution using data collected and processed for field trials.

2. If awarded this Project, the Consultant will provide two (2) training classes for this solution to approximately 24 people per class, at no additional charge to DOTD. DOTD will work with the Consultant to schedule these training dates.

c. This solution shall have the ability to export data for use in DOTD's Pavement Management System in an approved data format provided by DOTD.

6. Software Data Processing & Management Tool

a. The Consultant shall provide an application and database that provides full data processing, analysis and management capabilities on all distress data and/or pavement management data. This application will also need to validate, and if necessary, manage the synchronization requirements for pavement images and/or forward facing perspective images and/or right facing right-of-way images and all data.

1. This solution will host the "Raw Data Files" that is expected to be the original data source for both the QA/QC Electronic Data Files and the Summary Data Files. It will contain data at increments relative to the capabilities of the data collection technology, which will be generally termed "Raw Data" and will provide DOTD with the opportunity to look at a more detailed level of data then the summary provided in the Electronic Data Files.

2. The Electronic Data Files will generally summarize data to 0.004 mile (21.21 foot) lengths.

3. The Summary Data Files will generally summarize data to 0.100 mile (528 foot) lengths.

4. Additional Data Files, as noted via various data dictionaries, will be delivered as per the details outlined for those data dictionaries.

5. The Consultant shall provide all necessary software licenses (if applicable).

b. The Consultant shall provide extensive details outlining all capabilities of this data management software tool. This will include the most recent version of the training manual.

1. The Consultant may be required to demonstrate this solution using data collected and processed for field trials.

2. If awarded this Project, the Consultant will provide two (2) training classes for this solution to approximately 24 people per class, at no additional charge to DOTD. DOTD will work with the Consultant to schedule these training dates.

c. This solution shall have the ability to export data for use in DOTD's Pavement Management System.

7. Software Asset Inventory Capture Tool

a. The Consultant shall provide an application, preferably web based, that provides full data capture functionality necessary for asset inventory capture, using the forward facing perspective images and/or right facing right-of-way images.

1. The Consultant shall provide all necessary software licenses (if applicable).

2. Potential asset inventory items may include, but are not limited to, traffic signals, signs, sign structures, guard rail, guard rail end treatments, crash attenuators, high mast lighting, cable barriers, etc.

3. Please note Task 24 and 25, of this Project, require a one-time Local Jurisdiction Road asset and attribute inventory capture. These assets and attributes are noted in the appropriate Data Dictionaries for those Tasks.

b. This application will be required to engage the DMI measures, the inertial navigation system, the location reference system and/or the Geographic Information System in whatever manner necessary to accurately geo-reference and location reference the asset.

1. The location data will be provided by the Consultant in the Asset Inventory Capture Tool data files, near the end of each A or B Cycle, or as directed by DOTD. It is the intent of DOTD to allow for all final location corrections to occur prior to delivery of this location data.

2. These location data files shall allow the data to be associated by districts.

3. These location data files will not be a separate task, or payment item, since this data is already captured for, and paid for by, other task.

c. The application shall be capable of acquiring accurate linear measurements from the forward facing perspective images and/or right facing right-of-way images.

d. The Consultant shall provide extensive details outlining all capabilities of this asset inventory capture software tool. This will include the most recent version of the training manual.

1. The Consultant may be required to demonstrate this solution using images collected and processed for field trials.
2. If awarded this Project, the Consultant will provide one (1) training class for this solution to approximately 24 people, at no additional charge to DOTD. DOTD will work with the Consultant to schedule the training date for this class.

B. Pavement Condition Measures

All pavement condition measures shall be reported in the appropriate data shell per the appropriate data dictionary for that measure. The Consultant can choose to submit separate data tables for each data dictionary or can submit a single data table with appropriate filters and defined queries that allow for differentiation of the data deliveries. DOTD will have final approval and acceptance for either of these chosen delivery methods. The items that follow provide additional information relative to providing the data to populate the data dictionary tables. Refer to the data dictionary for full deliverables and details.

1. Pavement Distress Cracking

a. The Consultant shall provide details for all aspects of cracking data collection and reporting.

b. The Consultant shall conform to the Louisiana Distress Identification Protocols, or later versions, is required.

c. The Consultant shall explain in detail, the differences between 2D and 3D technology with respect to Distress Cracking data capture, in the "Technical Detail Response" table.

d. The Consultant shall identify if and when the proposed technology can identify cracks of 0.04 inch (1 mm) width per the proposed MAP-21 Notice of Proposed Rules. The Consultant shall identify the lowest theoretical measure possible, and the lowest measure that can be practically or reasonably achieved, with the final selected 2D or 3D technology.

e. All distresses, and calculated indexes, shall be evaluated and reported in tenth (0.100) mile increments.

f. The Consultant shall provide data as defined in the Louisiana Distress Identification Protocols.

g. The Consultant shall report condition data for all analysis lane miles, excluding Local Roads, described in the section "System Description". Local Roads will be addressed differently as defined in this Project.

h. The Consultant shall report all condition data by Control Section logmile, LRS-ID logmile and GPS coordinates.

i. Visual distress identification and quantification in real time from the DCV will not be allowed.

2. Roughness – (IRI) International Roughness Index

a. The Consultant shall provide details for all aspects of IRI data collection and reporting.

b. The Consultant shall identify the lowest allowable speed at which their DCV can accurately capture valid IRI measurements within this SOP.

c. Conformance to the ASTM E950-09 Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference, or its latest version, is expected.

d. Conformance to the AASHTO R43-13 Standard Practice for Quantifying Roughness of Pavements, or its latest version, is expected.

e. The longitudinal profile of a pavement surfaces, shall be captured in both wheel paths, for 100% of all Analysis Lane Miles. Roughness data shall be acquired using a Class II laser type profiler supplied and calibrated using the Quarter Car Simulation approach via either 2D or 3D technology.

f. International Roughness Index (IRI) shall be reported in units of inches/mile.

g. The Consultant shall explain in detail, the differences between 2D and 3D technology with respect to Roughness data capture, in the "Technical Detail Response" table.

h. For QA/QC purposes, IRI values will be summarized in section lengths of 0.004 miles (21.12 feet) in the Electronic Data Files.

i. In addition, longitudinal profile data should be stored in Raw Data Files for every one (1) inch of pavement, while the computed IRI values shall be summarized and retained for every four (4) inches of pavement in the left wheel path and the right wheel paths, along with the standard deviations of the left and right wheel paths. These values shall be made available to DOTD for further review via the Software Data Processing & Management Tool.

j. For Reporting purposes, computed IRI values shall be averaged and reported for each tenth (0.100) mile segment (528 feet) for both the left and right wheel paths in the Summary Data File. These reports shall include an average IRI for the tenth (0.100) mile segment.

3. Faulting

a. The Consultant shall submit provide details for all aspects of Faulting data collection and reporting.

b. The Consultant is expected to exceed the requirements of the AASHTO R36-13 Evaluating Faulting of Jointed Concrete Pavements (JCP) as defined below.

c. The Consultant shall explain in detail, the differences between 2D and 3D technology with respect to Faulting data capture, in the "Technical Detail Response" table.

d. The Consultant shall be required to capture and deliver faulting data, longitudinally, in the right wheel path only, for 100% of the analysis lanes on all jointed concrete pavements.

1. The Consultant must be able to synchronize the pavement image with the data, and then identify the actual location of all construction joints for the jointed

concrete pavement via pavement images. Real time fault data capture and reporting will not be acceptable. The Consultant will not be allowed to solely establish joint detection or location via algorithms such as ProVal or via a pre-defined nominal joint spacing variable such as 20 foot spacing.

2. Joint location can be programmatically determined, but the final actual joint locations must be manually validated, prior to determine faulting values.

e. The Consultant shall then post process the faulting data to determine the value of all faults at these actual defined joints, using no minimum faulting threshold.

f. Faulting depth data will be captured and reported to the nearest 0.04 inch (1 mm), or to the lowest measure that can be practically or reasonably achieved with the final selected 2D or 3D technology.

g. Where the "approach" slab is higher than the "departure" slab, faulting will be reported as a positive (+) fault. Where the "approach" slab is lower than the "departure" slab, faulting will be reported as a negative (-) fault.

h. The average faulting for each tenth (0.100) mile increment (528 feet) will be calculated using the absolute value of all fault measures, including fault measures of (0.0 inch) values and using the actual number of manually identified joints.

i. For QA/QC purposes, post process generated faulting values, using no minimum fault threshold, shall be provide in a separate table in the Electronic Data Files at each defined joint.

1. Also the location of each defined joint shall be provided to the nearest thousandth (0.001) of a mile (5.28 feet), control section logmile, LRS-ID logmile, and GPS coordinates.

2. The defined joint locations shall also be identified via some type of colored marking, on the submitted pavement images supplying the pavement distress data for QA/QC.

j. For Reporting purposes, the maximum positive fault, maximum negative fault, the computed average faulting and the number of identified joints for each tenth (0.100) mile increment (528 feet) shall be reported in the Summary Data File. This reporting data shall be compiled from the faults derived using defined joints using no minimum fault threshold.

4. Rutting

a. The Consultant shall provide details for all aspects of rutting data collection and reporting. Fill quantities and high/low shoulder data collection and reporting will be required and require an SOP. These items will, as determined by the Consultant, be included in the Rutting SOP or they will have their own SOP.

b. Conformance to the AASHTO PP 38-00 (2006) Standard Practice for Determining Maximum Rut Depth in Asphalt Pavements, or later version, is expected.

c. Rutting depth shall be captured and reported in units of inches, to the nearest 0.04 of an inch (1 mm), or to the lowest measure that can be practically or reasonably achieved with the final selected 2D or 3D technology.

d. The Consultant shall explain in detail, the differences between 2D and 3D technology with respect to Rutting data capture, in the "Technical Detail Response" table.

e. For QA/QC purposes, computed rutting data shall be summarized in section lengths of 0.004 miles (21.12 feet) in the Electronic Data Files, for the left wheel path and the right wheel paths.

1. Rutting **shall NOT** be identified on the submitted pavement images supplying the pavement distress data for QA/QC.

f. For Reporting purposes, the average rut depth shall be reported for each tenth (0.100) mile increment in the Summary Data File.

1. The maximum rut depth for each tenth (0.100) mile increment shall also be reported.

2. The count of rut depth measures, identified at each 0.004 miles (21.12 feet) measure, that exceed 0.40 inches, summarized for each tenth (0.100) mile increment shall be reported.

3. **Fill Quantities** shall be calculated and reported to identify the volume of asphalt necessary to fill ruts for each tenth (0.100) mile increment. These fill quantities shall be reported in cubic feet.

5. High/Low Shoulders

a. The Consultant shall capture the elevation difference between the right side shoulder and pavement edge, regardless of the shoulder type. This value will be measured in units of inches, to the nearest 0.04 of an inch (1 mm), or to the lowest measure that can be practically or reasonably achieved with the final selected 2D or 3D technology.

1. Where the "shoulder" is higher than the "pavement edge", the value will be reported as a positive (+) value. Where the "shoulder" is lower than the "pavement edge", the value will be reported as a negative (-) value.

b. For QA/QC purposes, high/low shoulder data shall be summarized in section lengths of 0.004 miles (21.12 feet) in the Electronic Data Files.

c. For Reporting purposes, the high/low shoulders shall be averaged and reported for each tenth (0.100) mile increment in the Summary Data File.

1. The number of high shoulders exceeding (2) two inches, for each tenth (0.100) mile increment, shall also be reported in the Summary Data File.

2. The number of low shoulders exceeding (-2) negative two inches, for each tenth (0.100) mile increment, shall also be reported in the Summary Data File.

6. Macrotexture

a. The Consultant shall provide details for all aspects of Macrotexture data collection and reporting.

1. The Consultant shall explain in detail, the differences between 2D and 3D technology with respect to Macrotexture data capture, in the "Technical Detail Response" table.

2. DOTD only intends to use this data to provide appropriate information for Friction calculations. So both 2D and 3D capabilities must demonstrate, if possible, how the data can be supplied for the area represented by the right wheel path.

3. DOTD does not capture bleeding or raveling, so other Macrotexture capture capabilities of 2D or 3D technology will not be required at this time. This information should still be presented in the appropriate area of the "Technical Detail Response" table.

b. Conformance to the ASTM E1845-15 Standard Practice for Calculating Pavement Macrotexture Mean Profile Depth, or later version, is expected.

c. The Consultant shall provide the Mean Profile Depth, the Root Mean Square and the Percentage of Valid Samples, for the right wheel path, for 100% of all pavements.

d. The sampling frequency shall comply with the ASTM E1845-15 specification.

e. The Percentage of Valid Samples, as defined by ASTM E1845-15, must remain above 90% or the data shall be recollected.

f. The Mean Profile Depth and Root Mean Square shall be identified in units of inches to four (4) decimals.

g. For QA/QC purposes, macrotexture data shall be summarized in section lengths of 0.004 miles (21.12 feet) in the Electronic Data File.

h. For Reporting purposes, RMS, MPD & Percentage of Valid Samples shall be reported for each tenth (0.100) mile increment in the Summary Data File.

7. Pavement Grade Classification & HPMS Reporting

a. The Consultant shall provide details for all aspects of Grade data collection and reporting.

b. Conformance to the March 2014 Highway Performance Monitoring System Field Manual, or later version, is expected.

c. Grade classifications shall be captured and reported per HPMS Item 45: Grades_A through Grades F for all pavement sections as shown below.

Grade Classification	Percent Grade
A	0.0 – 0.4
B	0.5 – 2.4
C	2.5 – 4.4
D	4.5 – 6.4
E	6.5 – 8.4
F	8.5 or greater

d. Should the HPMS Grade designation or segregation change, as a result of MAP-21 during this contract, the Consultant shall make the necessary adjustments to provide the new deliverables without additional compensation.

e. For QA/QC and Reporting purposes, the Consultant shall report the various grade classification data in a Grade data table, with the data as identified in the "Grade" Data Dictionary, summarized to tenth (0.100) mile increments.

f. For Reporting HPMS sections only, the Consultant shall generate another separate HPMS Grade data table, with the same data as identified in the "Grade" Data Dictionary summarized to tenth (0.100) mile increments.

8. Vertical Curve Classification

a. The Consultant shall provide details for all aspects of Vertical Curve data collection and reporting.

b. Vertical Curve classifications shall be captured and the following table for all pavement sections.

Curve Classification	Degrees
A	Under 3.5 degrees (i.e., 0.061 radians)
B	3.5 – 5.4 degrees (i.e., 0.061 – 0.094 radians)
C	5.5 – 8.4 degrees (i.e., 0.096 – 0.147 radians)
D	8.5 – 13.9 degrees (i.e., 0.148 – 0.243 radians)
E	14.0 – 27.9 degrees (i.e., 0.244 – 0.487 radians)
F	28 degrees (i.e., 0.489 radians) or more

c. For QA/QC and Reporting purposes, the Consultant shall report the various vertical curve classification data in a Vertical Curve data table, with the data as identified in the "Vertical Curve" Data Dictionary, summarized to tenth (0.100) mile increments.

9. Pavement Curve Classification & HPMS Reporting

a. The Consultant provide details for all aspects of Horizontal Curve data collection and reporting.

b. Conformance to Item 43 Curves_A through Curves_F (Curve Classification), in the March 2014 Highway Performance Monitoring System Field Manual, or later version, is expected.

c. Horizontal Curve classifications shall be captured and reported for all pavement sections, as shown below.

Curve Classification	Degrees
A	Under 3.5 degrees (i.e., 0.061 radians)
B	3.5 – 5.4 degrees (i.e., 0.061 – 0.094 radians)
C	5.5 – 8.4 degrees (i.e., 0.096 – 0.147 radians)
D	8.5 – 13.9 degrees (i.e., 0.148 – 0.243 radians)
E	14.0 – 27.9 degrees (i.e., 0.244 – 0.487 radians)
F	28 degrees (i.e., 0.489 radians) or more

d. Should the HPMS Horizontal Curve Classification or segregation change, as a result of MAP-21 during this contract, the Consultant shall make the necessary adjustments to provide the new deliverables without additional compensation.

e. For QA/QC and Reporting purposes, the Consultant shall report the various curve classification data in a separate Horizontal Curve data table, with the data as identified in the "Horizontal Curve" Data Dictionary summarized to tenth (0.100) mile increments.

f. For Reporting HPMS sections only, the Consultant shall generate another separate HPMS Horizontal Curve data table, with the same data as identified in the "Horizontal Curve" Data Dictionary summarized to tenth (0.100) mile increments.

10. Skid Testing (Friction)

a. The Consultant shall provide details for all aspects of Skid Testing data collection and reporting.

b. The skid testing measuring system shall consist of a trailer with test wheels towed by a vehicle, which is equipped with a data collection computer.

c. The data collected shall include friction values obtained according to the ASTM E274, the *Standard Test Method for Skid Resistance of Paved Surfaces Using a Full-Scale Tire*.

d. The friction values at all locations shall be obtained for two tire types, the standard rib (tread) tire, as prescribed in ASTM E501 Standard Specification, and standard smooth (blank) tire as prescribed in ASTM E524 Standard Specification.

e. Each wheel of the trailer shall be equipped with a transducer to measure the vertical and horizontal load experienced by the wheel. The trailer shall also be equipped with a water dispensing nozzles for each wheel, which will spray water onto the road surface ahead of each test to simulate wet weather conditions.

f. The Skid Testing measuring system shall have an annual certification of calibration and correlation conducted at a nationally recognized certified friction measuring system evaluation site such as Central/Western Field Test and Evaluation Center located in College Station, TX or Eastern Field Test and Evaluation Center located in East Liberty, OH.

g. The Consultant shall conduct additional check runs against local sites, selected by the department, to ensure proper calibration and accuracy of the system, in the event of any repairs having to be performed on the mechanical or electronics of the system while the Consultant is in the process of collecting data for this contract.

h. The Consultant will link the Skid Testing measuring system to the DCV's DMI (Distance Measuring Instrument). The Consultant must follow all DMI calibration protocols outlined in this Project.

i. DOTD will identify the analysis lane miles each year.

j. The test speed should be conducted at 40 mph within $\pm$ 1 mph where the speed limit is below 50 mph and at a speed of 50 mph within $\pm$ 1 mph where the speed limit is greater than 50 mph.

k. The testing frequency shall occur per the following intervals:

1. Five (5) tests per mile for a 0 to 1 mile long LRS-ID
2. Three (3) tests per mile for a 1 to 3 mile long LRS-ID
3. Two (2) test per mile for a 3 to 5 mile long LRS-ID
4. One (1) tests per mile for a greater than (>) 5 mile long LRS-ID

l. All bridge decks, that have a different surface material than the pavement prior to the bridge, will be tested separately, in accordance to its length, in the appropriate intervals that are described above.

m. If Consultant proposes to use multiple skid testing units, it shall be demonstrated that all vehicles are calibrated to produce measurement differences 5% or less between units. This demonstration must be documented and reported in writing to the DOTD. The units must be identified with a unique number and that number must accompany all data reported from that unit.

n. For QA/QC and Reporting purposes, the Consultant shall generate separate Friction data table, with the same data as identified in the "Friction" Data Dictionary.

1. The Friction data shall be reported at the appropriate locations where it is collected per the testing frequency intervals.

2.3 Project Requirements

A. Quality Control Plan

The Consultant shall submit a Quality Control Plan that provides extensive details of their quality control methods, procedures, and protocols. The QC Plan shall be integrated with the required SOPs, and their requirements, identified in this Project.

This QC Plan will require the Consultant to assure that data is collected accurately and that data quantification reflects actual pavement condition, within the requirements in this Project. The Consultant's personnel shall work with DOTD to analyze and review the data and immediately reschedule data/image capture for any section found to be invalid.

The Consultant shall, for Project evaluation purposes, submit with their QC Plan, samples of monthly reports that comply with the reporting requirements of this Project. Multiple samples of each report can be submitted if the Consultant feels this is necessary to convey their ability to comply with the reporting requirements outlined in this Project.

DOTD expects the Consultant to fully cooperate with DOTD with respect to the QC plan. This implies that the necessary efforts by the Consultant to repair, recapture, or in some manner correct all issues that arise, in a mutually agreed upon solution, will occur.

DOTD reserves the right to require additional procedures, methods, protocols, data items, reporting measures or any reasonably appropriate modifications to the Consultant's QC plan when issues arise that could jeopardize successful capture and delivery of these Project requirements.

In addition to the QA/QC requirements identified throughout this Project, the QC plan shall also address, but is not limited to, the following items.

1. Equipment Calibrations & Camera Maintenance

a. All equipment calibrations and camera maintenance are to be performed in accordance with specific manufacturer recommendations.

b. Equipment calibrations refer to anything that requires proper/regular calibration to ensure that it is in proper working order and will produce expected, acceptable results.

c. A regular maintenance and testing program of the equipment and cameras, in accordance with the manufacturer's recommendations, shall be performed and documented by the Consultant.

d. DOTD will establish Primary Baseline calibration sites. Prior to being authorized by DOTD to collect data, the Consultant's Data Collection Vehicle (DCV) will be calibrated to a Primary Baseline calibration site. Data acquisition and data evaluation will be performed at least three times on each pavement calibration section to allow for the calibration of electronic sensor data. Such calibration must be maintained for the duration of subsequent data collection. The electronic sensor data will be evaluated for accuracy, under DOTD supervision, as appropriate for the equipment.

e. Calibrations will be repeated as needed, or as defined further in following sections.

f. All calibrations procedures performed during this Project, along with the recorded calibration data, are to be documented (i.e., results from tests are recorded and any corrective action taken shall be explained in detail) and reported to DOTD on a monthly basis.

g. The Consultant's Final Report shall also document the calibration procedures, the calibration data that was collected and any corrective action taken and explained in detail.

h. DCVs that leave the State, require repairs, to either the vehicle or data collection equipment, or are out of service for an extended period of time, must be recalibrated on the DOTD approved Primary Baseline calibration sites.

i. DCVs must be recalibrated at least once per month at DOTD approved Primary Baseline calibration sites, or as directed by DOTD.

2. Quality Control Verification Sites

a. The Consultant shall calibrate all DCV's on the DOTD baseline Primary Baseline calibration sites prior to a DCV collecting any data and also just prior to establishing a (DQCVS) District Quality Control Verification Sites in a district.

b. During the first week of data collection in each new district, a DQCVS shall be established by the Consultant on a Control Section. The Consultant shall establish a DQCVS with known IRI and Rutting or Faulting values. Separate DQCVS sites are required for each district.

c. For subsequent ongoing data collection within a particular district, the DQCVS will be run weekly by each DCV and compared with the original data collected for that section. The Consultant will evaluate these measurements to determine the accuracy of field measurements and to identify needed equipment recalibrations at the Primary Baseline calibration sites.

d. All weekly DQCVS data collection shall be documented in writing and electronically (digital images with electronic sensor data) and both shall be delivered to DOTD in monthly reports.

3. Distance Measuring Instrument

a. The Consultant shall calibrate the DMI (Distance Measuring Instrument) using Primary Baseline calibration sites provided by DOTD.

b. The Consultant must provide all findings, inclusive of the calibration number before the calibration process, the calibration number after the calibration process, location of the calibration site, DOTD provided length of the calibration site, and length of calibration site as measured by the DMI before and after calibration, and list any discrepancies found during the calibration process.

c. The calibration of the DMI shall be reported monthly to DOTD. The report shall include any discrepancies that are found, the corrective action taken, and a detailed explanation of the matter.

d. The Consultant's Final Report shall also document DMI calibration details.

4. Inertial Navigation System, LRS, GIS

a. The QC Plan shall define the quality assurance methods and procedures in place to ensure that both geo-referenced, and location referenced, data and images are located within proposed precision and accuracies.

1. The Consultant shall reference the Louisiana Transportation Research Center's Final Report 539 "DOTD Standards for GPS Data Collection Accuracy" found at https://www.ltrc.lsu.edu/pdf/2015/FR_539.pdf

b. The Consultant shall report monthly all calibration details and efforts to ensure accurate coordinates and location reference is occurring.

5. Manual Distress Rater and Review of Automated Distress Ratings

a. The QC Plan shall include the requirements outlined in this section.

b. When manual rating of various pavement distresses/conditions are provided, or when distress rating review of automated distress identifications are provided, the Consultant shall provide a data quantification rating/review process which will include a rater training plan and ongoing rater consistency testing for the data quantification or review.

c. The data quantification rating/review process shall assure rater accuracy and consistency, throughout the state, over the Project duration for the distresses being rated.

1. For manual rating, the data collection and quantification process should be applied in the same manner by all raters using the process. The plan must address the methods to demonstrate and monitor rater consistency throughout the entire data collection and quantification process.

2. For review of automated rating, the plan must address how consistency is provided via the methods and procedures in place to validate automated ratings by reviewers.

d. The Consultant will be required to have a unique identification of both their DCV's and their raters, so as to facilitate comparison and to aid in the determination of the consistency of both.

e. The data quantification rating process must be approved by DOTD prior to implementation.

f. The Consultant shall provide monthly reports of the results of the data quantification rating process, for the duration of the Project, and summarized the test results in the final report.

6. Forward Facing Perspective and Right Facing Right-of-way Image Capture

a. The QC Plan shall define the quality assurance methods and procedures in place to ensure appropriate image capture.

b. The Consultant will document the following in monthly reports.

1. Daily validation of clean enclosures and/or camera lenses for Forward Facing Perspective and Right Facing Right-of-way Cameras.

7. Pavement Data and Image Capture

a. The QC Plan shall define the quality assurance methods and procedures in place to ensure appropriate pavement data and pavement image capture.

b. The Consultant will document daily validation of functioning sensors and pavement imaging cameras in the monthly reports.

c. The pavement view camera image will be measured and verified by using the Consultant's crack detection/measurement system to determine the actual footprint (width) of the image for each Data Collection Vehicle prior to data collection. That footprint image must be maintained for the duration of the contract. The Consultant will be required to verify daily that the DCV(s) footprint is the same as the previous day. Such verification shall be documented (i.e., results from tests are recorded and any corrective action taken explained in detail) and reported in monthly reports.

1. These items will also be included as an appendix in the final report.

2.4 Deliverables

2.4.1 Preliminary Activities & Initial Pilot (Task 1)

A. Consultant Responsibilities

1. Following the Notice to Proceed, the Consultant shall attend meetings and discussions with DOTD personnel to finalize the deliverables, methods, technical requirements, procedures and guidelines for the Project.

2. The Consultant in conjunction with DOTD will develop and finalize the invoicing and Project delivery schedule.

3. The Consultant may be required to recollect and report certain data already collected via the Field Trial if technical or procedural changes are required.

4. The Consultant shall perform calibration test for the proposed DCVs; shall initiate and test the Quality Assurance and Quality Control Program; and shall begin to calibrate

raters and or rating schemes for automated crack detection software in identifying typical highway pavement types and distress classifications.

5. For calibration testing, the Consultant shall be responsible for all traffic control as per the U.S. Department of Transportation - Manual of Uniform Traffic Control Devices for Streets and Highways (MUTCD) and safety related procedures for the mutual protection of the Consultant's personnel, DOTD employees, and the public. The Consultant shall provide a seat for DOTD staff in the Data Collection Vehicle(s). The occupants and DCV(s) must comply with all Louisiana statutes that regulate vehicle operation (i.e. seat belts, insurance, driver's license, operational permits, oversized vehicle permits, speed limits, etc.).
6. The Consultant shall provide initial training for all proposed software for up to six (6) DOTD employees. Additional training is noted with the software requirements.
7. The Consultant shall participate in a small Pilot Project to finalize and gain acceptance of methods, procedures, deliverables, reporting, etc. that will be used for the remainder of the Project. This Pilot Project will include roadway systems found in Task 2 through 9 so that upon completion acceptance by DOTD, the pilot deliverables will complete some percentage of those Task's and as such would be billable.
    a. The Consultant is encouraged to complete the Pilot as quickly as possible to provide as much time as possible to accomplish "Bonus Eligible" Tasks.
8. DOTD reserves the option to request a Pilot Project at the start of each full cycle.

B. DOTD Responsibilities

1. Identification of roadways for the calibration test and the types of data to be collected for each type of roadway.
2. Identification of roadways for the Pilot Project.
3. Provide various data delivery formats, tables, databases, etc.
4. Provide the updated Louisiana Distress Identification Protocols.
5. Finalize the maximum and minimum values, where appropriate for various distress items, during "Task 1: Preliminary Activities & Initial Pilot," including which of the 2D or 3D technologies will be used.
6. DOTD will review with the Consultant the DOTD's Location Reference System, Inertial Navigation System, and Geographic Information System.

C. Consultant Deliverables

The Consultant's deliverables for Task 1 will include:

1. The Quality Assurance and Quality Control Program that is documented and published by the Consultant. This document will be presented to DOTD for review and approval prior proceeding with further Tasks.
2. Final or updated installation of all appropriate software solutions.
3. A copy of the processed data results of the calibration test runs.

4. Test loading of processed pavement condition data into the DOTD's dTIMS® (Deighton Solution) import database.
5. An updated Master Schedule plan for the data collection and quantification of the field condition data.
6. Forward facing perspective images and right facing right-of-way images, with "Header Information," as specified in this Project.
7. Pavement images with distress identification markings, joint locations, etc.
8. Electronic Data Files, with all appropriate QA/QC data, as identified in this Project.
9. Summary Data Files, with all appropriate summary data, as identified in this Project.
10. The software viewing tool, the software data processing and management tool, the software asset inventory capture tool and appropriate training.
11. Confirmation of data and image synchronization, and location verification, via the software above.
12. Monthly Reports, detailing the results of calibration sites, Rater calibration, results of data test load, sensor calibrations, inertial navigation data, etc. including all monthly reporting requirements outlined in this Project.
13. All data and image files will be submitted on external hard drives (USB 2.0) or on other pre-approved storage media.

2.4.2 Data & Image Collection (for Tasks 2, 4, 8, 10, 12, 16, 18)

A. Consultant's Responsibilities

1. Meet all technical requirements outlined in this Project, Supporting Documents and Data Dictionaries required to meet the deliverables of these Task.
2. Collect all appropriate data for the pavement condition assessment requirements of the Project.
3. Collect clear, digital forward facing perspective images, right facing right-of-way images, pavement images for all pavements.
4. Report the locations of all construction zones and or other route deviations.

B. DOTD's Responsibilities

1. Identify roadways to be studied and the types of data to be collected for each type of roadway.
2. Supply the Consultant with copies of the Department's control section database file, and district control section base map; Listing of GPS coordinates for start and end of each control section.
3. Supply electronic copies of the roadways base maps and databases.
4. Supply at least one DOTD representative to assist in the navigation on the State Highway System when deemed necessary by DOTD
5. Determine when conditions are acceptable for data collection, either by being in the Consultant's DCV or by a review of the digital images afterward.

6. Determine when images are acceptable, via a bi-weekly DOTD review of submitted images.

C. General Requirements

1. All data is to be collected via the "from" location descriptions and the "to" location descriptions in the DOTD Location Referencing System and the GIS base map.

2. All data will be collected with respect to the requirements of this Project in conjunction with Louisiana Distress Identification Protocols.

3. All data shall be collected in the right lane of the ascending direction of Control Section log mile on undivided two, three, and 4 lane roads and from the right lane in each direction on divided roads with four or more lanes. Additionally, there will be a limited number of two lane roadways that will be run in both directions. The DCV shall begin collection of digital images not less than a tenth (0.100) mile before the beginning of each control section and shall stop collection of digital images not less than a tenth (0.100) mile past the end of the control section.

4. The Consultant shall report when construction zones, bridges, lane deviations, and railroad crossings occur, or are encountered, during data collection.

A. Data from construction zones, bridges, lane deviations and any diversions from the correct travel lane shall not be used in calculating one-tenth mile averages and other statistics, but shall be reported in the Raw Data File.

B. Consultant shall report when construction zones are encountered within the tenth (0.100) mile segments.

C. Consultant shall report when bridges are encountered and identify the number of bridges within the tenth (0.100) mile segments.

D. Consultant shall report when railroad crossings are encountered and identify the number of railroad crossings within the tenth (0.100) mile segments.

E. Consultant shall report when lane deviations occur and identify when they occur in the tenth (0.100) mile segments.

5. The Consultant field staff shall have the capability of monitoring data collection in real time in the DCV so as to minimize data errors.

6. The Consultant shall demonstrate that all DCV's are calibrated to produce measurement differences (IRI, rutting and faulting data) of 5% or less between vehicles.

7. The Consultant must notify the DOTD whenever the DCV first enters any district, reenters a district after an absence of a week or more, or returns to the Project after leaving the state. DOTD uses these notifications to advise District Administrators, as a professional courtesy, of the presence of the Consultant in their district.

8. Vehicles must be identified with a unique number and that number must accompany all data reported from that vehicle.

9. DOTD will provide pavement type for reference (i.e., asphalt, composite, and jointed concrete) information for all on-system routes. The Consultant shall present a methodology for validating this pave type information prior to, or during, data distress

quantification. Before any distress quantification is done, the Consultant needs to be certain what the pave type is so as to quantify the correct distress types.

D. Deliverables

1. The Consultant shall furnish the images to DOTD on external hard drives (USB 2.0) or on other pre-approved storage media, on a bi-weekly basis. The bi-weekly delivery shall be accompanied by all required files need for viewing the images with the software to enable the automatic retrieval of a specific segment of road, viewing of its image, image clarity (i.e. darkness, extreme sun, light rain or standing water or other debris in roadway). Locations with unacceptable image quality shall be collected again at no additional cost to the department.
2. The Consultant shall deliver bi-weekly Raw Data Files containing the DCV's electronic sensors (rutting, IRI, faulting, GPS data, etc.).
3. All daily/weekly equipment calibrations test results (i.e. DMI, Laser Profiler, video footprint, etc.) submitted on a monthly basis.
4. All daily/weekly electronic sensor verification results (i.e. re-run of sections that had been run the previous Monday to determine that the DCV is still in calibration) submitted on a monthly basis.

2.4.3 Distress Data Analysis & Delivery (for Tasks 3, 5, 9, 11, 13, 17, 19)

A. Consultant's Responsibilities

1. Meet all technical requirements outlined in this Project, Supporting Documents and Data Dictionaries required to meet the deliverables of these Task.
2. Perform data analysis, quantify distresses, generate index data
3. Evaluate and report pavement distresses on 0.100 mile increments
4. Supply data for each LRS_IDs in DOTD's Location Reference System
5. Submit clear, digital pavement images, forward facing perspective images, and right facing right-of-way images for all pavements.

B. DOTD's Responsibilities

1. Provide to the Consultant the Louisiana Distress Identification Protocols.
2. Supply at least one DOTD representative to review distress quantification and assist the Consultant's personnel in the coordination of the Quality Assurance and Quality Control Program.

C. General Requirements

1. Reporting Increments: All distresses shall be evaluated and reported on tenth mile (0.100) increments. DOTD will provide, and the Consultant shall use, the Louisiana Distress Identification Protocols. The Consultant shall report condition data for all of the approximately 20,600 analysis lane miles, which are to be reported per the Location Reference System.
2. As previously required in "Quality Assurance and Quality Control Program", the DOTD shall test and verify (as part of the Quality Assurance and Quality Control Program) the

consistency of several quantified processed data. Such verification by the department may result in the Consultant being notified to resolve problems with the quantified distress data.

3. The Consultant shall deliver all data/images, on external hard drives (USB 2.0) or DOTD approved storage media, to the DOTD Management Systems offices located at 1201 Capital Access road, Baton Rouge, Louisiana.

4. The Consultant shall quantify and summarize distresses and report those quantified distresses (along with the rutting, roughness, faulting, and GPS data) as outlined in the Deliverables. The Consultant shall load into the DOTD's dTIMS® import database and query for errors before delivery. The dTIMS® import database containing the summarized district data is to be delivered by the Consultant's personnel who are responsible for preparing and loading the summarized data for the dTIMS® import database. The Consultant's personnel shall assist DOTD in the review of the data and immediately reschedule for testing any section found to be invalid.

D. Deliverables

1. All quantified pavement condition assessment data properly loaded into the dTIMS® import database (provided to the Consultant during Task 1 Preliminary activities) and reported in tenth (0.100) mile increments as required.

2. All data/images are to be delivered on external hard drives (USB 2.0) or on other pre-approved storage media.

3. Electronic Data Files/Tables containing all relevant requirements outlined in this Project.

4. Summary Data Files/Tables containing all relevant requirements outlined in this Project.

5. Image Location Data Files/Tables containing all relevant location information and image file storage location.

6. All asset inventory location files to allow asset measuring in the Asset Inventory Software tool.

7. Raw Data Files containing the DCV's electronic sensors (rutting, IRI, faulting, pavement distress, GPS data, etc.) shall also be included within this deliverable, in addition to the Electronic Data Files.

8. As a final delivery, the Consultant shall supply for each district, all approved forward facing perspective images and right facing right-of-way images accompanied by all approved associated files and databases with supporting files for that district.

a. This delivery shall be on an approved storage media (server) that shall have the ability to connect to the DOTD network via an Ethernet connection with its own IP address.

b. The server for each of the 9 district deliverables shall be formatted properly to enable the access of this media by the software provide via this Project.

c. These servers will be DOTD's property after the completion of the Project.

d. These deliveries must be completed by August 1st.

2.4.4 Image Collection & Image Delivery (for Tasks 6, 7, 14, 15, 20, 21)

A. Consultant's Responsibilities

1. Meet all technical requirements outlined in this Project, Supporting Documents and Data Dictionaries required to meet the deliverables of these Task.
2. Collect clear, digital forward facing perspective images and right facing right-of-way images for all pavements.
3. Report the locations of all construction zones and or other route deviations.

B. DOTD's Responsibilities

1. Identify roadways to be studied.
2. Supply the Consultant with copies of the Department's control section database file, and district control section base map; Listing of GPS coordinates for start and end of each control section.
3. Supply electronic copies of the roadways base maps and databases.
4. Supply at least one DOTD representative to assist in the navigation on the State Highway System when deemed necessary by DOTD
5. Determine when conditions are acceptable for data collection, either by being in the Consultant's DCV or by a review of the digital images afterward.
6. Determine when images are acceptable, by a bi-weekly DOTD review of submitted images.

C. General Requirements

1. All images are to be collected with respect to the DOTD's Location Referencing System.
2. All images shall be collected in the right lane of the secondary direction of Control Section.
3. Images from construction zones, detours and other diversions from the correct travel lane shall still be submitted. The Consultant shall report the locations of construction zones encountered.
4. The Consultant shall demonstrate that all DCV's are calibrated to generate proper location measurements per the DCV calibration requirements. This must be documented and reported in writing, in the monthly reports, to the DOTD. Vehicles must be identified with a unique number and that number must accompany all data reported from that vehicle.

D. Deliverables

1. The Consultant shall furnish the JPEG images to DOTD on external hard drives (USB 2.0) or on other pre-approved storage media, on a bi-weekly basis.
2. Images will initially be submitted without "Header Information". Upon QA/QC and acceptance testing approval, the Consultant will resubmit the final images with appropriate "Header Information" applied.

3. The bi-weekly delivery shall be accompanied by all required files need for viewing the images within the software, to enable the automatic retrieval of a specific segment of road, viewing of its image, allow verification of location, and image clarity (i.e. darkness, extreme sun light rain or standing water or other debris in roadway). Locations with unacceptable image quality shall be collected again at no additional cost to the department.

4. All weekly equipment calibrations test results (i.e. DMI, camera angles, video footprint, etc.) submitted on a monthly basis.

5. All weekly electronic sensor verification results (i.e. re-run of sections that had been run the previous Monday to determine that the DCV is still in calibration) submitted on a monthly basis.

2.4.5 Final Documentation (Task 26)

The Consultant shall provide the following final documentation by June 1st.

A. A final delivery of all quantified data (i.e. previously delivered district data inclusive of any subsequent required revisions) for all districts, on external hard drives (USB 2.0) or on other pre-approved storage media.

B. Final copies of all Raw Data Files, Electronic Data Files, and Summary Data Files generated during the course of the Project with the appropriate software to access, review, view, etc. these files.

C. DOTD shall be the owner of all data and images delivered for this Project and the Consultant shall not be allowed to subsequently charge or make money for this data and images.

D. Copies of all reports, routing sheets, field notes, documents relating to or impacting the Project, etc.

E. All reports shall be delivered in hard copy format and in electronic format (Word 2010) (.docx) on external hard drives (USB 2.0) or on other pre-approved storage media.

2.4.6 Skid Testing (Task 22)

A. General Requirements

1. Skid Testing will not be part of the Field Trials.

2. Compliance with ASTM E274, the *Standard Test Method for Skid Resistance of Paved Surfaces Using a Full-Scale Tire*.

3. Compliance with ASTM E501 Standard Rib (Tread) Tire Specification, and ASTM E524 Standard Smooth (Blank) Tire Specification.

4. Obtain annual certification of calibration and correlation conducted at a nationally recognized certified friction measuring system evaluation site such as Central/Western Field Test and Evaluation Center located in College Station, TX or Eastern Field Test and Evaluation Center located in East Liberty, OH.

5. Perform routine calibration checks against established (DQCVS) District Quality Control Verification Sites.

6. Compliance with DMI calibration protocols outlined in this Project.

7. Perform data capture in analysis lane miles as described in this Project and the Louisiana Distress Identification Protocols.
8. Meet multiple skid unit calibration requirements.

B. Deliverables

1. The Consultant shall generate separate Friction data table, with the same data as identified in the "Friction" Data Dictionary.
   a. Skid testing data will include the date and time of collection
   b. The data will include the location of each test will include control section, LRS-ID, direction of travel and LRS-ID logmile. Also to be recorded with each test should be the friction number, test speed, tire type used, wheel path (right or left) and the pavement surface type.
2. If it is determined at the time of collection that tests could not be performed on all or a portion of a section because of construction, unsafe condition or other factor, this should also be recorded into a file.
3. The Consultant will report the GPS coordinates for the beginning, at every tenth (0.100) mile increment, at every testing location and at the end of each section.
4. DOTD will provide the Consultant with an example of the latest friction report for the Consultant to use in submitting this data.
5. The report will also contain a Map of the Friction Number (Ribbed < 30, Smooth < 20) and deliver the ARCGIS file that created the map.
6. Also included in this report should be parish and district summary tables. The sort order for these tables should be parish, surface type, test speed and tire type. Reported in these tables using all test from each grouping are the total number of test, the average SN and the standard deviation. Also reported using the Skid Test Result tables are the minimum and maximum SN averages and the control sections that these numbers represent.

2.4.7 Historical Data Conversion (Task 23)

The Consultant will be required to convert or configure the past three (3) data collection cycles, including images, to a format that allows their proposed software solutions to access and display this data and imagery in conjunction with the data and imagery they will capture for this Project.

A. Consultant's Responsibilities

1. Meet all technical requirements outlined in this Project, Supporting Documents and Data Dictionaries required to meet the deliverables of this Task
2. Convert three (3) data collection cycles of data and images.
3. Demonstrate converted data in Consultant's software.
4. Support, Updates, Corrections, etc. for this data, and data conversion, should subsequent errors, omissions, or mistakes, on the part of the Consultant, be determined as full use of this data, and software, is expanded by DOTD.

B. DOTD's Responsibilities

1. Provide three (3) cycles of data to Consultant

C. General Requirements

1. Only the necessary data format shall be affected.
2. The data integrity shall not be compromised in any way to accomplish this Task. The data shall retain its original value, meaning, purpose and usefulness.

D. Deliverables

1. Converted data, or data tables, installed in the various software solutions provided by the Consultant.
2. Any data tables, configuration tables, etc. necessary to provide access to the data.
3. Converted images to display in the software solutions synchronized with the converted data.

2.4.8 Local Road Data Collection (Task 24)

Forward facing perspective images and right facing right-of-way images shall be collected for a portion of the local jurisdiction public road network which shall be identified by DOTD. This one time Task shall encompass approximately 18,000 analysis lane miles.

A. Consultant's Responsibilities

1. Meet all technical requirements outlined in this Project, Supporting Documents and Data Dictionaries required to meet the deliverables of this Task.
2. Collect GPS data and location information on all defined local jurisdiction public roadways.
3. Collect clear, digital perspective view and right view camera images for all of the studied roads.
4. Report the locations of all construction zones and or other route deviations where no data collection was therefore possible.
5. Identify "roads" that cannot be determined as either "Public" or "Private" to DOTD for further review to make a final determination while the DCV is in the area. This shall save time and be more productive.

B. DOTD's Responsibilities

1. Supply at least one DOTD contact representative to assist in the navigation on the local jurisdiction public roadways when deemed necessary by DOTD.
2. Determine when conditions and images are acceptable, via a review of the bi-weekly image submittals.
3. DOTD shall provide the Consultant with a "blank" Esri file geo-database feature schema for each of the road feature collections.
4. DOTD shall provide that various Data Dictionaries for this Task.

5. DOTD shall supply a file geo-database of the current public roadways that DOTD is aware of. This geo-database is NOT meant to be an authoritative, nor complete source of all roads to be collected, but only to provide reference in assisting collection.

6. Supply Local Road Decision Tree.

C. General Requirements

1. The Consultant shall collect forward facing perspective images and right facing right-of-way images in the right lane of both directions of each LRS identified by LRS-ID whether two-way or divided.

2. The DCV shall begin a lead-in collection of digital images prior to the beginning of each LRS-ID and shall stop after a lead-out collection of digital images past the end of the LRS-ID to ensure the proper starting and stopping locations are captured. This will be used for QA/QC and acceptance testing.

   a. Asset and attribute data capture will only be performed on the Lead-in and Lead-outs sections if the start or stop of a roadway is adjusted, by DOTD, to correctly define their locations.

3. The Consultant shall demonstrate that all DCV's are calibrated to generate proper location measurements per the DCV calibration requirements. This must be documented and reported in writing, in the monthly reports, to the DOTD. Vehicles must be identified with a unique number and that number must accompany all data reported from that vehicle.

4. Images from construction zones, detours and other diversions from the analysis lane shall still be submitted.

   a. The Consultant shall report the locations of construction zones encountered.

   b. Data from construction zones, detours and other diversions from the analysis lane shall not be used in calculating or reporting data, but shall be reported in the database.

5. The Consultant shall abide by the DOTD Local Road Inventory Collection Manual.

6. The Consultant shall use the procedures documented in the Local Road Decision Tree to make determination of whether a roadway is "Private."

   a. The justification for the determination of "Private" shall be in the appropriate data dictionary record.

   b. The Consultant shall collect and provide digital images for DOTD to review and approve the designation of "Private". These digital images could include gates, signs, etc. or could be documented notification of a verbal statement from owner including the owner's name if available.

7. The Consultant shall work with the DOTD Geographic Unit to address any issues with existing or missing LRS_IDs.

8. The Consultant shall count all bridges and quantify the totals by tenth (0.100) mile segments.

D. Deliverables

1. The Consultant shall furnish the JPEG images and data to DOTD on external hard drives (USB 2.0) or on other pre-approved storage media, on a bi-weekly basis.

2. The bi-weekly delivery shall be accompanied by all required files need for viewing the images within the software, to enable the automatic retrieval of a specific segment of road, viewing of its image, allow verification of location, and image clarity (i.e. darkness, extreme sun light rain or standing water or other debris in roadway). Locations with unacceptable image quality shall be collected again at no additional cost to the department.
3. Raw Data Files containing the raw data from the DCV's electronic sensors (GPS data) shall also be included within this deliverable.
4. Confirmation of data and image synchronization, and location verification, via the software viewing tool.
5. All weekly equipment calibrations test results (i.e. DMI, camera angles, video footprint, etc.) submitted on a monthly basis.
6. All weekly electronic sensor verification results (i.e. re-run of sections that had been run the previous Monday to determine that the DCV is still in calibration) submitted on a monthly basis.
7. JPEG Images will initially be submitted without "Header Information". Upon QA/QC and acceptance testing approval, the Consultant will resubmit the final images with appropriate "Header Information" applied.
8. Esri ArcGIS file geo-database v 10.3 or greater shall be the format in which all features are delivered.

2.4.9 Local Road Asset Inventory Delivery (Task 25)

An asset inventory shall be collected on a portion of the local jurisdiction public road network not maintained by DOTD. This one time inventory collection shall encompass approximately 18,000 analysis lane miles which shall be identified by DOTD.

This inventory represents the final data collection, of a multi-year collection, of the local jurisdiction public road network.

A. Consultant's Responsibilities

1. Meet all technical requirements outlined in this Project, Supporting Documents and Data Dictionaries required to meet the deliverables of this Task.
2. Collect all assets and attributes defined in **2.5.9.D** "**Local Jurisdiction Road Asset & Attribute Identification".**

B. DOTD's Responsibilities

1. Provide DOTD Local Road Inventory Collection Manual
2. Supply "blank" ESRI file geodatabase features for each asset to be collected and the segmented attribute table. This file geodatabase will include correct schema and appropriate domains for data to be delivered.
3. Provide Data Dictionary for each attribute collected.

C. General Requirements

1. Capture, via the Consultants Asset Inventory Capture Tool, the assets and attributes defined in **2.5.9.D** "**Local Jurisdiction Road Asset & Attribute Identification"**.
2. All data shall be location referenced using the Location Reference System Identification (LRS-ID) provided by DOTD and GPS coordinates.
3. All data shall be exported to the supplied Esri geo-database features for use in GIS applications. The Consultant shall use whatever geo-processing tools necessary to complete this requirement. All data must be compliant with the provided Esri geo-database features for use in GIS applications.
4. The Consultant shall reference the DOTD Local Road Inventory Collection Manual.
5. The Consultant shall generate a segmented Attribute Table of feature attributes which are identified below.

D. Deliverables

1. Collect the listed assets by Geographic Feature type. Data Dictionaries define specific data items to collect for each feature. Summaries of collected data may be required for reporting purposes. These shall be noted in the Data Dictionaries and the blank GIS schema for each feature. This data shall be capture and reported along a given LRS-ID.

    a. Geographic Features (Assets) to Collect:

    1. Local Roads – Line Feature of Non-State Maintained Public Roads
    2. Bridges – Line Feature of Bridge, Tunnel, & Causeway Locations
    3. Curbs Outside – Line Feature of Curbs on right side of roadway
    4. Curbs Inside – Line Feature of Curbs on left side of One Way & Divided Streets
    5. Grade Classification – Line Feature of the Percent Grade Classifications
    6. Horizontal Curve – Line Feature of Horizontal Curvature Classifications
    7. Intersections – Point Feature at intersection of road features
    8. Lane Widths – Line Feature of roads with the average Lane Widths in direction of travel
    9. Number of Lanes – Number of through lanes in the direction of travel
    10. Medians – Line Feature of roads with Median Types and Widths
    11. On Route Parking Outside – Line Feature of Parking on the right side of a roadway
    12. On Route Parking Inside – Line Feature of Parking on the left side of a roadway for One Way & Divided Streets
    13. Surface Type – Line Feature of roads with Pavement Types and Pavement Widths including all lanes and shoulders (measured in feet)
    14. Railroad Crossings – Point Feature at intersection of railroads and roads
    15. Shoulders Outside – Line Feature of Shoulders on right side of roadway
    16. Shoulders Inside – Line Feature of Shoulders on left side of One Way & Divided Streets

17. Sidewalks Right – Line Feature of Sidewalks on right side of roadway

18. Sidewalks Left – Line Feature of Sidewalks on left side of One Way & Divided Streets

19. Sight Distance – Line Feature of safe visible distance to pass other vehicles. It is also used to identify location of single passing striping (yes/no)

20. Speed Limit Signs – Point Feature at location of each 'Speed Limit Sign.

21. Terrain Type – Line Feature identifying toll locations along a roadway.

22. Turn Lanes Right – Point Feature at location of each designated turn lane.

23. Turn Lanes Left– Point Feature at location of each designated turn lane.

24. Vertical Curve – Line Feature of Vertical Curvature Classifications

*Widths shall be averaged to the nearest 0.5 foot in the final delivery

b. Geographic Features (Assets) to Summarize:

1. Number of Bridges along each LRS

2. Number of Posted Bridges along each LRS

3. Number of At-Grade Intersections with Signals along a LRS

4. Number of At-Grade Intersections with Stop Signs along a LRS

5. Number of At-Grade Intersections with Yield Signs along a LRS

6. Number of At-Grade Intersections with No Control Device along a LRS

7. Number of At-Grade Intersections with Pedestrian Signals along a LRS

8. Number of At-Grade Intersections with Roundabouts along a LRS

9. Number of ADA Compliant Sidewalk Ramps along a LRS

10. Number of Railroad Crossings along a LRS

c. Geographic Cultural Features (Assets) to Capture:

1. Cemetery

2. Church

3. Church & School

4. Church with Cemetery

5. Courthouse

6. Fire Station

7. Hospital

8. Police Station

9. Post Office

10. School

2. Create and deliver a segmented attribute data table of the following feature assets from Task 25 D.1.a. is required to optimize the asset data. The attributes to collect are listed here.
   a. Surface Type
   b. Shoulder Type Outside
   c. Shoulder Type Inside
   d. Median Type
   e. Lane Width
   f. Number of Lanes
   g. Pavement Width
   h. Shoulder Width Outside
   i. Shoulder Width Inside
   j. Median Width
   k. Speed Zone
   l. On Route Parking Outside
   m. On Route Parking Inside
   n. Facility Type field in the local road feature
3. Data is to be reported on approved media storage dictated by DOTD appropriate in both size and compatibility.
4. Asset inventory measuring software files and software installation.
5. An asset inventory file used by Consultant to derive geo-database data is to be reported on approved media storage dictated by DOTD appropriate in both size and compatibility.

2.4.10 Optional: Local Road Asset Inventory Data Conversion (Task 27)

The Consultant optionally may be asked to convert or configure the past Local Road data and images, to a format that allows their proposed software solutions to access and display this data and imagery in conjunction with the data and imagery they will capture for this Project.

A. Consultant's Responsibilities

1. Meet all technical requirements outlined in this Project, Supporting Documents and Data Dictionaries required to meet the deliverables of this Task
2. Convert existing data and images.
3. Demonstrate converted data in Consultant's software.
4. Support, Updates, Corrections, etc. for this data, and data conversion, should subsequent errors, omissions, or mistakes, on the part of the Consultant, be determined as full use of this data, and software, is expanded by DOTD.

B. DOTD's Responsibilities

1. Provide Local Road data/images to Consultant

C. General Requirements

1. Only the necessary data format shall be affected.
2. The data integrity shall not be compromised in any way to accomplish this Task. The data shall retain its original value, meaning, purpose and usefulness.
3. Esri ArcGIS file geo-database v 10.3 or greater shall be the format in which all features are delivered.

D. Deliverables

1. Converted data, or data tables, installed in the various software solutions provided by the Consultant.
2. Any data tables, configuration tables, etc. necessary to provide access to the data.
3. Converted images to display in the software solutions synchronized with the converted data.