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TERMS OF REFERENCE

ORTHOPHOTO ACQUISITION

SCOPE OF PROJECT

Supply the National Capital Commission with 17 rectified orthographic image files in uncompressed internally geo-referenced TIFF format to cover the defined contract area of 36.3 square kilometres (see Exhibit 'A'). The image files must provide a **seamless mosaic** of orthophoto mapsheets in which all seam-lines (edges) between the individual orthophotos are made invisible. The aerial photography is 1:6000, b/w, snow-free and leaf-free acquired in the Spring of 2009. The photography was produced by Champlain Air Surveys. All orthographic image files must be in black and white.

- 1.) Each image file must have .1 metre pixel resolution.
- 2.) Each image file must not exceed 400 megabytes in size.
- 3.) Each image file must have a 'common' 1 metre (10-pixel) overlap with all adjacent image files.
- 4.) One (1) DEM file for each of the above files, in ASCII format (see Exhibit 'B') of sufficient quality and density to meet the map accuracy standards.

All products must be delivered to:

National Capital Commission
Room 202, 40 Elgin Street
Ottawa, Ontario K1P 1C7

Attention: Rand Collins, 4th floor

Requirements

The work consists of producing digital orthophoto image files in uncompressed internally geo-referenced TIFF format created by scanning negatives produced from black and white aerial photography. These negatives must be scanned at a resolution **greater than or equal to 16 microns**. These negatives must be free of dust, lint, scratches, fingerprints, and similar artefacts prior to being scanned. The scanned data must then be digitally rectified to an orthographic projection on a pixel by pixel basis. All orthophoto processing must be on the 3 degree Modified Transverse Mercator projection (Zone 9) using co-ordinate values expressed in metres, based in NAD83.

The image rectification must be carried out using the Cubic Convolution Algorithm or better. A Bi-linear Convolution Algorithm or Nearest Neighbour Algorithm is not acceptable. Each delivered TIFF tile will be a mosaic of multiple, scanned and processed aerial photographic images. The images selected for each TIFF file must have their differential tone and contrast adjustments performed by an autododging process and the join line between the selected images must be unobtrusive.

Horizontal accuracy standards relate to the NCC 1:2000 scale digital topographic mapping database and are as follows: Ninety percent of all well defined features must be located within 0.50mm of their true position at a designated map scale of 1:2000 (or 1 metre at ground scale).

All TIFF files must have the TIFF tag RowsPerStrip set so that each strip approximates 24 kilobytes. All TIFF files must be 8-bit greyscale. The TIFF files must not be compressed and must not contain 'null' data. Each TIFF file must have a 'common' 1 metre (10-pixel) overlap with each adjacent image file in order to eliminate the banding that sometimes appears at the junction of image files when plotted on media.

Mandatory Aerial Photography Digital Scanner Parameters

The digital scanner used for this project must meet or exceed all of the following seven (7) parameters:

| <u>Parameter</u> | <u>Minimum values</u> |
|------------------------------------|--------------------------|
| 1) Geometric Accuracy | +/- 3 microns |
| 2) Geometric Precision | 1 micron resolution |
| 3) Optical density | 0.001 to 3.4D |
| 4) Dynamic range | 2.8D |
| 5) Optical resolution | 8 microns or better |
| 6) Light sensing technology | CCD – linear array |
| 7) Output Data – Bit Depth Minimum | 8 bit b/w, 24 bit colour |

Image quality must not be compromised by increasing the scan throughput.

DEM Collection

The digital elevation model (DEM) of x,y,z point values suitable for this project must be dense enough to prevent visual warping around bridges and freeway overpasses. Break line points from cultural and other surface features (ridges, swales, bridges, freeway overpasses, and other points of elevation change) must supplement the DEM where necessary. The DEM must have 90% of the points vertically accurate to within .5 metre. The contractor must verify any existing DEM and LiDAR points that they desire to utilize.

Material supplied to contractor

The NCC will supply the Spring 2009 photographic negatives.
The NCC will supply the following digital files only:

| | |
|---------------------------------|--------------------------------------|
| Contract area boundary (vector) | Existing 2003 DEM |
| Road centrelines (vector) | Existing 2007 LiDAR elevation points |
| | Existing 2003 and 2007 orthophotos |
| | Existing 1:2000 vector datasets |

The data sets identified above will be provided in ESRI shapefile format only. All files are in NAD83 and 3degree MTM projection, Zone 9.

Deliverables

- 1.) One (1) uncompressed image file in TIFF format for each tile. Each file must have .1metre pixel resolution and must not exceed 400 mb in size.
- 2.) One (1) ASCII DEM file (for each of the above image files) of sufficient quality to meet NCC map accuracy standards (format must comply as shown in **Exhibit 'B'**).
- 3.) A complete aerial triangulation report, citing equipment and software utilized, total number of models used, and number of tie points per model.

Items 1, 2 and 3 must be delivered on standard DVD. All file names must be in lower case only. File names must conform to the following naming convention:

image_1.tif
image_1.tfw
image_1.dem

Review of specifications

The Contractor must be prepared to attend two meetings at his own expense, if required, during the course of the Contract. All meetings will be held in Ottawa.

Inspection and Examination

The NCC may at any time inspect any or all of the equipment utilized for the work

Schedule and delivery

The National Capital Commission must receive all deliverables for the contract no later than August 30, 2009. The contractor is responsible for all deliverables in transit. The contractor is responsible for all transportation costs associated with the deliverables.

Subcontracts

Aside from the acquisition of horizontal & vertical control, no other aspect of this project shall be subcontracted. The successful Contractor must provide proof that they have the necessary equipment & software to perform the required work.

Ownership of Products

All products resulting from the work and all materials supplied to the Contractor will be the property of the National Capital Commission. The Contractor will store all materials under suitable atmospheric conditions until the completion of the work, then he will ship them to the National Capital Commission properly identified and packaged.

Copyrights

The National Capital Commission will have sole ownership of the copyrights of all work produced. Reproduction of any document is forbidden, without written permission from the National Capital Commission.

Acceptance of Finished Deliverables and Payment

The Director of the Information Technologies and Geomatics Services Division or their duly appointed representative will be the sole judge as to the quality of the work, equipment and materials. They will have the authority to order the proper re-execution of any work which, in their opinion, is not in accordance with the specifications or instructions. The Contractor will carry out any rework at the contractor's own expense.

The Contractor may be asked to present to the Inspector at any time during the course of the contract, satisfactory evidence that the instruments used are in proper calibration.

The NCC will perform visual checks of all image tiles for acceptable mosaics, contrast, exposure, building lean, smearing, and skewing. The NCC's Control & Engineering Surveys section will perform extensive checks for positional accuracy of the image files. The contractor is responsible for all errors and omissions in the image files and all rejected image files must be corrected and resubmitted at the contractor's expense.

The NCC will select the standard digital orthophoto file from the contract image tile layout. The contractor must submit in the first delivery the following items:

- 1) The standard image file plus its two adjacent image files.
- 2) All raw scan files used for the standard image file.
- 3) All the film rolls used for this project.

In order to derive data quality and precision standards for the project, the NCC will inspect the standard image file for image quality, mosaics, contrast, exposure, building lean, smearing, skewing, positional accuracy, edge matching and pixel overlap. During the course of the project, the NCC will compare the raw scan files with the delivered image files in order to assist in the quality control. **Only after receiving approval, in writing, from the NCC to proceed**, shall the contractor produce the remaining image files.

The NCC has up to 5 (five) calendar days to perform its quality control process on each image file. The NCC has up to 6 (six) months from May 22, 2009 to accept all the image files.

Additional Information

| | |
|-------------|---|
| Exhibit 'A' | Tile layout. Contract boundary |
| Exhibit 'B' | Sample DEM file format. |
| Exhibit 'C' | I.C.A.S. Specifications. |
| Exhibit 'D' | DVD containing the following data sets in ESRI shapefile format (all NCC data is NAD83 and 3degree MTM projection): Road centrelines Tile layout Existing 2003 DEM. Existing 2006 LiDAR elevation data. Existing 2003 and 2007 orthophoto images. Existing 1:2000 vector data. |

EXHIBIT 'B'

Every record in each DEM file must consist of the following items in the following order:

Easting, Northing, Elevation.

Ex.: 362000.00,5035990.00,89.03
362000.00,5035998.00,89.15
362000.00,5036006.00,100.25
362000.00,5036014.00,99.78

Each item must be comma delimited, spaces are not permitted. The use of commas other than as delimiters is not permitted.

