LINK-GIS
A Northern Kentucky Geographic Information System

Request for Proposals (RFP) for Digital Orthophoto and Digital Elevation Data Production, and GIS Photogrammetric Mapping Services

RFP Final Document and
Technical Specifications

Northern Kentucky Area Planning Commission (NKAPC)
Acting on behalf of
The LINK-GIS Partnership

Kenton and Campbell Counties, Kentucky

November 13, 2006

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I. Introduction

The **Northern Kentucky Area Planning Commission (NKAPC),** acting on behalf of the **LINK-GIS Partnership** is inviting qualified firms to submit proposals for professional services related to the development of digital orthophotography, the development of elevation data, and the compilation of and/or updates of planimetric data. The details of this request are explained within this Request for Proposals (RFP.) This ***Request for Proposals (RFP) for Digital Orthophoto and Digital Terrain Model Production, and GIS Photogrammetric Mapping Services*** will be available at **9:00 AM EST on Monday, November 13, 2006** from the:

LINK-GIS Partnership
Northern Kentucky Area Planning Commission
2332 Royal Drive
Ft. Mitchell, KY 41017

The LINK-GIS Partnership

LINK-GIS is a partnership between the **Northern Kentucky Area Planning Commission (NKAPC)**, the **Sanitation District No. 1 (SD1)**, **the Kenton County and the Campbell County Property Valuation Administrators (KCPVA & CCPVA respectively)** which are the county property assessing offices, **the Kenton County and the Campbell County Fiscal Courts (KCFC & CCFC respectively)** which are the county legislative bodies, and the **Northern Kentucky Water District (NKWD)**. Each partner shares in the responsibility of data acquisition and maintenance. The **NKAPC** is the managing partner of the **LINK-GIS Partnership**.

In addition to these partners, there are many other organizations, both public and private, that contribute both data and resources to the **LINK-GIS** system, and make use of its capabilities. Presently the GIS database contains data for the entirety of both Kenton and Campbell Counties.

Definition of Project Area

The total project area includes the entirety of both Kenton and Campbell Counties in Northern Kentucky. The total project area for both counties is approximately 375 square miles. Terrain elevations range from approximately 475 feet to over 1,000 feet above sea level. The **LINK-GIS Partnership** will evaluate costs related to producing digital orthophotography, planimetric compilation and/or updates, and a new Digital Terrain Model (DTM) for the entire project area, but specifically wishes to evaluate costs related to the two (2) options described in this RFP. A project area map is included as an attachment to this RFP **(Attachment A)**.

Scope of Work Overview

The scope of work for this project will include:

- Production of natural color digital orthophotos
- Development of new digital elevation data to include:
  - A **LiDAR point cloud**
  - A (bare earth) **Digital Terrain Model (DTM)**
  - A **Triangulated Irregular Network (TIN)** for each county (Kenton and Campbell)
  - New **Topographic Contour Lines**
- Photogrammetric compilation and/or updates to planimetric data to include the following layers:
  - Building footprints, concrete pads and other impervious surfaces
  - Roadway edges (curbs), parking lots and other impervious surfaces (no road centerlines will be captured)
  - Bridges, including concrete box culverts
  - Recreational features – parks, ball fields, golf courses, etc.
  - Drainage features, both
    - Natural - including rivers, streams, cross-country ditches, lakes, ponds, etc.
    - Artificial - including ditches, culverts, head walls, catch basins, etc.
  - Fences, both
    - In developed areas along interstate highways only
    - Everywhere else in undeveloped areas

All mapping products will be delivered in **Kentucky State Plane coordinates, North Zone, NAD83 Coordinate Datum, 1993 HARN Adjustment**. Vertical datum will be **National Geodetic Vertical Datum (NGVD) 1988 Adjustment**. In responding to this RFP, the vendor should take into consideration both options described below and price them separately in the cost proposal section. Each option is defined below:

Option 1

New vertical color aerial photography will be captured for all **urban areas** in Kenton and Campbell Counties, which are defined as **north and west** of the blue line (see **Attachment A**). This photography must be captured at a scale sufficient for producing 1" = 100' planimetric mapping meeting the **American Society for Photogrammetry and Remote Sensing (ASPRS) Class 1 Accuracy Standards for Large Scale Maps** and for production of color digital orthophotography at a resolution of 0.5 feet (6 inches).

New color aerial photography will be captured for all **rural areas** in Kenton and Campbell Counties, which are defined as **south and east** of the blue line (see **Attachment A**). This photography must be captured at a scale sufficient for producing 1" = 200' planimetric mapping meeting the **American Society for Photogrammetry and Remote Sensing (ASPRS) Class 1 Accuracy Standards for Large Scale Maps** and for production of color digital orthophotography at a resolution of 1.0 feet (12 inches).

New digital elevation data will be produced for the entire project area. The **DTM(s)** produced

shall be of sufficient quality to be used in the production of the digital orthophotos as well as for the creation of 2 foot contours in **urban areas** and 4 foot contours in **rural areas.**

The vendor shall propose the best solution for **photogrammetrically compiling and/or updating the planimetric data for the entire project area**. Planimetric data will be compiled/updated at 1" = 100' for **urban areas** and 1" = 200' for **rural areas**. The planimetric data requirements are found in **Section VI**. The vendor should note that the planimetric data must be compiled in a manner suitable for stormwater analysis, specifically polygons for the calculation of impervious surface areas. All planimetric mapping produced will conform to **ASPRS Class 1 Accuracy Standards for Large Scale Maps.**

Option 2

New vertical color aerial photography will be captured for the entirety of both Kenton and Campbell Counties. This photography must be captured at a scale sufficient for producing 1" = 100' planimetric mapping meeting the **ASPRS Class 1 Accuracy Standards for Large Scale Maps** and for production of color digital orthophotography at a resolution of 0.5 feet (6 inches).

New digital elevation data will be produced for the entire project area. The **DTM** produced shall be of sufficient quality to be used in the production of the digital orthophotos as well as for the creation of 2 foot contours in all areas.

The vendor shall propose the best solution for **photogrammetrically compiling and/or updating the planimetric data for the entire project area**. Planimetric data will be compiled/updated at 1" = 100' for all areas. The planimetric data requirements are found in **Section VI**. The Vendor should note that the planimetric data must be compiled in a manner suitable for stormwater analysis, specifically polygons for the calculation of impervious surface areas. All planimetric mapping produced will conform to the **ASPRS Class 1 Accuracy Standards for Large Scale Maps.**

For both options described above, all digital orthophotography will be organized on the established tile grid (see **Attachment A**). Planimetric mapping will be delivered in **ArcGIS™ Personal GeoDatabase** format and therefore should not be organized on the tile grid, but delivered as a single file for each layer. In both cases, all data developed by the vendor through this procurement shall be delivered in a format that is compatible with the **LINK-GIS Partnership's** existing hardware and software environments and according to established standards specified in the **LINK-GIS** database dictionary.

Also, for both options described above, the color aerial photography may be captured using either a traditional film based aerial camera or by using a digital based matrix array aerial camera. If captured with a traditional film based aerial camera, the film frame shall capture natural color. If captured with a digital based matrix array aerial camera, the digital frame shall capture natural color, but may additionally and optionally, capture other light bands such as, but not necessarily limited to, near infrared (NIR).

Economies of Scale

The **LINK-GIS Partnership** (NKAPC) is releasing this RFP at or near the same time that Boone County in Northern Kentucky will be releasing its own RFP for similar services. The **LINK-GIS Partnership** (NKAPC) wishes to encourage all responding vendors to consider cost savings that may be achieved by one vendor performing both projects.

However, all responding firms should be assured that the **LINK-GIS Partnership** (NKAPC) will first select the firm(s) it wishes to negotiate with using the established criteria (see **Evaluation and Selection Criteria).** If the selected firm(s) has also responded to Boone County's RFP, then, and only then, will the **LINK-GIS Partnership** (NKAPC) consider the possibility of one firm performing both projects. The purpose of this requirement is to ensure that the firm with the proposal best meeting the needs of the **LINK-GIS Partnership** (NKAPC) is selected and also to ensure that a firm is not eliminated because it did not choose to respond to both RFPs. Nevertheless, if all counties cannot agree on the same firm, the **LINK-GIS Partnership** (NKAPC) reserves the right to choose the firm it feels will best meet its needs.

Vendors choosing to respond to both proposals must still follow the individual proposal submission requirements outlined in each agency's RFP. A copy of the **Cost Worksheet** with amended costs reflecting economies of scale must be submitted in addition to the **Cost Worksheet** for the **LINK-GIS Partnership** (NKAPC) alone.

II. General Requirements

This Request for Proposals is not an offer to purchase but is a request to receive proposals. The RFP, the proposal submitted in response, and any individually negotiated issues, will constitute any final contract which may result. Should conflicts arise, negotiated items shall take precedence over the RFP and the proposal; the RFP shall take precedence over the proposal.

The **LINK-GIS Partnership** (NKAPC) reserves the right to accept or reject any or all responses, as well as the right to negotiate with one or more, or none of the responding firms. Omissions, alterations, or irregularities of any kind shall constitute sufficient cause for rejection of a proposal. However, the **LINK-GIS Partnership** (NKAPC) reserves the right to waive irregularities in the proposals. The **LINK-GIS Partnership** (NKAPC) reserves the right to advertise for new proposals if, in its judgment, the best interests of the **LINK-GIS Partnership** will be served.

By responding to this RFP, the vendor acknowledges that they have no prior knowledge of the contents of this RFP and the specifications defined in it. All expenses incurred by firms in connection with preparing and submitting responses to this RFP are that vendor's alone. It is the responsibility of each responding vendor to be aware of, and comply with, all relevant local, state, and federal licensing and statutory requirements. All proposals submitted become the property of the **LINK-GIS Partnership** and will not be returned. The **LINK-GIS Partnership** is not, and will not be, responsible for any costs incurred by the respondent in proposal preparation, presentations, site visits or benchmarks performed.

Format of Proposals

All proposals being submitted in response to this RFP shall contain at a minimum the following information. Please be clear and concise in your responses.

- Letter of Transmittal
- Executive Summary
- Brief overview of responding firm, including primary office location, other office locations pertinent to this response, primary business of the firm, and size of the firm.
- Submission of information showing sufficient financial strength to assure continued existence of the firm.
- List of organizations for which applicable/similar products have been produced and delivered, to include:
  - Location
  - Description of products produced and delivered
  - Contracting authority or client name, including contact person and telephone numbers
- Technical Response to RFP
- Cost and financing options

- Certification of product accuracy in terms of **ASPRS Class 1 Accuracy Standards for Large Scale Maps**
- Schedule of product production and delivery
- Statement indicating the willingness of the firm to discuss the potential establishment of non-performance penalties if the firm is selected for negotiations

Evaluation and Selection Criteria

The evaluation criteria for each proposal received will be the vendor's technical capabilities, and capacity to perform the indicated work in this RFP, and shall include the following:

Quality of proposal in showing an understanding of the required work necessary for meeting scope of the RFP	**5 %**
Compelling demonstration of ability of vendor to deliver products on time, at or below budgeted costs, while meeting the requirements of the project	**10 %**
Equipment available to perform work in a timely and professional manner	**5 %**
Capacity of vendor to perform the work, including demonstrated knowledge of aerial photography and film processing and scanning (or digital frame image processing) and LiDAR services required for automated mapping and geographic information systems	**25 %**
Specialized experience and technical competence of firm and staff who will actually be working on the project, including past experience with similar projects for countywide areas including major urban areas	**15 %**
Project organization and management, including staffing, management control and subcontractor utilization	**15 %**
Fee proposal evaluation	**25 %**
TOTAL	**100 %**

A selection committee composed of representatives of the **LINK-GIS Partnership's** Technical Committee and members of **NKAPC's GIS, IT, and Administrative Departments** will rate each Proposal and may select up to three (3) proposals for further consideration. If more than one is selected, each vendor selected may be invited to discuss their proposal with the Selection Committee. Upon conclusion of any such discussions, one firm may be selected for negotiations. The Selection Committee will present their recommendations to **NKAPC's Executive Director** for concurrence prior to the commencement of any such negotiations.

Proposal Submission Requirements

The respondents must submit an original and six (6) copies of the proposal by **4:00 PM EST on Friday, December 15, 2006** at the **NKAPC Offices**. The packages should be addressed as follows:

Dennis Andrew Gordon, FAICP
Executive Director
Northern Kentucky Area Planning Commission
2332 Royal Drive
Fort Mitchell, KY 41017

The respondents are responsible for assuring that the proposals are delivered by the deadline.

"Proposal for Digital Orthophoto and Digital Elevation Data Production, and GIS Photogrammetric Mapping Services" should be indicated clearly on the outside of your packages. All proposals received after the deadline will be returned to the respondents. All proposals received by the deadline shall be opened by **Mr. Gordon and Trisha Brush, GISP, Deputy Director for GIS Administration,** or their designee(s), **at 4:00 PM EST on Friday, December 15, 2006** at the NKAPC offices. The public is invited to attend.

RFP Timetable and Selection Schedule

The following is the schedule for release, submission, and selection:

Milestone	Date
RFP Released	**9:00 AM EST - Monday, November 13, 2006**
RFP Questions Submittal Due Date	**5:00 PM EST - Wednesday, November 22, 2006**
Responses to Submitted Questions	**5:00 PM EST – Friday, December 1, 2006**
Proposal Due Date	**4:00 PM EST - Friday, December 15, 2006**
Preferred Vendor Selection and Notification (Negotiations begin)	**3:00 PM EST - Friday, December 22, 2006**

Requirements

The project shall consist of producing and delivering all specified digital orthophoto products, digital elevation data, and planimetric data in the format specified by this RFP, and furnishing all documentation necessary to satisfy the requirements of the RFP. Additionally, all tools, materials, supervision, and labor necessary to make the final products usable by the **LINK-GIS Partnership**, will be furnished by the responding firm. Completion of the project shall consist of, but not be limited to, the following items:

- Provision of a project production and delivery schedule
- Provision of a bi-monthly project status report and schedule
- Delivery of all documentation described in the approved submission
- Delivery of all digital orthophoto products in the specified format
- Delivery of all digital elevation data products in the specified formats
- Delivery of all digital planimetric data products in the specified format
- Provision of a certification of product accuracy in terms of **ASPRS Class Accuracy Standards** for all products furnished. The statement should specifically warrant that the delivered products

are sufficient to be used for the intended purposes stated earlier.

The RFP states the **LINK-GIS Partnership's** requirements relative to the design and delivery of the products presently contemplated. "Price extras" caused by failure of the firm responding to the RFP to fully comply with the technical specifications will not be allowed. Each exception to the RFP must be noted. To avoid any misunderstanding in this matter, the following statement should be included in the submission:

"We certify that the products quoted in this proposal conform fully in every respect to the specifications submitted to us in the subject RFP dated ***November 13, 2006****, with the following exceptions (. . . exceptions may be listed here . . .)"*

Product Delivery Schedule

Each proposal should include a preliminary schedule for the production and delivery of all deliverables. An anticipated schedule for full completion of this project is indicated in **Section VII** of this RFP. The products will be delivered to, and used in the **LINK-GIS** (NKAPC) office, located at **2332 Royal Drive, Fort Mitchell, KY 41017**. The offices are open to all applicants, every day between **8:00 AM and 5:00 PM EST, Monday-Friday** (holidays excepted).

Obligations and Responsibilities of Firms Responding to the RFP

By submitting a proposal, the responding firm will be held accountable for having informed themselves as to the conditions under which the work will be accomplished, the contents of all applicable proposal documents and the provisions of all laws, ordinances, regulations, wage rates, and labor conditions prevailing at the work site. Any failure, omission, or neglect to so inform themselves of such items will not relieve the submitting firm of their obligation to successfully execute and perform completely the work within the time allocated in the contract.

Use of Subcontractors

None of the services or deliverables described in this RFP may be subcontracted by the potential successful vendor without the prior knowledge and written approval of the **LINK-GIS Partnership** (NKAPC). If subcontractors are requested and approved, the vendor shall nonetheless retain full responsibility to the **LINK-GIS Partnership** (NKAPC) for all work completed or uncompleted by any subcontractors.

For approval purposes, the vendor shall provide the **LINK-GIS Partnership** (NKAPC) with references for any proposed subcontractors and a description of the services they will perform. The **LINK-GIS Partnership** (NKAPC) reserves the right to accept or reject any proposed subcontractor.

Domestic Production of Services and Deliverables

All services and final deliverables described in this RFP shall be entirely performed and created in the United States of America and in accord with all applicable local, state, and federal law.

Corrections

Erasures or other changes in the firm's submission must be explained or noted over the company CEO's/President's or authorized designee's signature.

Corporations

If the successful approved firm is a corporate body, it shall furnish at the time of executions of the contract, a resolution of the directors of the corporation bearing the seal of the corporation, evidencing authority of the officer signing the contract to do so.

Particular attention is called to any statutory requirements of the **Commonwealth of Kentucky** relative to the licensing of corporations organized under the laws of any other state.

Equal Employment Opportunity

Attention of all firms responding to this RFP is particularly called to the requirements for insuring that employees and applicants for employment are not discriminated against because of their race, creed, color, sex, or national origin.

Costs Related to Proposal

The respondent shall be fully responsible for all costs incurred in the development and submission of its proposal. The **LINK-GIS Partnership** (NKAPC) assumes no contractual obligation as a result of the issuance of this Request for Proposals, the preparation or submission of a proposal, the evaluation of proposals, or final selection. Selected proposal respondents may be asked to present their proposals to the **LINK-GIS Partnership** (NKAPC). The costs of such presentations shall be borne solely by the respondents.

Invoicing and Payment

Products required by the contract shall be delivered on a schedule to be agreed upon with the **LINK-GIS Partnership** (NKAPC). A delivery and payment schedule will be decided upon as a part of any negotiations.

III. Aerial Photography Specifications

Attachment A shall become part of any contractual agreement. The flight plan presented by the vendor for the spring 2007 fly-over shall be based on this area and will be submitted to the **LINK-GIS Partnership** (NKAPC) for approval.

Existing Monumentation and Ground and Photo Control

The NKAPC, in conjunction with several other local agencies, has established an extensive and highly accurate monumentation network covering Boone, Kenton and Campbell Counties. **To the maximum extent both possible and practicable, vendors are strongly encouraged to make use of this monumentation network when establishing ground control and photo control in their proposals.** Details regarding this monumentation network are available by selecting the **Monumentation** link on the **LINK-GIS** Interactive Mapping web site - **http://www.linkgis.org/mapping.html.**

The vendor shall provide the location and identification of all ground control and photo control points established and used during the flyover in **ArcGIS™ Personal GeoDatabase** format.

Conditions

Vertical, natural color aerial photography shall be accomplished in the spring of 2007, during the period when deciduous trees are without leaves. Photography will not be undertaken when the ground is obscured by snow, haze, fog, or dust, when streams are not within their normal banks, or when cloud shadows will appear on more than 5 % of the area in any one photograph. The photographs shall not contain objectionable shadows caused by relief or low solar altitude.

Flight Plan and Scale

The vendor shall prepare a proposed flight plan based on **Appendix A**, which shall show the flight lines to be utilized. Each flight line will be flown continuously across the project area. The principal points of the first two (2) and last two (2) frames of each flight strip shall fall outside the boundaries of the project area, and all side boundaries shall be covered by a minimum of 25 % of the photo frame. This flight plan shall be submitted as part of the proposal. The final accepted flight plan to be developed after any potential contract award shall be submitted in **ArcGIS™ Personal GeoDatabase** format to the **LINK-GIS Partnership** (NKAPC) upon completion of the photography.

In this digital flight plan, a point shall be digitized to represent the principal point of each individual photographic frame. The attribute table of the principal points database shall indicate a unique ID for each point, the frame number, the flight line number to which the frame belongs, the starting and ending flight line segments to which the frame belongs, the state plane coordinates of the principal point of the photo frame, the three dimensional (Airborne GPS) coordinates of the sensing platform at the time of frame exposure, and the attitude (roll, pitch and yaw angles) of the sensing platform at the time of frame exposure.

Each flight line shall be digitized as a chain of individual line segments representing the flight line segments connecting the principal points of the consecutive photo frames. Each flight line shall be digitized in the order and direction that the frames are flown. The attribute table of the flight line segments shall indicate a unique ID for each segment, the flight line number to which the segment belongs, the IDs of the "From" and "To" principal points defining the segment and the straight line (planar) distance of each segment in feet. Unacceptable aerial photography shall be reflown by the vendor at no additional cost to the **LINK-GIS Partnership** (NKAPC), with the reflight coverage overlapping the accepted photography by at least two stereo models.

Natural color aerial photography shall be obtained at an appropriate scale to produce the specified 1" = 100' and 1" = 200' planimetric mapping and color digital orthophotography. Respondents should specify the aerial photographic scales they plan to use for this project in their response and should include justification for said scale.

End lap, Side lap, Crab, Tilt

Consecutive photos in each flight line shall have an average forward overlap of 60 % (± 2 %) to ensure full stereoscopic coverage. End lap of less than 55 % or more than 65 % in one or more exposures will be cause for rejection of the flight strip, or a portion thereof.

Side lap between adjacent parallel flight lines shall be a minimum of 30 %. Any parallel flight lines having side lap of 25 % or less will be rejected and reflown.

Crab in excess of three degrees (3°) measured with respect to both lines of flight may be cause for rejection of a flight strip or any portion thereof in which the excess crab occurs. This includes relative crab between any two successive exposures.

Tilt of the camera from vertical at the instant of exposure shall not exceed 3 %, nor shall it exceed 5 % between successive exposure stations. Average tilt over the entire project shall not exceed 1 %.

Aerial Camera

The vendor may choose to accomplish the photography with either a traditional film based aerial camera or with a digital based aerial camera, but not both. However, if a digital camera is proposed it shall be of the "matrix array" variety which takes only full frame digital photographs, and shall not be of the "pushbroom" or "linear array" variety.

Regardless of the photographic technology proposed, the aerial camera shall be a precision aerial mapping camera equipped with a low distortion, high resolution lens. Camera characteristics shall be such that the aerial photographs taken can be satisfactorily used with the vendor's proposed photogrammetric compilation equipment and environment. The camera shall be equipped with and utilize electronic Forward Motion Compensation.

If film photography is proposed, images on the aerial negatives and/or film diapositives shall be clear and

sharp in detail and free from light streaks, static marks, scratches, color distortions or any other blemishes. Special care shall be exercised to ensure proper development and thorough fixing and washing of all film to avoid rolling film on drums or in any way distorting it during processing or drying. Film shall be exposed and processed with a target density range of 1.0 ± 0.2, as measured in the neat image areas of each roll of film. Minimum density, as measured with a densitometer with a scale range of 0 to 3.0, should not be less than 0.3 and the maximum density not greater than 1.5. All fiducial mark images shall be visible, clear and sharp.

Before, during, and after processing, the film shall not be subjected to extremes of temperature, or rolled tightly on drums or in any way stretched, distorted, scratched, or marked, and shall be free from finger marks, dirt, chemical, and other stains, or blemishes of any kind.

If digital photography is proposed, the digital aerial images shall be clear and sharp in detail and of high radiometric quality. The camera shall capture the images in an uncompressed "lossless" image format. The camera shall, at minimum, utilize a 12-bit per pixel radiometric resolution. The images shall also be free from image blurs, image artifacts, "cold" or "hot" pixels, color distortion, color balance or tonal problems, or any other kind of "digital blemish". All fiducial mark images shall be visible, clear and sharp.

A USGS camera calibration report, no more than three years old, shall be submitted with the response to these technical specifications for each aerial camera to be used to assure that the camera lens, focal length, light filter, shutter, image format, and its platen (for film) or CCD array (for digital)are all photographically adequate and within acceptable accuracies.

The absence of a calibration report verifying that the camera meets the specified requirements may be cause for disqualification of the vendor. The combination of camera, cone, lens, camera body, and magazine(s) submitted for approval shall be, if acceptable, the only combination used for this project. The entire project area will preferably be flown using one type of camera assembly. If the dimensional stability of the camera has been disturbed since its last calibration, the vendor should have the camera recalibrated prior to acquisition of photography. The vendor will be ultimately responsible for errors caused as a result of incorrect calibration of the camera.

Airborne GPS (ABGPS)

In the acquisition of the aerial photography, airborne GPS data shall be captured using an onboard dual frequency GPS receiver and an equivalent ground base station receiver. The photogrammetric camera must have an event marker to send and receive the returning pulses from the geodetic survey grade receiver. Base station receivers shall also accept dual frequency receivers. The receivers shall collect the GPS data at one-second intervals and post-processed using on-the-fly (OTF) ambiguity resolution techniques to obtain positions on each exposure station within an RMSE of 5 cm. To reduce potential errors, the base stations receivers and the airborne receiver should be of the same make and airborne GPS compatible.

To maintain quality, the PDOP should not exceed 4, the satellite configuration should be a minimum of five (5) satellites when collecting data during the flight mission and the mask must be a minimum of ten degrees (10°). The number of base stations required should be a minimum of two (2) with each baseline being no more than 30 miles from each other. It is preferable to have at least one base station located within the project site. Each base station must be positioned over a first order point (such as a HARN point).

The vendor will be responsible for post-processing the airborne and base station data and prepare this data for aerial triangulation processes. The processing should be performed daily to ensure the recordings for each flight are acceptable. Any flight lines with unsatisfactory recordings shall be re-flown at the earliest opportunity. A hardcopy and digital format may be required for delineating the nadir point on each exposure (easting, northing, and elevation). The accuracy of each point must meet the mapping requirements as noted in this document.

Supporting ground-based GPS surveys shall be conducted with sufficient accuracy to support production of the final orthophotos and planimetric/topographic mapping to meet **ASPRS Class 1 Accuracy Standards** for 1" = 100' and, where applicable, 1" = 200' mapping.

Labeling and Photo Index

Each exposure shall be clearly labeled at the edge of the negative, just inside the image area, on the north edge. This labeling shall include the following information at a minimum:

- Date of photography
- Scale of photography
- Camera focal length
- "**LINK-GIS Partnership (NKAPC)"**
- Flight strip number
- Exposure number

The scale of photography shall be given in inches and feet. Flight strip numbers are not to be repeated anywhere within the photographic coverage of the contract and will be numbered consecutively, starting with Strip No. 1, and continuing sequentially over all flight lines.

If traditional film photography is proposed, the vendor shall prepare a color photo index by joining together the contact prints (or a set of reduced size prints), trimmed to the image area. The prints shall be carefully matched so that the corresponding images overlap and all photo numbers are visible. This original composite of contact prints shall be photocopied, reduced in scale, and reproduced on uniform size sheets.

Contact Prints or Digital Frames

If traditional film photography is proposed, one set of contact prints will be prepared from the original

aerial negatives. Contact prints must be uniform in tone and range of density and must show all details of the negatives clearly. All prints will be clear and free from chemicals, stains, blemishes, fog, streaks, or any defects which would limit their usefulness. Any prints that curl upon drying shall be flattened without affecting their image dimensions or quality, and shall be delivered in a smooth, flat, and usable condition. These contact prints shall be sent to the **LINK-GIS Partnership** (NKAPC) for evaluation purposes within two weeks after the date of aerial photography. All contact prints will remain the property of the **LINK-GIS Partnership** (NKAPC).

If digital photography is proposed, one set of digital photo frames will be prepared from the original digital exposures. These digital frames shall be in uncompressed TIFF image format containing the full 12-bit radiometric pixel values for each wavelength that is collected, and shall be sent to the **LINK-GIS Partnership** (NKAPC) for evaluation purposes within two weeks after the date of aerial photography. All digital photo frames will remain the property of the **LINK-GIS Partnership** (NKAPC).

IV. Digital Orthophoto Requirements

This Section describes the specifications for the production of the digital orthophotography. Vendor proposals shall clearly state and explain the compliance, or non-compliance with these requirements. Appropriate documentation shall be included to fully describe system features and capabilities and shall be identified through a cross reference.

General Specifications

Color digital orthophotos shall be produced for all the entirety of all tiles specified within the project area (see **Attachment A**).

If film photography is proposed, the color digital orthophotos shall be created by scanning the diapositive or aerial photography using a precision image scanner. The scanned data shall then be digitally rectified to an orthographic projection on a pixel-by-pixel basis. If digital photography is proposed, the digital image shall also be digitally rectified to an orthographic projection on a pixel-by-pixel basis. The **LINK-GIS Partnership** (NKAPC) requires that the color digital orthophotos be created directly through the procedures described above, not through the scanning of a hard copy orthophoto.

Equipment and Production Requirements

The proposals should include a discussion of the procedures and equipment used in the production of the digital orthophotos including scanning and rectification procedures. Special consideration should be given to the following production requirements:

Scanning Methods (for film photography) - Scanning devices used shall be precision photogrammetric scanners capable of scanning at resolutions finer than the pixel resolutions specified in this RFP. Include in the proposal the specific scanning devices and resolutions that will be used in production. Pixel resolution shall not be interpolated to a finer resolution than that developed through the initial image scans.

Camera pixel resolution (for digital photography) - Include in the proposal the specific camera pixel resolution(s) that will be used in production. Pixel resolution shall not be interpolated to a finer resolution than that developed through the original digital camera exposure.

Processing - In the proposal, the respondent should give a detailed explanation of the methods proposed for the creation of the digital orthophotos such as the types of inputs which will include the scanned images.

Ground Resolution - Digital orthophotos will be delivered at a resolution of 0.5 feet for the 1" = 100' orthophotos and 1.0 foot for the 1" = 200' orthophotos. For film photography, the respondents should explain the scanning methods used to reach the desired resolution. For digital photography, the respondents should explain the methods used to reach the desired resolution.

Image Mosaicking and Quality - The image with the best contrast shall be used as a reference image when the color digital orthophoto images are mosaicked. All other images shall have their brightness values adjusted to that of the reference image. The delivered color digital orthophotos will not contain defects such as out-of-focus imagery, blurs, whorls, twists, color blemishes, dust marks, scratches, or inconsistencies in tone and density between individual orthophotos and/or adjacent sheets.

Orthophoto Check Files

One set of digital orthophotos at 1" = 100' (or 1" = 200' where applicable) for the project area(s) shall be provided for each orthophoto map sheet (see **Attachment A**) and delivered in **GeoTIFF** format using either a lossless image compression or no compression. The orthophoto files must be produced directly from the digital data.

Any orthophoto check file that is rejected and returned to the vendor for corrections will necessitate a new replacement file. The vendor should set up a tracking application to track the quality control status of each delivery.

Data Structure and Coordinate System

The final data delivery shall consist of a complete set of digital orthophoto files (based on the map tile grid in **Attachment A**) in **GeoTIFF** image format on DVD disk media. The orthophoto files must be produced directly from the digital data. All orthophoto files will be georeferenced by the vendor prior to delivery. World coordinate files (.tfw) files for each orthophoto file shall also be delivered.

Additionally, a set of **MrSID**™ format files, organized optimally for each county, and created with a 25:1 compression ratio, shall be provided.

All digital orthophoto products shall be referenced horizontally to the **Kentucky State Plane Coordinate System, North Zone, NAD83, 1993 HARN Adjustment.**

Accuracy Standards

The digital orthophotos produced through this procurement shall meet the **ASPRS Class 1 Accuracy Standards for Large Scale Maps**.

Quality Control

Quality control procedures shall be utilized by the vendor. The respondents should discuss the quality control procedures proposed for the production of digital orthophotos. The specific devices and procedures, the proposed methods for correcting errors, and the proposed level of support required by the Partnership should be detailed in the proposal.

V. LiDAR, Digital Terrain Model (DTM), Triangulated Irregular Network (TIN) and Topographic Contour Line Specifications

The specifications for the compilation of digital elevation data is described in this section.

LiDAR Specifications

A **LiDAR** point cloud, to be used for modeling of buildings and other three dimensional features shall be delivered. The **LiDAR** cloud shall contain elevation values for **first** and, where applicable, **last and intermediate return signals**. The **LiDAR** cloud shall cover the entirety of the project area and shall extend beyond the borders of the project area by at least ½ mile. The **LiDAR** mission may be flown with airplane or helicopter and shall be flown at a time with no snow cover and when water levels are reasonably normal (not flood stage). Additionally, the vendor shall describe the following items:

- **LiDAR** cloud specifications (horizontal point density, horizontal & vertical RMS error, ground footprint size, pulse rate and other relevant technical data)
- **LiDAR** collection device, including calibration test methods and results
- **LiDAR** collection mission (flight height, flight-line sidelap, point density)
- Aircraft, navigation and mission planning activities
- Any photo or video products collected during **LiDAR** mission(s)
- Any difference in data collection in urban areas vs. rural areas
- In all cases, the **LiDAR** data captured shall be of sufficient quality and density to support the creation of a DTM for use in the creation of the orthophotos and for generation of 2 foot and, where applicable, 4 foot contours
- Filtering and quality control processes used to eliminate missing coverage, invalid point locations, elevations, "foam" or other anomalies

LiDAR Mission

- The Vendor shall contact the FAA and coordinate the **LiDAR** mission with them
- The **LiDAR** receiver shall, where applicable, capture at least 2 returns
- The **LiDAR** receiver shall, if possible, capture an intensity value for each return, with at least 256 value levels
- The **LiDAR** mission may be flown with airplane or helicopter. Flights may be flown day or night. The number and location of flight lines, sidelap, cycle speed, beam repetition rate, scan angle and swath width shall be provided to the **LINK-GIS Partnership** (NKAPC) before the flight mission

The vendor shall validate the quality of the **LiDAR** data at the end of each mission day. The vendor may choose to collect film, video, or digital imagery during the mission to validate the quality of the **LiDAR** data and to assist in creating the bald-earth surface, but it is not a requirement in this scope of work. A copy of any additional imagery shall be included as a deliverable to the **LINK-GIS Partnership** (NKAPC).

LiDAR Deliverable

The **LiDAR** deliverable shall be a digital file of **x, y, and z** points. Where applicable, multiple **z** points and return signal intensity values, if any, shall also be included. All **LiDAR** points shall be referenced horizontally to the **Kentucky State Plane Coordinate System, North Zone, NAD83, 1993 HARN Adjustment**. Vertical (**z**) values shall be referenced to the **National Geodetic Vertical Datum (NGVD) 1988 Adjustment**.

Digital Terrain Model (DTM) Specifications

A **DTM** (bare earth surface) shall be produced to support the creation of the digital orthophotos as well as the generation of topographic contour lines.

If **Option 1** is selected, a **DTM** shall be produced to support the generation of contours at the 2 foot interval for urban areas and at the 4 foot interval for rural areas. The topographical elevation requirements for well-defined points shall meet or exceed **ASPRS Class 1 Accuracy Standards** for a 2 foot contour interval for topographic feature points and **DTM** elevation points in the urban area, and shall meet or exceed **ASPRS Class 1 Accuracy Standards** for a 4 foot contour interval for topographic feature points and **DTM** elevation points in the rural area.

If **Option 2** is selected, a **DTM** shall be produced to support generation of contours at the 2 foot interval for the entire project area. The topographical elevation requirements for well-defined points shall meet or exceed **ASPRS Class 1 Accuracy Standards** for a 2 foot contour interval for topographic feature points and **DTM** elevation points.

The **DTM(s)** shall consist of **LiDAR** data supplemented with breaklines at all significant terrain breaks as may be needed to support generation of contours at the intervals specified, and sufficient to be used in the production of the digital orthophotography. All hydrography lines, bridges, buildings, road and parking lot edges, rail centerlines, and any other significant feature causing an abrupt change in the terrain, will be compiled as terrain breaks. Additionally, accurate contouring at this interval will require the use of "hard" and "soft" breaklines to depict varying degrees of sharpness in linear terrain changes.

DTM Deliverable

The **DTM** deliverable shall consist of a pair of digital files in **ASCII** text format. One file shall contain the mass points used and the other shall contain the supplemental breaklines used in the **DTM**. All **DTM** mass points and breaklines shall be referenced horizontally to the **Kentucky State Plane Coordinate System, North Zone, NAD83, 1993 HARN Adjustment**. Vertical **(z)** values shall be referenced to the **National Geodetic Vertical Datum (NGVD) 1988 Adjustment.**

Triangulated Irregular Network (TIN) Specifications and Deliverable

A separate **TIN** shall be produced for each county (Kenton and Campbell) in the project area, using the **DTMs** generated previously. The vendor shall propose the average point spacing to be used in creation of these **TINs**. Each **TIN** shall be delivered in a format compatible with **ESRI ArcGIS™** software and referenced to the **Kentucky State Plane Coordinate System, North Zone, NAD83, 1993 HARN Adjustment.** Vertical **(z)** values shall be referenced to the **National Geodetic Vertical Datum (NGVD) 1988 Adjustment.**

Topographic Contour Line Specifications

Topographic contour lines shall be computer generated from the **DTM(s)** and shall be delivered in **ArcGIS™ Personal GeoDatabase** format as a seamless GIS layer of 2 foot contours in urban areas, and, if applicable, a separate seamless GIS layer of 4 foot contours in rural areas. Contour lines should be smoothed cartographic curves which are continuous, pass through buildings, and reflect the terrain under bridges and overpasses.

The contour lines shall not loop, repeat, contain gaps or broken segments, or intersect other contour lines. All contour lines must be spatially consistent in the elevation they are intended to represent. The attribute table of the contour lines shall contain a numeric value representing the elevation of the contour line.

In the case of separate 2 foot and 4 foot contour layers in urban and rural areas respectively, the end points of 4 foot contour lines in rural areas which are adjacent to areas with 2 foot contour lines in urban areas, shall "snap" mathematically to the common end point of the adjacent 2 foot contour line. All contours shall meet or exceed map accuracy standards for **ASPRS Class 1 Accuracy Standards.** In addition, the vendor shall:

- Describe the process for calculating and smoothing the contours
- Describe the quality control processes used

Topographic Contour Line Deliverables

The Topographic Contour Line deliverable shall consist of an **ArcGIS™ Personal GeoDatabase** layer of 2 foot contour lines, and where applicable, a separate layer of 4 foot contour lines, referenced to the **Kentucky State Plane Coordinate System, North Zone, NAD83, 1993 HARN Adjustment**. Vertical (**z**) values shall be referenced to the **National Geodetic Vertical Datum (NGVD) 1988 Adjustment**.

VI. Planimetric Mapping Specifications

The specifications for compiling and/or updating the planimetric base map layers are described in this section. Vendor proposals shall clearly state and explain the compliance, or non-compliance with these requirements. Appropriate documentation shall be included to fully describe system features and capabilities. The **LINK-GIS Partnership** (NKAPC) reserves the right to evaluate the costs associated with the planimetric mapping prior to deciding if it shall be included in this procurement.

Planimetric Layers to be compiled/updated

The proposal shall include a description of the methods to be used for **photogrammetrically compiling and/or updating the planimetric base mapping for the project area.** The **LINK-GIS Partnership** (NKAPC) will provide to the successful vendor a copy of its existing planimetric layers for reference in the process of compiling/updating. In compiling/updating these layers, the following guidelines should be used to determine whether new compilation or updating is the appropriate course of action:

When to update features:

- If a feature in the current planimetric layer is no longer representative of the same feature visible in the new photography, the vendor shall update or re-compile the feature to accurately represent the visible feature

- If a feature in the current planimetric layer is no longer visible in the new photography or has been replaced with a new feature, the vendor shall delete the old feature from the layer and shall, if appropriate, replace it with a representation of the new feature which has replaced it in the new photography.

When to compile new features:

- If the current planimetric layer does not contain a feature which is visible in the new photography, the vendor shall compile a new planimetric representation of the visible feature.

When no action is necessary:

- If the current planimetric layer already contains an accurately compiled representation of a visible feature, no further compilation is necessary for that feature.

The planimetric mapping will include the following features:

- Building footprints, concrete pads and other impervious surfaces as polygons
- Roadways as polygons using road edges and curbs (no road centerlines will be captured)
- Bridges, including concrete box culverts, as polygons
- Parking lots, loading docks and other impervious surfaces as polygons

- Recreational features – parks, ball fields, golf courses, etc. as polygons
- Drainage features, both
  - Natural - including rivers, streams, cross country ditches, lakes, ponds, etc. as polygons and line features
  - Artificial - including ditches, culverts, head walls, catch basins, etc. as line and point features
- Fences as line features, both
  - In developed areas along interstate highways only
  - Everywhere else in undeveloped areas

Planimetric Equipment Requirements

The specific photogrammetric equipment to be used for compilation must be specified in the proposal. The interactive editing system to be used should also be specified. The equipment used for production must be the same equipment identified in the proposal.

Planimetric Content

The graphic representation requirements of the features captured, as well as annotation and attribute requirements, are shown in table following this sub-section.

The planimetrics will be compiled/updated photogrammetrically at 1" = 100' for urban areas, and if applicable, at 1" = 200' for rural areas. An impervious area geodatabase will be produced outside of this procurement by the **LINK-GIS Partnership** using the planimetric polygon features captured through this procurement. Therefore, the vendor should take special note of how the planimetric features are to be captured in anticipation of the partnership's desire to produce this geodatabase. In particular, each building, parking lot, roadway, or other impervious surface will need to be captured as a polygon. Impervious surface driveways will also need to be captured as polygons. If grass, dirt, or planters are contained within parking lots these need to be captured as polygons, so that they may be tagged as exclusionary polygons (islands) at the time the impervious geodatabase is produced by the partnership.

Production Requirements

With regard to the compilation/update of planimetric features, it is important that the vendor understand the following requirement:

There shall be no overshoots, undershoots, overlaps or gaps between or amongst adjacent features which visually appear in the aerial photography to be physically and immediately adjacent to (i.e., actually touching) another feature.

The following compilation requirements must be adhered to by the vendor with full **ArcGIS™** topology. The **LINK-GIS Partnership** (NKAPC) data dictionary specifies the current data structure and will be provided for review.

- Common Boundaries - All graphic features that share a common boundary, regardless of digital map layer, must have the exact same digital representation of that feature in all common layers.

- Point Duplication - No duplication of points that occur within a data string is permitted.
- Connectivity - where graphic elements visually meet, they must also digitally meet. All confluences of line, area, and polygon data must be exact mathematically; that is, no "overshoots," "undershoots", "offsets" or "pseudo nodes" are permitted. Lines that connect polygons must intersect those polygons precisely; that is, every end point must be an intersection point of the respective polygon.
- Line Quality - A high quality cartographic appearance shall be achieved. Transitions from straight line to curvilinear line segments shall be smooth, and without angular inflections at the point of intersection. The digital representation must not contain extraneous data at a non-visible level. There shall be no jags, hooks, or zero length segments. Curvilinear graphic features should be smooth with a minimum number of points. When appropriate, line smoothing programs should be used to minimize the angular inflection in curvilinear lines.
- Any lines that are straight, or should be straight, shall be digitized using only two points that represent the beginning and ending points of the line.
- The compilation of new drainage features, whether natural or artificial, shall be done in a manner to reflect the direction of water flow from higher to lower elevation in order to facilitate the modeling of stream network flow.
- Segmentation - the digital representation of linear elements must reflect the visual network structure of the data type. An element should not be broken or segmented unless that segmentation reflects a visual or attribute code characteristic, or unless the break is forced by database limitations.
- Area and Polygon Closure and Centroids - for area features being digitized, the last coordinate pair must be exactly (mathematically) equal to the first coordinate pair; that is, the last vertex point shall "snap" to the same location as the first.
- Point Criteria - all point features shall be digitized as a single x, y coordinate pair at the visual center of that graphic feature.

Data Structure and Coordinate System

The planimetric data layers will be delivered in **ArcGIS™ Personal GeoDatabase** format. All files will be referenced to the **Kentucky State Plane Coordinate System, North Zone, NAD83, 1993 HARN Adjustment** by the vendor prior to delivery. Vertical datum will be **National Geodetic Vertical Datum (NGVD) 1988 Adjustment**.

Accuracy Standards

Planimetric data shall be compiled in accordance with the **ASPRS Class 1 Accuracy Standards for Large Scale Maps.**

Precision

All coordinate data shall be created and stored using double precision coordinates.

Photogrammetric Layer Check Files

As with the digital orthophoto check files, the vendor shall provide digital photogrammetric check files for each layer compiled/updated. These file shall be delivered in **ArcGIS™ Personal GeoDatabase** format on DVD disk media or portable hard drive. Any digital photogrammetric check file that is rejected and returned to the vendor for corrections will necessitate a new replacement file. The vendor should set up a tracking application to track the quality control status of each delivery.

VII. Deliverables and Schedule

Deliverables

Unless otherwise specified, the vendor shall provide ten (10) final copies of all digital data produced on DVD media. All final digital orthophotography, digital elevation data sets, and digital planimetric data layers shall include complete and accurate metadata in **ArcGIS™** compatible format. This requirement is an integral part of the data deliveries.

Deliverables

- **Color Aerial Photography**
  - **ArcGIS™ Personal GeoDatabase** of ground control and photo control points
  - **ArcGIS™ Personal GeoDatabase** of final flight plan
  - For traditional film – full set of color contact prints and photo index map
  - For digital photography – full set of color, full frame, full 12-bit per pixel resolution digital files in uncompressed or lossless compressed **TIFF** format for each band captured
  - Only one (1) copy required for the ground/photo control, flight plan, and full frame digital photography data sets

- **Color Digital Orthophotography**
  - In uncompressed or lossless compressed **GeoTIFF** format with associated world files
  - Option 1
    - 6 inch pixels in urban areas
    - 12 inch pixels in rural areas
  - Option 2
    - 6 inch pixels in all areas
  - For digital photography only – orthophotography to include natural color as well as any additional bands captured
  - **MrSID™** format files, organized optimally for each county at 25:1 compression ratio (natural color only)

- **Digital Elevation Data**
  - Option 1
    - **LiDAR** – **ASCII** format x, y, z point cloud including multiple z-values where applicable and return signal intensity values, if any (file compression allowed)
    - **DTM(s)** (bare earth surface) – Mass point file(s) and breakline file(s) in **ASCII** format, capable of generating 2 foot contours in urban areas and 4 foot contours in rural areas
    - **TIN** – one for each county (Kenton and Campbell)
    - Topographic contour lines - **ArcGIS™ Personal GeoDatabase** layer of 2 foot contour lines in urban areas and separate layer of 4 foot contour lines in rural areas
  - Option 2

- **LiDAR** – **ASCII** format x, y, z point cloud including multiple z-values where applicable and return signal intensity values, if any (file compression allowed)
- **DTM** (bare earth surface) – Mass point file(s) and breakline file(s) in **ASCII** format, capable of generating 2 foot contours in all areas
- **TIN** – one for each county (Kenton and Campbell)
- Topographic contour lines - **ArcGIS™ Personal GeoDatabase** layer of 2 foot contour lines in all areas

- **Planimetric Base Mapping**
  - Delivered as a single, seamless layers in **ArcGIS™ Personal GeoDatabase** format
  - Option 1: Photogrammetrically compiled/updated planimetric data
    - 1" = 100' in urban areas
    - 1" = 200' in rural areas
  - Option 2: Photogrammetrically compiled/updated planimetric data
    - 1" = 100' in all areas

Proposed Schedule

The vendor shall propose a schedule that will achieve all of the objectives outlined in this RFP. The schedule shall include all phases of the project and shall clearly indicate task/deliverable dependencies within or between phases. Significant milestones and delivery dates shall also be indicated. The schedule should be realistic and not over promise on milestones or delivery dates.

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VIII. Cost Worksheet

Product or Service	Kenton County	Campbell County	Combined County Totals
Ground/Photo Control			
Option 1 (urban areas)			**$0.00**
Option 1 (rural areas)			**$0.00**
Sub-totals for Option 1	**$0.00**	**$0.00**	**$0.00**
Option 2 (all areas)			**$0.00**
Aerial Photography			
Option 1 (urban areas)			**$0.00**
Option 1 (rural areas)			**$0.00**
Sub-totals for Option 1	**$0.00**	**$0.00**	**$0.00**
Option 2 (all areas)			**$0.00**
Digital Orthophoto Production			
Option 1 (urban areas) - 6" pixels			**$0.00**
Option 1 (rural areas) - 12" pixels			**$0.00**
Sub-totals for Option 1	**$0.00**	**$0.00**	**$0.00**
Option 2 (all areas) - 6" pixels			**$0.00**
MrSID™ Files (25:1 compression)			
Option 1 (urban areas) - 6" pixels			**$0.00**
Option 1 (rural areas) - 12" pixels			**$0.00**
Sub-totals for Option 1	**$0.00**	**$0.00**	**$0.00**
Option 2 (all areas) - 6" pixels			**$0.00**
Digital Elevation Data Production			
LiDAR Point Cloud			
Option 1 (urban areas)			**$0.00**
Option 1 (rural areas)			**$0.00**
Sub-totals for Option 1	**$0.00**	**$0.00**	**$0.00**
Option 2 (all areas)			**$0.00**
DTM(s)			
Option 1 (urban areas)			**$0.00**
Option 1 (rural areas)			**$0.00**
Sub-totals for Option 1	**$0.00**	**$0.00**	**$0.00**
Option 2 (all areas)			**$0.00**
TIN(s)			
Option 1 (urban areas)			**$0.00**
Option 1 (rural areas)			**$0.00**
Sub-totals for Option 1	**$0.00**	**$0.00**	**$0.00**
Option 2 (all areas)			**$0.00**

Topographic Contour Lines			
Option 1 (urban areas)			**$0.00**
Option 1 (rural areas)			**$0.00**
Sub-totals for Option 1	**$0.00**	**$0.00**	**$0.00**
Option 2 (all areas)			**$0.00**
Planimetric Compilation/Update			
Option 1 (urban areas) - 1" = 100'			**$0.00**
Option 1 (rural areas) - 1" = 200'			**$0.00**
Sub-totals for Option 1	**$0.00**	**$0.00**	**$0.00**
Option 2 (all areas) - 1" = 100'			**$0.00**
GRAND TOTAL			
Option 1	**$0.00**	**$0.00**	**$0.00**
Option 2	**$0.00**	**$0.00**	**$0.00**

IX. Attachments