**1411799447 Appendix A – Scope of Work**
**Survey Services for Transmission/Distribution and Substation Projects**

## SECTION 1: OBJECTIVES AND DESCRIPTION OF PROJECTS

### 1.1 General

JEA is soliciting qualifications from Survey firms to perform surveying, and LiDAR services needed for Distribution/Transmission and Substations facilities. JEA will require the successful bidder to perform all surveying including aerial LiDAR, digital orthophotography for use in PLS-CADD for distribution/transmission line projects, terrestrial LiDAR for Substation 3D modeling.

## SECTION 2: SCOPE OF SERVICES

### 2.1 Distribution/Transmission

The bidder shall perform a LiDAR survey to be used in developing PLS-CADD models.

2.1.1 Survey Devices: The consultant's aircraft, LIDAR equipment, cameras, GPS antenna, and all other non-standard equipment or devices shall be installed and operated according to current FAA regulations and guidelines.

2.1.2 LiDAR Sensor: Must be able to collect up to 8 observations (returns) for each laser pulse. One recorded observation must be the last return. Must record a laser intensity value for each recorded observation. Must operate under eye-safe conditions at all times and have an automatic shut-off if the eye-safe criteria is not met at any time during flight.

2.1.3 Survey Control: GPS base station data must be collected during the flight for use in post processing and must be located on a control point with published coordinate values. Aerial survey mission must begin and end within 20 kilometers of control point with GPS base station. Distance from base station must not exceed 50 kilometers at any time during the flight. A continuously operating reference station (CORS) may be used in place of a standard GPS base station.

2.1.4 Ground Control: Ground control and ground-truthing are required to ensure data accuracy. Any access onto JEA transmission corridors needs to be coordinated with the JEA Transmission Project Design Engineer. Aerial targets and/or photo-identifiable (PID) points must be set and surveyed along the corridors at a maximum distance of ten (10) miles between control points. Near each visible control point (target or PID), five (5) ground-truthing points shall be surveyed on hard surfaces or in open, low-grass areas. At a minimum control points will be an iron rod with cap set flush with the ground, or a nail with disk when setting in hard surfaces. All control must bear the registration number of the licensed surveyor or survey business. The absolute positional accuracy of the values reported for control points shall be within 0.15 feet horizontally, and 0.20 feet vertically, at a 95% confidence interval.

2.1.5 Survey Data: All survey data shall be referenced to:

- The North American Datum of 1983 (latest adjustment).
- East Zone (901) of the Florida State Plane Coordinate System.

- North American Vertical Datum of 1988. U.S. Survey Feet

2.1.6 Survey Report: A survey report shall be submitted certifying to the survey methods and accuracy of the control points. Report shall include a listing of all survey control and ground-truthing points with their coordinates, elevations, and point descriptions.

2.1.7 The LiDAR mapping corridors for the new circuits shall be approved by JEA Transmission Project Design Engineer prior to data acquisition, with the following minimum requirements:

- LiDAR data shall be acquired along the corridor with a minimum width of 450 feet.
- LiDAR data shall be feature-coded to a width that covers the open corridor plus 50 feet into the adjacent tree line.
- LiDAR data within the feature-coded area shall have a minimum overall point density of 50 points per square meter.
- Relative horizontal and vertical accuracies of the LiDAR point data shall be 0.30 feet at 95% confidence interval or better.
- Absolute horizontal and vertical accuracies of the LiDAR point data shall be 0.30 feet at 95% confidence interval or better, as compared to field-surveyed ground control and ground-truth data.

2.1.8 Feature Coding: Consultant shall feature-code the LiDAR data. The feature code file (*.fea) shall be provided to the consultant by JEA. The proposed feature code file, "feature_code.fea" is being provided to aid in the procurement process.

2.1.9 Weather Data: The Weather data will need to be collected for the as-built LiDAR survey. Weather data must be collected during the times of LiDAR data acquisition. Weather stations must be ground-based and placed within the corridor being surveyed. Weather stations should be no more than ten (10) miles from any point on the transmission lines being surveyed and/or a minimum of two (2) stations per circuit. Weather data shall be recorded in 1-minute intervals and include:

- Date in local format (MM-DD-YYYY)
- Time in local Eastern Time (ET)
- Ambient Temperature (°F)
- Wind Speed (feet per second)
- Wind Direction (compass referenced such as N, SE, WNW or with a heading)
- Solar Radiation (watts per foot squared)
- Consultant will submit a weather report that includes one line of weather data for each span of conductor, to include the items listed above in section 2.1.9 along with the "from"

and “to” structure number to define the conductor spans. Structure numbers shall be based off the proposed design.

## 2.2 Substation

Scope of Work:

This sample RFP describes a scope of work that will include but may not be limited to the following:

- Structural LiDAR scans of subject substation.
- Creation of a point cloud for the subject substation yard.
- Surface reconstruction and grouping into components.
- Development of cells to replicate field elements.
- Importing of data into 3D Bentley OpenUtilities environment.
- Ability to identify the size (diameter) of existing conductors, along with size (diameter) of strain and rigid bus.
- Ability for the LiDAR equipment to operate in higher temperatures (up to 110 deg Fahrenheit).

JEA requires that all cells created during the project be available to be stored and utilized in future 3D projects. All point cloud data, drawings, and associated electronic files, including any cell elements and/or part elements developed during this work shall be the property of JEA and delivered to 225 N Pearl St, Jacksonville, FL 32202 by a provider representative.

Field Collection Requirements

### 2.2.1 HORIZONTAL/VERTICAL CONTROL

The horizontal coordinate datum will be North American Datum 1983 (2011) Florida East Zone State Plane Coordinates Zone unless otherwise specified.

The vertical elevation datum will be North American Vertical Datum 1988 (Geoid18) unless otherwise specified.

A minimum of two (2) primary (reference) control points in direct line of site, will be established on the exterior of the substation based the on the above mentioned datums or as provided.

- Static GPS redundant observations to local Continuously Operating Reference Station (CORS) network
- RTK GPS redundant observations from published control points
- Require a 4”X4” concrete monument.

A minimum of three (3) secondary control points (scan target points) will be established on the interior of the substation to control and geo-reference the scans of the substation from established primary control points.

- RTK GPS redundant observations from primary control, or a closed traverse loop by survey total station.
- Elevation bench run (level loop) from primary control (or client specific benchmark) using electronic digital level.
- Number of secondary control points to be determined by size, shape of substation and/or area of interest.
    - 400-foot maximum distance between secondary control points

    - Secondary control points must be in direct line of site to at least one (1) other control point.
- Establish permanent site targets if requested.

2.2.2 SCANNER REQUIREMENTS

Scans shall be collected using a laser scanner capable of acquiring data at an accuracy of 1-3mm at a range of 25 meters, and provides full color (R,G,B) data and/or photos.

SLAM scanning systems can be used but must be able to provide equal accuracy and resolution results as to the terrestrial scanner requirements.

Scans will be captured at the appropriate resolution for the project.

- As-built surveys (medium resolution) 6mm grid spacing at 10 meters.
- Full 3D modeling (high resolution) 3mm grid spacing at 10 meters.

2.2.3 SCAN CAPTURE

Scan positions will be captured to adequately cover the project area of interest (AOI) and provide a minimum amount of shadowed, obscured, or blank areas.

- Scans will be captured at no more than 30 feet from the previous scan position.
- Scans will be captured with photos to produce a colorized point cloud.
- Capture High-Resolution Photos of nameplates of ground level substation equipment to be geotagged onto point cloud data.
- If required, additional items can be photographed and geotagged onto the point cloud.
    - Foundation condition, cable trench, cabinet wiring.

2.2.4 SCAN REGISTRATION

Scans will be registered using cloud-to-cloud and targeted registration methods to the established survey control. Scans should be combined into one complete registered-colorized data set. All efforts should be taken to achieve a registration accuracy between scans (cloud to cloud) and to the established survey control of plus or minus 6mm (0.02ft) for both vertical and horizontal measurements.

**SECTION 3: TASK PLAN**

**3.1 <u>Surveying:</u>**

The winning bidder will be responsible for obtaining all surveys needed for the successful completion of a design package. These shall include:

3.1.1 Topographical Survey – Topographical points to be picked up on a 20’ grid within the limits of the survey area, unless otherwise noted.

3.1.2 As-built Survey – Post construction survey per direction from the JEA project representative.

3.1.3 LiDAR Survey for use in PLS-CADD modeling to create overall design and As-Built LiDAR Survey for use in PLS-CADD to verify as-built clearances.

3.1.4 Tree Survey – Tree survey to include species, location, and trunk caliper of tree.

3.1.5 Wetland Survey – if applicable

3.1.6 Improvement Survey

3.1.7 Underground Facility Locates – Winning bidder to provide ASCE Quality Level B survey, with a cost/soft dig locate for Quality Level A. Winning bidder must also work with the JEA representative to gather all JEA as-built data prior to commencement of survey. Any discrepancies between the surveyed conditions and as-built data shall be brought to the attention of the JEA representative.

3.1.8 Bathymetric Survey – Pre and Post Construction Survey with elevation to be pick up on a 5' grid.

3.1.9 Any other surveys the bidder deems necessary to complete all tasks.

**SECTION 4: DELIVERABLES**

**4.1 Transmission:**

The winning bidder shall provide complete sets of civil, architectural, transmission, structure. and electrical drawings as needed for Engineering and analysis.

4.1.0 Provide signed and sealed electronic files in AutoCAD as specified above.
4.1.1 Provide PDFs scalable to 11"x17" as well as 24"x36" including a combined PDF of the drawing set.
4.1.2 One (1) final as-built pls-cadd backup file(*.bak) of each new circuit(for D&T). The deliverables should also include the following:

- Feature-coded LiDAR data
- Structure ID points
- Survey control points

4.1.3 Survey files must me signed and sealed by a surveyor licensed in the State of Florida.

**4.2 Substation:**

4.2.1 The final deliverable for Substation project could be 2D CAD drawings created from the point cloud or a 3D MicroStation v8i Drawings from the terrestrial field scans. The 3D MicroStation model must illustrate complete and accurate physical design and electrical connections of the substation and conforms with stated specification.
4.2.2 Scan Deliverable:

- Registration report
- Georeferenced, registered, colorized point cloud in MicroStation format.
  - Classified point cloud
  - Exported file types - E57, POD
- If requested, a Virtual Walk-Through deliverable will be provided.