

SCOPE OF SERVICES

FOR

## **TB NEXT SURVEY SUPPORT SERVICES - CONTINUING**

Financial Project ID's: 437199-8-32-02

FAP No.: TBD

Revised: 1/11/2024 6/22/2023

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## EXHIBIT "A"

## SCOPE OF SERVICES FOR TB NEXT SURVEY SUPPORT SERVICES

#### 1 PURPOSE

The purpose of this Exhibit is to describe the scope of work and the responsibilities of the CONSULTANT and the DEPARTMENT in connection with Surveying and Mapping Services. The services to be provided under this Agreement will be on an as needed basis using Task Work Orders issued by the DEPARTMENT. Each Task Work Order will define the project scope for which the services will be provided.

Major Work Mix: 8.1 & 8.2 Minor Work Mix: 8.3 & 8.4

The Scope of Services establishes which items of work described in the FDOT Design Manual, FDOT Surveying and Mapping Procedure Topic 550-030-001, FDOT Surveying and Mapping Handbook, Chapter 472 and Standards of Practice, and other pertinent manuals to accomplish the work are specifically included in this contract, and also which of the items of work will be the responsibility of the CONSULTANT and/or the DEPARTMENT.

All maps, surveys, field notes, plans and design documents are to be prepared with Standard English values in accordance with all applicable DEPARTMENT manuals and guidelines.

The CONSULTANT shall be aware that as a project is developed, certain modifications and/or improvements to the original recommendation may be required. The CONSULTANT shall incorporate these refinements into the Surveying and Mapping services, and will consider this effort to be an anticipated and integral part of the work.

The CONSULTANT shall demonstrate good project management practices while working on this project. These include communication with the DEPARTMENT and others as necessary, management of time and resources, and documentation. The CONSULTANT shall set up and maintain throughout the design of the project a contract file in accordance with DEPARTMENT procedures. It shall be the CONSULTANT's responsibility to utilize the very best Surveying and Mapping judgment, practices, and principles possible during the prosecution of the work commissioned under this contract.

The DEPARTMENT will provide contract administration, management services, and technical reviews of all work associated with the development and preparation of the contract deliverables. The DEPARTMENT will provide job-specific information and/or functions as outlined in this contract.

## 2 **PROJECT DESCRIPTION**

The scope of services for this surveying and mapping project will use the same activity numbers (Activities 27.0, 28.0, 29.0 and 30.0), as the statewide Highway and Bridge/Structural Design Scope of services.

#### 2.1 SURVEY (Activity 27.0)

Limits and details to be determined per Task Work Order.

Design Survey:

Note: It is the discretion of the CONSULTANT which methodology is proposed to perform and prepare the topographic/DTM survey. This methodology must be approved by the District Surveying and Mapping Dept., the District Location Surveyor, or their designee. If Terrestrial

Static LiDAR instruments and technologies are utilized, the CONSULTANT shall follow the applicable guidelines and procedures for Terrestrial Mobile LiDAR in the FDOT Surveying & Mapping Handbook.

Project Network Control (PNC) Sheets, also referred to as Control (CTL) Sheets, shall be prepared depicting the horizontal project control, the vertical project control, the alignment, and the alignment reference points. The sheet(s) shall be on a standard  $11" \times 17"$  FDOT title block, and shall not be signed, sealed, or certified on the face of the map.

Subsurface Utility: N/A

Right-of-Way Survey:

Provide a Right of Way Control Survey for the limits of the project. The Right of Way Control Survey shall abut and be in complete agreement with existing Right of Way Control Survey(s). Existing monumentation shall be held unless it is in the signing surveyor's opinion the previous Control Survey is in error.

- a. Tie section lines, quarter section lines, (and quarter-quarter section lines when pertinent) to the Survey Line. Ties shall be made by closed traverse, appropriate redundancy, or an approved procedure. All corners shall be found or set in the field with corners properly identified with size and type and recorded in the field book.
- b. Tie all subdivisions including condominium boundaries, at the beginning and end; block lines, and street right of way lines to the Survey Line. Ties shall be made by closed traverse, appropriate redundancy, or an approved procedure. All block corners shall be found or set in the field with corners properly identified with size and type and recorded in a field book. A sufficient amount of field ties must be made in order to establish the original block boundaries or existing right of way as shown on existing right of way maps in each subdivision and or condominium. Efforts should be made to identify all vacated streets within a subdivision, along with the recording data of vacation. It should be noted that 90° ties from the centerline of the side streets or radial ties to any corner will not be accepted by the DEPARTMENT. All ties must be shown as intersecting the Survey Line with the respective subdivision lines.
- c. Make individual property line ties where apparent property line disputes may occur. If information is available from local surveyors, submit copies of their surveys.

## 2.2 PHOTOGRAMMETRY/REMOTE SENSING (Activity 28.0)

Limits and details to be determined per Task Work Order.

Provide Photogrammetry and Remote Sensing for mapping. Collection platforms may include but are not limited to Rotor aircraft, fixed wing aircraft and unmanned aerial vehicles. The use of any Unmanned Aircraft System, Unmanned Aerial Vehicle, drone, or similar system to accomplish contract activities must comply with federal, state, and local laws and regulations. The use of Unmanned Aerial Vehicle or Unmanned Aircraft Systems for surveying and mapping collection will be determined on a case by case basis with final approval by the District Location Surveyor. The CONSULTANT performing work must be pre-qualified in Work Type 8.3.

## 2.3 MAPPING (Activity 29.0)

Limits and details to be determined per Task Work Order.

Control Survey Map:

The field Control Survey shall be presented in the form of a 24" x 36" certified drawing. The CONSULTANT shall certify this drawing as a Control Survey, which meets the Standards of Practice adopted by the Florida Department of Agriculture and Consumer Services, Board of Professional Surveyors and Mappers, Chapter 5J-17 of the Florida Administrative Code. These survey drawings shall be at a scale of 1 inch = 400 feet for a key map and a scale of 1 inch = 40 feet for detail sheets or a scale acceptable to the DEPARTMENT. Unless otherwise directed, the surveyor shall furnish the DEPARTMENT with a signed, sealed and certified copy of the above map along with the CADD drawing files.

The Right of Way Control Survey shall abut and be in complete agreement with existing Right of Way Control Survey(s). Existing monumentation shall be held unless it is in the signing surveyor's opinion the previous Control Survey is in error.

All existing right-of-way shall be plotted on the Control Survey with ties by station/offset to the Survey Line at all breaks, including any maintained right of way. Utilize existing monumentation to establish the position of the existing right-of-way. All secondary monumentation located shall be depicted on the map. When utilized to support or determine the position of a primary corner (i.e. block corner, section corner or parent tract corner), and the secondary monument is on-line between two primary corners, then a single in-line distance is sufficient. If the secondary monument is found to not occupy a proper corner position, then a station/offset to the Survey Line can be used, unless the monument can be positioned, by fallings, to a nearby accepted corner.

The CONSULTANT shall acquire a last deed of record for each property adjoining the project limits and research any additional rights of way that may have been acquired by a local governmental agency (i.e. city or county). All deeds, documentation from local government agencies, and supporting documents shall be delivered to the DEPARTMENT.

- a. The Cover Sheet (sheet one) shall contain among other things a vicinity map, legend, index of sheets, all pertinent general survey notes, and the Certification that the Control Survey was made for the purpose of surveying, referencing, describing and mapping the Survey Line and providing horizontal position data for the support or control of right of way related maps for the transportation facility shown and depicted hereon. "I further certify said survey was done under my responsible charge and meets the Standards of Practice set forth by the Florida Board of Professional Surveyors and Mappers in Chapter 5J-17 Florida Administrative Code pursuant to Section 472.027 Florida Statutes."
- b. The Key Sheet(s) shall be at a scale of 1 inch = 400 feet, or a scale acceptable to the DEPARTMENT, and shall depict the following:
  - 1) Complete Survey Line alignment data, including beginning of survey station, all curve data, bearings on all tangent lines along the Survey line, all intermediate control point stations, and end of survey station. All control points must be identified as to type and size of material found or set at each respective point.
  - 2) All section lines, quarter section lines, and when pertinent. quarter-quarter section lines must be shown with the station where their intersection with Survey Line occurs, with a distance from the nearest corner to Survey Line, and bearings and distances between all corners. Type of corner, either found or set, should be spelled out or identified by a legend. All ties shall be shown to depict a closed traverse to assure acceptable closure.
- c. The Detail Sheet(s) shall be at a scale of 1 inch = 40 feet, or a scale acceptable to the DEPARTMENT, and along with information shown on the Key Sheets shall depict the following:

- 1) All existing right of way shall be shown with ties to all breaks in the right of way, including any maintained right of way.
- 2) All subdivisions, including condominium boundaries, must be shown with a station where the Survey Line and each subdivision line intersect. A distance from Survey Line to the existing right of way line or nearest found or set corner, and bearings and distances on all subdivision lines which were intersected with the Survey Line. All lot and block numbers, street names, plat book, page, recording date, and name of each subdivision must be shown. All ties shall be shown to depict a closed traverse to assure acceptable closure.
- d. The Reference Sheet(s) shall be separate sheet(s), does not need to be plotted to scale, and shall depict the following:
  - 1) All of the Survey Line control points and reference lines/points, along with the type and size of material used for each respective reference point;
  - 2) Reference points for Public Land Survey corners that may potentially be removed during planned construction if any, along with the type and size of material used for each respective reference point shall be shown.

The complete Control Survey shall be submitted to the DEPARTMENT for review and approval.

Right-of-Way Map:

Right-of-Way Maps shall be prepared for current limits of the project and shall follow District Seven's Guide For Right of Way Maps and Legal Descriptions, dated March 1, 2017. Base Maps shall be prepared directly from the Control Survey and existing Project DGN and Geopak files.

A Title Search Map shall be prepared and submitted to the DEPARTMENT prior to the 30% Phase submittal described below. The Title Search Map shall include the County tax parcel, or folio identification, sufficient to enable the DEPARTMENT to begin Title Search Report procurement and parcel numbering.

Phase submittals shall be as follows:

30% Submittal depicting preliminary property lines based upon adjacent last deeds of record and/or available tax or property appraiser information, and merged topographic information.

60% Submittal depicting accurate property lines for properties identified to have right-of-way acquired, derived from review of Title Search Reports provided by the DEPARTMENT, with complete geometry for the parent tracts; parcel bubbles identifying parcel numbering for proposed take areas; proposed r/w lines; ties to topographic information; Table of Ownership Sheet with Parcel No., Sheet No., and Ownership columns completed.

A field review shall be conducted immediately after the 60% Submittal to verify topographic information; identify parcel specific design impacts; determine field work necessary to verify parent tracts; and identify appraisal/acquisition issues. This review shall be attended by the CONSULTANT mapper.

90% Submittal depicting complete geometry for all take areas and remainders; legal descriptions for all take areas; completed Table of Ownership Sheets showing areas of takes and remainders.

100% Submittal shall include final electronic map and legal description files and Certification of legal descriptions.

Legal Descriptions:

Legal Descriptions shall be prepared for R/W acquisition parcels and shall follow District Seven's Guide For Right of Way Maps and Legal Descriptions, dated March 1, 2017.

Maintenance Map: TBD per Task Work Order

Miscellaneous Items: TBD per Task Work Order. Including but not limited to Specific Purpose surveys, Monumentation Surveys or Maps, Jurisdictional Surveys, bathymetric surveys, etc.

## 2.4 TERRESTRIAL MOBILE LiDAR (Activity 30.0)

Limits and details to be determined per Task Work Order.

If Terrestrial Mobile LiDAR instruments and technologies are utilized, the CONSULTANT shall follow the FDOT Terrestrial Mobile LiDAR Surveying & Mapping Guidelines for the limits and deliverables TBD per Task Work Order.

### 2.5 **Project Schedule**

Within ten (10) days after issuance of a Task Work Order, and prior to the CONSULTANT beginning work, the CONSULTANT shall provide a detailed project activity/event schedule for DEPARTMENT and CONSULTANT activities required to meet the current DEPARTMENT Production Date. The schedule shall be based upon *the current anticipated "Submit Final ROW Requirements" date of \_ (subject to change) and the current anticipated "Production Date" of \_ (subject to change)*. The schedule shall be accompanied by an anticipated payout and fiscal progress curve. For the purpose of scheduling, the CONSULTANT shall allow for a *four* week review time for each phase review and other submittals as appropriate.

The schedule shall indicate all required submittals.

Periodically, throughout the life of the project, the schedule and curves shall be reviewed, and with the approval of the DEPARTMENT, adjusted as necessary to incorporate changes in the work concept, *project milestones* and progress to date.

The approved scheduled and schedule status report, along with progress and payout curves, shall be submitted with the monthly progress report.

The schedule shall be submitted in excel, spreadsheet, database, or system-compatible format.

The above schedule submittal shall reflect project-specific input from each affected DEPARTMENT discipline, including Permits, Utilities, Right-of-Way, and Modal Planning and Development (noise walls, etc.). The CONSULTANT shall be responsible for ensuring that such input is received and reviewed with the DEPARTMENT Project Manager in advance.

## 2.6 Submittals

The CONSULTANT shall furnish plans and documents as required by the DEPARTMENT to adequately control, coordinate, and approve the plans.

The CONSULTANT shall have their Quality Control, Quality Assurance and applicable Constructability documents complete and available for review by the DEPARTMENT at the time of each phase submittal.

The DEPARTMENT reserves the right to visit the premises of the CONSULTANT at any time to review the project's status, upon one-hours' notice.

## 2.7 **Provisions for Work**

Surveying & Mapping services shall be accomplished in accordance with the DEPARTMENT's Surveying & Mapping Procedure, Topic 550-030-101; Surveying & Mapping Handbook; Highway Field Survey Specifications; Roadway and Traffic Design Standards (Index Series 600); District Seven Quality Assurance Guidelines and Check Lists; Safety Standards which may be adopted; Right-of-Way Procedures Manual; and current practices, memorandums, and special instructions. Work shall comply with the Standards of Practice for Surveying and Mapping, Chapter 5J-17 Florida Administrative Code, pursuant to Chapter 472.027, Florida Statutes, and Chapter 177 Florida Statutes.

All field survey work performed for the DEPARTMENT will be recorded in field books furnished by the CONSULTANT. Field books will be 6-1/2" by 8-3/4" cross section book with 10 by 10 grid on both sides of the opening and in the format shown in the DEPARTMENT's Surveying and Mapping Handbook. All phases of the Survey data recorded in the field books (such as Bench Line, Reference Points, etc.) will be kept together and not in different sections throughout the book. All electronically collected data shall be per the Surveying and Mapping Handbook. Evidence of a peer review by the CONSULTANT's Surveyor & Mapper in responsible charge shall be provided with submittals. Upon approval, the field books shall be certified by the CONSULTANT's Surveyor in responsible charge of the work being performed.

The CONSULTANT shall submit to the DEPARTMENT all survey notes, computations, supporting maps, and necessary Survey Maps (prepared using CADD) to document their surveys. All Surveying & Mapping forms and Map deliverables, such as Right-of-Way Control Surveys, Horizontal and Vertical Project Control forms, Certified Corner Record forms, etc., shall be prepared and submitted in DEPARTMENT standard format, such as Microstation DGNs and an Access Database, and provided to the DEPARTMENT on approved storage media.

Right-of-Way Control Survey submittals shall include copies of the survey field notes, computations, plats, supporting maps, all required deeds, two (2) hard copies/prints, and all CADD files. When the map is submitted for final review, the survey notes and computations (corrected for any DEPARTMENT comments) shall be resubmitted. The survey notes shall include documentation of decisions reached from meetings, telephone conversations, and site visits.

If a situation arises that calls for a deviation from the above methods and procedures, written permission must be acquired from the District Location Surveyor.

All maps, plans and designs are to be prepared with English values in accordance with all applicable current DEPARTMENT manuals, memorandums, guidelines and other documents, including, but not limited to, the following:

Survey and Mapping

- Rule Chapter 5J-17, F.A.C., Standards of Practice for Professional Surveyors and Mappers
- All Applicable Florida Statutes and Administrative Codes
- Applicable Rules, Guidelines codes and Authorities of other Municipal, County, State and Federal Agencies
- Florida Department of Transportation Surveying & Mapping Procedure Topic 550-030-101
- Florida Department of Transportation Surveying & Mapping Handbook
- o Florida Department of Transportation Right of Way Procedures Manual

These documents are revised periodically by the responsible agencies and adopted by authorities having jurisdiction on building projects. The design CONSULTANT and the project manager are advised to obtain applicable versions of these documents from the responsible agency prior to use.

## 2.8 Services To Be Performed By The DEPARTMENT

When appropriate the DEPARTMENT will provide those services and materials as set forth below:

- When appropriate, the DEPARTMENT will provide project data currently on file.
- Provide numbers for field books.
- Provide letters of authorization designating the CONSULTANT as an agent of the DEPARTMENT in accordance with F.S. 327.274.
- Provide access for the CONSULTANT to utilize the DEPARTMENT's Information Technology Resources.

## **3 PROJECT GENERAL TASKS**

#### PROJECT COMMON TASKS

Project Common Tasks, as listed below, are work efforts that are applicable to many project activities, 27 Design survey through 30 Remote Sensing/Mobile LiDAR. These tasks are to be included in the project scope in each applicable activity when the described work is to be performed by the CONSULTANT.

Field Reviews: Includes all trips required to obtain necessary data for all elements of the project.

<u>Technical Meetings</u>: Includes meetings with DEPARTMENT and/or Agency staff, between disciplines and subconsultants, progress review meetings (phase review), and miscellaneous meetings. The CONSULTANT shall prepare, and submit to the DEPARTMENT's Project Manager for review, the meeting minutes for all meetings attended by them. The meeting minutes are due within five (5) days of attending the meeting.

<u>Quality Assurance/Quality Control</u>: It is the intention of the DEPARTMENT that Surveying and Mapping CONSULTANTS are held responsible for their work, including plans review. Detailed checking of CONSULTANT plans or assisting in designing portions of the project for the CONSULTANT is not the intent of having external design consultants. The purpose of CONSULTANT plan reviews is to ensure that CONSULTANT plans follow the plan preparation procedures outlined in the criteria are followed with the DEPARTMENT concept, and that the CONSULTANT submittals are complete.

The CONSULTANT shall be responsible for the professional quality, technical accuracy and coordination of all surveys, designs, drawings, specifications and other services furnished by the CONSULTANT under this contract.

The CONSULTANT shall provide a Quality Control Plan that describes the procedures to be utilized to verify, independently check, and review all maps, design drawings, specifications, and other documentation prepared as part of the contract. The CONSULTANT shall describe how the checking and review processes are to be documented to verify that the required procedures were followed. The Quality Control Plan may be one utilized by the CONSULTANT as part of their normal operation or it may be one specifically designed for this project. The CONSULTANT shall submit a Quality Control Plan for approval within twenty (20) calendar days of the written Notice to Proceed. A marked up set of prints from a Quality Control Review indicating the reviewers for each component (structures, roadway, drainage, signals, geotechnical, signing and marking, lighting, surveys, etc.) and a written resolution of comments on a point-by-point basis will be required with each phase submittal. The responsible Professional Engineer, Landscape Architect, or Professional Surveyor and Mapper that performed the Quality Control review will sign a statement certifying that the review was conducted and found to meet required specifications.

The CONSULTANT shall, without additional compensation, correct all errors or deficiencies in the designs, maps, drawings, specifications, and/or other services.

<u>Independent Peer Review</u>: When directed by the DEPARTMENT, a subconsultant shall perform Independent Peer Reviews.

Supervision: Includes all efforts required to supervise all technical activities.

<u>Coordination</u>: Includes all efforts to coordinate with all disciplines of the project to produce a final set of design documents.

### 4 DESIGN SURVEY SCOPE OF SERVICES

Note: Activity numbers (below) for survey and mapping are consistent with the statewide Highway and Bridge/Structural Design Scope of Services activity numbers.

### 27 SURVEY

The CONSULTANT shall perform survey tasks in accordance with all applicable statutes, manuals, guidelines, standards, handbooks, procedures, and current design memoranda.

The CONSULTANT shall submit all survey notes and computations to document the surveys. All field survey work shall be recorded in approved media and submitted to the DEPARTMENT. Field books submitted to the DEPARTMENT must be of an approved type. The field books shall be certified by the surveyor in responsible charge of the work being performed before the final product is submitted.

The survey notes shall include documentation of decisions reached from meetings, telephone conversations or site visits. All like work (such as bench lines, reference points, etc.) shall be recorded contiguously. The DEPARTMENT may not accept field survey radial locations of section corners, platted subdivision lot and block corners, alignment control points, alignment control reference points and certified section corner references. The DEPARTMENT may instead require that these points be surveyed by true line, traverse or parallel offset.

## 27.1 Horizontal Project Control (HPC)

Establish or recover HPC, for the purpose of establishing horizontal control on the Florida State Plane Coordinate System or datum approved by the District Surveyor (DS) or District Location Surveyor (DLS); may include primary or secondary control points. Includes analysis and processing of all field collected data, and preparation of forms.

Establish/Recover HPC on NAD 83 adjustment of 2011, unless otherwise approved by the District Location Surveyor, for the purpose of establishing the alignment of the project on the Florida State Plane Coordinate System and assure an error free or closed alignment. A horizontal control form will be submitted in both hard copy and an Access database file (template provided by the DEPARTMENT) on all old and new control stations used or set along with the field books. Control points set are to be concrete monuments with an FDOT brass disk, or other suitable material, both provided by the CONSULTANT. Control points shall be set at 3,000-foot intervals and in areas likely to survive future construction.

At a minimum, the CONSULTANT shall tie two (2) existing alignment points per mile of alignment during the Primary Control Network. Said alignment points shall be considered as existing Primary Control during post processing.

## 27.2 Vertical Project Control (VPC)

Establish or recover VPC, for the purpose of establishing vertical control on datum approved by

the District Surveyor (DS) or the District Location Surveyor (DLS).; may include primary or secondary vertical control points. Includes analysis and processing of all field collected data, and preparation of forms.

Establish/recover VPC (a bench line) on NAVD 1988, unless otherwise approved by the District Location Surveyor. A vertical control form will be submitted in both hard copy and an Access database file (template provided by the DEPARTMENT) on all old and new Bench Marks used or set along with the field books. Bench Marks set are to be concrete monuments with an FDOT brass disk, or other suitable material, both to be provided by the CONSULTANT. Bench Marks are to be set at 1,000-foot intervals and in areas likely to survive future construction. If any existing FDOT bench mark disks are found in head walls, wing walls, bridges, etc., incorporate these disks in the bench line and submit both a hard copy and an Access database file unless otherwise directed.

## 27.3 Alignment and Existing Right-of-Way (R/W) Lines

Establish, recover or re-establish project alignment. Also includes analysis and processing of all field collected data, existing maps, and/or reports for identifying mainline, ramp, offset, or secondary alignments. Depict alignment and existing R/W lines (in required format) per DEPARTMENT R/W Maps, platted or dedicated rights-of-way.

This alignment should be established by recovering the tangent lines of existing DEPARTMENT Right of Way maps if such maps exist, or in the center of dedicated Right of Way as per subdivision plats, or in the center of the pavement when no Right of Way map or dedication exists. Note: This alignment shall be approved by the District Location Surveyor and/or his designee before being placed on the ground. No other phases of the Location Survey shall be performed until this Survey Line has been approved by the DEPARTMENT, placed on the ground by the CONSULTANT, and reviewed in the field by the DEPARTMENT and the CONSULTANT's Surveyor in responsible charge. The DEPARTMENT alignment approval process includes the delivery of the ALGNRDxx CADD file by the CONSULTANT.

Tie all major alignment control points to this baseline control and establish Florida State Plane Coordinates on each respective control point.

Stake and station the alignment at 100' intervals on the proportioned distances between the major control points so the stations will coincide with the Florida State Plane Coordinate System.

The Project RWDTRDxx CADD file shall be prepared and delivered concurrent with the SURVRDxx CADD file and other required deliverables, in their proper file structure as required for final deliverables.

#### 27.4 Aerial Targets

If required, place, locate, and maintain required targets and/or photo identifiable points. Includes analysis and processing of all field collected data, existing maps, and/or reports. Placement of the targets will be at the discretion of the aerial/LiDAR firm.

Aerial or terrestrial LiDAR targets may be placed right and left of alignment on flat surfaces visible from above. Targets are spaced along the project as directed by the photogrammetrist or remote sensor. Target size is specified by the photogrammetrist or remote sensor and should have a contrasting black and white pattern. Horizontal values, stations and offsets and Vertical elevations are required on all targets. For 2D planimetric only photography, vertical values may be established using RTK GPS survey methods, and noted as such in the notes and report.

#### 27.5 **Reference Points**

Reference Horizontal Project Network Control (HPNC) points, project alignment, vertical control points, section, <sup>1</sup>/<sub>4</sub> section, center of section corners and General Land Office (G.L.O.) corners as required.

Reference points shall be found or set for all Survey Line control points, and shall be in-line and extend outside of the existing and proposed Right of Way. It is preferred that the alignment reference points be at a 90° angle to the Survey line in a tangent, a bisecting angle at a noncurve PI, and radial in curves. These shall be recorded in a field book, and depict all monumentation, stationing, angles, and distances.

### 27.6 Topography/Digital Terrain Model (DTM) (3D)

Locate all above ground features and improvements for the limits of the project by collecting the required data for the purpose of creating a DTM with sufficient density. Shoot all break lines; high and low points. Effort includes field edits, analysis and processing of all field collected data, existing maps, and/or reports.

It is preferred that a field survey party perform field checks, such as for curb type, utility type and void area densification. Make a complete topographic survey including, but not limited to, apparent wells, trees if required, significant roof drains, visible utilities, lane lines, pavement striping for turn lanes, and passing/no passing lane changes. Incorporate R/W information for entire project in the final topography delivery as shown on DEPARTMENT R/W Maps (if such maps exist) that meets the roadway design CADD standards.

All features and improvements shall be labeled in CADD with sufficient frequency and in such a manner that positive identification can be easily made. Labels shall conform to the current specifications for desired text size and spacing.

### 27.7 Planimetric (2D)

Locate all above ground features and improvements. Deliver in appropriate electronic format. Effort includes field edits, analysis and processing of all field collected data, existing maps, and/or reports.

## 27.8 Roadway Cross Sections/Profiles

Perform cross sections or profiles. May include analysis and processing of all field-collected data for comparison with DTM.

DTM-check cross sections shall be collected at approximately 1,000-foot intervals. The resulting comparison report shall contain: the cross section point description; the cross section point horizontal position (station-offset or northing-easting); the cross section point elevation with the DTM-derived elevation; the assigned tolerance reasonably expected between elevations; the difference between elevations, if any; the assigned tolerance to the point; and an explanation of difference out of tolerance.

### 27.9 Side Street Surveys

Refer to tasks of this document as applicable.

#### 27.10 Underground Utilities – N/A

## 27.11 Outfall Survey

Locate all above ground features and improvements for the limits of the project by collecting the

required data for the purpose of a DTM. Survey with sufficient density of shots. Shoot all break lines, high and low points. Includes field edits, analysis and processing of all field collected data, existing maps, and/or reports.

Make all out fall and retention/detention pond surveys including high water information, pipe locations, size and flow lines, and any terrain features controlling high water conditions.

### 27.12 Drainage Survey

Locate underground data (XYZ, pipe size, type, condition and flow line) that relates to above ground data. Includes field edits, analysis and processing of all field collected data, existing maps, and/or reports.

Perform drainage survey including pipe type, location, size and flow line elevations. If drainage system branches off the main line, survey should be extended to the next structure.

### 27.13 Bridge Survey (Minor/Major)

Locate required above ground features and improvements for the limits of the bridge. Includes field edits, analysis and processing of all field collected data, existing maps, and/or reports.

Provide bridge data survey in accordance with FDOT Surveying and Mapping Handbook.

## 27.14 Channel Survey

Locate all topographic features and improvements for the limits of the project by collecting the required data. Includes field edits, analysis and processing of all field collected data, maps, and/or reports.

## 27.15 Pond Site Survey

Refer to tasks of this document as applicable.

## 27.16 Mitigation Survey

Refer to tasks of this document as applicable.

## 27.17 Jurisdiction Line Survey

Perform field location (two-dimensional) of jurisdiction limits as defined by respective authorities. Also includes field edits, analysis and processing of all field collected data and preparation of reports.

## 27.18 Geotechnical Support

Perform 3-dimensional (X,Y,Z) field location, or stakeout, of boring sites established by geotechnical engineer. Includes field edits, analysis and processing of all field collected data and/or reports.

## 27.19 Sectional/Grant Survey

Perform field location/placement of section corners, 1/4 section corners, and fractional corners where pertinent. Includes analysis and processing of all field-collected data and/or reports.

Tie section lines, quarter section lines, (and quarter-quarter section lines when pertinent) to the Survey Line. All corners shall be found or set in the field with corners properly identified with size and type and recorded in the field book.

### 27.20 Subdivision Location

Survey all existing recorded subdivision/condominium boundaries, tracts, units, phases blocks, street R/W lines and common areas. Includes analysis and processing of all field collected data and/or reports. If an unrecorded subdivision is on file in the public records of the subject county, tie the existing monumentation of the beginning and end of unrecorded subdivision.

Tie all subdivisions including condominium boundaries, at the beginning and end; block lines, and street right of way lines to the Survey Line. Ties shall be made by closed traverse or acceptable redundancy. All block corners shall be found or set in the field with corners properly identified with size and type and recorded in a field book. Efforts should be made to identify all vacated streets within a subdivision, along with the recording data of vacation. It should be noted that 90° ties from the centerline of the side streets or radial ties to any corner will not be accepted by the DEPARTMENT. All ties must be shown as intersecting the Survey Line with the respective subdivision lines.

### 27.21 Maintained R/W

Perform field location (2-dimensional) of maintained R/W limits as defined by respective authorities, if needed. Also includes field edits, analysis and processing of all field collected data, preparation of reports.

Tie maintained right of way to the survey line where needed and as directed by the maintaining authority. Have the field books certified as to Maintenance Limits by the maintaining authority.

## 27.22 Boundary Survey

Perform boundary survey as defined by DEPARTMENT standards. Includes analysis and processing of all field-collected data, preparation of reports.

#### 27.23 Water Boundary Survey

Perform Mean High Water, Ordinary High Water and Safe Upland Line surveys as required by DEPARTMENT standards.

Make tide studies where applicable and tie these lines to the Survey Line, to comply with Chapter 177, Part II, Florida Statutes. The CONSULTANT shall tie all ordinary high water and mean high water lines to the Survey Line.

## 27.24 Right-of-Way Staking, Parcel/Right of Way Line

Perform field staking and calculations of existing/proposed R/W lines for on-site review purposes.

Monument existing R/W line at proposed mast arm/strain pole locations to ensure the proposed mast arm/strain pole foundation is within the right of way.

#### 27.25 Right-of-Way Monumentation

Set R/W monumentation as depicted on final R/W maps for corridor and water retention areas.

After construction of the project and as directed by the District R/W Surveyor, all R/W owned by the DEPARTMENT in fee simple and easement shall be monumented as directed by the DEPARTMENT.

Recover/reestablish the alignment of the project. Stake the alignment at every B.O.S., E.O.S., PC, PI (if possible), PT and POT (1000' intervals or as previously established) along the alignment and depicted on the R/W Control Survey or R/W Map.

Recover/reestablish all survey line control point references. References shall be at every B.O.S., E.O.S., PC, PI (if possible), PT and POT and set outside the Right of Way. The references shall be at intervals not greater than 1000' along the alignment unless the recovery of previously established references at greater intervals is approved by the District Location Surveyor. These references shall be staked in the field and recorded in field books.

Monument points on the Right of Way (R/W), left and right of each PC, each PT, each PI (if no curve) and each POT along the alignment, and also at each break point on the R/W line.

In areas where platted rights of way precede FDOT right of way, R/W Control Survey subdivision block monumentation shall be held or reset at locations shown on the survey.

At the same time the R/W Monumentation is performed, the Public Land and other corners that fall within the R/W will be monumented.

Additional subdivisions/condominiums that are found to have been platted subsequent to the R/W Control Survey or R/W Map shall be field surveyed and the survey information recorded in DEPARTMENT field books. The subdivision information shall be included in the CADD file and shown on the R/W Monumentation Map. The existing R/W Control Survey shall not be modified, nor shall a new R/W Control Survey be prepared.

#### 27.26 Line Cutting

Perform all efforts required to clear vegetation from the line of sight.

#### 27.27 Work Zone Safety

Provide work zone as required by DEPARTMENT standards.

## 27.28 Vegetation Survey

Locate vegetation within the project limits.

#### 27.29 Tree Survey

Locate individual trees or palms within the project limits.

#### 27.30 Miscellaneous Surveys

Refer to tasks of this document, as applicable, to perform surveys not described herein.

#### 27.31 Supplemental Surveys – N/A

#### 27.32 Document Research

Perform research of documentation to support field and office efforts involving surveying and mapping.

CONSULTANT shall acquire a last deed of record for each property adjoining the project limits and research any additional rights of way that may have been acquired by a local governmental agency (i.e. city or county). All existing right of way will be plotted on the Control Survey with ties by station/offset to the survey line at all breaks in the right of way. Utilize existing monumentation, if apparent. All deeds and/or any documentation acquired from local governmental agencies must be delivered to the DEPARTMENT upon completion of the Control Survey.

#### 27.33 Field Review

Perform verification of the field conditions as related to the collected survey data.

## 27.34 Technical Meetings

Attend meetings as required and negotiated by the Surveying and Mapping Department.

### 27.35 Quality Assurance/Quality Control (QA/QC)

Establish and implement a QA/QC plan. Also includes subconsultant review, response to comments, any resolution meetings if required, and preparation of submittals for review, etc.

### 27.36 Supervision

Perform all activities required to supervise and coordinate project. These activities must be performed by the project supervisor, a Florida P.S.M. or their delegate as approved by the District Surveying Office.

### 27.37 Coordination

Coordinate survey activities with other disciplines and *any and all adjacent and integral consultants so as to produce a final and complete survey product for the project(s) described herein*. These activities must be performed by the project supervisor, a Florida P.S.M. or their delegate as approved by the District Surveying Office.

### 28 PHOTOGRAMMETRY

The CONSULTANT shall perform photogrammetric tasks in accordance with all applicable statutes, manuals, guidelines, standards, handbooks, procedures, and current design memoranda.

In addition to the maps and photographic products, the CONSULTANT shall submit all computations to document the mapping. This *shall* include documentation of all decisions reached from meetings, telephone conversations, and site visits.

#### **28.1** Flight Preparation

Review record data, create target diagrams, and plan the mission.

### **28.2** Control Point Coordination

Determine photo identifiable control points, and mark contact prints.

#### 28.3 Mobilization

Perform pre- and post-flight aircraft inspection; prepare the aircraft and camera for the mission.

### **28.4** Flight Operations

Operate the aircraft, aerial camera, and other instruments to obtain aerial photography.

## 28.5 Film Processing

Process, check and annotate the aerial film.

## 28.6 Photo Products

Prepare contact prints, contact diapositives, and photo enlargements.

## 28.7 Scanning

Scan photographic images.

## 28.8 LiDAR

Includes data acquisition, post processing of LiDAR data to XYZ coordinates for "bare earth" classification.

## 28.9 Aerial Triangulation

Measure and adjust control within aerial images.

## 28.10 Surfaces

Includes collection of break lines and spot elevations.

## 28.11 Ortho Generation

Includes creation of final images.

## 28.12 Rectified Digital Imagery (Georeferenced)

Create the rectified digital image.

### 28.13 Mosaicking

Create the mosaic.

## 28.14 Sheet Clipping

Create plot files for sheets from the database.

## 28.15 Topographics (3D)

Prepare topographic maps, including surface and planimetrics. (Photogrammetrist *shall* not propose hours for Surfaces and Topographics.)

## 28.16 Planimetrics (2D)

Prepare 2D planimetric map.

## 28.17 Drainage Basin

Includes preparing drainage basin maps in clipped "sheet" format.

## 28.18 CADD Edit

Perform final edit of graphics for delivery of required Microstation .dgn, CADD, and Geopak files.

## 28.19 Data Merging

Merge photogrammetric files, field survey files, and data from other sources.

### 28.20 Miscellaneous

Other tasks not specifically addressed in this document.

## 28.21 Field Review

Perform on-site review of maps.

### 28.22 Technical Meetings

Attend meetings as required.

## 28.23 Quality Assurance/Quality Control (QA/QC)

Establish and implement a QA/QC plan.

### 28.24 Supervision

Supervise all photogrammetric activities. This task must be performed by the project supervisor, a Florida P.S.M.

## 28.25 Coordination

Coordinate with all elements of the project to produce a final photogrammetric product. *The CONSULTANT shall coordinate their work with any and all adjacent and integral consultants* so as to produce a final and complete mapping product for the project(s) described herein.

## 29 MAPPING

The CONSULTANT *shall* be responsible for the preparation of control survey maps, right-of-way maps, maintenance maps, sketches, other miscellaneous survey maps, and legal descriptions as required for this project in accordance with all applicable DEPARTMENT Manuals, Procedures, Handbooks, District-specific requirements, and Florida Statutes. All maps, surveys and legal descriptions *shall* be prepared under the direction of a Florida Professional Surveyor and Mapper (PSM) to DEPARTMENT size and format requirements utilizing DEPARTMENT approved software, and *shall* be designed to provide a high degree of uniformity and maximum readability. The CONSULTANT *shall* submit maps, legal descriptions, quality assurance check prints, checklists, electronic media files and any other documents as required for this project to the DEPARTMENT for review at stages of completion as negotiated.

#### Master CADD File

## 29.1 Alignment

- 29.2 Section and 1/4 Section Lines
- 29.3 Subdivisions/Property Lines

## **Existing Right-of-Way**

## 29.5 Topography

### **29.6** Parent Tract Properties and Existing Easements

## 29.7 Proposed Right-of-Way Requirements

The ENGINEER OF RECORD (EOR) will provide the proposed requirements. The PSM is responsible for calculating the final geometry. Notification of Final Right of Way Requirements along with the purpose and duration of all easements will be specified in writing.

### 29.8 Limits of Construction

The limits of construction DGN file as provided by the EOR will be imported or referenced to the master CADD file. Additional labeling will be added as required. The PSM is required to advise the EOR of any noted discrepancies between the limits of construction line and the existing/proposed right of way lines, and for making adjustments as needed when a resolution is determined.

### 29.9 Jurisdictional/Agency Lines

These lines may include, but are not limited to, jurisdictional, wetland, water boundaries, and city/county limit lines.

### **Sheet Files**

- 29.10 Control Survey Cover Sheet
- 29.11 Control Survey Key Sheet
- 29.12 Control Survey Detail Sheet
- 29.13 Right-of-Way Map Cover Sheet
- 29.14 Right-of-Way Map Key Sheet
- 29.15 Right-of-Way Map Detail Sheet
- 29.16 Maintenance Map Cover Sheet
- 29.17 Maintenance Map Key Sheet
- 29.18 Maintenance Map Detail Sheet
- 29.19 Reference Point Sheet

This sheet(s) *shall* be included with the Control Survey Map, Right-of-Way Map and Maintenance Map.

29.20 Project Network Control Sheet

## 29.21 Table of Ownerships Sheet

### **Miscellaneous Surveys and Sketches**

- 29.22 Parcel Sketches
- 29.23 TIITF Sketches
- **29.24** Other Specific Purpose Survey(s)
- 29.25 Boundary Survey(s) Map
- 29.26 Right-of-Way Monumentation Map
- 29.27 Title Search Map
- 29.28 Title Search Report
- 29.29 Legal Descriptions
- 29.30 Final Map/Plans Comparison

The PSM will perform a comparison of the final right of way maps with the available construction plans to review the correctness of the type of parcel to be acquired and the stations/offsets to the required right of way. The PSM will coordinate with the EOR to resolve any conflicts or discrepancies and provide documentation of the review.

- 29.31 Field Reviews
- 29.32 Technical Meetings
- 29.33 Quality Assurance/Quality Control
- 29.34 Supervision
- 29.35 Coordination

The CONSULTANT shall coordinate their work with any and all adjacent and integral consultants so as to produce a final and complete mapping product for the project(s) described herein.

#### 29.36 Supplemental Mapping – N/A

#### **30 TERRESTRIAL MOBILE LIDAR**

The CONSULTANT shall perform Terrestrial Mobile LiDAR tasks in accordance with all applicable statutes, manuals, guidelines, standards, handbooks, procedures, and current design memoranda.

In addition to the maps and LiDAR products, the CONSULTANT shall submit all computations and reports to support the mapping. This will include documentation of all decisions reached from meetings, telephone conversations, and site visits.

#### 30.1 Terrestrial Mobile LiDAR Mission Planning

Research and prepare materials necessary for the successful execution of the Mobile LiDAR Mission. This includes but is not limited to route and safety planning, GPS /data acquisition scheduling, weather reports, and site terrain research.

#### **30.2** Project Control Point Coordination

All efforts necessary to coordinate the proper placement of project ground control i.e. base stations, transformation control points, and validation points, supporting the Mobile LiDAR survey.

### 30.3 Terrestrial Mobile LiDAR Mobilization

Prepare the LiDAR sensor and vehicle for project data collection, and get specialized personnel and equipment on site.

#### 30.4 Terrestrial Mobile LiDAR Mission

Perform site calibrations of LiDAR sensor and collect laser survey data, including any simultaneous base station GPS occupations and operation of any necessary safety equipment.

## 30.5 Terrestrial Mobile LiDAR Processing

Download and post process collected measurement data from Mobile LiDAR vehicle sensors, and any base stations occupied during mission. Analyze Mobile LiDAR measurement points and scan route overlaps. Separate any large point cloud data sets into manageable file sizes with corresponding indexes.

#### 30.6 Terrestrial Mobile Photography Processing

Process, reference, and name digital photographic imagery files collected during Mobile LiDAR mission.

## 30.7 Transformation / Adjustment

Adjust LiDAR point cloud data to Project Control points. Create point cloud data file(s) in approved digital format. Prepare required reports of precision and accuracy achieved. If this task is performed by separate firm, or is the final product to be delivered, include effort for Survey Report.

### **30.8** Classification / Editing

Identify and attribute (classify) point cloud data into requested groups. Classify or remove erroneous points.

## **30.9** Specific Surface Reporting

Prepare reports, data and/or graphics of specific surface details such as, but not limited to pavement rutting, bridge structure clearance to roadway surface.

### **30.10** Topographic (**3D**) Mapping

Produce three dimensional (3D) topographic survey map(s) from collected Mobile LiDAR data. This includes final preparation of Construction Information Management (CIM) deliverable, if applicable.

#### 30.11 Topographic (2D) Planimetric Mapping

Produce two dimensional (2D) planimetric map(s) from collected Mobile LiDAR data.

## 30.12 CADD Edits

Perform final edit of graphics for delivery of required CADD files. This includes final presentation of CIM deliverable, if applicable.

#### **30.13** Data Merging

Merge Mobile LiDAR survey and mapping files, with other field survey files, and data from other sources.

#### 30.14 Miscellaneous

Other tasks not specifically addressed in this document.

#### **30.15** Field Reviews

Perform on site review of maps.

### **30.16** Technical Meetings

Attend meetings as required.

#### 30.17 Quality Assurance/ Quality Control

Establish and implement a QA/QC plan.

### 30.18 Supervision

Supervise all Terrestrial Mobile LiDAR activities. This task must be performed by the project supervisor, a Florida P.S.M.

#### **30.19** Coordination

Coordinate with all elements of the project to produce a final product.

#### 5. **PROJECT REQUIREMENTS**

## 5.1 Liaison Office

The DEPARTMENT and the CONSULTANT will designate a Liaison Office and a Project Manager who shall be the representative of their respective organizations for the Project. While it is expected the CONSULTANT shall seek and receive advice from various state, regional, and local agencies, the final direction on all matters of this project remain with the DEPARTMENT Project Manager.

#### 5.2 Key Personnel

The CONSULTANT's work shall be performed and directed by the key personnel identified in the proposal presentations by the CONSULTANT. Any changes in the indicated personnel shall be subject to review and approval by the DEPARTMENT.

### 5.3 **Progress Reporting**

The CONSULTANT shall meet with the DEPARTMENT as required and shall provide written progress and schedule status reports that describe the work performed on each task. Progress and schedule status reports shall be delivered to the DEPARTMENT concurrently with the monthly invoice. The Project Manager will make a judgment as to whether work of sufficient quality and quantity has been accomplished by comparing the reported percent complete against actual work accomplished.

### 5.4 Correspondence

Copies of all written correspondence between the CONSULTANT and any party pertaining specifically to this contract shall be provided to the DEPARTMENT for their records within one (1) week of the receipt or mailing of said correspondence.

### 5.5 Professional Endorsement

The CONSULTANT shall have a *Licensed* Professional Surveyor and Mapper in the State of Florida sign and seal all reports, documents, and plans as required by DEPARTMENT standards.

#### 5.6 Computer Automation

The project will be developed utilizing Computer Aided Drafting and Design (CADD) systems. The DEPARTMENT makes available software to help assure quality and conformance with policy and procedures regarding CADD. It is the responsibility of the CONSULTANT to meet the requirements in the DEPARTMENT'S CADD Manual *and CADD Production Criteria Handbook* (*including the minimum 95% compliance threshold for all design files*). The CONSULTANT will submit final documents and files as described herein.

### 5.7 Coordination with Other Consultants

The CONSULTANT shall coordinate their work with any and all adjacent and integral consultants so as to effect complete and homogenous plans and specifications for the project(s) described herein.

## 6. INVOICING LIMITS

Payment for the work accomplished will be in accordance with the Method of Compensation of this contract. Invoices shall be submitted to the DEPARTMENT in a format prescribed by the DEPARTMENT. The DEPARTMENT Project Manager and the CONSULTANT shall monitor the cumulative invoiced billings to ensure the reasonableness of the billings compared to the project schedule and the work accomplished and accepted by the DEPARTMENT.

For projects with lump sum invoicing, an invoice for 100% complete will not be approved until the project has been submitted to the DEPARTMENT. All scoped activities, limits, design data, and deliverables, must be fulfilled before 100% invoice will be approved.