Statement of Work
for the Acquisition and Production of
High Resolution Orthoimagery in Texas

All specifications in this SOW are optional depending on a particular data collection project and agreed upon by sponsors.

Sections in red text are meant to be either filled in, removed, or have an option chosen before a SOW is released for bid proposals.

Introduction

This Statement of Work is issued by the Texas Water Development Board (TWDB) [on behalf of (entity name)] to acquire [leaf-off, leaf-on] high resolution (pixel resolution) orthoimagery and associated products from **airborne** digital camera systems. The Area of Interest (AOI) includes approximately xx square miles. The AOI is directly affected by funding availability and interested parties and is subject to change.

[Insert description of AOI: size, land cover composition, land access, urban centers, etc.]

Proposals should address local conditions and unique project considerations as well as fully explain project methodology. An innovative and cost-effective project approach is encouraged and TWDB welcomes alternate specifications, suggestions, and pricing.

[Insert description of how the data will be used by sponsors.] The products acquired by this contract will be available in the **public domain** through the Texas Natural Resources Information System (TNRIS) for use by government entities and the public.

Timeline Requirements

The Project Phase Table includes due dates for preliminary and final orthoimagery. The selected data provider will emphasize meeting these deadlines in the proposal.

Supplemental Information

The following datasets are provided with this solicitation at: http://xxxxxxxx

- AOI grid: ***xxxx.shp***
- Digital Pricing Table: ***PricingTable.xlsx***
- Lidar coverage: *http://xxxxxxx*

Texas Strategic Mapping Program Goals

It is the intent of the Texas Strategic Mapping Program (StratMap) to purchase geospatial data products that will provide direct savings, efficiencies, and cost duplication avoidance through inter-governmental collaboration and partnerships. The StratMap Contract is instrumental to these goals. Both the StratMap

Program and the StratMap Contract are administered by the Texas Natural Resources Information System, a division of the Texas Water Development Board (TWDB).

Accuracy and Quality of Products

The StratMap Program, through the StratMap Contract, uses prequalified commercial data providers to collect and process geospatial data and separately selects third party quality assurance consultants, as needed, to review products and processes. Each participant in the program is expected to maintain internal quality controls and assurances to minimize errors and document procedures to ensure the data will meet or exceed requirements.

Project Phase Table

		Orthoimagery Data Provider	QA/QC Provider
Phase I	**PRE-FLIGHT PLANNING**		
	Kick-Off Meeting		
	Tasks	*Develop flight operations plan*	
		System calibration and geodetic control validation	
	Deliverables ***Due date:** [ ]	**Schedule**	**Review and comment**
		Flight plan	
		Ground control plan	
		Sensor calibration report(s)	
	***Responsible party:** [ ] ***Payment amount:** [ ]		
Phase II	**DATA ACQUISITION**		
	Tasks	*Perform flight setup and geodetic control process*	*Collect QA/QC checkpoint survey in consultation with acquisition vendor*
		Fly project area to acquire data	
		Verify data after each flight mission	
	Deliverables ***Due date:** [ ]	**Flight and airborne GPS report**	**Review and comment**
		Ground control table/points and survey report(s)	
		Data acquisition status updates	
	***Responsible party:** [ ] ***Payment amount:** [ ]		
Phase III	**DATA PROCESSING**		
	Tasks	*Generate raw image data*	
		Inspect raw image data and determine re-flights	
		Aerotriangulation	
		Initial radiometric adjustments	
		Orthorectification	
		Generate & QA mosaics	
		Rework problem areas	
	Deliverables ***Due date:** [ ]	**Orthoimagery Production Sample PILOT: area > 10% of the entire project AOI**	**Review pilot and comment**
		Preliminary Orthoimagery – 100% of AOI	**Review and comment**
		Re-submit Phase III deliverables as necessary	
		Data processing status updates	
	***Responsible party:** [ ] ***Payment amount:** [ ]		

Phase IV	**FINAL PRODUCT DEVELOPMENT**		
	Tasks	*Create final uncompressed orthoimagery*	
		Create final compressed orthoimagery	
		Create compressed mosaic(s)	
		Generate vector index	
		Generate metadata	
	Deliverables ***Due date:** **[ ]**	**Final uncompressed orthoimage tiles**	**Review and comment on horizontal accuracy and quality of products**
		Final compressed orthoimage tiles	
		Final compressed mosaic(s)	
		Vector index	
		Seamline file(s)	**Approve or reject deliverables**
		Metadata	**Deliver QA/QC checkpoint table**
		Online data review tool access	
		Re-submit Phase IV deliverables as necessary	
		Data processing status updates	**Submit final QA/QC report**
	***Responsible party:** **[ ]** ***Payment amount:** **[ ]**		
Phase V	**OPTIONAL PRODUCT DEVELOPMENT**		
	Tasks	*Create optional data products: (list here)*	
		Generate metadata per optional product	
	Deliverables ***Due date:** **[ ]**	**Final optional data products: (list here)**	
		Metadata per product	
		Data processing status updates	
	***Responsible party:** **[ ]** ***Payment amount:** **[ ]**		
	Project Closeout Meeting		

*Due dates, responsible parties, and payments will be finalized at the kick-off meeting.

Specification for Orthoimagery

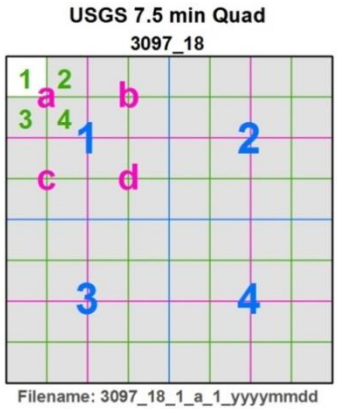
Phases I & II: Orthoimagery Pre-Flight Planning and Data Acquisition	
Requirement	**Description**
Camera type	**Digital** camera sensor system onboard fixed wing or helicopter airborne platforms. The digital camera sensor system shall be a tested, stable (maintained), geometrically calibrated system with appropriate documentation, suitable for use in the acquisition and production of precision photogrammetric orthoimagery. The contract administrator shall be notified of all camera malfunctions within 72 hours with a written report of the malfunction. A malfunction is defined as a failure in any element or process of the camera that causes an interruption of the normal operations of the camera system which includes any key components, such as camera mount, airborne global positioning system, inertial measurement unit, and on-board data storage. Example airborne digital camera systems: • Leica Geosystems ADS series (ADS100 or ADS80) --- Pushbroom Camera • Microsoft Vexcel's UltraCamX --- Frame Camera • Intergraph's Z/I Imaging Digital Mapping Camera (DMC) --- Frame Camera • [Medium format camera for lower altitude small area collections.] The use of more than one **type** or **brand** of digital camera in the acquisition is NOT allowed.
Acquisition time frame	Imagery shall be captured between **xxx, 20xx** and **xxx, 20xx** AND during **[leaf-off, leaf-on]** conditions. If weather conditions cause delays in acquisition, the absolute last day of data capture is **xxx, 20xx**.
Sun angle and time of day of capture	Imagery will be acquired during a time of day to minimize shadows due to sun angle. Target sun angle should be **> 30 degrees** above the horizon. See USNO table. May start acquisition earlier (>18 degrees) **ONLY** if coastal cloud cover presents a problem.
Airspace	The AOI may contain areas of controlled or restricted airspace. **It is the responsibility of the imagery provider** to obtain all approvals necessary for all required clearances to cover the AOI.
Tilt	The axis of the camera should be in a vertical position. The tilt (departure from the vertical) should not exceed four degrees (4˚) or the relative tilt between images or strips exceed six degrees (6˚). Tilt shall not average more than two degrees (2˚) in any 16km (10 mile) section of a flight line and shall not average more than one degree (1˚) for the entire project.
Conditions during acquisition	Imagery shall be captured only when the sky is free from clouds, cloud shadows, high overcast clouds causing low illumination, haze, fog, smoke, and dust. Ground features should be free of excessive waters due to rain or snow. Other environmental factors causing non-manmade obstruction of the ground surface should be minimal. Light conditions should be such that images are free from smear, blur, excessive glare, or noise.
Cloud cover	Less than **5%** cloud cover per final uncompressed image tile AND less than **5%** of the entire AOI. **"5%"** includes cloud shadows.
Forward overlap	60% or greater
Sidelap	Min 15% Max 45% Average 20-30% over entire flight line
Flight altitude	Flying height in accordance with specified orthoimage spatial resolution. There should be a 1:1 ratio between captured pixel size and ground resolution.
Coverage	No voids due to cloud cover (< 5%), instrument failure, or water bodies.
Airborne GPS	Camera position (latitude, longitude, and elevation) shall be recorded with airborne GPS. Airborne GPS data shall be differentially corrected and organized as individual datasets grouped

	by corresponding flight line. Differentially corrected airborne GPS positional data shall be stored on portable media, in a nonproprietary format. The horizontal root-mean-square error (RMSE) of the airborne GPS control data shall not exceed **0.2m**. The vertical RMSE of the airborne GPS control shall not exceed **0.3m**.
IMU exterior orientation	Inertial Measurement Unit (IMU) is included as a component of the camera station control. The RMSE of the adjusted IMU data shall not exceed **0.3m** and must be used to ensure accuracy.
Geodetic control	Orthoimagery provider must collect ground control to meet the absolute geometric accuracy specified in the **Horizontal Accuracy Standards** table. The project will be controlled using the latest available National Geodetic Survey (NGS) control adjustment of the project area plus additional new ground control needed for the project. Orthoimagery provider shall submit a ground control report that contains a narrative, computations, and field notes & photos for all points used in the ground control solution. The check points are to be collected by the orthoimagery vendor for the purpose of internal QC of image horizontal accuracy. The specification and amount are to be determined by the orthoimagery vendor. Check point specifications for horizontal accuracy listed in the ASPRS Positional Accuracy Standards for Digital Geospatial Data are encouraged.

Phases III & IV: Orthoimagery Data Processing and Product Development						
Spatial resolution [choose one or more columns]	**3-inch**	**6-inch**	**12-inch**	**0.5-meter**	**2-foot**	**1-meter**
Example Applications	Utilities engineering Roadside furniture mapping	CBD mapping Public works management Transport engineering Urban forestry	Urban municipal mapping Traffic control management	Damage assessment to structures Urban municipal mapping Bridge maintenance	Semi-urban mapping Parks and recreation management	Identification of debris. Rural mapping Crop identification
Example identifiable & measurable features	Utility boxes Reflective road markings Parking meters Golf course flags Power lines Communication lines	Road centerlines Tennis/ Basketball court line markings Fence posts Culverts Bus shelters Manholes Train tracks	Communication towers Road turning lane and pedestrian crossing markings Road speed bumps Fences Park benches	Cattle guards Complex housing and roof structures Extensions to housing Sidewalks Nature trails Overhead rail bridges	Sheds Helipad markings Driveways Car ports Medians Bike lanes	Single trees in sparsely covered areas Stock ponds Wind turbines Extensions to commercial buildings County and gravel roads Railroads Alleys
Image Tile Scheme – USGS Grid Standard	0.9375' DO4Q	0.9375' DO4Q	[1.875' DO3Q or 0.9375' DO4Q]	3.75' DOQQ	3.75' DOQQ	3.75' DOQQ
Image Tile Buffer	100 feet	300 feet	300 feet	150 meters	150 meters	300 meters
Requirement	**Description**					
Spectral resolution	**4-Band (R,G,B,NIR)** Bands will be ordered **1-Red 2-Green 3-Blue 4-Near Infrared**. Mis-registration between any bands shall not exceed 1 pixel.					

	All bands (R,G,B,NIR) shall be captured simultaneously or near simultaneously (< 500 milliseconds difference) using a single camera.
Radiometric resolution	Unprocessed (raw) data should have a bit depth of > 8, such as 12 or 16. Final tiled uncompressed and compressed orthoimagery should be **8-bit unsigned** per band. The original bit depth at data acquisition should remain the same throughout all image processing steps. Conversion to 8-bit should only occur during the mosaic step.
Radiometric adjustments	**Histogram Clipping** - Imagery shall have a tonal range that prevents the clipping of highlight or shadow detail. **Brightness** – the mean pixel count shall be within ±7.5% of the middle DN value allowed for 8-bit data (min. 108, max. 147). Images should not appear too dark or too bright. **Contrast** – Images should not be faded or washed out. **Color balancing** should be performed so that no color shift (one dominant color) exists within an image. Overall tonal quality should be rich, not dull. Features should exhibit their true color in a natural color composite. In a color infrared composite, dominant red/pink tones should not be present in non-infrared sensitive features. **Seamlines** – Localized adjustment of the brightness and color values will be done to reduce radiometric differences between seamline join areas. Changes in color balance across the project, if they exist, shall be gradual. Abrupt tonal variations between image files are not acceptable. **Shadows** should not be too dark. Features in shadow should retain a maximum level of detail without compromising other components of the image. **Sharpening** – Minimally sharpened imagery is preferred, however, processes that highly sharpen data should be avoided in order to maintain absolute accuracy. **Artifacts** – Image data shall be free of artifacts and blemishes that obscure ground feature detail. Feature 'blooming' or oversaturation should be minimal. **Noise** – Image data shall be free of noise caused by camera sensor abnormalities. As a **guideline only**, see target values in *NAIP Suggested Best Practices - Final Report* for histogram clipping, contrast, saturation, sharpness, and noise.
Formats and compression	**GeoTIFF** [DO4Q, DO3Q, DOQQ] tiles, **4-band** – Uncompressed (see further detail below) **JPEG2000** [DO4Q, DO3Q, DOQQ] tiles & county mosaic(s), **4-band** – Compressed, 15:1 optimal ratio for tiles, 50:1 for mosaics dependent on area and final file size. **ECW** [DO4Q, DO3Q, DOQQ] tiles & county mosaic(s) – Compressed, **4-band**, 15:1 optimal ratio for tiles, 50:1 for mosaics dependent on area and final file size. **MrSID** [DO4Q, DO3Q, DOQQ] tiles & county mosaic(s) – Compressed, **3-band or 4-band**, 15:1 optimal ratio for tiles, 50:1 for mosaics dependent on area and final file size. Orthoimage data must have quality compression (lossless or lossy) for achieving a visually lossless result and manageable file size. Compression should be the last step in the image processing chain. ----------

	GeoTIFF – Uncompressed detail: GeoTIFF Format Specification and TIFF Specification Revision 6 Required minimum TIFF and GeoTIFF Tags and GeoKeys: ImageWidth – "Example: 6720" ImageLength – "Example: 7620" BitsPerSample – "Example: 8,8,8,8" Compression – "Example: None or 1" PhotometricInterpretation – "Example: RGB or 2" Orientation – "Example: Top Left or 1" StripOffsets SamplesPerPixel – "Example: 3 or 4" RowsPerStrip – "Example: 1" StripByteCounts ExtraSamples* – "**0**" *Required only if SamplesPerPixel is >3. *See TIFF Revision 6.0.* GeoPixelScale aka ModelPixelScaleTag GeoTiePoints aka ModelTiepointTag GTModelTypeGeoKey – *ModelTypeProjected* GTRasterTypeGeoKey – *RasterPixelIsArea* ProjectedCSTypeGeoKey PCSCitationGeoKey – "A free text file for describing the projection and datum as <datum>/<projection>format. Example: NAD83 / UTM zone 15N" ProjLinearUnitsGeoKey – "A coded value for the linear units used by the projection. Values are listed in section 6.3.3.1 of the GeoTIFF 1.0 standard. Examples: Linear_Meter, Linear_Foot, Linear_Foot_US_Survey"
Compressed mosaic(s)	**Compressed county mosaic(s) (entire AOI).** Mosaic(s) shall be color balanced to give a consistent and uniform image quality appearance that eliminates a checkerboard effect. The mosaic should maintain as much of the color and appearance of the original color corrected tiles as practical. The file format will be **[JPEG2000, ECW, MrSID] [4-band, 3-band].** The compressed county mosaics will have background values (0,0,0).
Orthorectification method and elevation datasets	A rigorous orthorectification model in combination with the highest quality elevation datasets available should be employed. **See Shapefile of existing lidar DEMs available from TNRIS.** Other suitable elevation datasets must be supplied by the orthoimagery provider. The elevation datasets used should be documented in the metadata. Elevation datasets must be North American Vertical Datum of 1988 (**NAVD88**). The geometric solution should use the **most recent geoid** from the National Geodetic Survey. [Optional – True orthorectification, absolutely no feature lean.]
Interpolation method	Bicubic or Lagrange – Both methods use 4x4 neighbors. Interpolation and resampling processes should be minimal to preserve absolute accuracy.
Image coverage and non-image pixels	Image [DO4Q, DO3Q, DOQQ] tiles shall be covered in full with image data pixels. Partial [DO4Q, DO3Q, DOQQ] tiles with background values are not acceptable. Image [DO4Q, DO3Q, DOQQ] tiles should have no collars/borders, background values, artifacts or other non-image items around the edges. The compressed county mosaics will have background values (0,0,0).
Image tile buffer	All final orthoimage [DO4Q, DO3Q, DOQQ] tiles will have a buffer around all four sides of the image tile. See **Image Tile Buffer** section for extents. All final orthoimage tiles should have 90 degree corners, not rounded. The extents shall be computed by projecting the geographic corners and side midpoints to the required projection, then adding the buffer on each side of the resulting minimum bounding rectangle.

File naming convention	Each image name and label should include the **date** the image was captured. If a tile includes pixels from more than one flight line, the date of capture should be the acquisition date of the majority of the [DO4Q, DO3Q, DOQQ] tile's pixels. File naming convention: USGS Sixty-fourth Quad (DO4Q): "DDDD_Q_QQ_3Q_4Q_yyyymmdd" D = Degree block Q = Quad # QQ = Quarter-Quad # 3Q = 16th Quad letter 4Q = 64th Quad # y = acquisition year m = acquisition month d = acquisition day 
Orthoimage index	Digital index of the final uncompressed and compressed orthoimage tile products in **Shapefile** format. One polygon per [DO4Q, DO3Q, DOQQ] tile. At a minimum, the index should include date of capture and filename fields.
Metadata	All deliverables will include file and project level metadata documentation consistent with the Federal Geographic Data Committee's Content Standard for Digital Geospatial Metadata FGDC-STD-001-1998. Metadata should include all processing steps and software used. All image corrections should be well documented in the metadata. Compiled RMSE and CE both at 95% should be reported. Additionally, these topics should be addressed in the metadata: • Aircraft type and tail number • Average flying/acquisition height (AGL) • Camera manufacturer and model • Camera calibration process • Camera footprint description • Raw capture pixel resolution and bit depth • Final pixel resolution of product • Total bands of data acquired and spectral ranges (µm) • Use of ground control and/or GPS/IMU and associated internal validation or inspection processes • Elevation data used and detail (e.g. date Elevation obtained from TNRIS or USGS, resolution, did it require repair, etc.) • Quality control – Tests for accuracy Metadata documentation will consist of separate files paired with each image raster file in extensible markup language **(.xml)** format. Although not required for metadata production, files designed to define and support production of FGDC-compliant metadata are available from the USGS XMLInput Application. In addition to external metadata, 'user' metadata such as simple process steps, could be stored internally for each orthoimage raster as tag fields, GML, etc.
Spatial Reference Framework	
Projection	[UTM Zone #, State Plane #– (region name), Other]

Horizontal datum	[NAD 1983 (2011), WGS 1984]
Horizontal units	[Meter, US_Foot]

Defined projection – The projection must be **defined** (readable in stakeholder software) for every uncompressed and compressed orthoimage raster file.

World files are only required if geographic coordinates are not stored within a 'spatially aware' orthoimage, such as GMLJP2 for JPEG2000 data.

Accuracy

Horizontal Accuracy Standards

Accuracy Class	Pixel Size	NSSDA Specifications			Mosaic Seamline Maximum Mismatch
		$RMSE_{xy}$	$RMSE_r$	$Accuracy_r$ 95% Confidence	
ASPRS Recommended use: "Standard Mapping and GIS work"	**3.00 in**	6.00 in	8.49 in	**14.69 in**	12.00 in
	6.00 in	12.00 in	16.97 in	**29.37 in**	24.00 in
	12.00 in	24.00 in	33.94 in	**58.74 in**	48.00 in
	0.50 m	1.00 m	1.41 m	**2.45 m**	2.00 m
	2.00 ft	4.00 ft	5.66 ft	**9.79 ft**	8.00 ft
	1.00 m	2.00 m	2.83 m	**4.90 m**	4.00 m

Orthoimagery provider will report *compiled* absolute horizontal accuracy	According to the National Standard for Spatial Data Accuracy (NSSDA): 1) Report $RMSE_r$ in metadata in **[inches, feet, meters]** 2) Report $Accuracy_r$ in metadata as "**Compiled to meet ____ [inches, feet, meters]** horizontal accuracy at 95% confidence level"
Radiometric accuracy	Orthoimagery should have acceptable tonal balance across the entire project area. Tonal balance will be optimized for a natural color composite, unless otherwise specified, and will not deviate significantly from approved pilot data samples. Orthoimagery should be free of color artifacts and missing data values. Images should be cloud free or < 5% (includes shadows) per final image [DO4Q, DO3Q, DOQQ] tile. Orthoimagery should be free of smears and contain no warped features. Mis-registration among bands should be minimal and not exceed one (1) pixel. The natural content of the orthoimagery should be maintained as close as possible barring any radiometric adjustments necessary for the orthophoto production process, unless otherwise requested during pilot review.
Radial distortion	Buildings six (6) stories and taller should have minimal lean. These features should not extend over adjacent roadways, sidewalks, or parking lots.
Wavy or mismatched features	Roads (including overpasses) should not deviate from their path by more than three (3) pixels. Excessive horizontal displacement along seamlines or at image file boundaries is not acceptable.
Seamlines	Mosaic seamlines should not run through buildings, overpasses, water towers or radio towers. Seamlines should not be noticeable on the imagery at the viewing scale for which the orthoimagery were produced or generally 1.5 times that viewing scale. Visible seamlines are acceptable over large bodies of water.

	Building roof tops, water towers, and radio towers, shall not be clipped at seamlines or between individual image files.
List of Project Deliverables	
Phase I – PRE-FLIGHT PLANNING	
Schedule	Project schedule with projected milestones should also include due dates for ALL project phases. Timeline may be in any style or format suitable to Contract Administrator.
Flight plan	Flight plan for each AOI shall include: planned aircraft flight lines and GPS base stations on a graphic map and delivered in shapefile or kmz/kml format.
Ground control plan	Planned ground control and checkpoints on graphic map(s) and delivered in shapefile or kmz/kml format.
Sensor calibration report(s)	Most recent calibration report for the orthoimagery camera system(s).
Phase II – DATA ACQUISITION	
Flight and Airborne GPS report	Flight and AbGPS report should include at a minimum the following mission parameters: sensor make and model, nominal ground sampling distance, average groundspeed, and average flying altitude. Flight lines shall be provided in shapefile or kml/kmz format.
Ground control table	All ground control and checkpoints collected by the acquisition vendor shall be provided in an electronic table (csv, ASCII, xlsx, shp) including coordinates (X,Y) to three (3) decimal places and point ID at a minimum. GPS control report should include network parameters with base station IDs and location.
Ground control survey report	Along with control table, orthoimagery provider shall submit associated survey report including at a minimum on-the-ground photos (JPEGs) and selected geodetic control network and spatial parameters (i.e. coordinate system, geoid model).
Data acquisition status updates	Daily project progress reports. Email communication is sufficient.
Phase III – DATA PROCESSING	
Orthoimagery Production Sample PILOT: area > 10% of AOI	Production samples of compressed orthoimage tiles covering an area > 10% of the entire project AOI will be submitted for review along with at least four (4) uncompressed orthoimage tiles. The samples must meet all contractual requirements. Contract representatives will provide approval or disapproval with comments no later than five (5) business days after receipt.
Preliminary orthoimagery – 100% of AOI	Unedited orthorectified imagery of the entire AOI. The purpose of this deliverable is to provide georeferenced aerial imagery to the sponsors to start using **as soon as possible.**
Optional Product(s) Production Sample PILOT: area > 10% of AOI	Production samples of optional product(s) covering an area > 10% of the entire project AOI will be submitted for review. The samples must meet all contractual requirements. Contract representatives will provide approval or disapproval with comments no later than five (5) business days after receipt.
Data processing status updates	Weekly progress reports. Email communication is sufficient.

Phase IV – FINAL PRODUCT DEVELOPMENT	
Final uncompressed orthoimage tiles	Final uncompressed orthoimage [DO4Q, DO3Q, DOQQ] tiles as GeoTIFF 4-band.
Final compressed orthoimage tiles	Final compressed orthoimage [DO4Q, DO3Q, DOQQ] tiles from final uncompressed orthoimage tiles as **[JPEG2000, ECW, MrSID] [4-band, 3-band]** format.
Final compressed county mosaic(s)	Final compressed county mosaics from final uncompressed orthoimage [DO4Q, DO3Q, DOQQ] tiles as **[JPEG2000, ECW, MrSID] [4-band, 3-band]** format.
Vector index	Vector index file of the final uncompressed and compressed orthoimage [DO4Q, DO3Q, DOQQ] tiles in shapefile format.
Seamline files(s)	The seamline vector file will contain a polygon for each exposure or image strip used to create the final orthoimage [DO4Q, DO3Q, DOQQ] tiles. Attributes: ATTRIBUTE DATA — COLUMN NAME — EXAMPLE Image acquisition date — IDATE — 20120723 Polygon start date/time[1] — SDATE — 20120723 13:52 Polygon end date/time[1] — EDATE — 20120723 13:53 Spectral resolution[2] — SPEC — M4B Camera manufacturer — CAM_MAN — Leica Geosystems Camera model — CAM_MOD — ADS-80 Sensor or lens serial number — SENSNUM — 30029 Aircraft type[3] — AC_TYPE — C441 Aircraft tail number — ACTAILNUM — N12345R Average flying altitude (feet) — ALT — 10,000 [1] Local 24-hour clock. Start/end time is for the individual polygon and will be the same for frame-based systems. [2] Possible values: NC (natural color), CIR (color infrared), and M4B (4-band) [3] ICAO designator (e.g. use C441 for a Cessna 441 Conquest II)
Metadata	Project level metadata file **(.xml)** – FGDC-compliant. File level metadata per final uncompressed and compressed image tile and mosaic **(.xml)** – FGDC-compliant.
Online data review tool access	Contract Administrators should have access to an online tool to review and markup/comment on final orthoimagery free of charge and included with the project. The tool must be reliable, have no significant image refresh delays (> 5 seconds), and be available 24/7 for up to 20 users. Hosting of compressed imagery (at the optimal ratios listed under **Formats and compression**) is preferred for faster refresh rates. The imagery are expected to be available online for the review and markup of final orthoimagery until Final Orthoimagery QC is complete which could be up to three months after the last final orthoimagery deliverable is received. Additional time for hosting the imagery beyond the completion of final orthoimagery QC is not required.
Data processing status updates	Weekly project reports. Email communication is sufficient.

Phase V – OPTIONAL PRODUCT DEVELOPMENT [List optional product descriptions. The following are a small set of example optional products derived from orthoimagery.]	
Structures change detection	Update of all structure **rooftop** outlines in **X County** since a [year] aerial imagery data acquisition. Format: **Polygon** (rooftops) **Shapefile** Only added and modified structures polygon shapes should be updated with new linework. Existing structures **do not** need to be edited to account for any structure horizontal offsets encountered against the [year] imagery. **All added, removed, modified and existing structures larger than x square feet** in size will be updated and attributed. Required attributes: • **Status**: ○ ***Added*** – Structure has been Added since the [year] structures dataset. The structure is in the [year] imagery but not in the [year] structures dataset. ○ ***Removed*** – Structure has been Removed since the [year] structures dataset. The structure was in the [year] structures dataset but has been moved or demolished and not present in the [year] imagery. The polygon remains in the [year] structures dataset. ○ ***Modified*** – Structure has been Modified since the [year] structures dataset. The structure was in the [year] structures dataset but has since changed shape between [year] and the [year] imagery. Example – Addition of a room onto a house. ○ ***Existing*** – Structure has remained the same since the [year] structures dataset. The structure is in both the [year] structures dataset and the [year] imagery and has not changed. ○ ***Unknown*** – Structure status is undetermined. May be used only if necessary. • **X**: Location of structure centroid • **Y**: Location of structure centroid There are approximately **x** structures (residential and commercial buildings) in x County. Only structures, which include residential and commercial buildings greater than **x square feet**, are requested. The spatial resolution of the [year] orthoimagery is x-inch. *The 2014 structures are available with this solicitation.* ***Respondents shall include in their proposals methods for performing structure change detection. Respondents shall detail those methods, as well as the accuracy that they expect to achieve by employing those methods. Map accuracy for capturing Added, Removed, Modified, and Existing features should meet or exceed 95%.***
Other change detection	• Pools • Decks • Vegetation • Etc.
Planimetric elements	• Transportation ○ Street centerline ○ Unimproved road ○ Parking • Building footprint

	○ Building ○ Shed ○ Deck/porch/patio ○ Etc. • Sidewalk • Trail • Water feature ○ Water body, lake, canal ○ Stream, river ○ Marsh ○ Etc. • Tank • Vegetation ○ Treeline ○ Shrubline ○ Hedgerow ○ Etc. • Pool • Transmission tower • Cemetery • Quarry • Manhole • Billboard • Etc.
Oblique imagery	Imagery captured at approximately 45 degree angle from the ground. Obliques acquired in four directions + nadir. An ability to measure feature heights should be included.
Add-Ons	• Increased horizontal accuracy • Additional ground control collection • True orthorectification, absolutely no feature lean • Extra flight lines over dense urban or other areas • Other

DELIVERY OF PRODUCTS

All orthoimage products including all optional products are to be delivered to Contract Administrator and sponsors no later than **xx days** **after the last day of image acquisition.**

All final orthoimage products including all optional products will be delivered on portable external hard drives supplied by the data provider. File compression such as ZIP or RAR should not be applied to the products; this requirement should not be confused with image compression (JPEG2000, JPEG, etc.).
Sample pilot products may be delivered via FTP.

Intellectual Property Rights | Ownership and Accessibility

The contracting agency shall have unrestricted rights to all delivered reports and data. All orthoimagery products will become the property of the **Contract Administrator** and **sponsors**. All orthoimage products will be put in the public domain and be accessible from the **Texas Natural Resources Information System**, a division of the Texas Water Development Board.

Independent Quality Assurance and Quality Control Review

The Contract Administrator may establish contracts as needed, to perform independent quality assurance and control tasks in support of orthoimagery acquisition and processing. Prospective QA/QC providers should respond to the tasks outlined in the Project Phase Table.

The primary deliverable will be a report describing the QA/QC provider's quality processes and results of the orthoimagery provider products. The report will provide quantitative and qualitative analysis of the following:

Independent QA/QC Primary Review Tasks	
Review Task	**Requirement**
Inventory	• The data received matches the shipping manifest. • All data tiles can be read. • All data tiles required for the QC review were delivered. • Data format(s) is correct. • All data filenames are correct and consistent, including extensions. • All required ancillary data files are present, such as world files, .xml's, etc. • The ground sample distance is correct. • The projection definition is present and correct. • Bit depth is correct. • Compression ratio is correct, if applicable. • Image coverage is complete according to the project AOI, no data voids. • Orthoimage tiles conform to the correct footprint and have acceptable image tile buffers. • No missing bands. • Orthoimage index present and acceptable.
Visual inspection	• Color balance issues; one color too dominate, not consistent with approved sample. • Tonal balance issues; too dark, too bright, too much contrast, too little contrast, not consistent with approved sample. • Abnormal histograms, not normally distributed or excessively clipped. • Shadows too dark. • Features too bright or oversaturated causing excessive glare. • Image artifacts and blemishes. • Unacceptable compression artifacts. • Inconsistent background or 'no data' values or background values that are within the AOI. • Cloud and cloud shadow >5% of tile area. • Smears. • Warped or wavy features. • Feature lean, especially over roads, sidewalks, or parking lots. • Band mis-registration. • Obvious mosaic seam lines (not over water) or mismatched features. If there is an overall consistent issue in the dataset, a select number may be flagged that represent the problem. Statements describing the issue in the dataset as a whole should be included in the report.

Horizontal accuracy	Report accuracy as "Tested ____ [inches, meters, feet] horizontal accuracy at 95% confidence level" according to the National Standard for Spatial Data Accuracy (NSSDA) A horizontal accuracy assessment should be conducted using photo identifiable checkpoints. None of the checkpoints may be used that were employed during orthoimage production. Ideally, the checkpoints have a horizontal accuracy better than the orthoimage ground sample distance. The checkpoints must be collected by an entity other than the producer of the orthoimagery. The checkpoints should be distributed fairly evenly throughout the orthoimage AOI.
Metadata	Metadata files should exist per image file and per project. Metadata should be checked for FGDC-compliance.
Deliverables	
Report	A report describing the QA/QC provider's inspection processes and quantitative and qualitative results of the orthoimagery provider products. The report will be provided in a format acceptable to Contract Administrator, such as *.pdf.*
Vector file	A vector file of flagged issues discovered during inspection. This file should be a shapefile and contain at least one descriptor field.

References

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Ritter, Niles and Mike Ruth. GeoTIFF Format Specification GeoTIFF Revision 1.0. 28 December 2000. http://www.remotesensing.org/geotiff/spec/geotiffhome.html

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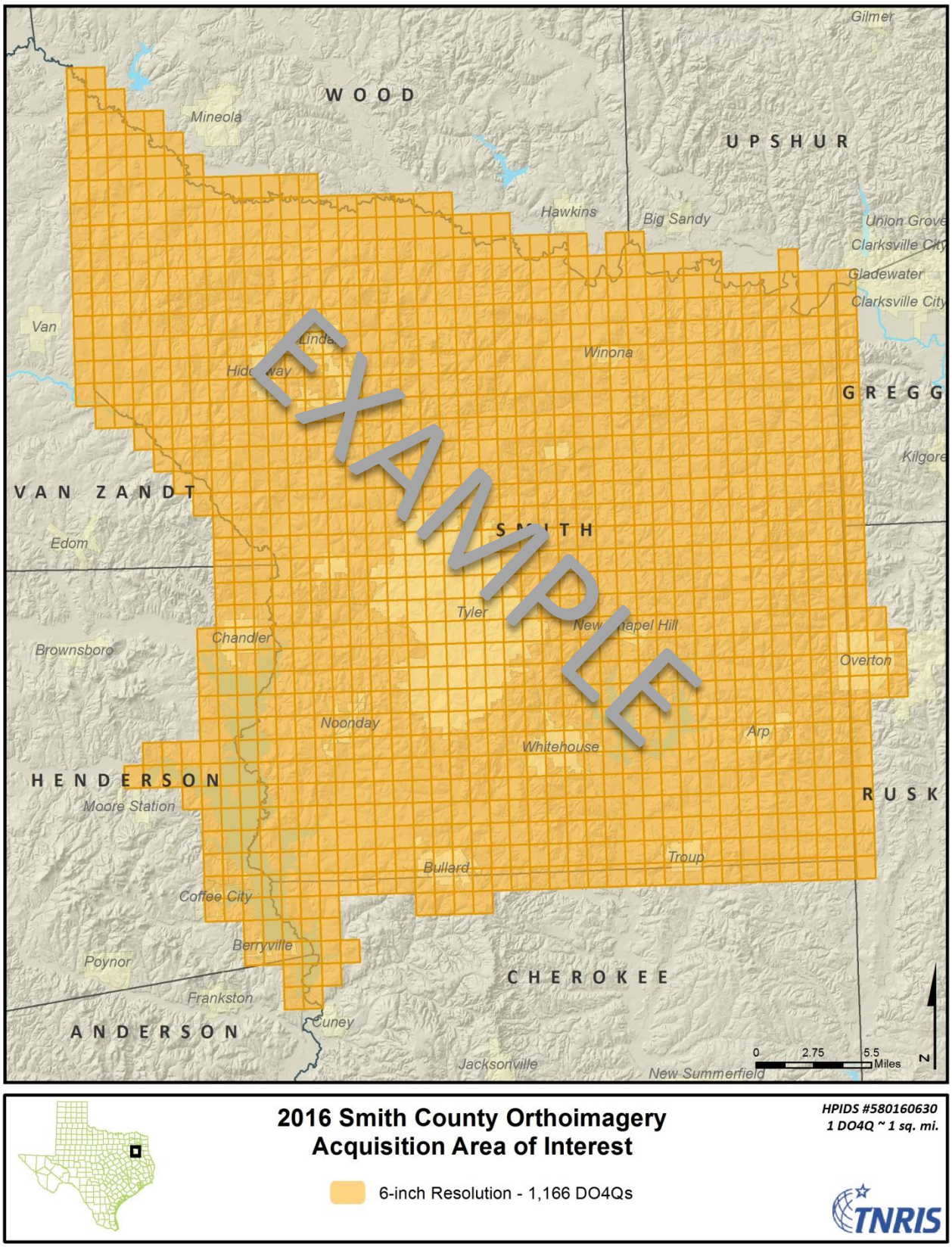
Area of Interest Map



2016 Smith County Orthoimagery
Acquisition Area of Interest

6-inch Resolution - 1,166 DO4Qs

HPIDS #580160630
1 DO4Q ~ 1 sq. mi.

TNRIS

Pricing Table

Electronic tables available online (see **Supplemental Information**)

Orthoimagery Pricing Table 1	
Regular Schedule**	
TWDB 580160630	
Company Name:	
Spatial resolution	**6-inch**
Spectral resolution	**4-Band (R,G,B,NIR)**
Unit Cost Per DO4Q (~1 sq. mi.)	
DO4Q tiles *6-inch = 1166 sq. mi.* *GeoTIFF* *JPEG2000* *JPEG*	$*
Total Cost For Mosaic	
Smith County Mosaic: *6-inch = 1166 sq. mi.* *JPEG2000* *JPEG*	$*
Total Cost Per Optional Product	
Structures	$
Pools	$
Decks	$

One unit cost to include all formats listed.

****See Project Phase Table for Regular Schedule***

TWDB and partners have the option to select any combination of proposed unit and total product costs.

Execution of Offer

Texas Water Development Board

Company Name: _____

Address: _____

_____

_____

Vendor Identification Number:

_____

Federal Tax Identification Number:

_____

I, _____, am the above-referenced company's representative and I am authorized to submit this response and sign future contract documents.

_____ _____

Authorized Signature Date