

COUNTY OF VENTURA CONTRACT NUMBER #9203

CONTRACT

This Contract entered into this 6th day of October, 2023, by, and between, the County of Ventura, a political subdivision of the State of California, hereinafter called "County" and CIRGIS, a federal 501 (c)(4) non-profit, having its Collaborative Business Office at 1047 Cove Street #200 Ventura, CA 93001, hereinafter called "Contractor."

WITNESSETH

WHEREAS it is necessary and desirable that Contractor be engaged by County for the purpose of performing lidar and aerial imagery services hereinafter referred to as the "2023 Ventura County Lidar & Imagery Acquisition Project":

NOW, THEREFORE, IT IS HEREBY AGREED by the parties as follows:

1. SERVICES TO BE PERFORMED BY CONTRACTOR

In consideration of the payments hereinafter set forth, Contractor will perform services for County in accordance with the terms, conditions and specifications set forth herein and Exhibit A, attached hereto. Service shall commence up on Notice to Proceed this Fall/Winter 2023. The resulting Lidar and imagery will be prepared and processed for the area shown on the Exhibit B map attached. Detailed technical specifications, deliverables, and timeline are provided in Exhibit C.

Final delivery to participants will be in Spring 2024 depending on contract execution, collection period, weather, and ground conditions appropriate for Lidar acquisition and aerial imagery.

2. PAYMENTS

In consideration of the services rendered in accordance with all terms, conditions and specifications set forth herein and in Exhibit A, County will make payment to Contractor in the manner specified in Exhibit A.

3. INDEPENDENT CONTRACTOR

No relationship of employer and employee is created by this Contract, it being understood that Contractor is an independent contractor, and neither Contractor nor any of the persons performing services for Contractor pursuant to this Contract, whether said person be member, partner, employee, subcontractor, or otherwise, will have any claim under this Contract or otherwise against County for sick leave, vacation pay, retirement benefits, social security, workers' compensation, disability, unemployment insurance benefits, or employee benefits of any kind.

It is further understood and agreed by the parties hereto that, except as provided in this Contract, Contractor in the performance of its obligation hereunder is subject to the control or direction of County merely as to the result to be accomplished by the services hereunder agreed to be rendered and performed and not as to the means and methods for accomplishing the results.

If, in the performance of this Contract, any third persons are employed by Contractor, such persons will be entirely and exclusively under direction, supervision and control of Contractor. All terms of employment, including hours, wages, working conditions, discipline, hiring and discharging or any other terms of employment or requirements of law, will be determined by Contractor, and County will have no right or authority over such persons or the terms of such employment, except as provided in this Contract.

The Contractor will comply with all of the provisions of the Worker's Compensation Insurance and Safety Acts of the State of California, the applicable provisions of Division 4 and 5 of the California Labor Code and all amendments, thereto; and all similar State and Federal acts or laws applicable; and will indemnify and hold harmless the County from and against all claims, demands, payment's', suits, actions, proceedings and judgments of every nature and description, including attorney's fees and costs, presented, brought or recovered against the County, for or on account of any liability under any of said Acts which may be incurred by reasons of any work to be performed under this Contract.

4. NON-ASSIGNABILITY

Contractor will not assign this Contract or any portion thereof, to a third party without the prior written consent of County, and any attempted assignment without such prior written consent will be null and void and will be cause at County's sole and absolute discretion, for immediate termination of this contract.

5. TERM

This Contract will be in effect from date of Notice to Proceed from the Ventura County Board of Supervisors on November 28th, 2023 through June 30, 2024 and subject to all the terms and conditions set forth herein. Time is of the essence in the performance of this contract as the Contractor has (4) four months to complete the services and deliverables from the first date of service commencing.

Continuation of the Contract is subject to the appropriation of funds for such purpose by the County's Board of Supervisors. If funds to affect such continued payment are not appropriated, County may terminate this project as thereby affected and Contractor will relieve County of any further obligation therefor.

6. TERMINATION

The County Purchasing Agent may terminate this Contract at any time for any reason by providing 10 days" written notice to Contractor. In the event of termination under this paragraph, Contractor will be paid for all work provided to the date of termination, as long as such work meets the terms and conditions of this Contract. On completion or termination of this Contract, County will be entitled to immediate possession of, and Contractor will furnish on request, all computations, plans, correspondence, and other pertinent data gathered or computed by Contractor for this particular Contract prior to any termination. Contractor may retain copies of said original documents for Contractor's files.

Contractor hereby expressly waives any and all claims for damages or compensation

arising under this Contract except as set forth in this paragraph in the event of such termination.

This right of termination belonging to the County of Ventura may be exercised without prejudice to any other remedy which it may be entitled at law or under this Contract.

7. DEFAULT

If Contractor defaults in the performance of any term or condition of this Contract, Contractor must cure that default by a satisfactory performance within 10 days after service upon Contractor of written notice of the default if Contractor fails to cure the default within that time, then County may terminate this Contract without further notice.

The foregoing requirement for written notice and opportunity to cure does not apply with respect to paragraph 4 above.

8. INDEMNIFICATION, HOLD HARMLESS AND WAIVER OF SUBROGATION

All activities and/or work covered by this Contract will be at the risk of Contractor alone. Contractor agrees to defend indemnify, and save harmless the County; including all of its boards, agencies, departments, officers, employees, agents and volunteers, against any and all claims, lawsuits, whether against Contractor, County or others, judgments, debts, demands and liability, including without limitation, those arising from injuries or death of persons and/or for damages to property, arising: directly or indirectly out of the obligations herein described or undertaken or out of operations conducted or subsidized in whole or in part by Contractor, save and except claims or litigation arising through the sole negligence or wrongdoing and/or sole willful misconduct of County. Contractor agrees to waive all rights of subrogation against County for losses arising directly or indirectly from the activities and/or work covered by this Contract.

9. INSURANCE PROVISIONS

A) Contractor, at its, sole cost and expense, will obtain and maintain in full force during the term of this Contract the following types of insurance:

- 1) General Liability ."occurrence" coverage in the minimum amount of \$1,000,000 combined single. Unlit (CSL) bodily injury & property damage each occurrence and \$1,000,000 aggregate, including personal injury, broad form property damage, products/completed operations, broad form blanket contractual and \$50,000 fire legal liability.
- 2) Commercial Automobile Liability coverage in the minimum amount of \$1,000,000 CSL bodily injury & property damage, including owned, non-owned, and hired automobiles. Also, to include Uninsured/Underinsured Motorists coverage in the minimum amount of \$100,000 when there are owned vehicles. Proof of Insurance to be provided by sub-contractor.
- 3) Workers' Compensation coverage, in full compliance with California statutory requirements, for all employees of Contractor and Employer's Liability in the minimum amount of \$1,000,000.

- B) All insurance required will be primary coverage as respects County and any insurance or self-insurance maintained by County will be excess of Contractor's insurance coverage and will not contribute to it.
- C) County is to be notified immediately if any aggregate insurance limit is exceeded. Additional coverage must be purchased to meet requirements.
- D) The County, and any applicable Special Districts are to be named as Additional Insured as respects to work done by Contractor under the terms of this Contract for General Liability Insurance.
- E) Contractor agrees to waive all rights of subrogation against the County, Its Boards, Agencies, Departments, any applicable Special, Districts, Officers, Employees, Agents and Volunteers for losses arising from work performed by Contractor under the terms of this Contract.
- F) Policies will not be canceled, non-renewed or reduced in scope of coverage until after sixty (60) days written notice has been given to the County of Ventura, Risk Management Division.
- G) Contractor agrees to provide County with the following insurance documents on or before the effective date of this Contract:
 - 1. Certificates of Insurance for all required coverage.
 - 2. Additional Insured endorsement for General Liability Insurance.
 - 3. Waiver of. Subrogation endorsement (a.k.a.: Waiver of Transfer Rights of Recovery Against Others, Waiver of Our Right to Recover from Others) for Workers' Compensation.

Failure to provide these documents will be grounds for immediate termination or suspension of this contract.

10. NON-DISCRIMINATION

A) General

No person will on the grounds of race, color, national origin, religious affiliation or non-affiliation, sex, age, handicap, disability, or political affiliation, be excluded from participation in, be 'denied the benefits, or be subjected to discrimination under this Contract.

B) Employment

Contractor will ensure equal employment opportunity based on objective standards of recruitment, selection, promotion, classification, compensation, performance evaluations, and management relations, for all employees under this Contract. Contractor's personnel policies will be made available to County upon request.

11. SUBSTITUTION

If particular people are identified in Exhibit A as working under this Contract, the Contractor will not assign others to work in their place without written permission from the County Purchasing Agent. Any substitution will be with a person of commensurate experience and knowledge.

12. INVESTIGATION AND RESEARCH

Contractor by investigation and research has acquired reasonable knowledge of all conditions affecting the work to be done and labor and material needed, and the execution of this Contract is to be based upon such investigation and research, and not upon any representation made by the County or any, of its officers, agents, or employees, except as provided herein.

13. CONTRACT MONITORING

The County will have the right to review the work being performed by the Contractor under this Contract at any time during Contractor's usual*working hours. Review, checking, approval or other action by the County will not relieve Contractor of Contractor's responsibility for the thoroughness of the services to be provided hereunder. This Contract will be administered by County of Ventura PWA or an authorized representative and coordinated with ITS.

14. ADDENDA

County may from time to time require changes in the scope of the services required hereunder. Such changes, including any increase or decrease in the amount of Contractor's compensation which are mutually agreed upon by and between County and Contractor will be effective when incorporated in written amendments to this Contract.

15. CONFLICT OF INTEREST

Contractor covenants that Contractor presently has no interest, including, but not limited to, other projects or independent contracts, and will not acquire any such interest, direct or indirect, which would conflict in any manner or degree with the performance of services required to be performed under this Contract. Contractor further covenants that in the performance of this Contract no person having such interest will be employed or retained by Contractor under this Contract.

16. CONFIDENTIALITY

Any reports, information, data, statistics, forms, procedures, systems, studies and any other communication or form of knowledge given to or prepared or assembled by Contractor under this Contract which County requests in writing to be kept confidential, will not be made available to any individual or organization by Contractor without the prior written approval of the County except as authorized by law.

17. NOTICES

All notices required under this Contract will be made in writing and addressed or

delivered as follows:

TO COUNTY: County of Ventura
Public Works Agency, Watershed Protection
800 South Victoria Avenue, #1610
Ventura, CA 93009

TO CONTRACTOR: CIRGIS COLLABORATIVE BUSINESS OFFICE
1047 COVE STREET #200
Ventura, CA 93001
Attn: Mr. David R. Burkhart CFO

Either party may, by giving written notice in accordance with this paragraph, change the names or addresses of the persons of departments designated for receipt of future notices. When addressed in accordance with this paragraph and deposited in the United States mail, postage prepaid, notices will be deemed given. On the third day following such deposit in the United States mail. In all other instances, notices will be deemed given at the time of actual delivery.

18. MERGER CLAUSE

This Contract supersedes any and all other contracts, either oral or written, between Contractor and the County, with respect to the subject of this Contract. This Contract contains all of the covenants and contracts between the parties with respect to the services required hereunder. Contractor acknowledges that no representations, inducements, promises or contracts have been made by or on behalf of County except those covenants and contracts embodied in this Contract. No contract, statement, or promise not contained in this Contract will be valid or binding.

19. RIGHTS IN DATA

Contractor may provide to the County as specified in Exhibit A title to all original written material including programs, card decks, tapes, listing and other programming documentation originated and prepared pursuant to this contract.

20. GOVERNING LAW

The validity of this Contract and any of its terms or provisions, as well as the rights and duties of the parties under this Contract, will be construed pursuant to and in accordance with the laws of the State of California.

21. SEVERABILITY OF CONTRACT

If any term of this Contract is held by a court of competent jurisdiction to be void or unenforceable, the remainder of the Contract terms will remain in full force and effect and will not be affected.

22. CUMULATIVE REMEDIES

The exercise or failure to exercise of legal rights and remedies by the County in the event

of any default or breach hereunder will not constitute a waiver or forfeiture of any other rights and remedies and will be without prejudice to the enforcement of any other right or remedy available by law or authorized by this Contract.

23. COMPLIANCE WITH LAWS

Each party to this Contract will comply with all applicable laws.

24. CONSTRUCTION OF COVENANTS AND CONDITIONS

Each term and each provision of this Contract will be Construed to be both a covenant and a condition.

WITNESS WHEREOF the parties hereto have executed this Contract.

COUNTY OF VENTURA

Marina L.
Porter

Digitally signed by Marina L. Porter
DN: CN = Marina L. Porter email = marina.
porter@ventura.org C = US O = Procurement
OU = GSA
Date: 2023.10.23 16:19:20 -0600

Authorized Signature

Marina Porter

Printed Name

Buyer

Title

10/23/2023

Date

CIRGIS*



Authorized Signature

Mary Cook Hurley

Printed Name

President

Title

10/24/2023

Date

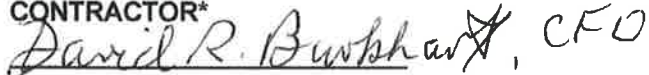
42-1631573

Tax Identification Number

2657700

Secretary of State Entity Number

CONTRACTOR*

 CFO

Authorized Signature

David R. Burkhart

Printed Name

Chief Financial Officer

Title

10/24/2023

Date

* If a corporation, this Contract must be signed by two specific corporate officers.

The first signature must be from either (1) the Chief Executive Officer, (2) the Chairman of the Board, (3) the President, or (4) a Vice President.

The second signature must be from either (a) the Secretary, (b) an Assistant Secretary, (c) the Chief Financial Officer (or Treasurer), or (d) and Assistant Treasurer. In the alternative, a single corporate signature is acceptable when accompanied by a corporate resolution demonstrating the legal authority of the signatory to bind the company for this Contract.

EXHIBIT "A"

2023 VENTURA COUNTY LIDAR & IMAGERY ACQUISITION PROJECT PROPOSAL

PROJECT INITIATION AND MANAGEMENT

The project will be initiated and managed by CIRGIS (www.cirgis.org). Channel Islands Regional GIS Collaborative (CIRGIS) is a 501c4 federal non-profit corporation. CIRGIS will act as an aggregator on behalf of Ventura County (County) and all other stakeholders. Since the year 2000, CIRGIS has empowered governments and businesses in Santa Barbara and Ventura Counties with collaborative geospatial projects and services.

DATA COLLECTION AND PROCESSING

CIRGIS's mapping contractor, The Sanborn Mapping Company (www.sanborn.com), will collect and process the data. Through a common RFP and vendor selection process, Sanborn was selected by CIRGIS to conduct various geospatial data acquisition in 2018, 2020, and 2022. Sanborn's contract was subsequently extended to July 31, 2024.

TIMELINE

Product data acquisition and collection will be done in the Fall/Winter 2023. The resulting Lidar and Aerial Imagery will be prepared and processed for the square mile area shown on Exhibit B map attached. This will be followed by final delivery to participants expected by Spring 2024 partly due to weather or climatic conditions.

The project delivery schedule is to be negotiated, pursuant to award, but anticipated to be approximately 120 calendar days following imagery, Lidar and control acquisition completion.

COST SHARE & LICENSE

Currently the County of Ventura, Cities of Camarillo, Fillmore, Santa Paula, Simi Valley, Thousand Oaks, and the United Water Conservation District have indicated commitment of their interest in this project during its formative stages. CIRGIS will continue to reach out to other potential interested parties which will ultimately lower the cost to the County of Ventura.

Each participant making a binding commitment to CIRGIS to participate and paying the associated cost will receive a license to use the digital products, including use by their consultants, when producing work products for the agency. The data delivered may not be distributed to others and the license may not be transferred.

EXHIBIT "A"

DELIVERABLES

The project will result in the following digital products for the square mile area shown on Exhibit A.

- a. 6" aerial orthophoto imagery, and Infrared (4th band) imagery
- b. Topographic contours from final DEM (1' incremental, 5' and 10' index contours)
- c. Lidar Quality Level 1 (QL1 — 8 points per square meter) Point Cloud (LAS)
- d. Breaklines
- e. Hydro-enforced Digital Elevation/Terrain Model (DEM/DTM)
- f. Digital Surface Model (DSM)
- g. Light Intensity images (gray scale)

The final deliverables will be in the horizontal datum NAD83, CA State Plane Coordinates System Zone 5 Feet. The vertical datum will be NAVD 88 Feet. The final data will be delivered in ESRI-compatible formats as stipulated in the enclosed specifications. The topographic contour files will also be provided in AutoCAD DWG format with the corresponding Elevations and Layers.

The enclosed Exhibit C technical specifications include detailed scope of work and specifications, project approach, deliverables, product formats and delivery schedule.

PROJECT COST

The total project cost for the above products is the amount of \$361,254. Currently Ventura County's share of the project cost is estimated to be **\$235,500, for both Phases I and II and includes approximately 672 TOTAL Square Miles of which, \$199,000 for approximately 570 Square Miles, are authorized under Phase I of this contract with the remaining 102 Square Miles for Phase II (additional \$36,500) to be authorized by the Board of Supervisors on November 28, 2023 under this Contract #9203** as to not hold up any part of the project work to be completed within the 120 day period. The balance of 362 Square Miles is to be paid by other stakeholders. Attached letters from other Municipalities show acceptance of the cost breakdowns per City. Ventura County's estimated share is subject to CIRGIS receipt of irrevocable participation commitments from each of the other stakeholders. Total project cost anticipates Sanborn using prequalified offshore production contractors. All subcontractors will be held to the same project specifications as required of Sanborn.

CIRGIS will continue to reach out to other potential interested parties which will ultimately lower the cost to the County of Ventura. Should CIRGIS be successful in securing additional participation, the additional cost savings to the County of Ventura will be reflected in the final invoice for the project.

PAYMENT SCHEDULE

CIRGIS proposes a milestone invoice schedule in coordination with Sanborn's delivery schedule, that will also be in accordance with the County of Ventura's policy guidelines as follows:

1. 50% upon completion, delivery, and acceptance of materials from Sanborn
2. 20% upon initial Ortho-imagery, delivery, and acceptance of materials
3. 20% upon initial Lidar delivery and acceptance of materials
4. 10% upon final acceptance on overall delivery of materials per project timeline within 120 days.

EXHIBIT "A"

TERMS AND CONDITIONS

The above items are subject to the following Terms and Conditions:

- A.** A time schedule for delivery of Sanborn work products above agreed upon by Sanborn and County as outlined in Exhibit C.
- B.** County to be responsible for any increased costs caused by County time delays or changes in the scope of services. Increases must have prior Board of Supervisor approval.
- C.** County to be responsible for any incidental costs such as packaging, postage, shipping, sales tax, etc., of which are inclusive in the total amount of the project.
- D.** Delivery of data to County to take place in phases as each item is completed by Sanborn and checked.
- E.** County to make progress payments to CIRGIS consistent with progress payment schedule required by Sanborn. County is entitled to a full refund of monies paid if Project is not completed through no fault of the County.
- F.** Invoices are paid 30 days in arrears of receipt of the invoice, no Late or Interest Fees will be paid per County of Ventura's Administrative Board Policy Manual.

EXHIBIT B

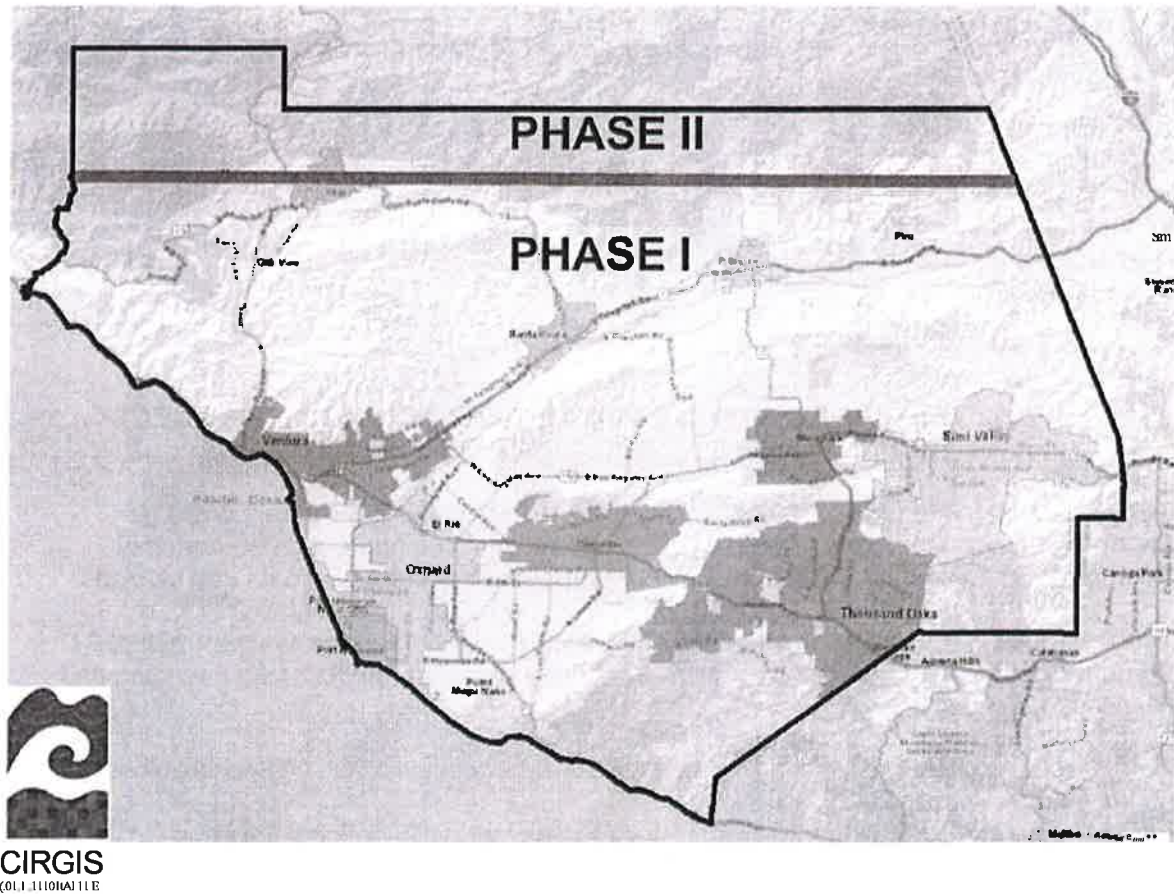


Exhibit B Proposed Data Acquisition Coverage Area South Half Ventura County - 1,033 square miles

Phase I - Contract #9203 for 570 square miles and is not to exceed the total of \$199,000.00

Phase II - May be amended upon Board of Supervisors Approval on November 28, 2023, to add additional funds of \$36,500.00

EXHIBIT C

Channel Islands
Regional GIS Collaborative
A non-profit public benefit corporation

CIRGIS, Inc.
Business Office
1047 Cove St #200
Ventura, CA 93001-3907
<http://www.cirgis.org>
EIN 42-1631573



2023 VENTURA COUNTY LIDAR & IMAGERY ACQUISITION PROJECT
TECHNICAL SPECIFICATIONS DELIVERABLES TIMELINE

CIRGIS is a 501c4 federal non-profit corporation. Using its existing contract with The Sanborn Mapping Company (Sanborn), CIRGIS, acting as an aggregator on behalf of Ventura County and other local stakeholders proposes to acquire new data and services.

The area of interest is an approximately 1,033 square mile area of the southern half of Ventura County, see Figures 1 through 3. Sanborn will provide the following new data and services:

- (a) Acquire LiDAR QL-1 with standard USGS Quality Level 1 (QL-1) Specifications and Deliverables.
- (b) Acquire 4-Band Ortho Imagery, 6-Inch Resolution (with Optional 3-Inch Resolution), including Infrared imagery (4th Band).
- (c) Sanborn will provide high-value, no-cost, Web-Based services to enhance customer experience:
 - **Sanborn Flight Analyst™** is a flight status tool that provides the status of the aerial acquisition as it is ongoing. This status tool can be viewed via any internet capable device with the customer choosing who has access to the information.
 - **Sanborn Image Analyst™** is an early access tool that provides a view of the georeferenced imagery within 7-14 days of the imagery being collected. These are called "quick views".
- (d) The project delivery schedule is to be negotiated, pursuant to award, but anticipated to be approximately 120 calendar days following imagery, lidar and control acquisition completion.

Sanborn's Scope of Work and Specifications, Project Approach, Deliverables and Delivery Schedule are provided on the following pages.

EXHIBIT C

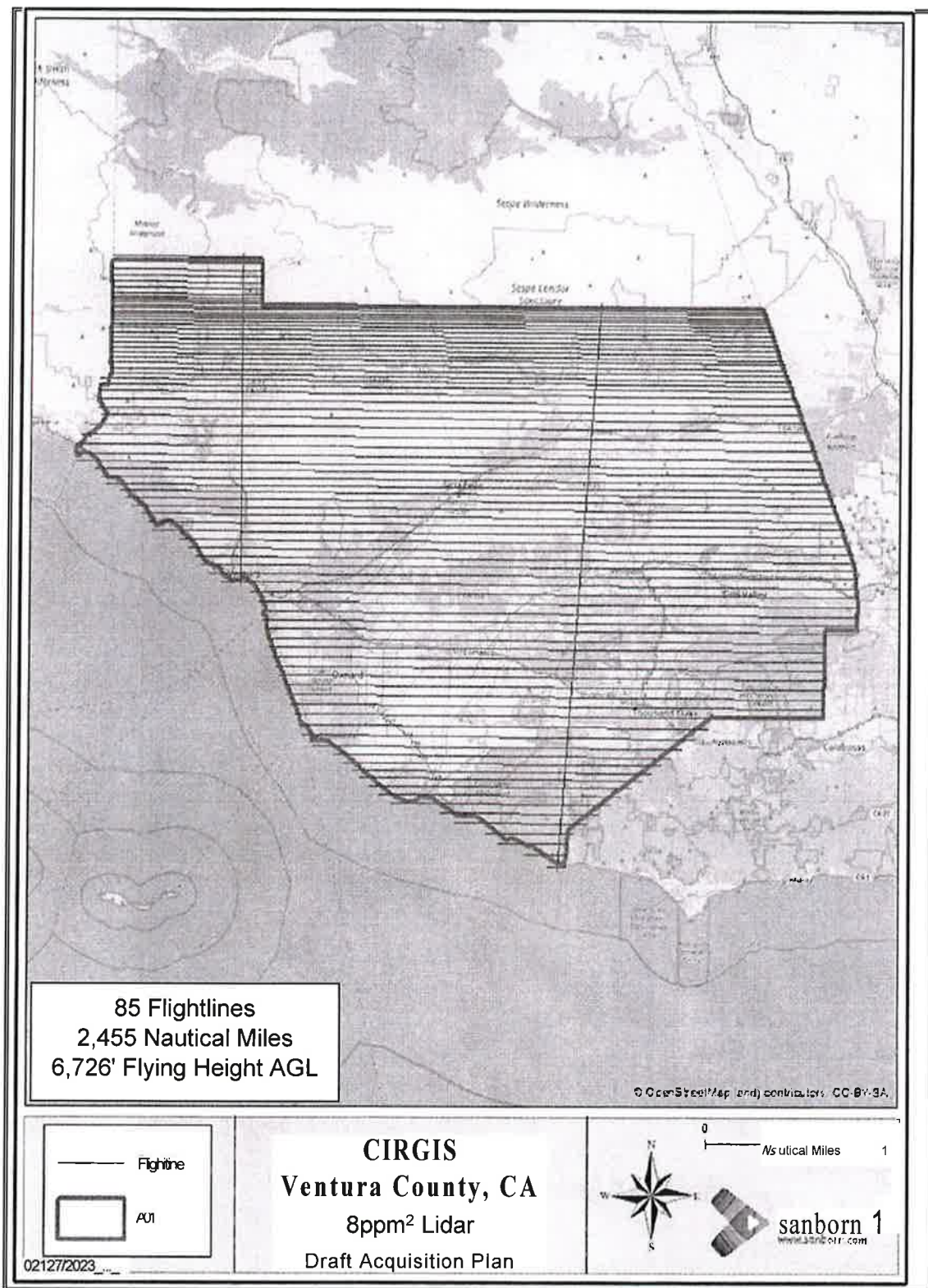


Figure 1 Ventura County Acquisition Area of Interest – Lidar

EXHIBIT C

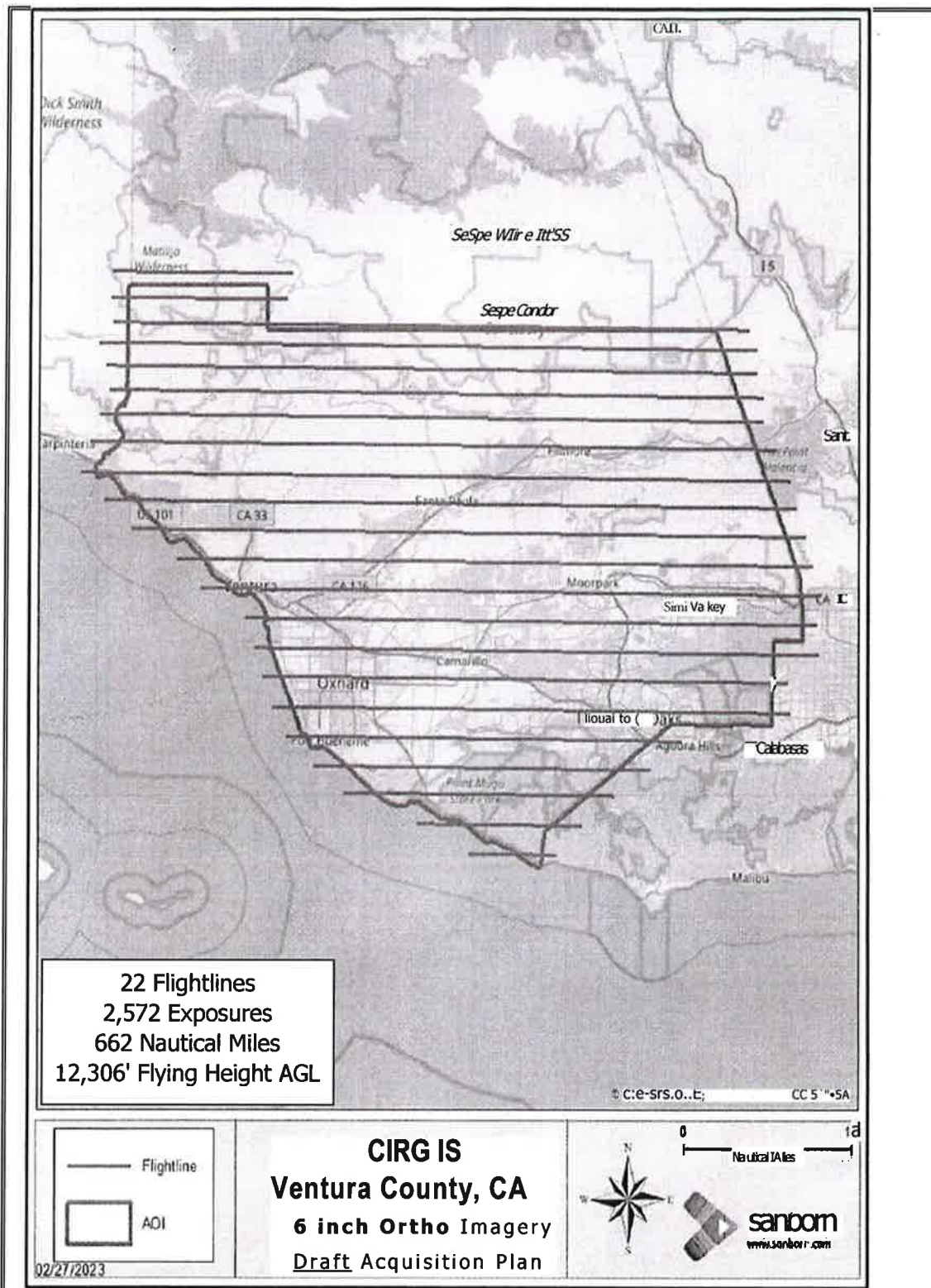


Figure 2 Ventura County Acquisition Area of Interest — 6" Ortho Imagery

EXHIBIT C

SCOPE OF WORK

Ground Calibration Points

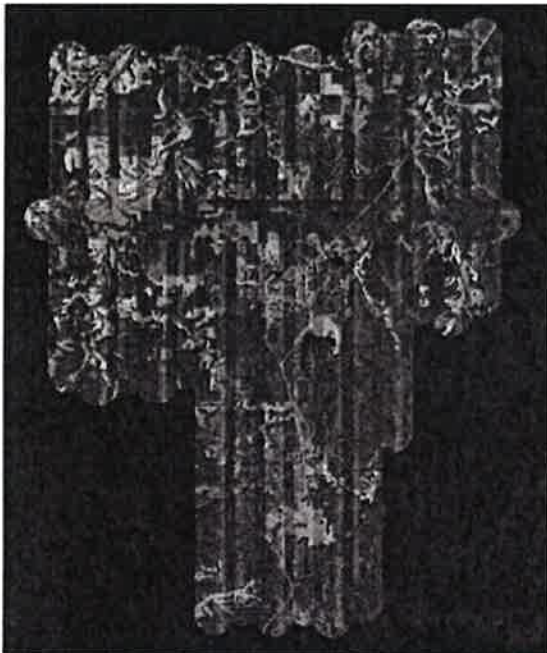
Sanborn will establish a total number of Ground Calibration Points (GCP) as required per the USGS and based upon the Area of Interest (AOI).

Lidar Relative Accuracy Assessment (Interswath Accuracy)

The table below shows the relative accuracy requirements of the QL1 lidar data as per the current USGS Lidar Base Specifications.

Relative Accuracy	QL1
Smooth Surface Repeatability RMSDZ (cm)	-CZ
Swath Overlap difference RMSDZ (cm)	58

Sanborn takes advantage of both visual and statistical validation methodologies to review and ensure the overlap consistency of the lidar data meets and/or exceeds project specifications. Differential Elevation (dZ) rasters are color ramped (dark green, green, yellow, orange, red) visual representations produced to identify vertical offsets between flight lines. The dZ rasters are reviewed in their entirety for flight lines and areas that exceed the required RMSDz. Furthermore, an additional set of TerraMatch Tie Lines are produced after corrections are applied and a Tie Line Report is produced to assess the X, Y and Z offset averages for each line and for the entire project. This visual and statistical review guarantees the relative accuracy of the lidar dataset.



Differential Elevation (dZ) Rasters

1	0.047	0.054	0.030	13	0.046	0.047	0.033	25	0.046	0.047	0.036
2	0.045	0.062	0.035	14	0.057	0.056	0.034	26	0.049	0.052	0.033
3	0.044	0.055	0.036	15	0.054	0.050	0.038	27	0.053	0.048	0.038
4	0.046	0.052	0.034	16	0.043	0.061	0.040	28	0.056	0.053	0.034
5	0.061	0.054	0.035	17	0.054	0.065	0.043	29	0.059	0.058	0.036
6	0.053	0.055	0.037	18	0.048	0.059	0.033	30	0.053	0.053	0.039
7	0.054	0.063	0.040	19	0.049	0.050	0.036	33	0.053	0.059	0.037
8	0.053	0.055	0.039	20	0.047	0.043	0.031	34	0.062	0.069	0.040
9	0.053	0.056	0.036	21	0.047	0.040	0.033	35	0.052	0.059	0.040
10	0.055	0.061	0.035	22	0.050	0.045	0.041	36	0.080	0.095	0.049
11	0.049	0.049	0.037	23	0.063	0.050	0.049				
12	0.047	0.046	0.037	24	0.054	0.049	0.042				

Internal Category	Observed Sales	(ft)	
Average Magnitude	0.053	0.053	0.027
RMS Values	0.096	0.092	0.052
Maximum Values	0.661	0.557	0.547
Observation Weight	170990.0	170990.0	709169.0

Overall Relative Accuracy (ft)
Category , misniaith

Terraflatfift Tie lines	
Category	observations
Section Lines	
Roof Lines	72,801

Interswath Accuracy Assessment

EXHIBIT C

Vertical Adjustment

After successful completion of the lidar calibration the point cloud data is vertically assessed against ground surveyed points and adjusted accordingly to meet the project required vertical accuracy. Internally, we call these survey points Lidar Calibration Points (LCP) as these points are used in the lidar calibration process and are independent of the check points used to report the accuracy of the lidar data as per the ASPRS and USGS requirements. When the project consists of multiple overlapping/bordering calibration blocks, some of the calibration points are selected in the overlapping areas between the blocks so that the consistency and accuracy of the data can be ensured at the transition areas.

A TIN of the point cloud is compared to the known coordinates of surveyed points and the offset to those points is compiled. The inverse of the average vertical offset of the lidar to the known surveyed points is applied to the lidar dataset. The vertically adjusted lidar dataset is then compared again to the known coordinates of the surveyed points to validate the vertical adjustment and ensure the calibrated lidar meets the Vertical Root Mean Square Error (RMSE_z) of the project.

Lidar Classification

The first step in the creation of topographic products from lidar (following processing and calibration) is classification of the point cloud. Sanborn will ensure that the point cloud classification is consistent across the entire project and there are no noticeable variations in the character, texture, or quality of the classification between tiles, swaths, lifts, or other non-natural divisions existing in the data. Sanborn will make sure that no more than 1 percent of the points possess a demonstrably erroneous classification value within any 1 km x 1 km area.

Class 1	Unclassified
Class 2	Ground
Class 7	Low Point (noise)
Class 9	Water (where hydro breakline polygons are collected)
Class 17	Bridge Deck
Class 18	High Noise
*Class 20	Ignored Ground (breakline proximity)
*Class 21	Snow
*Class 22	Temporal Change
Flags	Overlap and Withheld

**USGS Specific Point Data Record Formats 6-10*

The point classification is divided into the steps listed below, and described in the following subsections:

E1 Automated Filters

Manual Editing

Quality Check

EXHIBIT C

Automated Filters

The initial lidar point cloud classification is done using automated TerraScan macros distributed to the GeoCue processing cluster. The macros are specific for each project's requirements as well as the topography, taking into consideration terrain relief, ground cover, and natural and man-made features. The macros exploit the information related to the number of returns of a pulse, intensity, elevation, slope and height from the ground to classify the point cloud in an automated fashion.



Automated Filter Results — Nadir



Automated Filter Results - Oblique

Manual Editing

Following the automated classification process, a supervised or manual classification of the lidar point cloud is performed in MicroStation with the TerraSolid extension. Sanborn's lidar editing team goes through each tile with great precision to make sure that the points are classified correctly. The 3D editing includes cross-section or profile views of points to aid in classification, as well as on-the-fly surface model visualization to spot bare earth blunders for re-classification. The MicroStation Design File is geospatially linked with Google Earth to aid in the identification of features and/or terrain.



Manual Editing with MicroStation, TerraSolid and Google Earth

EXHIBIT C

Quality Check

Part of Sanborn's QC process is reducing the need for extensive manual editing and replacing it with a quicker and more robust method of identifying outliers or anomalies in a bare-earth surface. Through the production of a Digital Elevation Model (DEM), Sanborn's lidar team can pan through a project-wide bare-earth surface in Global Mapper in a fraction of the time needed to review individual tiles. This means quicker review of the entire dataset and the ability to find errors in the bare earth without manually opening each individual lidar tile. The lidar team can mark errors in the surface and reference those marks to correct the lidar directly.



Bare-Earth DEM Review at 1:5000

In addition to reviewing the bare-earth surface, Sanborn performs automated statistical checks to identify errors in classification or attributes of the manually-edited lidar dataset. Utilizing TerraScan and LP360, statistics are extracted from the project in its entirety to isolate errors on a per-file scale. Extraneous classes and attributes such as timestamps, precision, intensities, and CRS are reviewed for consistency. All identified errors are rectified prior to product generation.

Hydro-Flattening and Enforcement

Sanborn has designed custom workflow to produce hydro-flattened and/or hydro-enforced Digital Elevation Models (DEM) as per the latest USGS Lidar Base Specifications 2022 rev. A.

Hydro-flattening is the process of creating a lidar-derived DEM in which water surfaces appear and behave as they would in traditional topographic models created from photogrammetric methodologies. A traditional topographic DEM such as the United States Geological Survey (USGS) National Elevation Dataset (NED) represents the actual ground surface and hydrological features displayed in established ways. Roadway crossing drainages passing through culverts remain in the surface model because they are part of the landscape, as the culvert beneath the road is the manmade feature. Bridges and other manmade structures above the landscape are removed.

EXHIBIT C

Hydro Breakline Extraction

Sanborn digitizes hydrology features and edge-of-water breaklines using bare-earth points and lidar-derived elevation modulated intensity rasters in an artificial 3D environment. Planimetric mapping includes all hydrology and select man-made features, such as bridges and dams that affect hydrological flow. During this phase, the dataset is viewed in both 2D and 3D perspectives as terrain models and intensity rasters. Sanborn assigns the elevation for the lines and polygons referencing the bare earth lidar. Each hydrology feature is digitized in true horizontal position, and the Feature Type and Class are captured along with the X, Y, and Z attributes. Once all the features have been captured, a second technician performs a review for completeness, including horizontal placement and accuracy, referencing the bare earth lidar rasters before releasing the data back to production for product generation. Hydro-enforcement is an important and useful modification of the traditional topographic hydro-flattened DEM and produces hydrological surfaces that are fundamentally different at a functional level. Hydrological surfaces are identical to topographic surfaces in many respects, they differ significantly in specific ways. For example, in a topographic DEM roadway-crossing drainages passing through culverts are included in the surface as part of the landscape. From a hydrologic perspective however, these roadways create artificial impediments (digital dams) to the drainages and introduce sinks (un-drained areas) into the landscape.

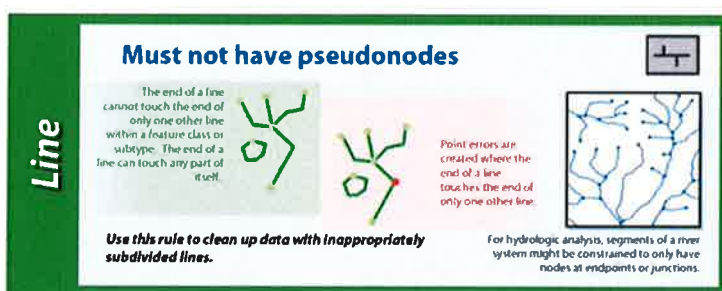
- Inland Ponds and Lakes
 - Water bodies of 8,000m² (2 acres) or greater surface area at the time of collection are flattened.
 - Flattened water bodies present as flat and level water surface (a single elevation for every bank vertex defining the water body's perimeter).
 - The entire water-surface edge shall be at or below the immediately surrounding terrain.
 - Long impoundments, such as reservoirs, inlets, and fjords, whose water-surface elevations decrease with downstream travel, shall be treated as streams or rivers.
- Inland Streams and Rivers
 - Streams and rivers of a 30m (100-feet) nominal width shall be flattened.
 - Streams or rivers whose width varies above and below 30 meters will not be broken into multiple segments.
 - Flattened streams and rivers shall present a flat and level water surface bank-to-bank (perpendicular to the apparent flow centerline).
 - Flattened streams and rivers shall present a gradient downhill water surface, following the immediately surrounding terrain.
 - In cases of sharp turns of rapidly moving water, where the natural water surface is notably not level bank-to-bank, the water surface will be represented as it exists while maintaining an aesthetic cartographic appearance.
 - The entire water surface edge shall be at or below the immediately surrounding terrain.
 - Stream channels shall break at culvert locations leaving the roadway over the culvert intact.
 - Bridges in all their forms are removed from the DEM.
 - Streams are continuous at bridge locations.
 - When the identification of a structure as a bridge or culvert cannot be made definitively, the feature shall be regarded as a culvert.
- Non-Tidal Boundary Waters
 - Boundary waters, regardless of size, shall be represented only as an edge or edges within the project; collection does not include the opposite shore.
 - The entire water-surface edge shall be at or below the immediately surrounding terrain.
 - The water-surface elevation will be consistent throughout the project.

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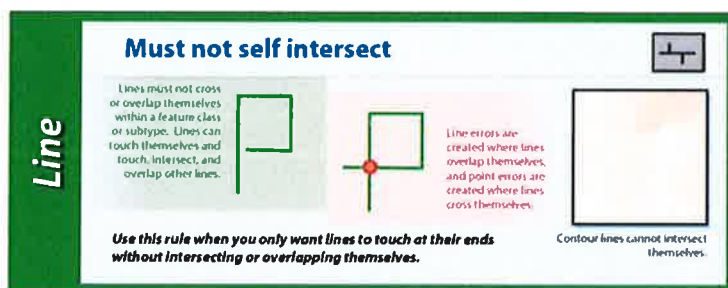
- The water surfaces shall be flat and level, as appropriate for the type of water body (level for lakes, a gradient for streams and rivers).
- Any unusual changes in the water-surface elevation during the collection (such as increased upstream dam discharge) are documented in the project metadata.
- Islands
 - Permanent islands of 4,000m² (1 acre) or larger shall be delineated in all water bodies.

Hydro Breakline Conflation and Monotonicity

Sanborn's final processing includes the use of custom routines to validate flow direction and monotonicity to ensure all vector nodes are flowing downhill for single and double-line streams, or are the same elevation for pools of water, including lakes and ponds. Other processing may include using standard Esri tools to eliminate pseudo-nodes or self-intersecting polygons that would impair hydrologic analysis.



Pseudo-nodes Diagram



Self-Intersect Diagram

EXHIBIT C

Hydro Breakline Lidar Classification

Sanborn utilizes the horizontal placement of the hydro breaklines to classify any and all collected inland ponds, lakes, rivers and/or streams to the appropriate Class 9 — Water. To aid in the aesthetic appeal of the hydro-flattened or enforced bare-earth surface DEM, lidar points within a distance no greater than the nominal pulse spacing of the breaklines will be classified as Class 20 — Ignored Ground (breakline proximity). All classes will maintain properly identified LASv1.4 Overlap Flags.

Lidar Product Generation

Sanborn has carefully reviewed the scope of work requirements for the proposal and will generate the deliverables as specified. The data will be delivered on portable hard drives. Interim deliveries may be provided via FTP if the CIRGIS desires. All tiled products will be delivered in accordance with the agreed upon tile index and naming scheme requested by the CIRGIS. All derivative products will be subjected to Sanborn's Quality Assurance (QA) procedures prior to delivery.

Raw Calibrated Lidar Point Cloud

Sanborn will deliver all collected points, fully calibrated, georeferenced, and adjusted to ground, organized in their original swaths, one file per swath, one swath per file. Files will be fully compliant LAS Specification version 1.4, Point Data Record Format 6, 7, 8, 9, or 10. If collected, waveform data in external auxiliary files with the extension (*.wdp) will be provided. All files will have correct and properly formatted georeferenced information as Open Geospatial Consortium (OGC) well known text (WKT) in all LAS file headers. GPS times will be recorded as Adjusted GPS Time at a precision sufficient to all unique timestamps for each pulse, and intensity values provided in normalized 16-bit.

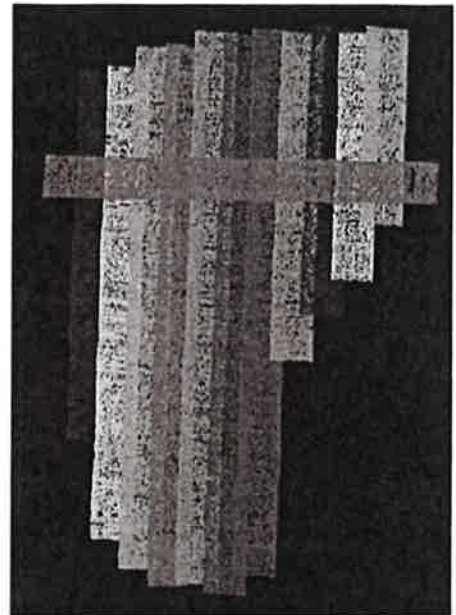
Classified Lidar Point Cloud

Sanborn will deliver all project swaths, returns, and collected points, fully calibrated, adjusted to ground, and classified, by tiles to the limits of the project boundary. Files will be fully compliant LAS Specification version 1.4, Point Data Record Format 6, 7, 8, 9, or 10.

All files will have correct and properly formatted georeferenced *Classified Tiles Colored by File*

information as Open Geospatial Consortium (OGC) well known text (WKT) in all LAS file headers. GPS times will be recorded as Adjusted GPS Time at a precision sufficient to all unique timestamps for each pulse, and intensity values provided in normalized 16-bit. Files will be produced in tile form, without overlap, using the project tiling scheme.

Last Updated 5/29/2023



Raw Swath Colored by File

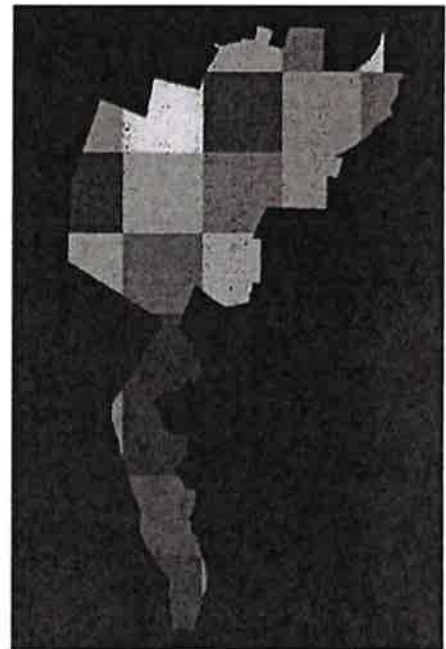


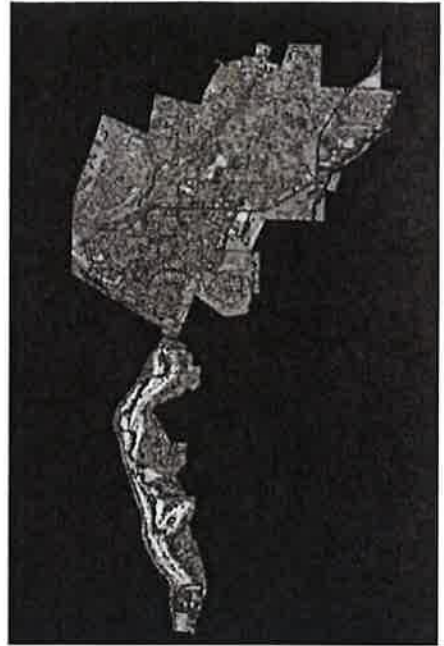
EXHIBIT C

First-Return Intensity Rasters

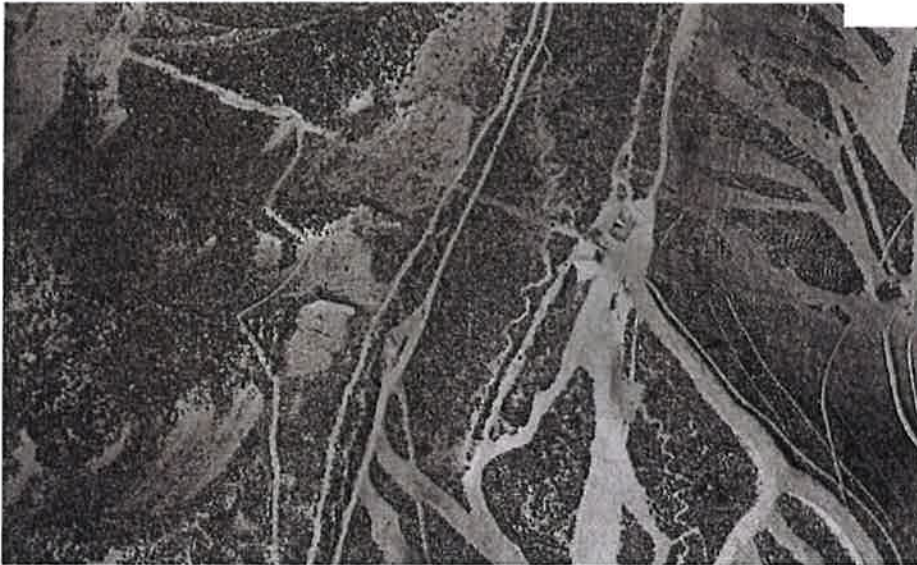
First-return intensity rasters will be generated to the limits of the project boundary. Rasters will be output to an industry-standard, GIS compatible, format. Files will be produced in tile form, without overlap, using the project tiling scheme.

First-Return Digital Surface Model (DSM)

A first-return DSM is produced from all first-return lidar points (with the exception of any "withheld" or "noise" classified points), creating a surface representing all ground and above ground features. The first return DSM is generated to the extents of either the Area of Interest (AOI), the Designed Project Area (DPA), or the Buffered Project Area (BPA). Each project quality level will determine the resolution (e.g., cell size) of the DSM to best represent the surface without any unnecessary over-interpolation of excessive smoothing. Each DSM will be produced to an industry-standard, GIS-compatible, 32-bit floating point raster format. The DSM data will be in the same CRS as the lidar data unless requested otherwise.



First-Return Intensity Rasters

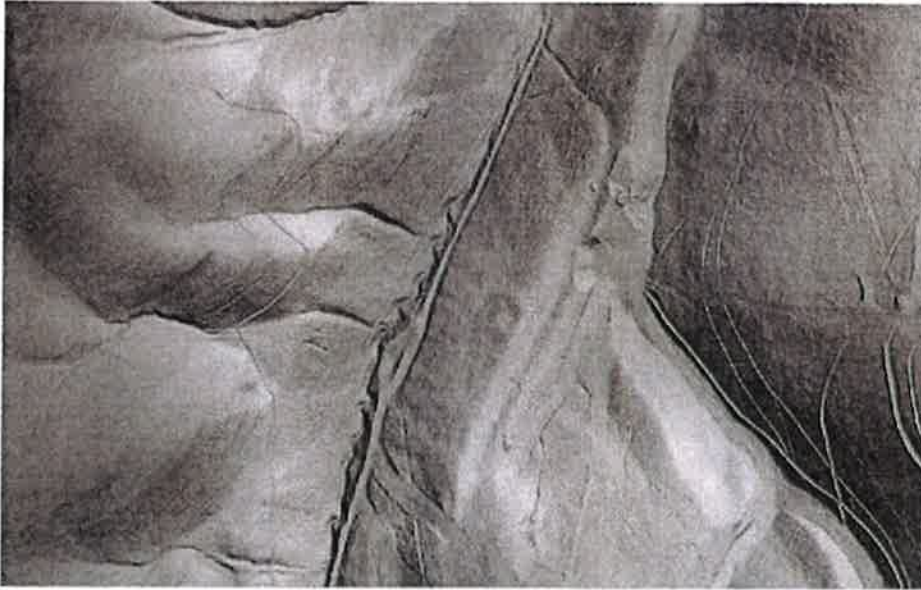


Digital Surface Model (DSM)

EXHIBIT C

Bare-Earth Digital Terrain Model (DTM)

A bare-earth DTM is produced from all ground-identified lidar points creating a representation of the bare-earth surface, excluding points for buildings, trees, low plants, etc. The bare-earth DTM is generated to the extents of either the Area of Interest (AOI), the Designed Project Area (DPA), or the Buffered Project Area (BPA). Each project quality level will determine the resolution (e.g., cell size) of the DTM to best represent the bare-earth surface without any unnecessary over-interpolation of excessive smoothing. Each DTM will be produced to an industry standard, GIS-compatible, 32-bit floating point raster format. The DTM data will be in the same CRS as the lidar data unless requested otherwise. Hydro-flattening or enforcement, if outlined in the project scope, will be implemented during the creation of the DTM.



Digital Elevation Model (DEM)

Topographic Contours

One-foot intermediate and ten-foot index contours will be delivered. Contours will be smooth, edge-matched, and seamless across tiles per tile in ESRI shapefile or file geodatabase format. The contours are mapping datasets that display highly accurate contour lines showing equal elevation that correspond to the orthometric heights of the bare earth surface. The contour lines and contour intervals depict elevation / altitude and depth, illustrating the general terrain for an area. The proposed contour product will be an automatically derived dataset, and no manual editing will be performed to alter or improve the topology or aesthetic quality. The contours will machine-generated from the final hydro-enforced DEM data as breaklines are already incorporated into the digital terrain.

