

4686.22



Letter Proposal



March 13, 2014

Mr. Matt Edmonson
UIUC Facilities & Services, Planning Division
Physical Plant Services Building
1501 S. Oak Street
Champaign, IL 61820

RE: PSSU14R19 Photogrammetry and LiDAR Services Retainer, Agreement #U14R19

Illinois Height Modernization Program: Phase I, Acquisition of Airborne LiDAR Data for Franklin, Jackson, and Perry Counties in Illinois

Dear Mr. Matt Edmonson:

The following proposal to the request for retainer services from Surdex for the Illinois Height Modernization Program (ILHMP), which is managed by the Illinois State Geological Survey (ISGS), to acquire leaf-off, airborne LiDAR data for Franklin, Jackson and Perry Counties and a small segment in Williamson and Union Counties, Illinois. Surdex is hoping to acquire the entire project in late winter/early spring 2014 however is willing to negotiate a schedule delay to fall 2014 if issues arise with flooding or vegetation to prohibit completion in the spring. The total project area consists of 1,754 square miles.

1. **Data Acquisition:** Project data acquisition of Light Detection and Ranging (LiDAR) data and initial processing and data quality assurance (QA) and quality control (QC) to validate the quality of newly acquired data. Acquisition will be planned and executed to conform with USGS LiDAR Base Specifications, version 1.0.

This proposal includes a detailed scope of work for the services required to complete data acquisition, the timeline for data acquisition through processing/QC, and itemized fees for proposed services. Surdex will complete all of the proposed work in Phase I using our own personnel and equipment.

PHASE I LiDAR ACQUISITION STATEMENT OF WORK

PROJECT AREA DESCRIPTION

LiDAR ACQUISITION SCOPE OF WORK

Surdex owns the Leica ALS-70HP SP3 aerial LiDAR system, providing rapid and accurate generation of digital terrain data and is the intended sensor to be used for data capture over this project in spring 2014.

LiDAR capture will only begin upon receipt of a notice to proceed. The project area will be cloud free and fog free between the aircraft and the ground and the ground will be snow free. No unusual flooding or inundation is allowed on the floodplain and upland areas. The acquisition will occur during leaf-off ground conditions.

The following parameters were utilized in preparation of the proposed flight plan over this three county area of interest (AOI). Since the AOI resides in two Stateplane zones, Surdex proposes overlapping flight plans to allow independent planning, acquisition and data processing in order to ensure the highest quality products, regardless of Stateplane zone. Additionally, the size of the AOI is large enough to require flight line breaks in order to maintain stated project accuracies. In the past, Surdex has encountered quality issues with flight lines spanning lengths as long as those that would be required to cover the entire AOI in one single pass, from either a north/south or east/west alignment. The location of the Stateplane zone line in relation to the project area

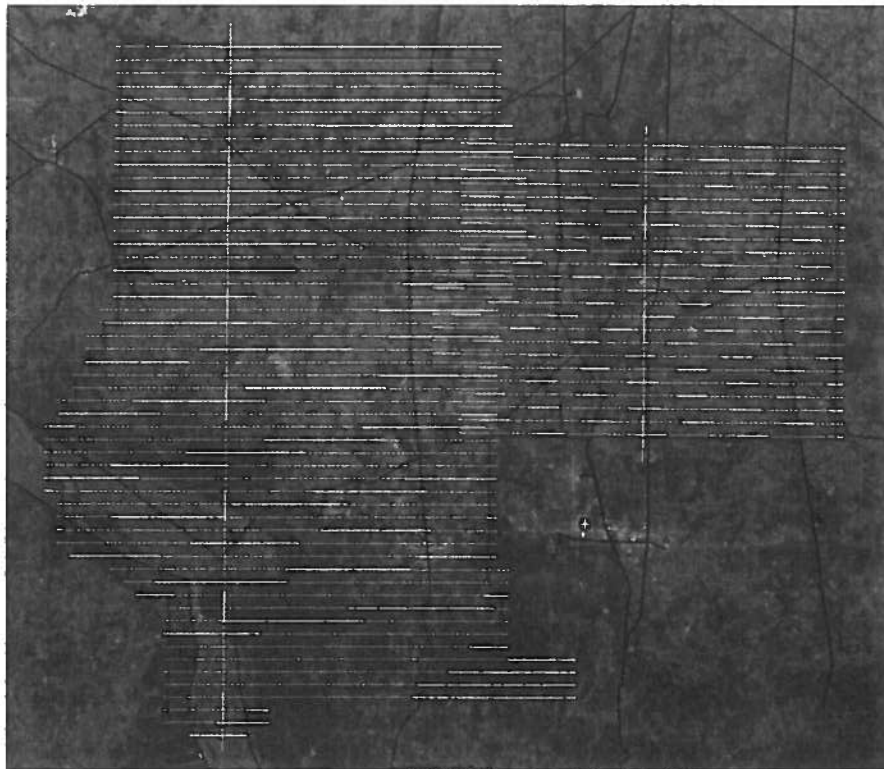
serves as a nice breaking point for the flight plan and allows for ideal management of data for acquisition or processing in either Stateplane zone.

A full tile buffer surrounding each project area has included in the plan and cross flights are included for calibration purposes. Final copies of all flight plans will be verified by a Certified Photogrammetrist. This will allow for each county to be produced in a single state plane zone with the appropriate tiles of overlap.

LIDAR SPECIFICATIONS AND FLIGHT PLAN

Preliminary LiDAR Sensor Setting (ALS 70 SP3)	
Parameter	Planned LiDAR
Field of view	40°
Flying height (AGL)	2,900 meters
Max laser pulse rate	185 KHz
Full Swath width	2175 meters
Minimum side lap	30%
Average point density	1.10 pts/meter ²
Average point spacing	0.95 meters
Vertical accuracy	<12.5 centimeters
Flight Lines / nautical line miles	79 FL / 1924 nm
Estimated ground speed	150 knots

Q13





INITIAL POST PROCESSING

DATA VALIDATION

Upon completion of each data mission, raw data will be copied in the field for redundancy purposes during transit and delivered to the Surdex office for review by our Senior LiDAR personnel. Surdex processes all LiDAR data through a custom designed post processing system consisting of commercial software products produced by TerraSolid and custom software tools developed in-house by Surdex. If reflight areas are identified, flight crews are notified of re-flights and given priority status to ensure that the areas are collected as close to the previous environmental conditions as possible. All flight lines and data coverage are initially verified for the entire project before we begin any de-mobilization from the project site.

FIELD SURVEY

Surdex Corporation will be responsible for all ground control surveying requirements. Surdex crews are supervised by our V.P. of Survey and Photogrammetric Engineering, Mr. Steve Kasten. Surdex estimates surveying 60 hard surface points in flat, open areas to be used for control of the LiDAR data and an additional 200 points will be collected (20 in each of 5 ground cover classes, in each flight block) to be used as independent QA/QC of all data collected.

For each point, ground photos will be acquired for future reference. Points will be collected utilizing GNSS methods. A combination of static and RTK GNSS field data collection techniques will be utilized. Deliverables will include a survey control report, XYZ coordinates and digital photos of each point.

PROJECT TEAM

The Surdex project team will consist of our key project personnel listed below.

Tim Donze – Business Development

Tim Bohn – Project Manager

Steve Kasten – VP, Survey & Photogrammetry

John Boeing – VP Operations

Charles Meyers – LiDAR Manager

Brad Barker – Quality Assurance Manager

Paul Briggs – Chief Pilot

Kevin Eichelberger – Flight Operations Manager

PROJECT REPORTING & DELIVERY/FEE SCHEDULE

SCHEDULE

The intention is to complete data acquisition during the spring of 2014 during leaf-off vegetative conditions and subsequent data QA/QC sufficient to ensure high-quality data have been acquired.

PROJECT REPORTING

Surdex will report project progress as milestones and percentage of each milestone completed to every 2 weeks.



DELIVERY ITEMS

Phase I deliverables will be project wide. Data collected will pass to Phase II for pilot production through final delivery.

1. **Project Reports**
 - a. Flight acquisition report
 - b. Processing/QC report
2. **Ground Survey**
 - a. Control points - XYZ coordinates, native IL Stateplane zone, NAD83, NAVD88 US Survey feet.
 - b. Check points - XYZ coordinates, native IL Stateplane zone, NAD83, NAVD88 US Survey feet.
 - c. Survey Report including ground photos of each point.



MILESTONE DESCRIPTION AND COMPLETION DATE

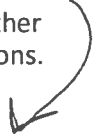
Approximate Schedule			
MILESTONE	START DATE	FINISH DATE	FEE
Phase I LiDAR Acquisition			
Notice to Proceed	3/31/2014	3/31/2014	\$0
Mobilization	3/31/2014	4/2/2014	[REDACTED]
Data Acquisition	4/2/2014	4/30/2014	[REDACTED]
Ground Survey	4/2/2014	4/30/2014	[REDACTED]
Initial Data Processing/QC	4/7/2014	5/16/2014	[REDACTED]
Phase I Completion/Reports	5/19/2014	5/30/2014	[REDACTED]
Phase I review by ISGS	6/2/2014	6/4/2014	\$0

PRICING

The fee consists of data acquisition and QC of all data for Perry, Jackson and Franklin Counties. Neither additional fees nor reimbursable cost are expected. Fees are payable to contract terms and conditions.

Phase I TOTAL FEE not to exceed: [REDACTED]

↑ same price



10 more flight lines

Sincerely,

SURDEX CORPORATION

Tim Donze
 Business Development
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1501 S. Oak Street
Champaign, IL 61820

RE: PSSU14R19 Photogrammetry and LiDAR Services Retainer, Agreement #U14R19

Illinois Height Modernization Program: Phase II, Processing of Airborne LiDAR Data for Franklin, Jackson, and Perry Counties in Illinois

Dear Mr. Matt Edmonson:

The following proposal to the request for retainer services from Surdex for the Illinois Height Modernization Program (ILHMP), which is managed by the Illinois State Geological Survey (ISGS), to process leaf-off, airborne LiDAR data for Franklin, Jackson, and Perry Counties in Illinois acquired in Phase I, late winter/early spring 2014.

- 1. Data Processing:** Using data acquired during Phase I, Surdex will resume data processing to create contract deliverables including las classification, generation of data derivative products, creation of metadata and reports, and final delivery of all data.

This proposal includes a detailed scope of work for the services required to complete data processing, timeline for production through final delivery, and itemized fees for proposed services. Surdex will complete all of the proposed work in Phase II using our own personnel and equipment.

PHASE II LIDAR PROCESSING STATEMENT OF WORK

PROJECT AREA DESCRIPTION

LIDAR PROCESSING SCOPE OF WORK

LiDAR data will be compliant with *U.S. Geological Survey National Geospatial Program Lidar Base Specification, Version 1.0* (see <http://pubs.er.usgs.gov/publication/tm11B3>); as such, classified point cloud deliverables are required to be in fully compliant LAS file format, v1.2. The version selected must be used for all LAS deliverables in the project.

Nominal pulse spacing (NPS) and point density: the overall project area is to be collected at an NPS of 0.93 meters, which equates to 1.15 pulses per square meter.

DATA CLASSIFICATION

TerraSolid/TerraScan software is used to run automated classification routines. Several macros (filter algorithms) will be employed on this project given the variances in terrain and scene morphology to obtain high-yielding results for this project and minimize the time and cost for manual terrain editing. The following list identifies the point classes to be used for this project:

Classified Point Cloud

- Classified Point Cloud:

Code:	Description:
0	Created, never classified



- | | | |
|---|------------------------------|---|
| 1 | Unclassified1 | |
| 2 | Ground | |
| 3 | Low Vegetation | <i>[numeric cutoff values to be provided by INHS]</i> |
| 4 | Medium Vegetation | <i>[numeric cutoff values to be provided by INHS]</i> |
| 5 | High Vegetation | <i>[numeric cutoff values to be provided by INHS]</i> |
| 6 | Building | |
| 7 | Low Point (noise) | |
| 8 | Model Key-point (mass point) | |

BREAKLINES

Surdex has a wide variety of tools available for the compilation of breaklines required for the hydro-flattening services. Suredex's process, developed and refined through numerous projects, includes both manual and automated procedures. Our R&D staff has developed software to assist and improve efficiency in the hydro-enforcement process.

Several sets of data are available to assist the technicians in developing the hydro-enforcement breaklines. These include; LiDAR data, color hillshade maps derived from the LiDAR data, National Hydrographic Dataset and intensity images are all useful developing hydro breakline data.

All breaklines developed for use in hydro-flattening will be delivered as an ESRI feature class, PolylineZ or PolygonZ format, as appropriate to the type of feature represented. ESRI file geodatabase format will also be delivered. Breaklines will be as a continuous layer and will use the same horizontal and vertical coordinate reference system and units as the LiDAR point delivery. Hydrographic flattening will be in conformance with USGS version 1.0.

METADATA

Project-level metadata will be delivered that fully complies with Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata (CSDGM) format standard in XML format. Metadata will describe the project, data acquisition methods, system calibration, processing methods, and statistical validation process and results. Project documentation will include control point and flight diagram information from the LiDAR acquisition flight.

QA/QC REPORTING

Surdex has QA/QC steps built into each production step to ensure stated project specifications are met. A checklist of all project deliverables will be created for internal production usage and validation. Data review will include LAS versioning, file format, projection, datums, units, returns, intensity, point classifications, high/low points, metadata and reports. All final products are reviewed by our Quality Assurance team, led by QA Manager Brad Barker, prior to delivery.

LiDAR MAPPING ACCURACY

LiDAR data delivered by Suredex will meet or exceed the following accuracies: Vertical accuracy will be less than or equal to 18.5cm RMSEz to meet USGS Quality Level 3 requirements for floodplain mapping and general topographic mapping. Final products will be checked using an independent software application, Topo Analyst created by Spatial Information Systems (SIS) based in Starkville, MS. This application provides comprehensive analysis of data throughout the project life cycle with a multitude of statistics, charts and graphs.



PROJECT TEAM

The Surdex project team will consist of our key project personnel listed below.

Tim Donze – Business Development

Tim Bohn – Project Manager

Steve Kasten – VP, Survey & Photogrammetry

John Boeing – VP Operations

Charles Meyers – LiDAR Manager

Brad Barker – Quality Assurance Manager

Paul Briggs – Chief Pilot

Kevin Eichelberger – Flight Operations Manager

PROJECT REPORTING & DELIVERY/FEE SCHEDULE SCHEDULE

The intention is to resume LiDAR production acquired during Phase I during leaf-off vegetative conditions. Surdex has included a 15-day window in Phase II for data quality assurance (QA) and quality control (QC) review by ISGS personnel of a pilot project area selected with input from ISGS.

PROJECT REPORTING

Surdex will report project progress as milestones and percentage of each milestone completed to every 2 weeks.



DELIVERY ITEMS

Products will be delivered as stand-alone county collections to existing Illinois tile index provided by ISGS including a one tile buffer around the exterior county outlines and a 5 mile buffer along common boundaries between Franklin and Jackson/Perry counties in the respective Stateplane zones.

Each data format will be processed and delivered in the following Stateplane zones:

- **Perry, Jackson Counties:** Geo-referenced to IL Stateplane NAD83, West Zone, NAVD88 US Survey feet.
- **Franklin County:** Geo-referenced to IL Stateplane NAD83, East Zone, NAVD88 US Survey feet

1. Unclassified LiDAR point cloud to ASPRS Standards.

- a. Calibrated in LAS v1.2 format.
- b. Calibrated in LAS v1.2 format.

2. Classified LiDAR point cloud to ASPRS Standards.

- a. Perry, Jackson Counties, calibrated and geo-referenced to Illinois Stateplane NAD83, West Zone, NAVD88 US Survey feet in LAS v1.2, *.dgn and *.DAT formats.
- b. Franklin County, calibrated and geo-referenced to Illinois Stateplane NAD83, East Zone, NAVD88 US Survey feet in LAS v1.2, *.dgn and *.DAT formats.

3. Hydrographic Breaklines, Microstation .dgn.

4. TIN surface in .TIN format

5. Hydro flattened .DEM format (if requested)

6. ESRI Geodatabase of all deliverables

7. SIS Topo Analyst LiDAR Vertical Accuracy Report

8. FGDC compliant metadata in .xml format.



MILESTONE DESCRIPTION AND COMPLETION DATE

Approximate Schedule			
MILESTONE	START DATE	FINISH DATE	FEE
Phase II LiDAR Processing			
Pilot Project Area production by Surdex	6/4/2014	6/20/2014	[REDACTED]
Pilot Project Area review by ISGS	6/23/2014	7/7/2014	[REDACTED]
Full Data Classification	7/7/2014	8/22/2014	[REDACTED]
Breakline Generation	7/21/2014	8/27/2014	[REDACTED]
DEM Generation	8/20/2014	8/29/2014	[REDACTED]
Final Deliverable Generation/Project Reports	9/2/2014	9/5/2014	[REDACTED]

PRICING

The fee consists of data processing to create contract deliverables including .las classification, generation of data derivative products, creation of metadata and reports, and final delivery of all data for Perry, Jackson and Franklin Counties. Neither additional fees nor reimbursable cost are expected. Fees are payable to contract terms and conditions.

TOTAL FEE not to exceed: [REDACTED]

Sincerely,

SURDEX CORPORATION

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 Business Development
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 Email: TimD@surdex.com