



SACOG Board of Directors

Item #05-10-11
Consent

October 13, 2005

Request for Proposals for Aerial Imagery Collection

Issue: Several jurisdictions have requested that staff explore a consolidated purchase of aerial imagery for jurisdictions in the SACOG region. The attached scope of work will be incorporated into a Request for Proposals to solicit vendors to bid on an imagery collection project.

Recommendation: The Housing & Land Use Committee recommends that the SACOG Board of Directors approve the attached scope of work for a Request for Proposals for Aerial Imagery Collection, and to authorize the Executive Director to select a proposal and execute a contract.

Committee Action/Discussion: For the last five years, staff has worked with our member agencies to coordinate aerial imagery collections at regular intervals. In many cases SACOG assisted county-based collaborative groups to jointly fund more detailed imagery collections. These joint projects were all coordinated through a vendor who then invoiced each agency separately. The imagery purchases were also for licensed products that in most cases were negotiated for individual county groups.

The Cities of Sacramento, Folsom, Woodland, Yuba City and Lincoln, along with the County of Sacramento have asked SACOG staff to explore a coordinated aerial imagery purchase. These agencies believe that a coordinated purchase of owned-imagery versus licensed imagery will increase our negotiating leverage with vendors. Through subsequent meetings, staff solicited all of our member and partner agencies for their interest in this process. Several other local governments, Caltrans, US Geological Survey, and one Homeland Security Task force have expressed interest in jointly funding an imagery collection.

The Request for Proposals will ask vendors to submit proposals by November 14. Vendors will be asked to submit a price for 500, 750, and 1,000 square miles of 6-inch color balanced imagery collection. Vendors will also be asked to price optional data that can be used to build digital terrain models that will improve the imagery accuracy.

Vendors who are short listed will also be asked to reserve collection flight time in late February to early March. SACOG staff will lead participating agencies in negotiations with one or two vendors beginning the week of November 21. Agencies who decide to participate in this project will need to make funding and collection area commitments by November 30.

Approved by:

Mike McKeever
Executive Director

MM:JC:ts
Attachment

Key Staff: Kenneth Hough, Director of Community Planning & Operations, (916) 340-6229
Gordon Garry, Director of Research & Analysis, (916) 340-6230
Joe Concannon, Senior GIS Analyst, (916) 340-6234

SCOPE OF WORK

INTRODUCTION

The Scope of Work described below involves providing all of the ground control surveys, flying and photography, photo lab work, film scanning, analytical aerotriangulation, terrain extraction, digital terrain modeling and digital image processing needed to produce color digital orthophotography with 6-inch pixels and a horizontal accuracy of +/- 2 feet. In addition, responses should address the optional collection of approximately 40 degree angled oblique imagery. Oblique imagery must be integrated with the orthophoto product such that each pixel of the digital image obliques are mapped to actual geographic coordinates, vertical measurements can be made, and can be integrated with existing geographic information systems data. Changes to the scope of work may be negotiated before the final contract and work scope are signed. Alternative approaches are welcome and should be discussed in the response to this request.

The project area includes the SACOG urbanized area plus several adjoining City areas (Attachment A) for a total of approximately 1,000 square miles. Responses are asked to address collection for the full 1,000 square mile area, the 750 square mile area and the 500 square mile area outlined in Attachment A.

A LIDAR collection for the Sacramento County area was completed in 2004. The resulting LIDAR points and/or 2' contours from that effort can be provided to the Consultant for the 2006 orthophotography effort. As a second option, responses are asked to price a LIDAR data collection for the 200 square mile area outlined in Attachment B. Costs for creating a digital terrain model and using that model to process that amount of imagery should be included in the pricing. On this option deductions should be noted where the 10-meter USGS 10 meter DEM will not be used.

The orthophotography will subsequently be used to support a variety of needs within the SACOG Regional GIS Coordinating Committee Membership including generating new planimetric detail for GIS. The data produced from this project will be used in a number of software systems including ArcView, Intergraph, ARC/INFO, and AutoCAD. All data produced for this project shall meet National Map Accuracy Standards for 1"=100' mapping.

GROUND CONTROL

The Consultant shall be responsible for establishing sufficient ground control to perform the required digital orthophoto mapping. The control survey shall be completed in accordance with accepted industry practice and the applicable provisions of the California Land Surveyor's Act. Global Positioning System (GPS) surveys shall be conducted in conformance with the most current Federal Geodetic Control Committee standards. The setting of control by airborne GPS methods is permissible.

The SACOG Regional GIS Coordinating Committee requires that all ground control coordinates and data products derived from them be furnished in California State Plane Coordinates, Zone 2. Horizontal datum shall be NAD 83 (1991.35 epoch); vertical datum shall be NAVD 1988. Working units shall be in U.S. survey feet. Ground control accuracy shall be second order or better.

Respondents shall submit a proposed flight and control plan to the SACOG Regional GIS Coordinating

Committee as part of their response. The planning map shall be of a known, even engineering scale, and shall indicate the proposed control locations, stereo model layout and flight plan. The mapping limit line shall also be plotted on the planning map. The mapping limit includes SACOG 1,000 square mile, 750 square mile and 500 square mile areas shown on Attachment A. Similar flight information shall be submitted for the area on Attachment B for those including that option in their proposal.

All labor and materials related to the ground control survey, including research and permits, shall be the responsibility of the Consultant.

Deliverables: 1) One bound set of all field data and derived information, including horizontal and vertical coordinates for all control positions
2) One ARC/INFO compatible file detailing the flight plan and containing the control point positions

AERIAL PHOTOGRAPHY

Color aerial photography shall be acquired using a precision aerial mapping camera equipped with a focal length lens and forward motion compensation. Consultant shall furnish the SACOG Regional GIS Coordinating Committee Membership with a calibration report for the camera that is current within 3 years.

Acquisition of aerial photography shall be conducted on a clear day/s during late February or early March 2006 between 10:00 a.m. and 2:00 p.m. Pacific Standard Time when the sun angle is not less than 30 degrees. Photography will not be undertaken when the ground is obscured by haze, smoke, fog or dust. The scale of the photography shall be 1"=800'. Orthophoto mapping limit boundaries shall fall within neat model limits of the photography. Consultant shall be liable for ensuring that all photography complies with industry standard tolerances for flight altitude, tilt, sidelap, endlap, and crab.

If film is used, all exposed film shall be processed using best available technology. All negatives shall be clear, sharp, and free of blemishes or damage. Each individual frame shall be labeled with the date of photography, photo scale, name of the SACOG Regional GIS Coordinating Committee Membership, flight line number, and exposure number. Consultant shall be responsible for storage of the negatives, unless and until delivery is requested by the SACOG Regional GIS Coordinating Committee Membership.

Deliverables: 1) One camera calibration certificate
2) One photo index sheet

ANALYTICAL AEROTRIANGULATION

The SACOG Regional GIS Coordinating Committee Membership encourages use of analytical aerotriangulation to reduce field control costs, and to verify integrity of the survey. Best available technology shall be utilized. The use of softcopy analytical aerotriangulation, or digital aerotriangulation, is acceptable. The consultant shall document the process used.

Consultant shall deliver a bound copy of the analytical aerotriangulation results. Coordinates and residual values shall be reported for all points. RMS values shall be reported for the final adjustment. Discarded points shall be noted and discussed.

- Deliverables: 1) One copy of copy the documented aerotriangulation process
2) One copy of aerotriangulation results

DIGITAL ORTHOPHOTOGRAPHY

Digital orthophotography shall be produced using the digital terrain models, control data, camera calibration data and raw raster imagery scanned from the aerial negatives as input. The rectification process shall involve solution of the appropriate photogrammetric equations for each pixel in the output image. Solution of photogrammetric equations at anchor points only, and warping the content of the original image between anchor points (rubber-sheeting) shall not be permitted.

Aerial negatives or film diapositives shall be converted to digital raster images using a precision photogrammetric scanner. Respondents shall state their proposed scanning resolution and the type of scanner to be utilized. The SACOG Regional GIS Coordinating Committee Membership specifically forbids interpolation of digital raster images to a resolution finer than that achieved by the scanning device.

The SACOG Regional GIS Coordinating Committee Membership will provide existing digital elevation data (LIDAR points and 2' contour data) for the Sacramento County. The consultant shall then use this data in addition to producing a new digital terrain model for use in orthorectifying the imagery for the remaining areas. The terrain model may be produced by any appropriate method available. This includes photogrammetric data extraction through interactive means or autocorrelation. LIDAR technology may also be utilized. Where automated data extraction is used, it is required that all point information be corrected to ground level. While the SACOG Regional GIS Coordinating Committee Membership is not setting specific requirements for mass point or break line density, it is emphasized that the consultant is liable for ensuring that both the DTM and derivative data products meet the accuracy requirements of the project.

Digital orthophotography shall be created as color .TIF files. Pixel resolution shall be 6-inches. Individual orthophoto image files shall match their corresponding tiles in the SACOG Regional GIS Coordinating Committee Membership's map sheet grid. Tiles shall be mosaicked so the images appear to be completely seamless when displayed or plotted. Radiometric adjustment shall be performed to balance brightness and contrast of the imagery over the entire project.

Consultant shall be responsible for georeferencing all orthophoto tiles and providing .TFW world header files for each tile of the SACOG Regional GIS Coordinating Committee Membership grid. The file naming convention will be determined by the SACOG Regional GIS Coordinating Committee Membership.

A single, SACOG Regional GIS Coordinating Committee Membership wide image shall also be created and delivered as a MrSID file with 10:1 compression or an alternative compression rate approved by the SACOG Regional GIS Coordinating Committee Membership.

- Deliverables: 1) One set of CD-ROM (DVD) disks with 24-bit color .TIF files and world header files
2) One set of CD-ROM (DVD) disks with 24-bit color .SID files and world header files
3) One SACOG Regional GIS Coordinating Committee Membershipwide 24-bit color .SID file and world header file

- 4) One set of DTM data in an ARC/INFO compatible format

OBLIQUE PHOTOGRAPHY OPTION

Responses including the option for oblique photography shall include a detailed collection plan. The oblique aerial photography collection shall be submitted for the 500, 750 and 1,000 square mile collection areas. Responders must provide detailed specifications on 1 foot and six-inch pixel resolution oblique images. Responders should include descriptions and pricing for a software solution that allows the oblique imagery to be integrated with the orthophoto product such that each pixel of the digital image obliques are mapped to actual geographic coordinates, vertical measurements can be made, and the oblique images can be integrated with existing geographic information systems data. Software applications must use standard ESRI formats and products and should also be included in the pricing for this option.

- 1) One set of CD-ROM (DVD) disks with 24-bit color .TIF files and world header files
- 2) One set of CD-ROM (DVD) disks with 24-bit color .SID files and world header files

PILOT PROJECT

The SACOG Regional GIS Coordinating Committee Membership will require delivery of a pilot project after ground control, image acquisition and analytical aerotriangulation have been completed for the entire SACOG Regional GIS Coordinating Committee Membership. This will involve production of four to six digital orthophoto tiles in a pilot project area selected jointly by the SACOG Regional GIS Coordinating Committee Membership and the photogrammetric consultant. Production of the balance of the orthophoto sheets will be predicated on timely and successful completion of the pilot project by the photogrammetric consultant. The SACOG Regional GIS Coordinating Committee Membership also reserves the right to make changes in the specifications and scope of work in this document based upon results of the pilot project, and negotiate changes in the contract.

QUALITY ASSURANCE/QUALITY CONTROL

Respondents shall discuss their quality assurance/quality control plan, outlining the steps taken and the individuals responsible for ensuring the integrity of the final product.

PRODUCT DELIVERY

In addition to all above specified deliverables all respondents shall include delivery of the all digital products on two USB2/Firewire External hard drives. This delivery will include all deliverables listed for the DIGITAL ORTHOPHOTOGRAPHY and OBLIQUE PHOTOGRAPHY OPTION sections of this document.



