TASK NAME: Alaska Mid-Accuracy DEM (ARRA $)

Information Page

The Government requests proposal for this task is split into the following separate sections:

1. The cost for data acquisition.
2. The cost for processing data (USGS Bald Earth Processing) and producing deliverables.
3. A total cost for the entire project.

TASK ORDER DETAIL 9/21/2011

USGS CONTRACT: G10PC00013

CONTRACTOR: Dewberry

TASK ORDER NUMBER: G10PD01415

TASK NAME: Alaska Mid-Accuracy DEM (ARRA $$)

The Contractor shall furnish all facilities, labor, materials and equipment, unless specifically identified otherwise, to provide the photogrammetric and mapping services and products in accordance with the specifications, terms and conditions contained in Contract No. **G10PC00013**, and the following requirements specific to this Task Order, and in accordance with Contractor's proposal dated _____ 2010 and in the amount of: $_____.

SECTION C - DESCRIPTION/SPECIFICATIONS/WORK STATEMENT

The following Section C additional requirements are applicable to this Task Order:

Statement of Work: Reference C.1 of the contract. This ARRA project is for a mid-accuracy DEM with 20-foot contour bare earth data covering the collection of 9 one-degree cells and the processing of 1 one-degree cell. In total, both the ARRA and non-ARRA task orders will acquire and process 28 one-degree cells. Two diagrams of the project area are included as Attachment A of this task order with the one-degree cells listed in a prioritized numerical ranking order. The total project area of the (9) one-degree cells is approximately 18,720 square miles. The total number of one-degree cells to be purchased under this task order will be contingent upon the negotiated cost.

For all areas, the contractor shall collect and provide a mid-accuracy Digital Elevation Model with a 20' contour accuracy and an Orthorectified RADAR Image (ORI) or similar product at a pixel resolution of 5.0m or better. Reflective Digital Surface Model (DSM) and a bald-earth Digital Terrain Model (DTM) DEM data with regular 5-meter post spacing shall also be provided for all areas. Additionally, HRTe3 data format for the entire area will be provided. FGDC-compliant metadata shall be provided for each data file and an ISO 9001 data-quality certification report shall be provided for each 15-minute tile.

1. **Deliverables: Two (2) copies of the data products shall be delivered under this task order. Both copies shall be on external hard drive media.**

   a. **Data Products:**

      1) High-resolution DSM with 5-meter posts
      2) High-resolution DTM with 5-meter posts
      3) Contrast-stretched ORI (or similar product) magnitude with 5-meter pixels
      4) FGDC-compliant metadata files and swath locator diagram
      5) Certified ISO 9001 data-quality report for each 15-minute tile (Quality Assurance Plan)
      6) Resampled edge-matched bare earth quarter cells (30'X30') in geographic projection

at- 0.4 arc/second post spacing (above 50N this data is .4 x .8))
7) HRTe3 data format
8) Void mask and a list of any ancillary sources to fill voids shall be generated for each surface and resolution
9) Monthly Progress reports summarizing current status, problems encountered, and resolution in MS Word format by the 10th day of each month.
10) Slope mask to define accuracies and edit criteria

b. **Miscellaneous Products:** Ground control used in the performance of this project shall be provided to the Government. Results of bias corrections and accuracy tests and test procedures shall be provided to the Government. The production of miscellaneous products is not required, but may be produced during the execution of this contract. At least one (1) copy of any miscellaneous products shall be delivered to the Government.

2. **Accuracy and Precision:**

a. **Elevation Data Models:** The cell size for all DEM data shall be a gridded 5.0 meter post spacing. DEM products shall meet a vertical accuracy of 3 meters at the 90% confidence level for a 0 – 10 degree slope.~~, 6 meters or better at the 90% confidence level for a 10 – 20 degree slope, 9 meters or better at the 90% confidence level for a 20 – 30 degree slope, and 12 meters or better at the 90% confidence level for a >30 degree slope.~~ DEM and ORI (or similar product) products shall meet a horizontal accuracy of 12.2 meters (CE90) or 13.9 meters (CE95), this equals RMSEr of 8.035 meters or RMSEx and RMSEy of 5.682 meters. This equals the horizontal accuracy requirements for maps and orthophotos at 1:24,000-scale. The results of any accuracy tests performed by the contractor(s) on any data provided under this task order shall be provided to the Government and the actual tested accuracy (if available) or estimated accuracy determined by the contractor shall be included in the metadata. The maximum absolute Z offset between existing adjacent datasets shall not exceed the combined nominal RMSE value for both datasets. For example, the maximum vertical offset between datasets with a 1.0-meter RMSE and a 2.0-meter RMSE is 3.0 meters. Elevation values shall be in NAVD 88 meters using the GEOID09 or later NGS geoid (if available) adjustment with precision of at least 0.01 meters. Geoid differences that might contribute to differences between datasets will be taken into account. Horizontal units shall be in Alaska Albers meters with a precision of at least 0.01 meters.

b. **Quality Mask:** A quality mask, in shapefile format, CD-Rom media, shall be provided for each elevation tile produced; the mask shall comprise shapefiles of polygons that represent all data points in the final product that were derived through an interpolation process. The interpolation process should follow the following guidelines:

Terrain	**Slope**	**Max Interp allowed (in pixels)**
Low	0-10 deg	100
Moderate	>10-20 deg	50
High	>20-30	30
Extreme	>30 deg	16

**Leave as void if capture conditions are not met.

**No more than 5% void is allowed in a single 15' X 15' tile. The 5% should pertain to void data prior to filling, not after interpolation or fill.

**No more than 3% void is allowed over the entire assignment area. The 3% should pertain to void data prior to filling, not after interpolation or fill.

The Quality Mask will break out the following:

- Vertical Accuracy based on percent slope (3m, 6m, 9m, >9m)
- Hydrology (any posts/pixels that represent water (lakes, ocean, DLD's…)
- Nulls or void data
- Void fill source (interpolated, DTED2, other…)

c. **Hydrologic Enforcement**: To ensure the lakes are flat and the streams flow downhill, hydro-enforcement shall be performed on DTMs. Enforcement parameters that exceed the following requirements are acceptable but not required.

1) Lakes: length greater than 150m and width greater than 50m will be portrayed at a constant elevation at least one meter below surrounding terrain.
2) Double-line drains: width greater than 50m extending 150m or more in length will be collected as flat surfaces at least one meter below surrounding terrain and shall be monotonic. **Additional info regarding monotonicity-** "During a teleconference on 07/28/2011, it was agreed upon that while the triangulations visible in the surface models were not ideal, they would be acceptable for Alaska IFSAR data. While this is an aesthetic issue and cannot be mathematically quantified, triangulations in future deliveries are not to exceed the magnitude or level of triangulation present in cell 12." DLD's that narrow to less than 50m for an extent of 300m in length shall still be depicted as the same DLD to avoid sausage link type portrayal. If the DLD width narrows to less than 30m it should be ended regardless of the 300m length criteria.
3) Coastal water will be set at an elevation of zero meters.
4) Coastal shorelines shall be delineated by the land/water interface detected by the collected elevation data.
5) Negative elevations behind a coastal shoreline such as swales, quarries and other man-made features are allowed but should follow the logic of the terrain. If this condition occurs it must be documented in the project README file. Contact NGA for guidance if this condition occurs.
6) Coastal features such as breakwaters that are too narrow for the post spacing to fully portray shall be artificially represented by expanding the shoreline such that there is contiguous land posts (no broken shorelines).
7) Islands greater than 30m in length or with a bare earth height 10m or greater above surrounding water will be portrayed.

d. **Perennial Ice:** Perennial ice shall be considered terrain and not water, ice, or snow, but annual ice or snow shall not be considered terrain for the purpose of timing the acquisition. Areas where no interfered data return is available shall be given interpolated values to fit the surrounding terrain. NODATA values or void areas are acceptable in the DEM.

e. **Spike/Well Threshold:** A spike/well threshold of 10m shall be used as a quality assurance check.

f. **Magnitude ORI (or similar product):** The pixel size of the orthorectified radar imagery (or similar product) shall be 5 meters. The XY RMSE of the orthorectified radar imagery (or similar product) shall not exceed 5.682 meters. The ORI (or similar product) shall be in a single-band 8-bit GeoTIFF image file format with a .tif file extension. All datasets shall join existing project datasets such that the maximum XY offset between existing adjacent datasets does not exceed 5.0 meters. Annual ice on waterbodies is

acceptable, but the government prefers that no ice be on waterbodies, including the ocean. A convention of value 1 is recommended for water and 0 for areas outside data capture/coverage (no data). Removal of actual data returns from ripples or waves on water is acceptable if required to remove speckle or other data noise artifacts from water. The ORI (or similar product) data shall be radiometrically corrected so adjacent swaths and tiles appear similar.

3. **Data format:**

   a. **All Data:** The nominal area of coverage per data set shall be 15-minute tiles. Datasets shall include not less than 350 meters over-edge data in X and Y. The horizontal datum shall be NAD 83 and the vertical datum shall be NAVD 88. The project area shall be in the Alaska Albers. All units shall be meters.

   b. **Elevation Data:** Elevation type shall be orthometric height. The DEM data shall be 32-bit in GeoTIFF format and a copy in HRTe3 data format.

   c. **File size:** File sizes shall be between 200 MB or less when zipped.

   d. **Tile size:** Tile size shall be 15- minute, or standard multiple thereof.

   e. **Data voids:** Areas of data voids shall be minimized and methods of mitigation shall be approved by the Contract Officer. For Alaska Albers projection the void value shall be -10,000 and for geographic projection shall be -32767. These areas must be identified in the quality mask.

4. **Magnitude Image Data:** The high-resolution orthorectified radar image (or similar product) magnitude data shall be in a single-band 8-bit GeoTIFF image file format with a .tif file extension. The pixel size shall be 5 meters. The data shall be geo-referenced to the Alaska Albers system. The pixels of the image shall relate to the elevation data such that 16 image pixels shall be exactly contained in each 5-meter DEM cell in a 4-cell by 4-cell array. The extent of coverage for an ORI (or similar product) dataset shall be exactly the same as the coverage for a DEM dataset.

5. **Metadata:** The metadata associated with each 15-minute tile shall be FGDC compliant.

   a. Metadata shall be provided in three formats:
      1) Extensible markup language with an .xml extension
      2) Hypertext macro language with an .html extension
      3) Text format with a .txt extension

   b. The metadata file name shall be the same as the data filename with the correct metadata file format extension.

   c. The base station(s) and/or navigation data processing used for differential global positioning of the aircraft during acquisition shall be provided. If different base stations and/or navigation data processing are used for different portions of the project area, the metadata for a particular tile shall identify only the respective base station(s) and/or navigation data processing for the swaths that comprise that tile.

d. The time of collection of the data is required. An acceptable approach to convey time of collection is to identify each swath in the metadata with the acquisition start time, end time, and flight direction to the nearest minute and date in GPS time.

e. A swath locator diagram comprised of georeferenced shape files in geographic coordinates that indicates the location of the swaths shall be included in the Survey Report to identify the location of the swaths on the ground.

f. A grid of the quarter-quadrangle tiles shall be included as one of the shape files. The swath identifier in the metadata shall be referenced to a swath identifier in the diagram. The directory that contains the diagram files shall be placed at the same level as the highest-level directory in the directory structure.

g. One copy of the locator diagram shall be included on each media item.

h. An additional layer shall be added to the diagram that indicates the project area(s).

6. **Quality Report:** An ISO 9001 data quality certification report shall be provided in Adobe .PDF format for each quarter-quadrangle. The report shall include the quality parameters of the elevation data acquisition and processing for the associated datasets.

7. **File Naming:** Prefer NGA established referencing of the southwest corner of each tile in the form of hDDMMhDDDMM (hemisphere,degree, minute). Any cell that contain voids will have "P" in the file name (hDDMMhDDDMMP)

8. **Licensing of data:** DEMs shall be available to all via the public domain.

9. **Digital Deliverables:** Reference C.1, 3.11 of the Contract.

   a. **Data Organization:** Datasets shall be organized on the media by ground location such that all datasets associated with a particular 15-minute tile are in a single directory.

   b. **Delivery Media and Labeling:** Deliveries of the evaluation copies of the data shall be on hard copy media, in a non-proprietary format mutually agreeable to the Government and the Contractor. The data shall not exceed 75% of the formatted capacity of the drive. The name(s) of the highest-level directories shall be on a label on the front of the drive if space is available or on the top of the drive. The drive software label shall begin with AK Mid-Accuracy1 followed by a unique identifier that the contractor chooses to specify a particular drive.

   After the evaluation copy of the data is accepted, the final data set will be supplied on hard copy media, in a non-proprietary format mutually agreeable to the Government and the Contractor.

10. **Deliverable Validation:** Reference C.1, 3.12 of the Contract. The Government will perform validation on all submitted deliverables.

11. **Use of Available Government Software:** There is no available Government software applicable to this Task Order.

12. **Government Point-of-Contact (POC):** The POC for technical questions associated with this task order, and recipient of the data is:

Address: USGS / NGTOC
ATTN: Patrick Emmett
1400 Independence
MS 666
Rolla Missouri, 65401

Telephone: 573-308-3587
FAX: 573-308-3810
e-mail: pemmett@usgs.gov

SECTION D - PACKAGING AND MARKING

The contractor shall package the media using shipping materials that are resistant to damage caused during normal shipping.

SECTION E - INSPECTION AND ACCEPTANCE

The following Section E additional requirements are applicable to this Task Order:

1. **Inspection Period:** Reference E.4 GS0720 of the Contract. The inspection period for each delivery for this task order is sixty (60) calendar days.

SECTION F - DELIVERIES OR PERFORMANCE

The following Section F additional requirements are applicable to this Task Order:

1. **Place of Delivery:** Reference F.2 GS0904 of the contract. The contractor shall submit all deliverables to the address of the POC, as shown in Section C.12 of this task order.

2. **Delivery Schedule:** Reference F.9 F981 of the contract. The Government requests a delivery schedule that considers the following:

   a. **Delivery Lot 1:** Evaluation copy for one (1) complete set (16, 15-minute tiles) of the project area of all products on external hard drive media. Lot 1 shall be delivered not more than sixty (60) calendar days after the acquisition is completed. The contractor shall inform the government of acquisition completion within 3 days of completion.

   b. **Delivery Lot 2:** Final copy for one (1) complete set (96, 15-minute tiles) of elevation products on external hard drive media. Delivery of lot 2 shall be delivered not more than two hundred-seventy (270) calendar days after acceptance of Lot 1.

   c. **Miscellaneous products:** If any, shall be delivered no later than the delivery of lot 2. Any delays resulting from the time required by the Government to evaluate the data deliveries will be appended to the scheduled delivery date of lot 2, if requested by the contractor.

3. **Negotiated Delivery Date(s)* for Task Order:**

a. **Delivery Lot One (1),** 9 one-degree cells acquired by September 1, 2010
b. **Delivery Lot One (1),** Pilot Cell #12 Deliverables to USGS shall be delivered by December 15, 2010.

*Actual date of lot 1 is dependent on acquisition completion and lot 2 is dependent on acceptance of prior delivery.

4. **Nonconforming deliverables:** Nonconforming deliverables returned to the Contractor for rework shall be delivered in accordance with Contract clause E.6 E784.

5. **Progress Report:** The contractor shall submit a monthly progress report for this task order in accordance with Contract clause F.5 GS0921 and F.6 GS0931.

SECTION G - CONTRACT ADMINISTRATION DATA

No additional Section G requirements are applicable for this Task Order.

SECTION H - SPECIAL CONTRACT REQUIREMENTS

1. **Government Furnished Property:** Reference H.12 H1480 of the contract.

No government furnished property is included as part of Section H.

SECTION I - CONTRACT CLAUSES

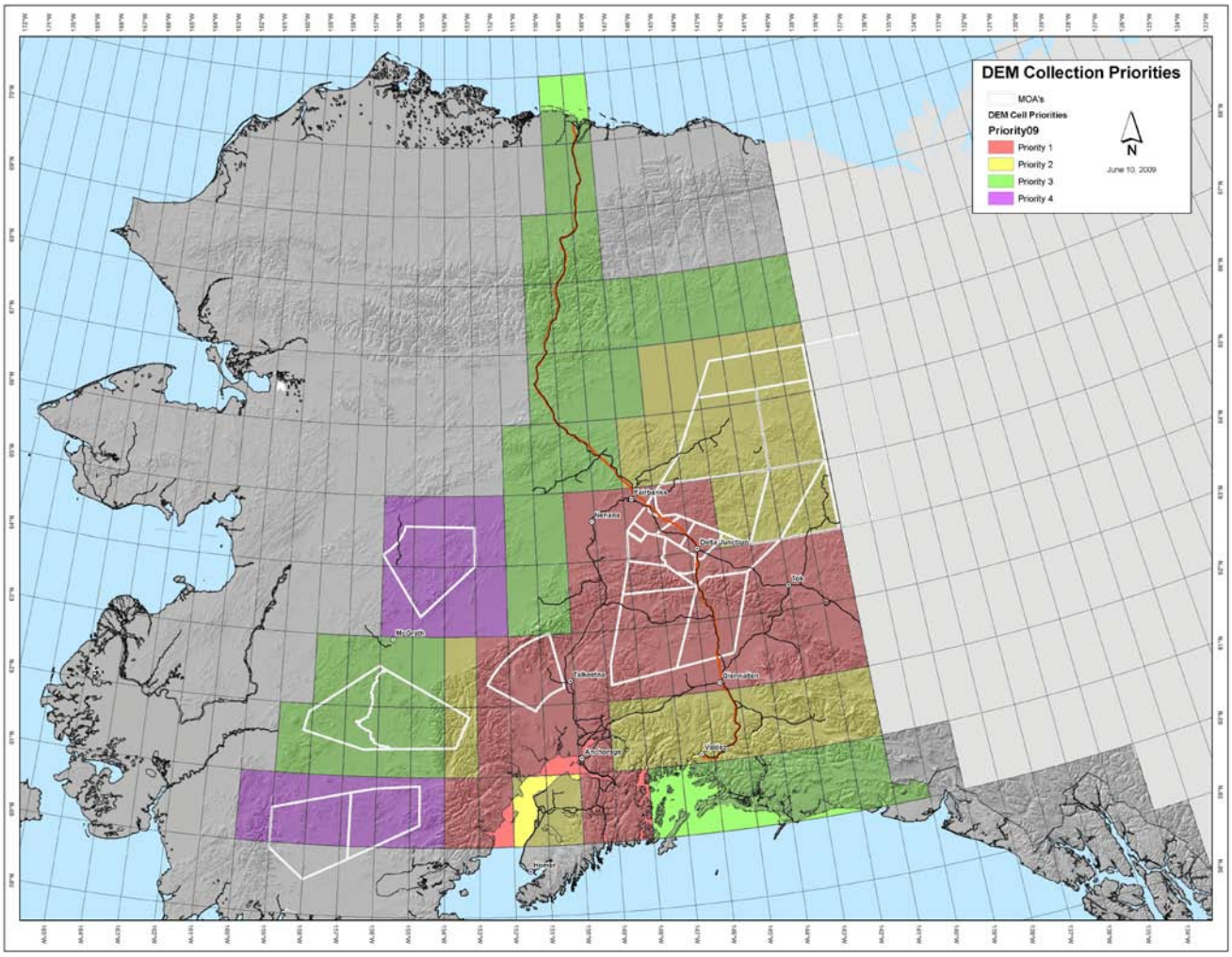
No additional detail is required for this Task Order.

SECTION J - LIST OF ATTACHMENTS TO THIS TASK ORDER

Identifier	Title/Description	Pages
Attachment A	Project Diagrams (Softcopy)	1

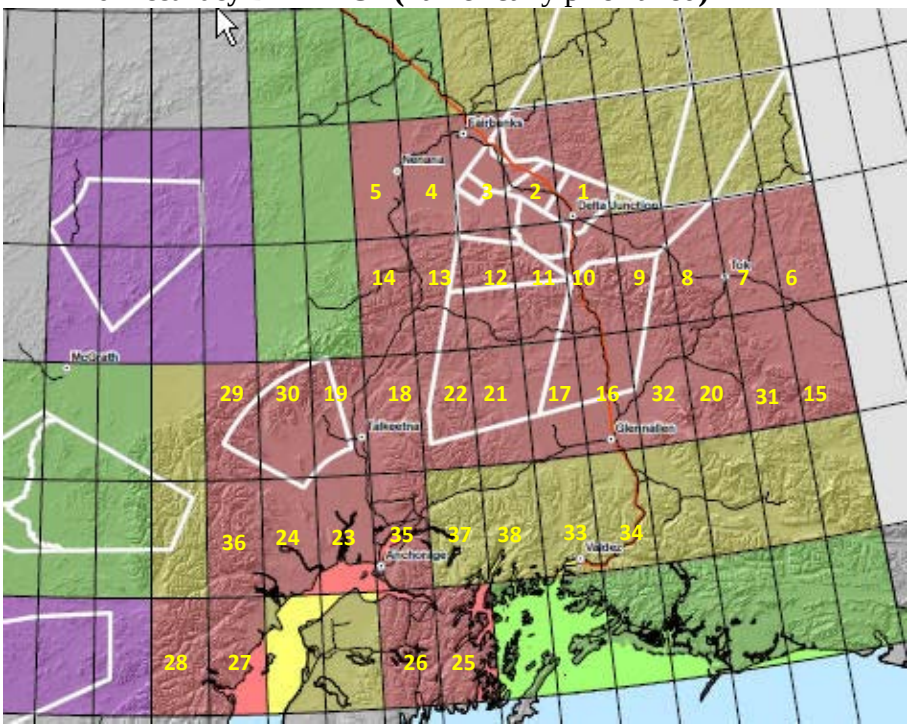
TASK ORDER ATTACHMENT A - Project Diagrams

1. AK Mid-Accuracy DEM AOI (See attached file DEM Collection Priorities 20090610.pdf)



TASK ORDER ATTACHMENT A - Project Diagrams

2. AK Mid-Accuracy DEM AOI (numerically prioritized**)**



Awarded cells (both ARRA and non-ARRA Tasks) – diagram: