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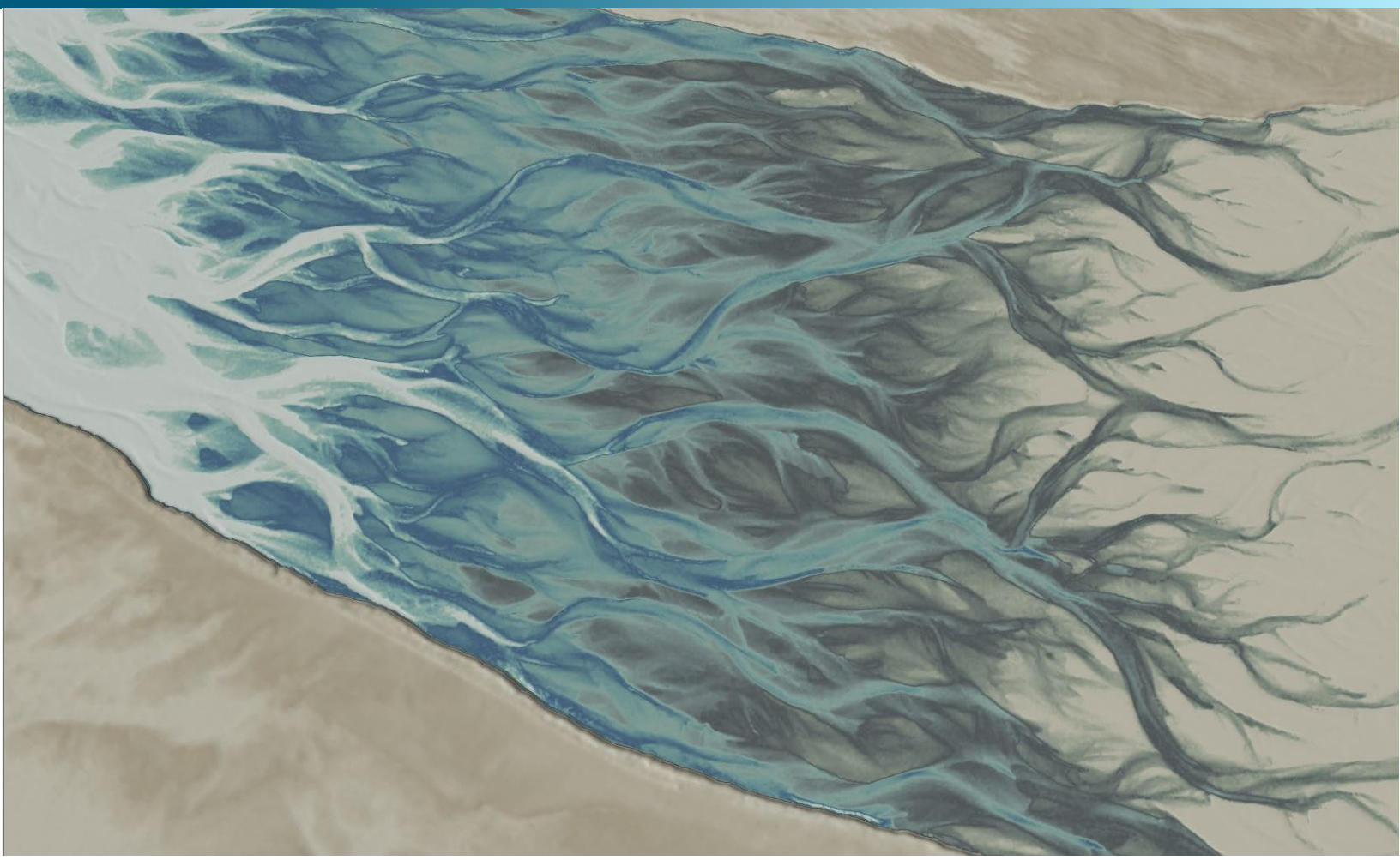
May 8, 2023



Platte River, Nebraska Fall 2022

Topobathymetric Lidar Technical Data Report

Prepared For:

Headwaters CORPORATION

Jason Farnsworth, Executive Director
Platte River Recovery Implementation Program
Headwaters Corporation
4111 4th Avenue, Suite 6
Kearney, Nebraska 68845
PH: 308-237-5728

Prepared By:

NV5 GEOSPATIAL

NV5
1100 NE Circle Blvd, Ste. 126
Corvallis, OR 97330
PH: 541-752-1204

TABLE OF CONTENTS

Cover Photo: A southeast view of a section of the Platte River topobathymetric model, colored by elevation.

INTRODUCTION

A scenic photo taken by NV5 acquisition staff shows a view of the Platte River in Nebraska (taken in November 2022).

In May 2020, NV5 (NV5) was contracted by Headwaters corporation to collect topobathymetic lidar data and digital imagery in the fall of 2022 as part of a multi-year (2020-2023) contract over the Platte River in central Nebraska. This data collection is part of NV5's ongoing partnership with Headwaters Corporation to provide data aiding in the Platte River Recovery Implementation Program. The Program is aimed at enhancing, restoring, and protecting the habitat for endangered species associated with the river system, specifically targeting the whooping crane, least tern, piping plover, and pallid sturgeon species. Traditional near-infrared (NIR) lidar was fully integrated with green wavelength (bathymetric) lidar in order to provide a seamless topobathymetric lidar dataset for analysis. This type of lidar data is well-suited for use in riverine locations, and is useful for assessing channel morphology and accurately modeling the topobathymetric surface inside of the study area.

This report accompanies the final delivered topobathymetric lidar data and documents contract specifications, data acquisition procedures, processing methods, and analysis of the final dataset including accuracy assessments, depth penetration, and density. Acquisition dates and acreage are shown in Table 1, a complete list of contracted deliverables provided to Headwaters corporation is shown in Table 2, and the project extent is shown in Figure 1.

Table 1: Acquisition dates, acreage, and data types collected on the Platte River Fall 2022 site

Project Site	Total Acres	Acquisition Dates	Data Type
Platte River Fall 2022, Nebraska	89,948	*11/3/2022 – 11/9/2022	Topobathymetric Lidar

*See Figure 6 for more detailed acquisition dates

Deliverable Products

Table 2: Products delivered to Headwaters corporation for the Platte River Fall 2022 site

Platte River Fall 2022 Lidar Products Projection: Nebraska State Plane Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: US Survey Feet	
Topobathymetric Lidar	
Points	LAS v 1.4 • All Classified Returns
Rasters	3.0 Foot ERDAS Imagine files (*.img) • Unclipped Topobathymetric Bare Earth Digital Elevation Models (DEM) • Clipped Topobathymetric Bare Earth Digital Elevation Models (DEM) • Bare Earth & Water Surface Models with Hydroflattened Ponds (DEM) • Highest Hit Digital Surface Model (DSM) • Depth Raster (Water Surface Model – Topobathymetric DEM) 1.5 Foot GeoTiffs • Green Sensor Intensity Images • NIR Sensor Intensity Images
Vectors	Shapefiles (*.shp) • Project Boundary • Lidar Tile Index (1,500 ft x 1,500 ft) • RasterTile Index • Bathymetric Coverage Polygon • Hydroflattened Pond Breaklines with Z values • Water's Edge Breaklines without Z values (used for bathymetric refraction correction) • Ground Survey Shapes

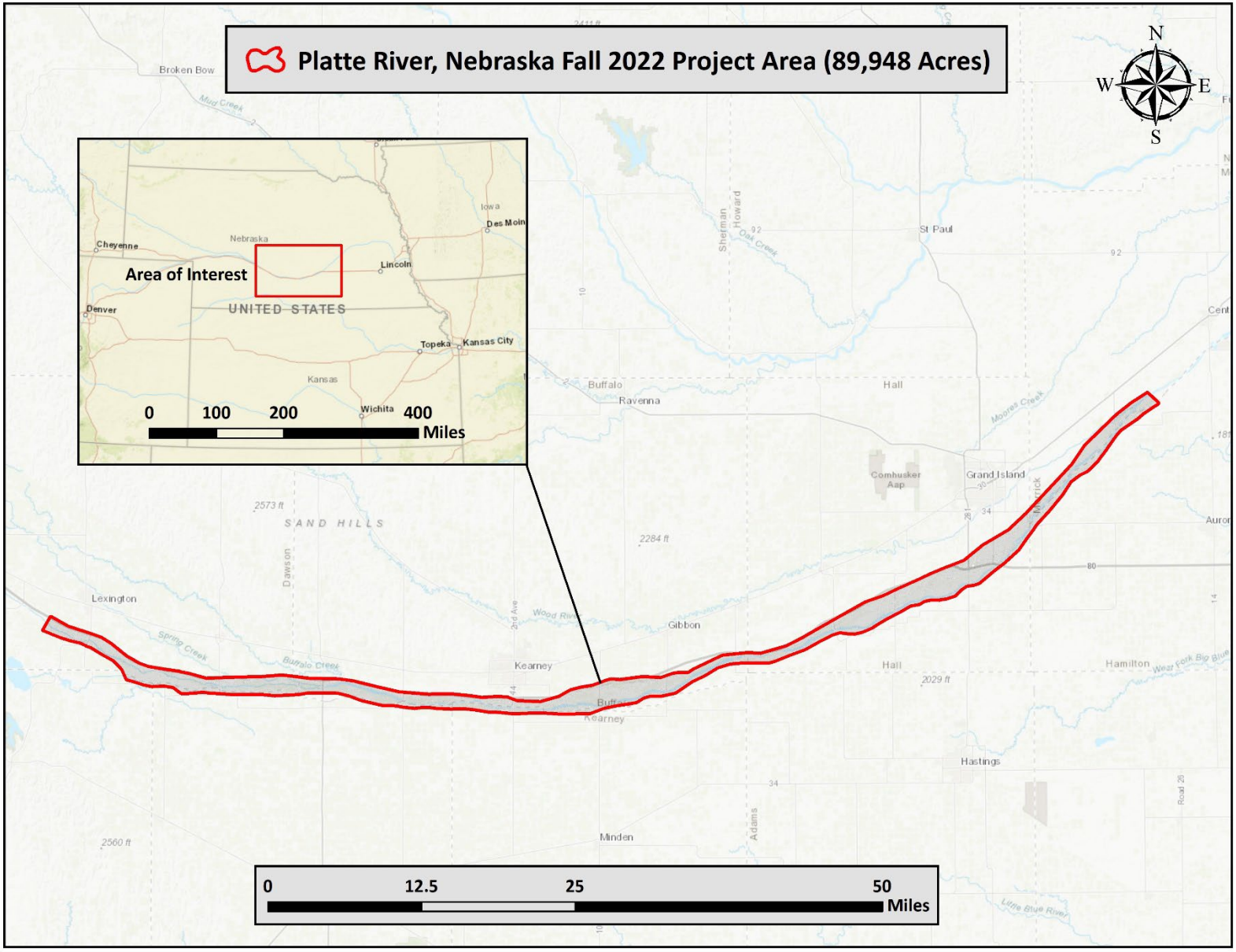


Figure 1: Location map of the Platte River Fall 2022 site in Nebraska

ACQUISITION

NV5's ground survey equipment set up in the Platte River Fall 2022 Lidar study area.

Planning

In preparation for data collection, NV5 reviewed the project area and developed a specialized flight plan to ensure complete coverage of the Platte River Fall 2022 Lidar study area at the target combined point density of ≥8 points/m^2. Acquisition parameters including; orientation relative to terrain, flight altitude, pulse rate, scan angle, and ground speed were adapted to optimize flight paths and flight times while meeting all contract specifications. Figure 5 shows these optimized flight paths and dates.

Factors such as satellite constellation availability and weather windows must be considered during the planning stage. Any weather hazards or conditions affecting the flight were continuously monitored due to their potential impact on the daily success of airborne and ground operations. In addition, logistical considerations including private property access, potential air space restrictions, and water clarity were reviewed. Channel flow rates and gage heights were continually monitored to target an aerial acquisition when flow rates, within the area of interest, were below 1,000 CFS (Figure 2, Figure 3). The aerial lidar was taken November 3 to November 9, 2022 when the flow rates met this criteria. However, the charts show when the turbidity measurements were taken, which show higher flow rates starting around November 11, 2022.

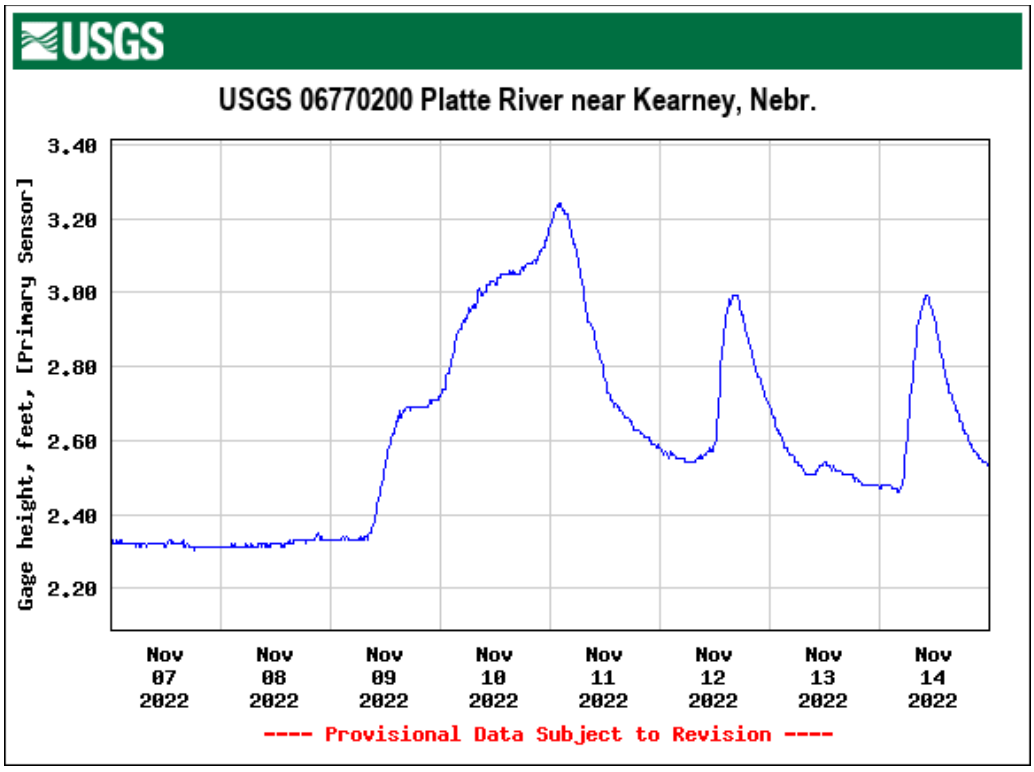


Figure 2: USGS Station 06770200 gage height along the Platte River at the time of Fall 2022 Lidar acquisition.

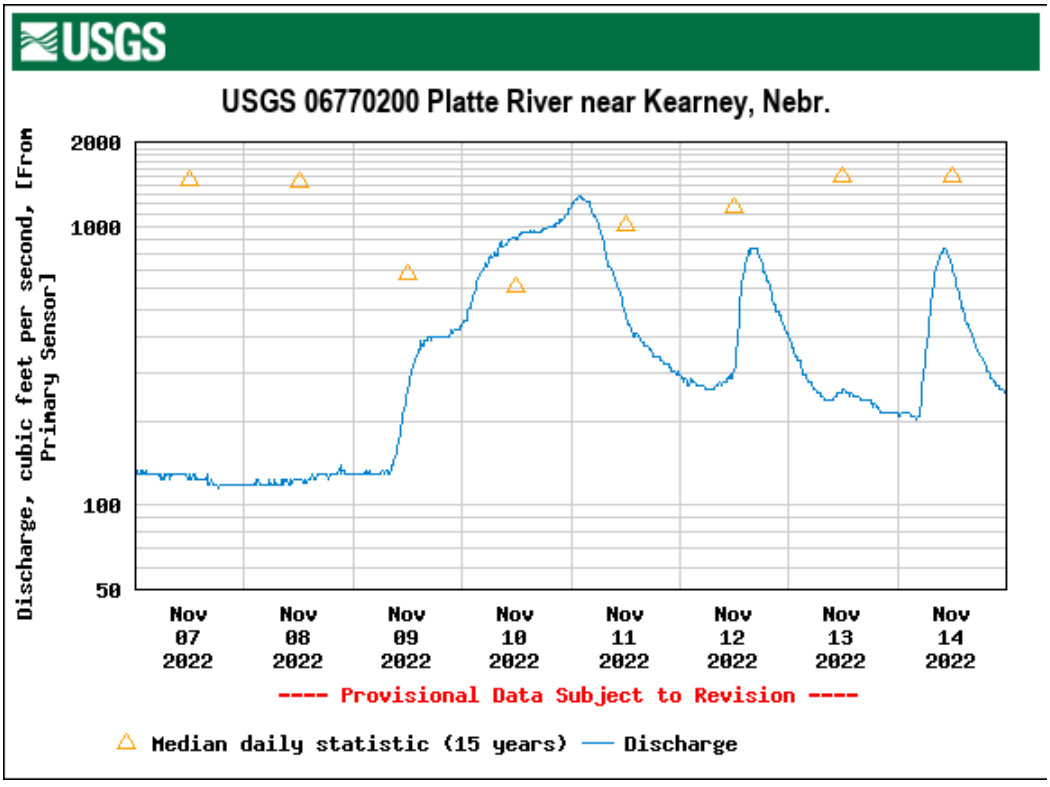


Figure 3: USGS Station 06770200 flow rates along the Platte River at the time of Fall 2022 Lidar acquisition.

Turbidity Measurements

In order to assess water clarity conditions during lidar collection, NV5 collected turbidity measurements and secchi depth readings at 13 locations within the project site between November 7th and 14th, 2022. Turbidity observations were recorded three times to confirm measurements. A true Secchi depth reading is where the Secchi depth reaches extinction. However, because of safety concerns and accessibility, some secchi depth readings were noted to have reached the bottom surface of the riverbed. Observed water clarity conditions can be seen in Figure 4 below, while the following Table 3 provides turbidity results per site on each day of data collection.

Figure 4: Water clarity photos taken by NV5's ground survey staff, along the Platte River in November, 2022.

Table 3: 2022 Water Clarity Observations for lidar flights

Turbidity Observations						
Date	**Location**	**Time (GMT)**	**Secchi Depth**	**Turbidity Sample 1 (NTU)**	**Turbidity Sample 2 (NTU)**	**Turbidity Sample 3 (NTU)**
11/7	Sample Site 1	16:00	*0.79 m	0.36	0.38	0.41
11/8	Sample Site 2	9:30	*0.49 m	2.17	2.22	2.04
11/8	Sample Site 3	12:00	*0.45 m	0.16	0.17	0.22
11/8	Sample Site 5	13:30	*0.50 m	0.19	0.20	0.17
11/8	Sample Site 6	15:30	*0.51 m	0.41	0.39	0.33
11/9	Sample Site 4	10:00	*0.60 m	3.92	3.99	4.07
11/10	Sample Site 7	09:30	0.47 m	15.22	12.62	12.22
11/11	Sample Site 6	13:30	*0.25 m	20.43	21.21	22.62
11/11	Sample Site 8	16:45	0.23	24.20	16.82	19.80
11/12	Sample Site 9	13:00	NA	14.61	13.69	13.56
11/12	Sample Site 10	15:30	0.54	15.64	16.28	17.52
11/13	Sample Site 10b	13:00	NA	0.50	0.24	0.25
11/13	Sample Site 11	14:45	*0.10	1.23	1.16	1.22
11/14	Sample Site 12	12:15	*0.30	14.57	10.76	15.37
11/14	Sample Site 13	15:45	NA	22.95	21.93	22.62

** Measurement is depth to the bottom surface due to observational depth limitations*

Airborne Lidar Survey

The lidar survey was accomplished using a Riegl VQ-880-GII green laser system mounted in a Cessna Caravan. The Riegl VQ-880-GII's integrated NIR laser (λ=1064 nm) adds additional topography data and aids in water surface modeling. The Riegl VQ-880-GII laser system can record unlimited range measurements (returns) per pulse, however a maximum of 15 returns can be stored due to LAS v1.4 file limitations. The recorded waveform enables range measurements for all discernible targets for a given pulse. The typical number of returns digitized from a single pulse ranges from 1 to 8 for the NIR sensor and 1 to 11 for the green sensor in the Platte River Fall 2022 project area.It is not uncommon for some types of surfaces (e.g., dense vegetation or water) to return fewer pulses to the lidar sensor than the laser originally emitted. The discrepancy between first return and overall delivered density will vary depending on terrain, land cover, and the prevalence of water bodies. Table 4 summarizes the settings used to yield an average pulse density of ≥8 pulses/m^2 over the Platte River Fall 2022 project area. Figure 5 shows the flightlines acquired using these lidar specifications.

Table 4: Lidar specifications and survey settings

Lidar Survey Settings & Specifications		
Acquisition Dates	11/3/2022 – 11/9/2022	11/3/2022 – 11/9/2022
Aircraft Used	Cessna Caravan	Cessna Caravan
Sensor	Riegl	Riegl
Laser	VQ-880-GII	VQ-880-GII-IR
Maximum Returns	14	13
Resolution/Density	Average 8 pulses/m^2	Average 8 pulses/m^2
Nominal Pulse Spacing	0.35 m	0.35 m
Survey Altitude (AGL)	450 m	450 m
Survey speed	135 knots	135 knots
Field of View	40 º	42 º
Mirror Scan Rate	80 Lines Per Second	Uniform Point Spacing
Target Pulse Rate	200 kHz	300 kHz
Pulse Length	1.5 ns	3 ns
Laser Pulse Footprint Diameter	31.5 cm	13.5 cm
Central Wavelength	532 nm	1,064 nm
Pulse Mode	Multiple Times Around (MTA)	Multiple Times Around (MTA)
Beam Divergence	0.7 mrad	0.3 mrad
Swath Width	328 m	345.5 m
Swath Overlap	55%	55%
Intensity	16-bit	16-bit
Accuracy	$RMSE_Z$ ≤ 9.2 cm Horizontal $Accuracy_r$ ≤ 60 cm	$RMSE_Z$ ≤ 9.2 cm Horizontal $Accuracy_r$ ≤ 60 cm

All areas were surveyed with an opposing flight line side-lap of ≥55% (≥100% overlap) in order to reduce laser shadowing and increase surface laser painting. To accurately solve for laser point position (geographic coordinates x, y and z), the positional coordinates of the airborne sensor and the attitude of the aircraft were recorded continuously throughout the lidar data collection mission. Position of the aircraft was measured twice per second (2 Hz) by an onboard differential GPS unit; aircraft attitude was measured 200 times per second (200 Hz) as pitch, roll and yaw (heading) from an onboard inertial measurement unit (IMU). To allow for post-processing correction and calibration, aircraft and sensor position and attitude data were indexed by GPS time.

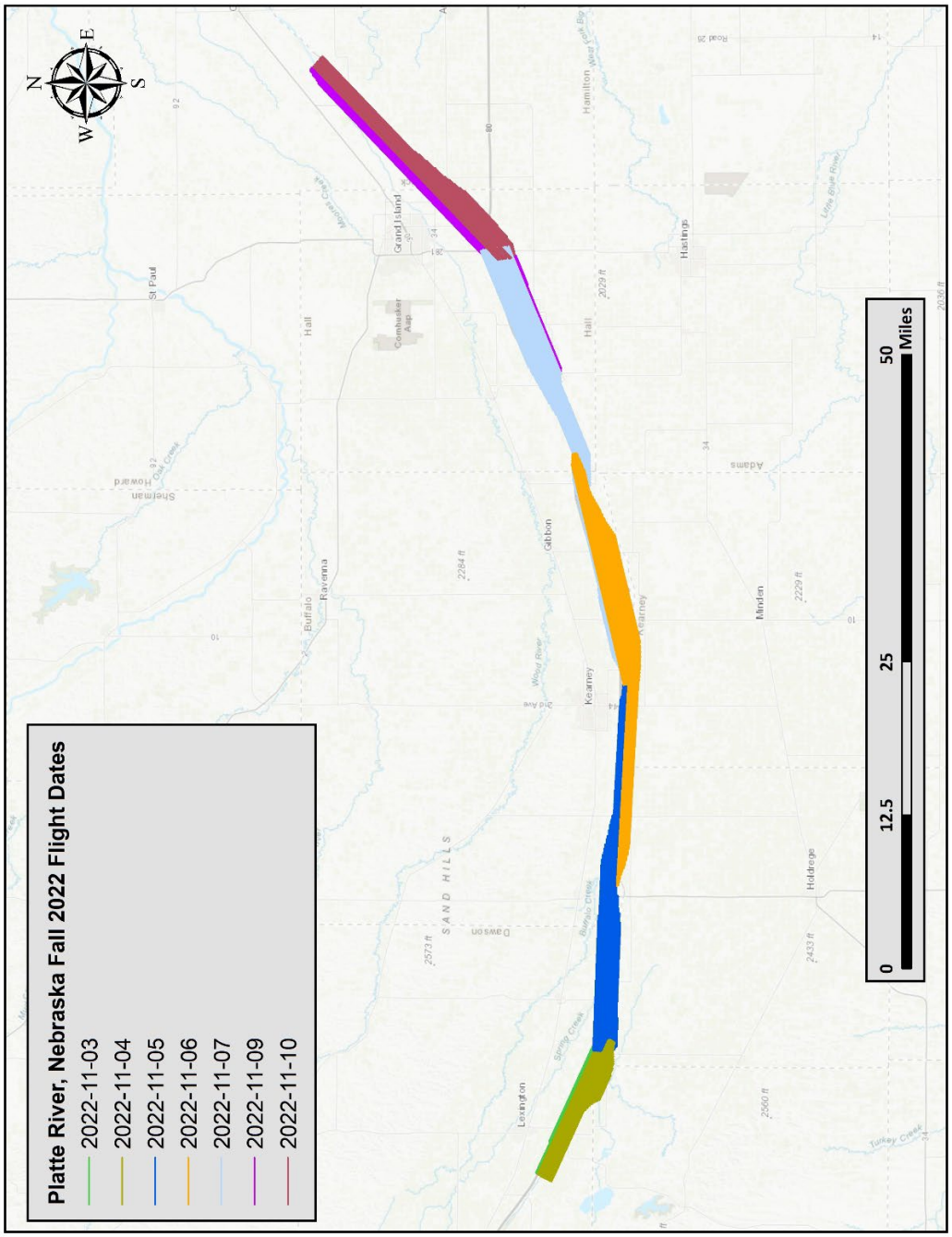


Figure 5: Flightline Survey Map

Ground Survey

Ground control surveys, including monumentation and ground survey points (GSPs), were conducted to support the airborne acquisition. Previously acquired ground control from Fall 2020 was used for calibration and to perform quality assurance checks on final lidar, while additional Fall 2022 ground control data were also used for quality assurance checks.

Base Stations

Base stations were used for collection of ground survey points using real time kinematic (RTK).

Base station locations were selected with consideration for satellite visibility, field crew safety, and optimal location for GSP coverage. For the Platte River Fall 2022 ground survey NV5 utilized two VRSNow reference stations, and two HxGN SmartNET reference stations (Table 5, Figure 6). For the Fall 2020 ground survey NV5 utilized two existing HxGN SmartNET reference stations, and three existing Trimble VRSNow reference stations (Table 6). NV5's professional land surveyor, Steven J. Hyde (NEPLS#769) oversaw and certified the ground survey.

Table 5: Nebraska CORS positions utilized for the Platte River Fall 2022 acquisition. Coordinates are on the NAD83 (2011) datum, epoch 2010.00

CORS ID	Latitude	Longitude	Ellipsoid (meters)	Network
NELN	40° 46' 05.66516"	-99° 42' 43.38894"	708.806	VRSNow
NEGN	40° 54' 37.07491"	-98° 22' 51.42422"	555.418	SmartNET
NEKY	40° 42' 38.93413"	-99° 04' 44.99783"	647.052	SmartNET

Table 6: Nebraska CORS positions utilized for the Platte River Fall 2020 ground survey. Coordinates are on the NAD83 (2011) datum, epoch 2010.00

CORS ID	Latitude	Longitude	Ellipsoid (meters)	Network
NEAA	40° 07' 56.78007"	-99° 22' 13.81927"	612.413	VRSNow
NEDO	40° 46' 39.11703"	-98° 22' 36.49354"	576.962	VRSNow
NELN	40° 46' 05.66516"	-99° 42' 43.38894"	708.806	VRSNow
NEGN	40° 54' 37.07491"	-98° 22' 51.42422"	555.418	SmartNET
NEKY	40° 42' 38.93413"	-99° 04' 44.99783"	647.052	SmartNET

To correct the continuously recorded onboard measurements of the aircraft position, NV5 utilized static Global Navigation Satellite System (GNSS) data collected at a 1 Hz recording frequency by the base station. During post-processing, the static GPS data were triangulated with nearby Continuously Operating Reference Stations (CORS) using the Online Positioning User Service (OPUS) to verify and update record positions as needed to align with the National Spatial Reference System (NSRS).

Ground Survey Points (GSPs)

For the Fall 2020 survey, ground survey points were collected using real time kinematic (RTK) survey techniques. For the Fall 2022 survey, ground survey points were collected using real time kinematic (RTK). For RTK surveys, a roving receiver receives corrections from a nearby base station or Real-Time Network (RTN) via radio or cellular network, enabling rapid collection of points with relative errors less than 1.5 cm horizontal and 2.0 cm vertical. RTK surveys record data while stationary for at least five seconds, calculating the position using at least three one-second epochs. All GSP measurements were made during periods with a Position Dilution of Precision (PDOP) of ≤ 3.0 with at least six satellites in view of the stationary and roving receivers. See Table 7 for NV5 ground survey equipment information.

GSPs were collected in areas where good satellite visibility was achieved on paved roads and other hard surfaces such as gravel or packed dirt roads. GSP measurements were not taken on highly reflective surfaces such as center line stripes or lane markings on roads due to the increased noise seen in the laser returns over these surfaces. GSPs were collected within as many flightlines as possible; however, the distribution of GSPs depended on ground access constraints and base station locations and may not be equably distributed throughout the study area.

Table 7: NV5 ground survey equipment identification

Receiver Model	Antenna	OPUS Antenna ID	Use	Year
Trimble R8	Integrated Antenna	TRM_R8_GNSS	Rover	2020
Trimble R12	Integrated Antenna	TRMR12	Rover	2022

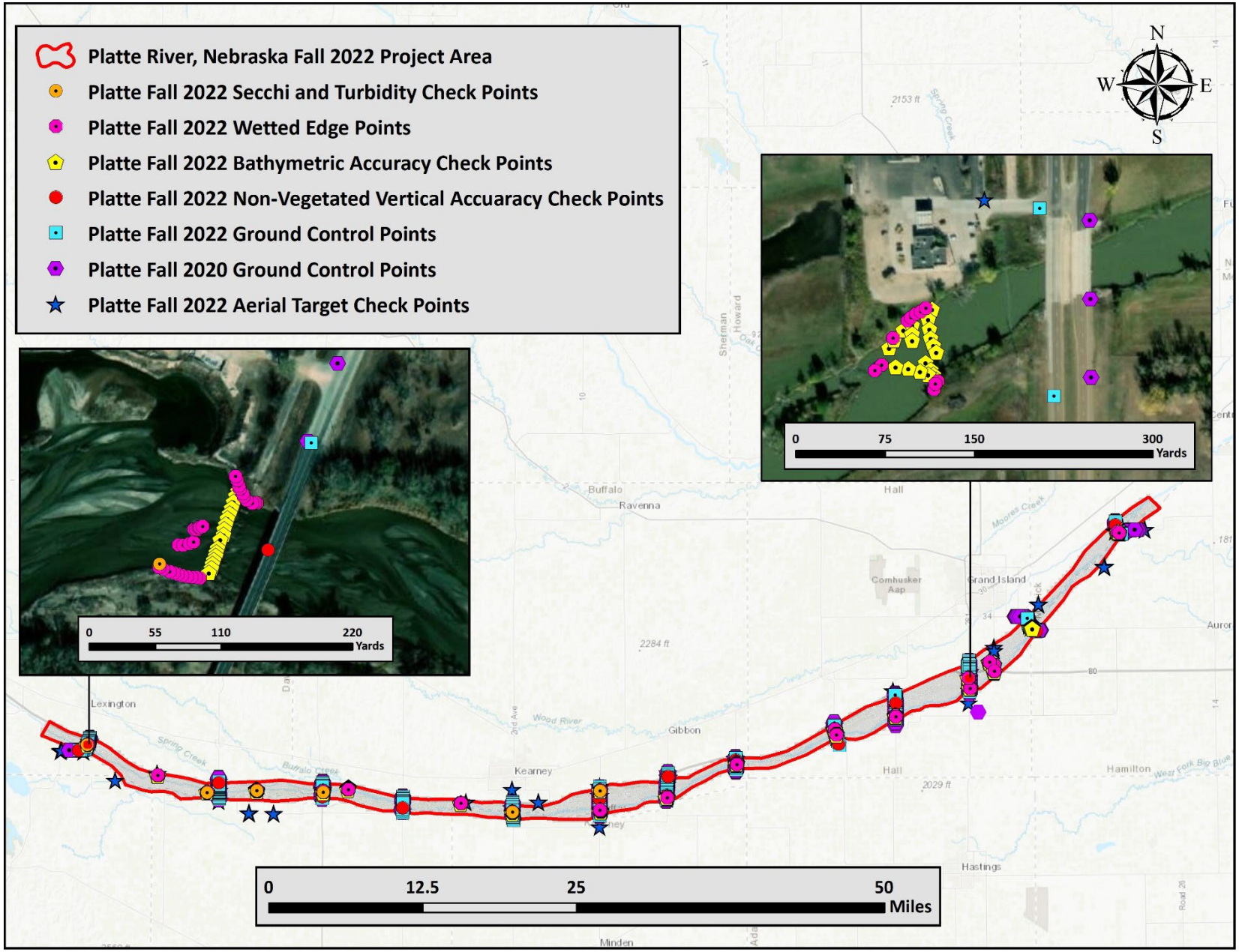
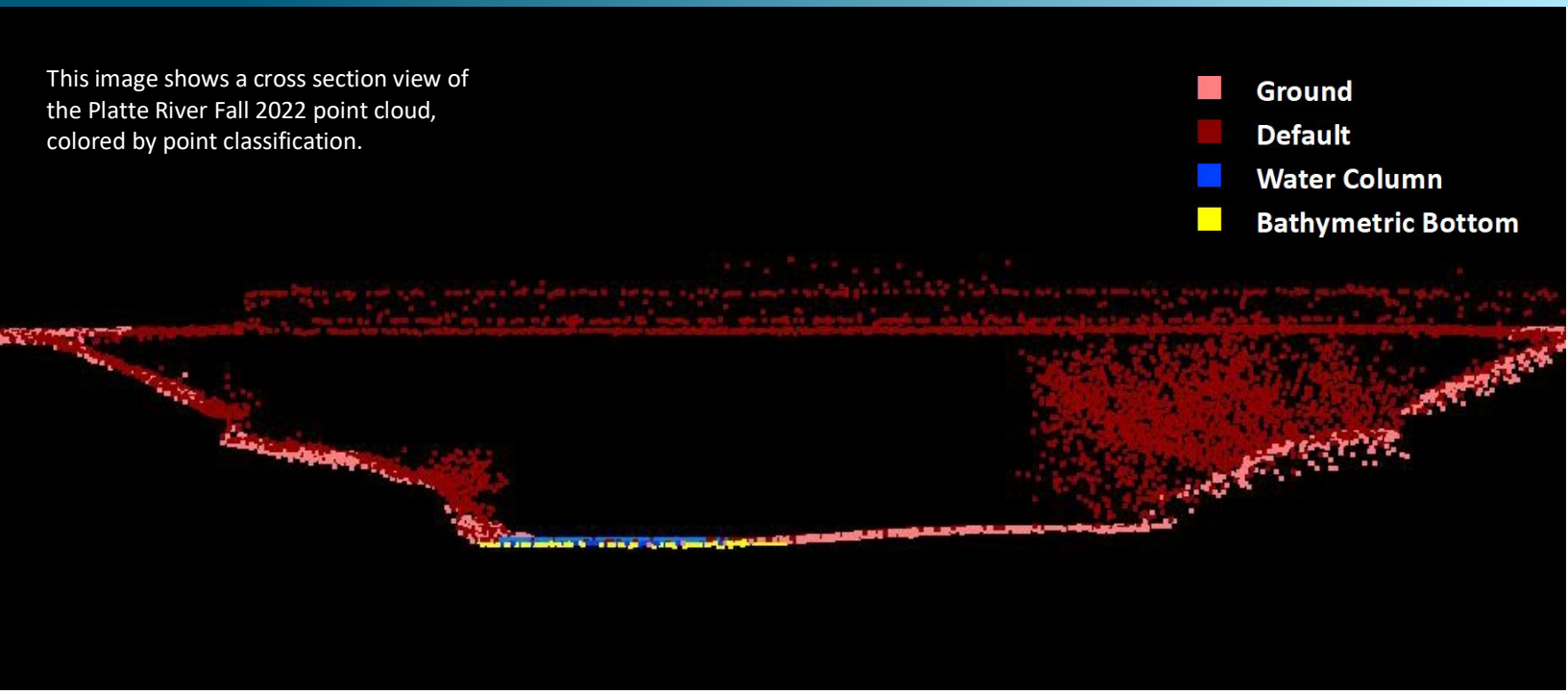


Figure 6: Ground Survey Location Map

This image shows a cross section view of the Platte River Fall 2022 point cloud, colored by point classification.



Topobathymetric Lidar Data

Upon completion of data acquisition, NV5 processing staff initiated a suite of automated and manual techniques to process the data into the requested deliverables. Processing tasks included GPS control computations, smoothed best estimate trajectory (SBET) calculations, kinematic corrections, calculation of laser point position, sensor and data calibration for optimal relative and absolute accuracy, and lidar point classification (Table 8).

Riegl's RiProcess software was used to facilitate bathymetric return processing. Once bathymetric points were differentiated, they were spatially corrected for refraction through the water column based on the angle of incidence of the laser. NV5 applied this refraction correction to water column points using NV5's proprietary LAS processing software, LAS Monkey. The resulting point cloud data were classified using both manual and automated techniques. Processing methodologies were tailored for the landscape. Brief descriptions of these tasks are shown in (Table 9).

Table 8: ASPRS LAS classification standards applied to the Platte River Fall 2022 dataset

Classification Number	Classification Name	Classification Description
1	Default/Unclassified	Laser returns that are not included in the ground class, composed of vegetation and anthropogenic features
1-O	Overlap/Edge Clip	Laser returns at the outer edges of flightlines that are geometrically unreliable
2	Ground	Laser returns that are determined to be ground using automated and manual cleaning algorithms
7	Noise	Laser returns that are often associated with birds, scattering from reflective surfaces, or artificial points below the ground surface
9	Water	NIR Laser returns that are determined to be water using automated and manual cleaning algorithms
40	Bathymetric Bottom	Refracted green sensor returns that fall within the water's edge breakline which characterize the submerged topography.
41	Water Surface	Green laser returns that are determined to be water surface points using automated and manual cleaning algorithms.
45	Water Column	Refracted green sensor returns that are determined to be water using automated and manual cleaning algorithms.

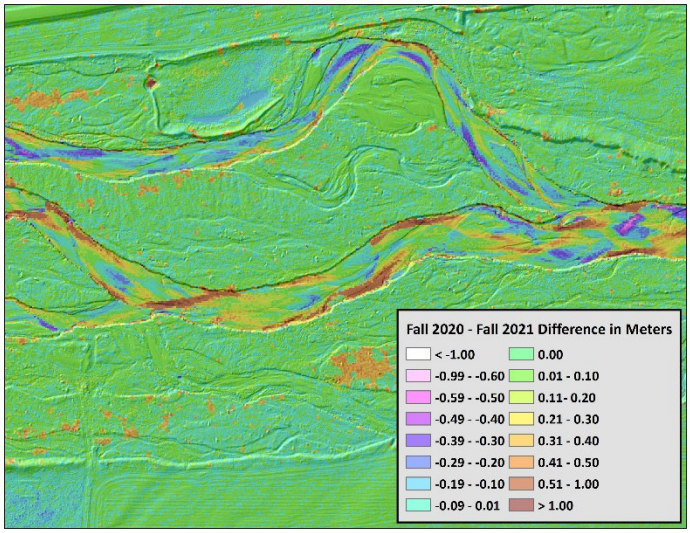
Lidar Calibration to Control Survey

The Platte River site experiences many geographical changes from year to year. Because the primary goal of the project is to map the changes within steam channel areas, it was determined that a single year of survey collection should be used as a primary reference dataset, in conjunction with the most current survey for both calibration and calculating accuracy statistics.

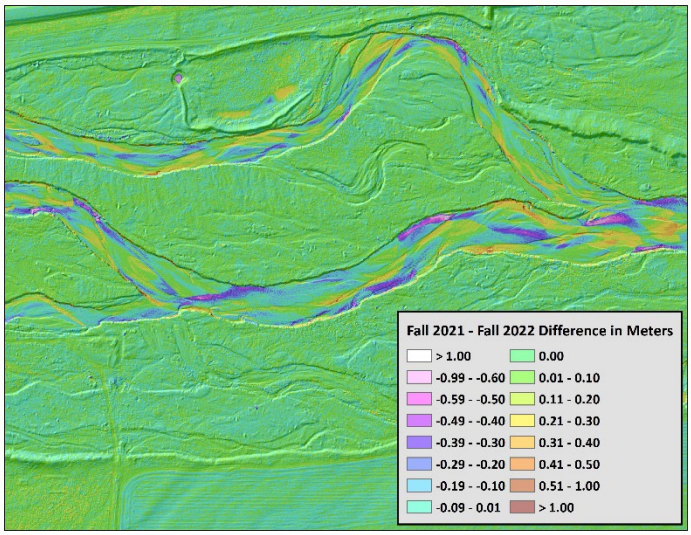
In accordance with NV5's change detection rework plan for the Platte River project, the Fall 2020 dataset and supporting ground survey control data were utilized as the primary control for the Platte River Fall 2022 topobathymetric lidar dataset. The decision to match Fall 2022's lidar data to the Fall 2020 "gold standard" survey control was based on Headwaters Corporation's paramount need to be able to compare the river's surface year-to-year relative to itself.

Lidar data was calibrated to the reference Fall 2020 dataset, and then compared to the Fall 2021 and 2022 ground surveys. During the QA/QC process, NV5 created difference rasters between the Fall 2020 and Fall 2022 datasets to check for alignment and to verify results after shifting the data to the Fall 2020 control (Figure 6).

A)



B)



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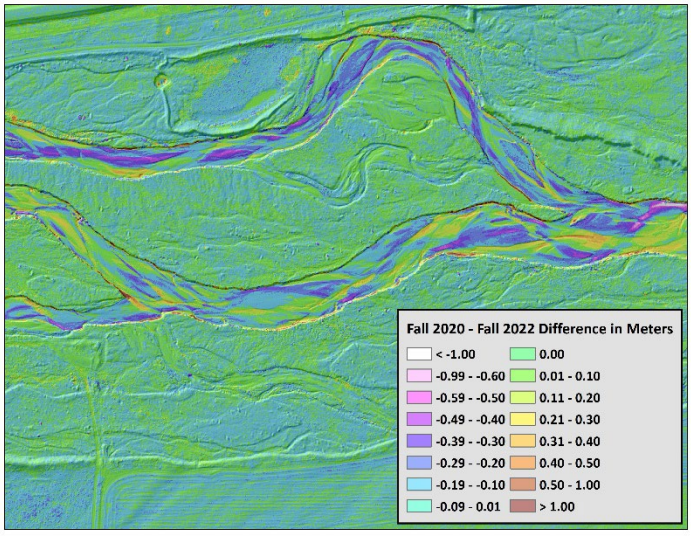


Figure 6: Raster Model displaying the difference, in meters, of the A) Fall 2020– Fall 2021, B) Fall 2021– Fall 2022, and C) Fall 2020– Fall 2022 bare earth surfaces

Table 9: Lidar processing workflow

Lidar Processing Step	Software Used
Resolve kinematic corrections for aircraft position data using kinematic aircraft GPS and static ground GPS data. Develop a smoothed best estimate of trajectory (SBET) file that blends post-processed aircraft position with sensor head position and attitude recorded throughout the survey.	POSPac MMS v.8.9
Calculate laser point position by associating SBET position to each laser point return time, scan angle, intensity, etc. Create raw laser point cloud data for the entire survey in *.las (ASPRS v. 1.4) format. Convert data to orthometric elevations by applying a geoid correction.	RiUnite v1.0.3
Using ground classified points per each flight line, test the relative accuracy. Perform automated line-to-line calibrations for system attitude parameters (pitch, roll, heading), and GPS/IMU drift. Calculate calibrations on ground classified points from paired flight lines and apply results to all points in a flight line. Use every flight line for relative accuracy calibration. Calibrate Fall 2022 Green channel to Fall 2020 reference data, and then Fall 2022 NIR to Fall 2022 Green data.	Bays-StripAlign v2.2.1
Import calibrated laser points into manageable blocks.	TerraScan v.19.005
Apply refraction correction to all subsurface returns.	Las Monkey 2.6.7 (NV5 proprietary software)
Classify resulting data to ground and other client designated ASPRS classifications (Table 8). Assess statistical absolute accuracy via direct comparisons of ground classified points to ground control survey data.	TerraScan v.19.005 TerraModeler v.19.003
Generate bare earth models as triangulated surfaces. Generate highest hit models as a surface expression of all classified points. Export all surface models in ERDAS Imagine (.img) format at a 3.0 foot pixel resolution.	Las Product Creator 4.0 (NV5 proprietary software) ArcMap v. 10.8
Export intensity images as GeoTIFFs at a 1.5 foot pixel resolution.	Las Product Creator 4.0 (NV5 proprietary software) ArcMap v. 10.8

Bathymetric Refraction Correction

Green lidar pulses refract as they enter the water column resulting in decreased speed of the light beam, which means that the position of the pulses needs to be corrected by accounting for this refraction. NV5 has developed proprietary software (Las Monkey) to perform this processing based on Snell's law. The first step is to develop a water surface model (WSM) from the NIR lidar water surface returns. The water surface model used for refraction is generated using NIR points within the breaklines defining the water's edge. Points are filtered and edited to obtain the most accurate representation of the water surface and are used to create a water surface model TIN. A TIN model is preferable to a raster based water surface model to obtain the most accurate angle of incidence during refraction.

Once the WSM is generated, the Las Monkey refraction software then intersects the partially submerged green pulses with the WSM to determine the angle of incidence with the water surface and the submerged component of the pulse vector. This provides the information necessary to correct the position of underwater points by adjusting the submerged vector length and orientation. After refraction, the points are compared against bathymetric check points to assess accuracy.

Lidar Derived Products

Because hydrographic laser scanners penetrate the water surface to map submerged topography, this affects how the data should be processed and presented in derived products from the lidar point cloud. The following discusses certain derived products that vary from the traditional (NIR) specification and delivery format.

Topobathymetric DEMs

Bathymetric bottom returns can be limited by depth, water clarity, and bottom surface reflectivity. Water clarity and turbidity affects the depth penetration capability of the green wavelength laser with returning laser energy diminishing by scattering throughout the water column. Additionally, the bottom surface must be reflective enough to return remaining laser energy back to the sensor at a detectable level. It is not unexpected to have no bathymetric bottom returns in turbid or non-reflective areas.

As a result, creating digital elevation models (DEMs) presents a challenge with respect to interpolation of areas with no returns. Traditional DEMs are "unclipped", meaning areas lacking ground returns are interpolated from neighboring ground returns (or breaklines in the case of hydro-flattening), with the assumption that the interpolation is close to reality. In bathymetric modeling, these assumptions are prone to error because a lack of bathymetric returns can indicate a change in elevation that the laser can no longer map due to increased depths. The resulting void areas may suggest greater depths, rather than similar elevations from neighboring bathymetric bottom returns. Therefore, NV5 created a water polygon with bathymetric coverage to delineate areas with successfully mapped bathymetry. This shapefile was used to control the extent of the delivered clipped topobathymetric model to avoid false triangulation (interpolation from TIN'ing) across areas in the water with no bathymetric returns.

Intensity Images

The difference in emitted wavelengths of the NIR (1064 nm) and Green (532 nm) lasers results in variation of the intensity information returned to the sensor for each laser. Additionally, the near-infrared wavelength is subject to spectral absorption by water, which can result in no returns over water surfaces. Due to these factors, NV5 created one set of intensity images from NIR laser first returns, as well as one set of intensity images from green laser first returns.

With bathymetric lidar a more detailed and informative intensity image can be created by using all or selected point classes, rather than relying on return number alone. If intensity information of the bathymetry is the primary goal, water surface and water column points can be excluded. However, water surface and water column points often contain potentially useful information about turbidity and submerged but unclassified features such as vegetation. For the Platte River Fall 2022 project, NV5 created one set of intensity images from NIR laser first returns, as well as one set of intensity images from green laser returns. Green laser intensity images were created using first returns over terrestrial areas only, as well as all water column and bathymetric bottom points in order to display more detail in intensity values (Figure 7).

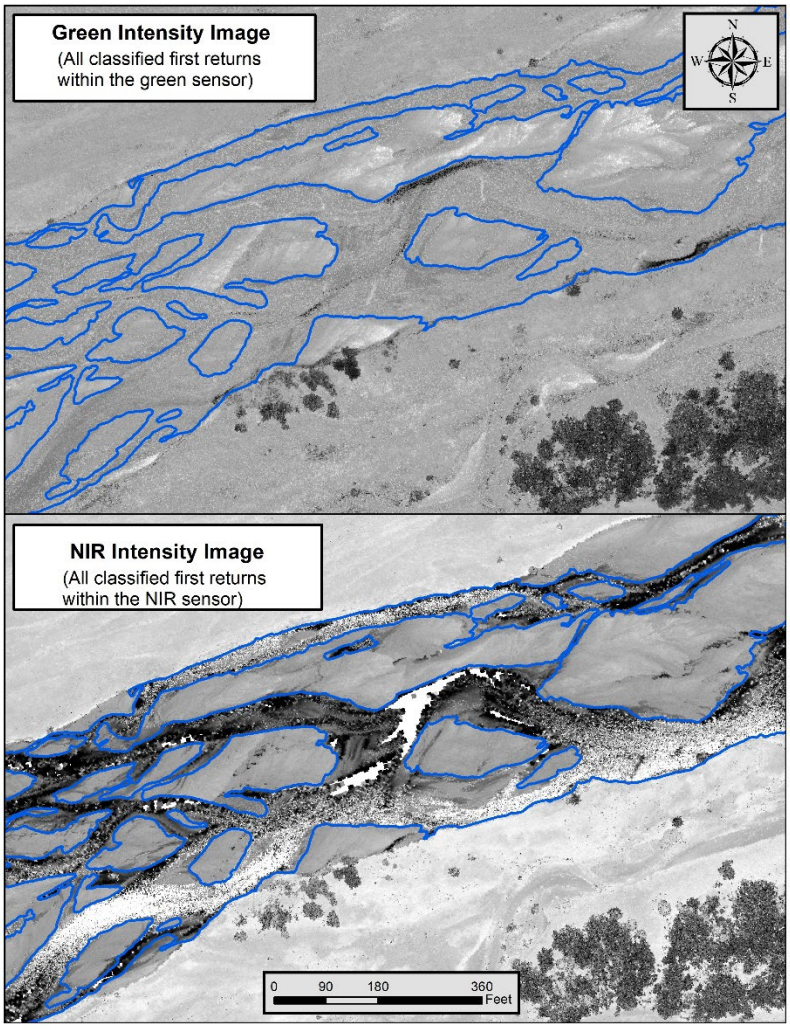


Figure 7: A comparison of Intensity Images from Green and NIR returns in the Platte River area

Hydro-flattening and Water's Edge Breaklines

Hydro-flattening of closed water bodies was performed through a combination of automated and manual detection and adjustment techniques designed to identify water boundaries and water levels. Boundary polygons were developed using an algorithm which weights lidar-derived slopes, intensities, and return densities to detect the water's edge. The water edges were then manually reviewed and edited as necessary.

For the Platte River Fall 2022 project area, all off channel waterbodies greater than 2 acres were flattened to a consistent water level. The hydro-flattening process eliminates artifacts in the digital terrain model caused by both increased variability in ranges or dropouts in laser returns due to the low reflectivity of water. Once polygons were developed, the initial ground classified points falling within water polygons were reclassified as water points to omit them from the final ground model. Elevations were then obtained from the filtered lidar returns to create the final breaklines.

Water boundary breaklines were then incorporated into the hydro-flattened DEM by enforcing triangle edges (adjacent to the breakline) to the elevation values of the breakline. This implementation corrected interpolation along the hard edge. Water surfaces were obtained from a TIN of the 3-D water edge breaklines resulting in the final hydro-flattened model (Figure 8).

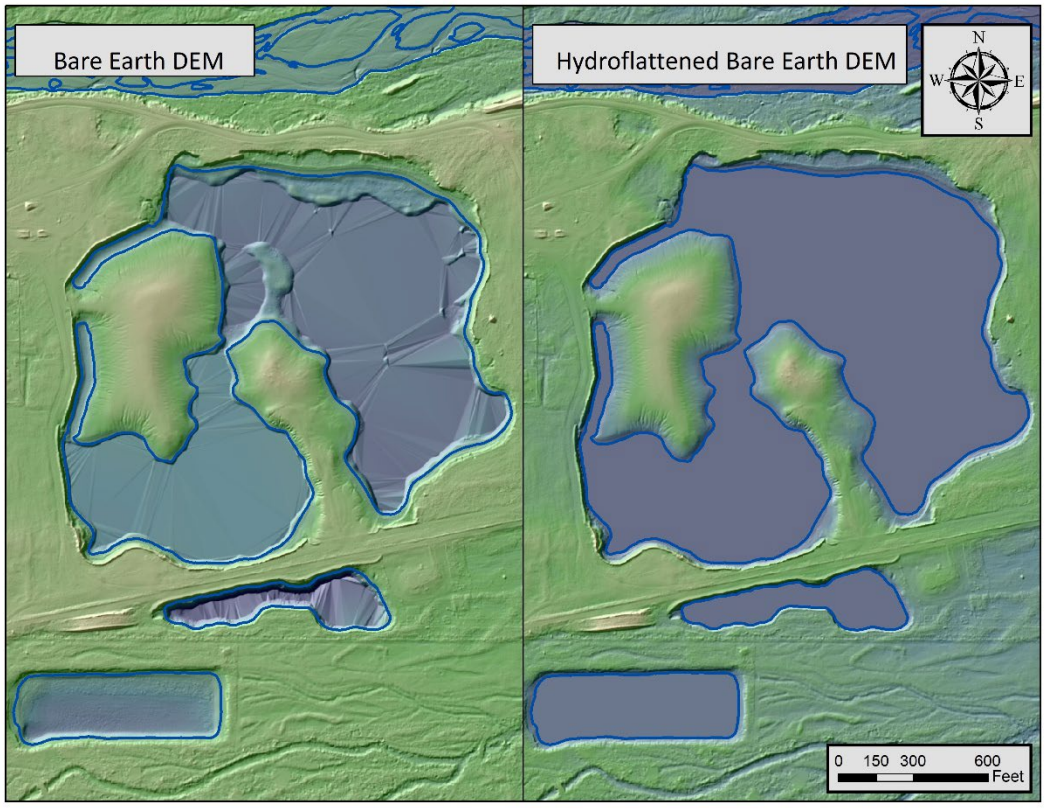
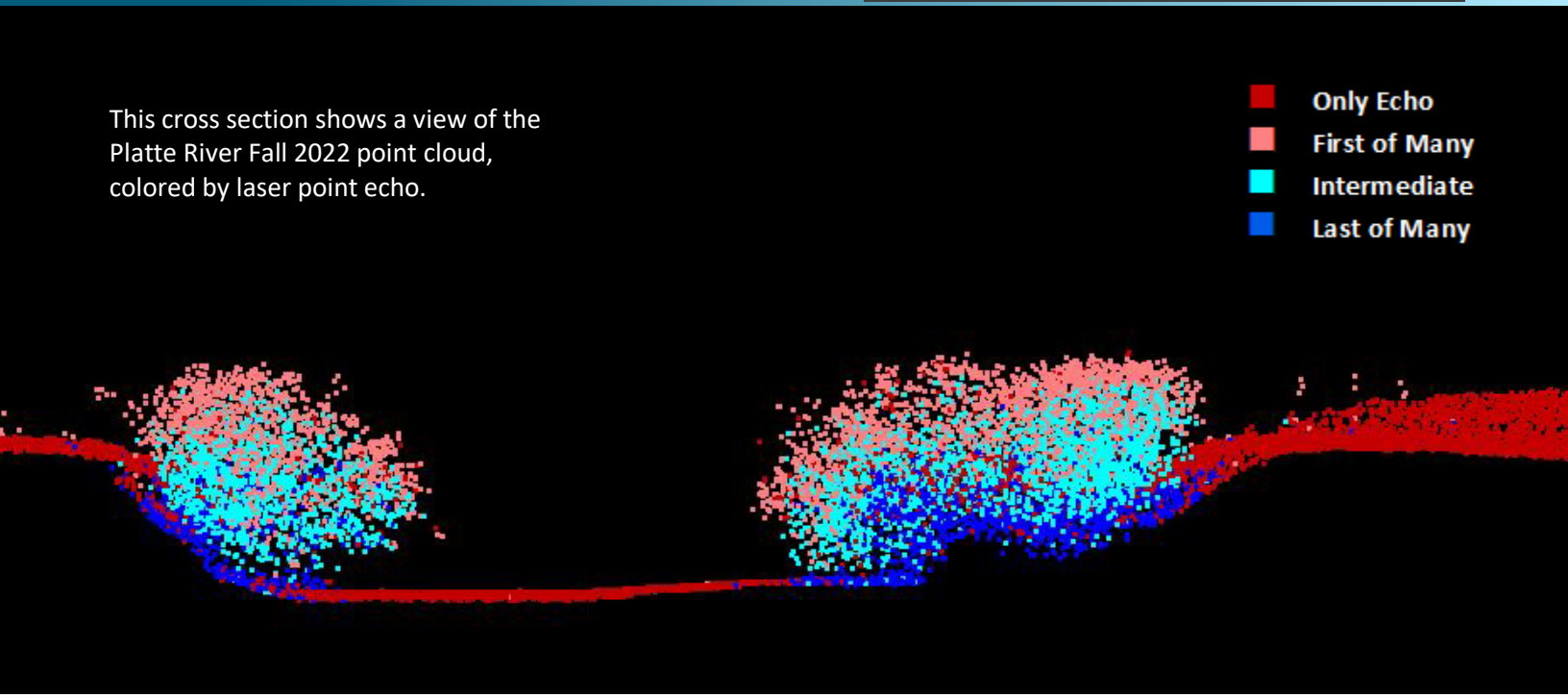


Figure 8: Example image of hydroflattening done for the Platte River Fall 2022 Lidar dataset

This cross section shows a view of the Platte River Fall 2022 point cloud, colored by laser point echo.



Bathymetric Lidar

An underlying principle for collecting hydrographic lidar data is to survey near-shore areas that can be difficult to collect with other methods, such as multi-beam sonar, particularly over large areas. In order to determine the capability and effectiveness of the bathymetric lidar, several parameters were considered including bathymetric return density, mapped depth, and spatial accuracy.

Mapped Bathymetry, Coverage and Depth

The specified depth penetration range of the Riegl VQ-880-GII sensor is 1.5 secchi depths. For the Fall 2022 data collection, the minimum secchi depth recorded as accessible locations was 3.05 centimeters (0.10 feet) while the maximum secchi depth recorded was 24.08 centimeters (0.79 feet). The maximum depth recorded for the Platte River Fall 2022 survey was 615.4 centimeters (20.19 feet). Figure 10 shows the depths in a section of the Platte River Fall 2022 project area.

This shapefile was used to control the extent of the delivered clipped topobathymetric model and to avoid false triangulation across areas in the water with no returns. Areas with no bathymetric bottom returns (voids), were identified by triangulating bathymetric bottom points with an edge length maximum of 15.2 feet. This ensured all areas of no returns (> 97 ft^2), were identified as data voids.

In total, 73.3% of the Platte River Fall 2022 topobathy project area was mapped as “covered”. A comparison throughout the years for bathymetric coverage is shown in Table 11 , while the depth comparison is shown in Table 10 and Figure 9.

Table 10: Depth coverage Comparizon between Fall 2020, 2021, and 2022 Acquisitions

Percent Mapped			
Depth (feet)	**Fall 2020 Depth Mapped**	**Fall 2021 Depth Mapped**	**Fall 2022 Depth Mapped**
Shallow	21.1%	17.9%	25.87%
0.11 – 1.00	69.5%	64.2%	59.85%
1.01 – 2.00	7.4%	11.7%	6.50%
2.01 – 3.00	1.1%	2.4%	2.58%
3.01 – 4.00	0.4%	1.0%	1.54%
4.01 – 5.00	0.1%	0.7%	0.96%
> 5.00	0.3%	2.1%	2.71%

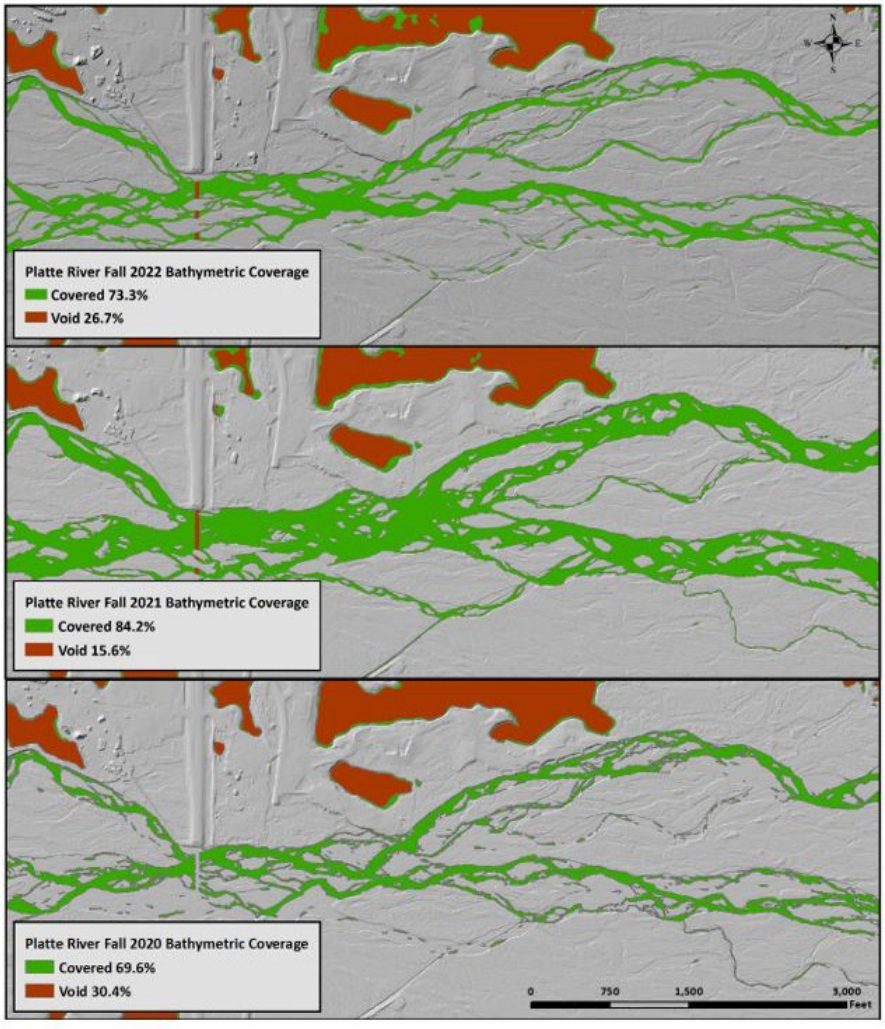


Figure 9: Comparison image of bathymetric coverage of the Platte River Fall 2022, 2021, and 2020 datasets.

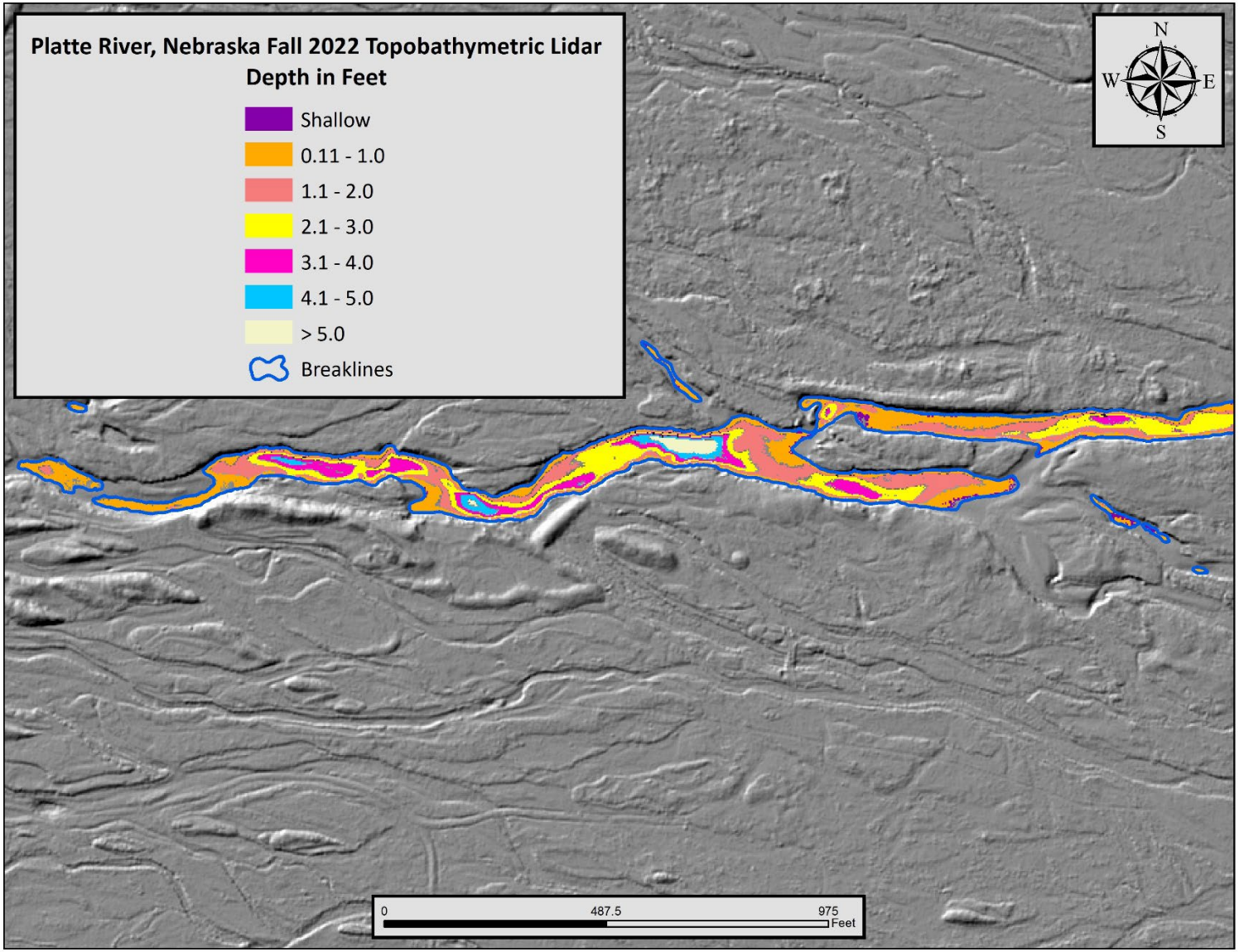


Figure 10: 2022 depth model showing a section of the Platte River Fall

Table 11: Bathymetric Coverage by Year

Data Collection Year	Total Water (acres)	Covered (acres)	Void (acres)	Covered (%)	Void (%)
2016	7,668.15	6,182.83	1,485.32	80.63%	19.37%
2017	7,465.07	5,816.21	1,648.86	77.91%	22.09%
2018	6,940.51	5,292.10	1,648.41	76.25%	23.75%
2019	12,610.03	10,996.20	1,613.83	87.20%	12.80%
2020	5,369.20	3,735.98	1,633.22	69.58%	30.42%
2021	8,691.98	7,319.71	1,372.27	84.21%	15.79%
2022	5,396.61	3,955.78	1,440.83	73.33%	26.70%

First Return Lidar Point Density

The acquisition parameters were designed to acquire an average first-return density of 8 points/m^2. First return density describes the density of pulses emitted from the laser that return at least one echo to the system. Multiple returns from a single pulse were not considered in first return density analysis. Some types of surfaces (e.g., breaks in terrain, water and steep slopes) may have returned fewer pulses than originally emitted by the laser.

First returns typically reflect off the highest feature on the landscape within the footprint of the pulse. In forested or urban areas the highest feature could be a tree, building or power line, while in areas of unobstructed ground, the first return will be the only echo and represents the bare earth surface.

The average first-return density of the Platte River Fall 2022 lidar project was 2.81 points/ft^2 (30.27 points/m^2) (Table 12). The statistical and spatial distributions of all first return densities per 100 m x 100 m cell are portrayed in Figure 11 and Figure 13.

Bathymetric and Ground Classified Lidar Point Densities

The density of ground classified Lidar returns and bathymetric bottom returns were also analyzed for this project. Terrain character, land cover, and ground surface reflectivity all influenced the density of ground surface returns. In vegetated areas, fewer pulses may have penetrated the canopy, resulting in lower ground density. Similarly, the density of bathymetric bottom returns was influenced by turbidity, depth, and bottom surface reflectivity. In turbid areas, fewer pulses may have penetrated the water surface, resulting in lower bathymetric density.

The ground and bathymetric bottom classified density of lidar data for the Platte River Fall 2022 project was 1.32 points/ft^2 (14.21 points/m^2) (Table 12). The statistical and spatial distributions for ground classified and bathymetric bottom return densities per 100 m x 100 m cell are portrayed in Figure 12 and Figure 13.

Additionally, for the Platte River Fall 2022 project, density values of only bathymetric bottom returns were calculated for areas containing at least one bathymetric bottom return. Areas lacking bathymetric returns (voids)were not considered in calculating an average density value. Within the successfully mapped area, a bathymetric bottom return density of 1.10 points/ft^2 (11.80 points/m^2) was achieved.

Table 12: Average Lidar point densities

Density Type	Point Density
First Returns	2.81 points/ft² 30.27 points/m²
Ground and Bathymetric Bottom Classified Returns	1.32 points/ft² 14.21 points/m²
Bathymetric Bottom Classified Returns	1.10 points/ft² 11.80 points/m²

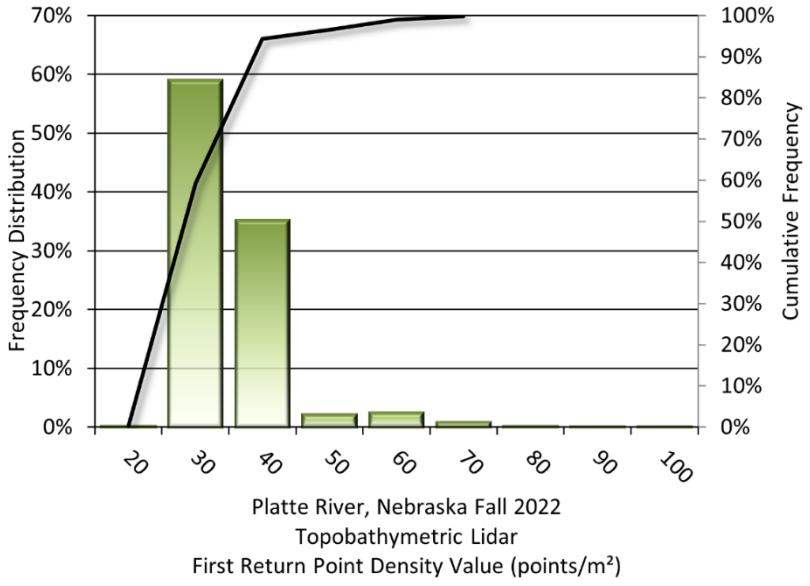


Figure 11: Frequency distribution of first return densities per 100 x 100 m cell

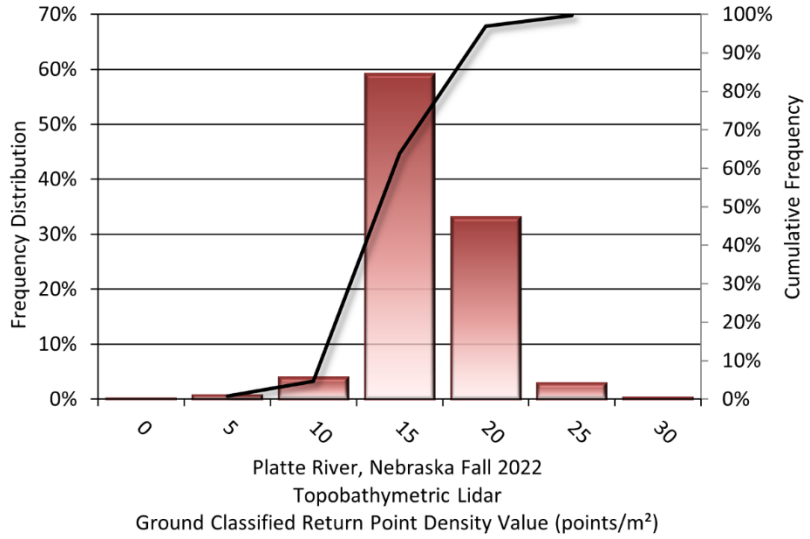


Figure 12: Frequency distribution of ground and bathymetric bottom classified return densities per 100 x 100 m cell

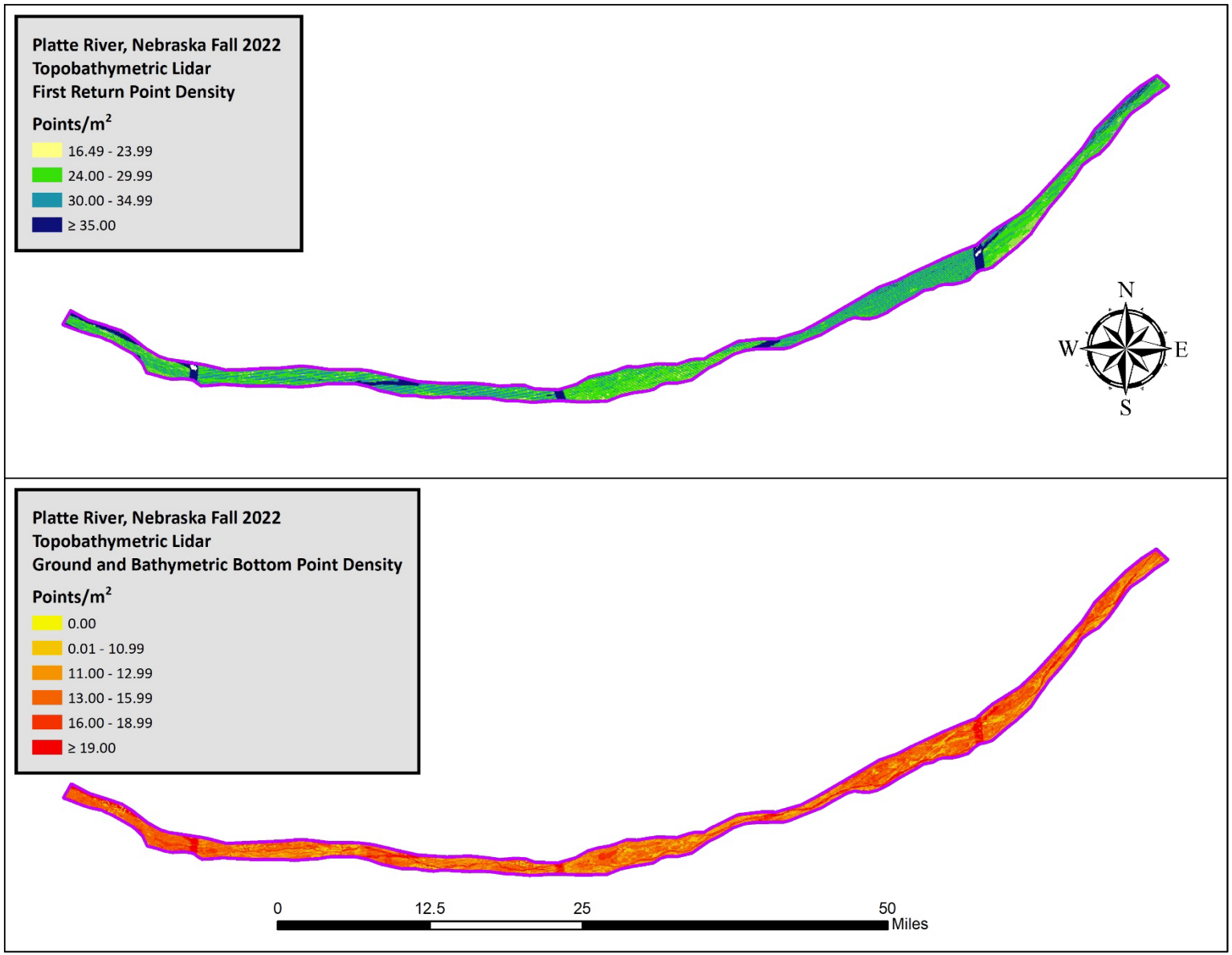


Figure 13: First return and ground and bathymetric bottom density map for the Platte River Fall 2022 lidar site (100 m x 100 m cells)

Lidar Accuracy Assessments

The accuracy of the lidar data collection can be described in terms of absolute accuracy (the consistency of the data with external data sources) and relative accuracy (the consistency of the dataset with itself). See Appendix A for further information on sources of error and operational measures used to improve relative accuracy.

Lidar Non-Vegetated Vertical Accuracy

Absolute accuracy was assessed using Non-vegetated Vertical Accuracy (NVA) reporting designed to meet guidelines presented in the FGDC National Standard for Spatial Data Accuracy[1]. NVA compares known ground check point data that were withheld from the calibration and post-processing of the lidar point cloud to the triangulated surface generated by the unclassified lidar point cloud. NVA is a measure of the accuracy of lidar point data in open areas where the lidar system has a high probability of measuring the ground surface and is evaluated at the 95% confidence interval (1.96 * RMSE), as shown in Table 13.

The mean and standard deviation (sigma σ) of divergence of the ground surface model from ground check point coordinates are also considered during accuracy assessment. These statistics assume the error for x, y and z is normally distributed, and therefore the skew and kurtosis of distributions are also considered when evaluating error statistics.

For the Platte Fall 2022 project, absolute accuracy statistics derived from the Fall 2020 and Fall 2022 ground surveys were assessed independently due to variations observed in the multi-year ground surveys, as discussed at the end of this section. The Fall 2022 data was calibrated to the Fall 2020 lidar dataset and ground survey. This approach will help ensure year-over-year consistency between bathymetric and topographic lidar returns for accurately modeling temporal changes to the Platte River channel; however, this approach also led to some accuracy statistics displaying higher than usual deviations between the lidar data and survey points.

Absolute Accuracy – Fall 2020 Ground Survey

Using the Fall 2020 ground survey to assess the Fall 2022 lidar data, 14 ground check points were withheld from the calibration and post-processing of the lidar point cloud, with resulting NVA of 0.158 feet (0.048 meters) as compared to the classified LAS, with 95% confidence (Figure 14 and Table 13).

NV5 also assessed absolute accuracy using 717 ground control points. Although these points were used in the calibration and post-processing of the lidar point cloud, they still provide a good indication of the overall accuracy of the lidar dataset, and therefore have been provided in Table 13 and Figure 15. Appendix B details the point offsets for the Platte Fall 2022 lidar as compared to the Fall 2020 ground survey data (Table 18 through Table 19).

[1] Federal Geographic Data Committee, ASPRS POSITIONAL ACCURACY STANDARDS FOR DIGITAL GEOSPATIAL DATA EDITION 1, Version 1.0, NOVEMBER 2014. https://www.asprs.org/a/society/committees/standards/Positional_Accuracy_Standards.pdf.

Table 13: Absolute vertical accuracy results - Fall 2022 lidar collection compared to Fall 2020 Survey

Absolute Vertical Accuracy – 2022 vs 2020 Survey		
	NVA, as compared to Classified LAS	**Ground Control Points**
Sample	14 points	717 points
95% Confidence (1.96*RMSE)	0.158 ft 0.048 m	0.234 ft 0.071 m
Average	-0.016 ft -0.005 m	0.003 ft 0.001 m
Median	-0.010 ft -0.003 m	0.003 ft 0.001 m
RMSE	0.081 ft 0.025 m	0.120 ft 0.036 m
Standard Deviation (1σ)	0.082 ft 0.025 m	0.120 ft 0.036 m

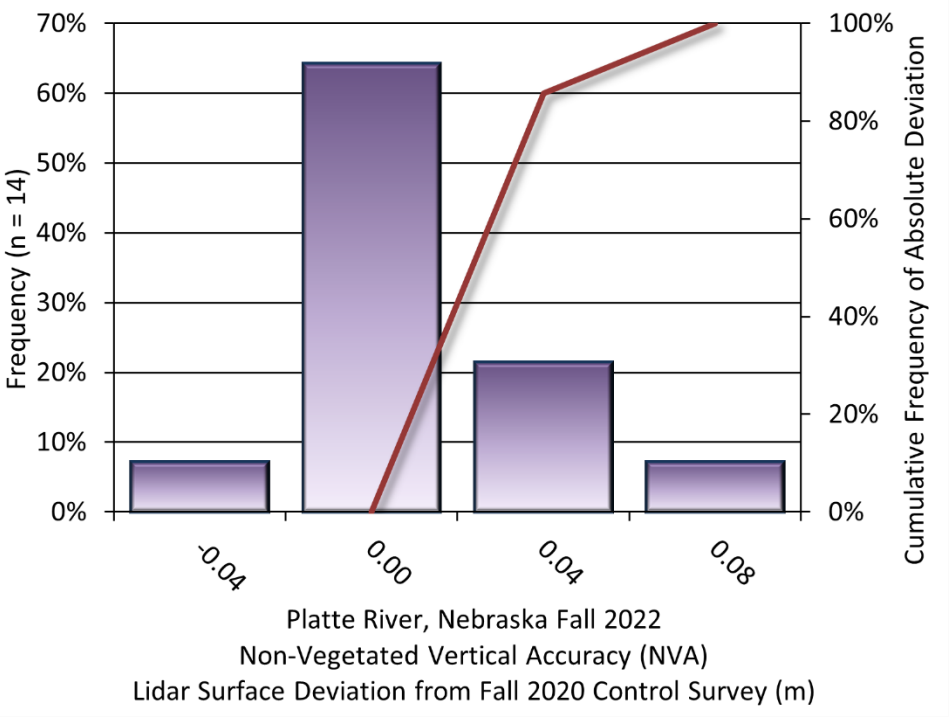


Figure 14: Frequency histogram for unclassified LAS deviation from ground check point values

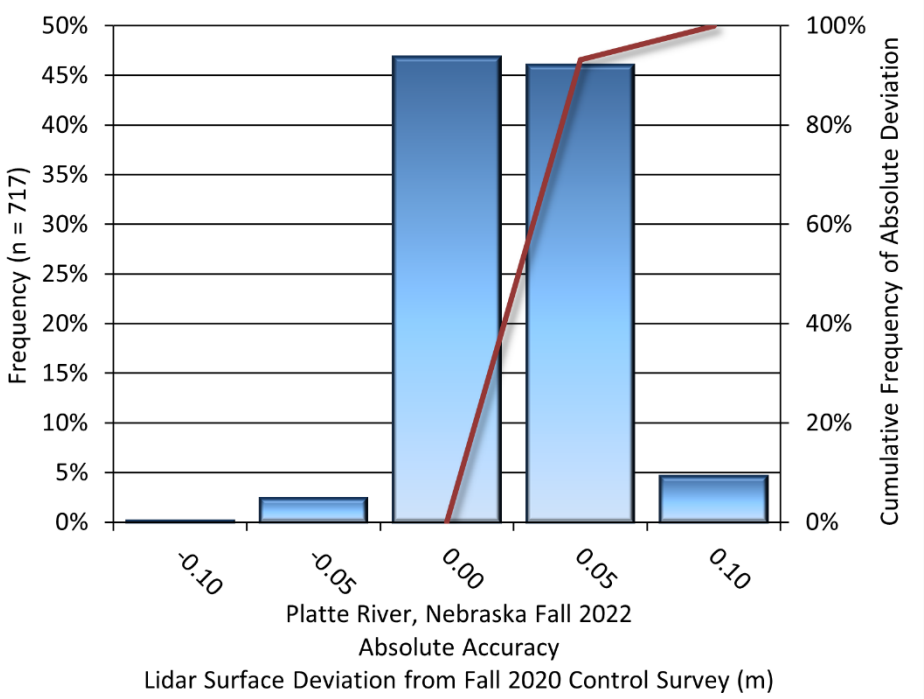


Figure 15: Frequency histogram for lidar surface deviation ground check point values

Absolute Accuracy – Fall 2022 Ground Survey

Absolute accuracy of the Fall 2022 lidar data was also assessed against the Fall 2022 ground survey control points and check points. These points were not used for the calibration of the Fall 2022 data and provide a good assessment of the data relative to current conditions.

For the Fall 2022 ground survey, 15 ground check points were evaluated, with resulting NVA of 0.174 feet (0.053 meters) as compared to the classified LAS, and 0.168 feet (0.051 meters) as compared to the bare earth DEM, with 95% confidence (Table 14, Figure 16, and Figure 17). NV5 also assessed absolute accuracy using 321 ground control points (Table 14, Figure 18), with resulting absolute accuracy of 0.174 feet (0.053 meters).

Appendix C details the point offsets for the Platte Fall 2022 lidar as compared to the Fall 2022 ground survey data (Table 20 through Table 22).

Table 14: Absolute accuracy results - Fall 2022 lidar collection compared to Fall 2022 Survey

Absolute Vertical Accuracy – 2022 vs. 2022 Survey			
	NVA, as compared to Classified LAS	**NVA, as compared to Bare Earth DEM**	**Ground Control Points**
Sample	15 points	15 points	321 points
95% Confidence (1.96*RMSE)	0.174 ft 0.053 m	0.168 ft 0.051 m	0.174 ft 0.053 m
Average	0.021 ft 0.007 m	0.015 ft 0.005 m	-0.002 ft -0.001 m
Median	0.049 ft 0.015 m	0.056 ft 0.017 m	0.010 ft 0.003 m
RMSE	0.089 ft 0.027 m	0.086 ft 0.026 m	0.089 ft 0.027 m
Standard Deviation (1σ)	0.089 ft 0.027 m	0.087 ft 0.027 m	0.089 ft 0.027 m

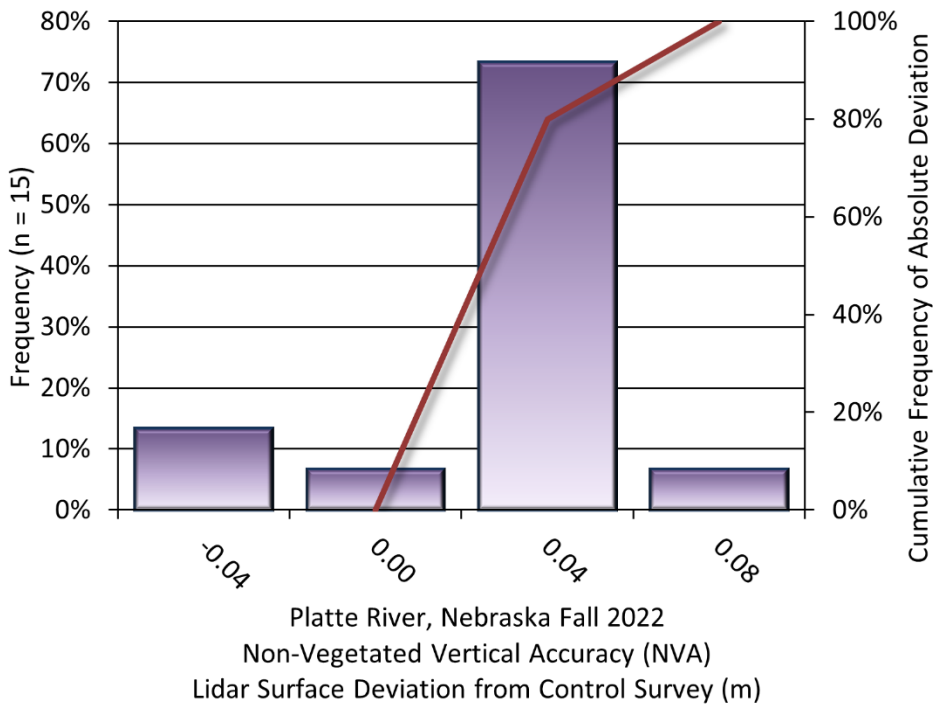


Figure 16: Frequency histogram for classified LAS deviation from ground check point values

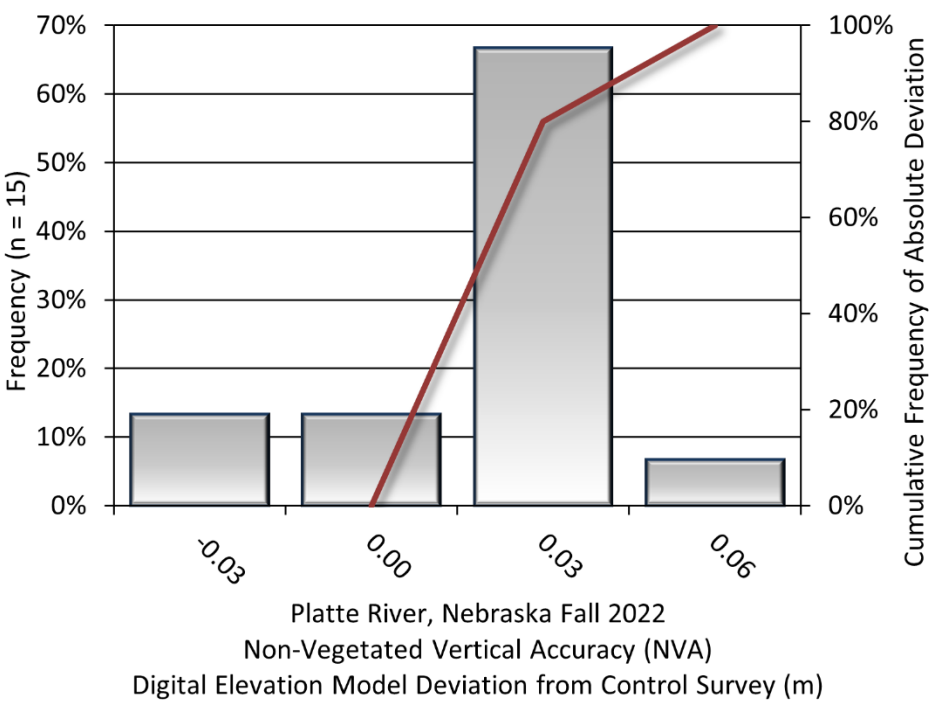


Figure 17: Frequency histogram for lidar bare earth DEM deviation from ground check point values

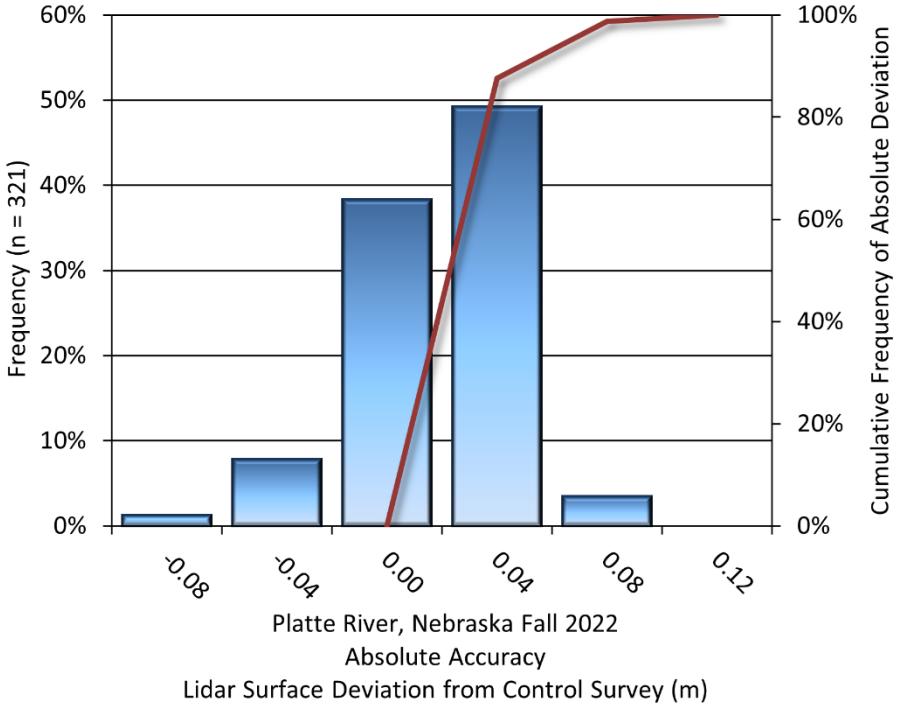


Figure 18: Frequency histogram for lidar surface deviation ground control point values

Lidar Bathymetric Vertical Accuracies

Bathymetric (submerged or along the water's edge) check points were also collected in order to assess the submerged surface vertical accuracy. Assessment of 532 submerged bathymetric check points resulted in a vertical accuracy of 0.469 feet (0.143 meters), while assessment of 440 wetted edge check points resulted in a vertical accuracy of 0.280 feet (0.085 meters), evaluated at 95% confidence interval (Table 15, Figure 19 and Figure 20).

Table 15: Bathymetric Vertical Accuracy for the Platte River Fall 2022 Project

Bathymetric Vertical Accuracy (VVA)		
	Submerged Bathymetric Check Points	**Wetted Edge Bathymetric Check Points**
Sample	532 points	440 points
95% Confidence (1.96*RMSE)	0.469 ft 0.143 m	0.280 ft 0.085 m
Average Dz	0.052 ft 0.016 m	0.041 ft 0.013 m
Median	0.036 ft 0.011 m	0.036 ft 0.011 m
RMSE	0.239 ft 0.073 m	0.143 ft 0.043 m
Standard Deviation (1σ)	0.233 ft 0.071 m	0.137 ft 0.042 m

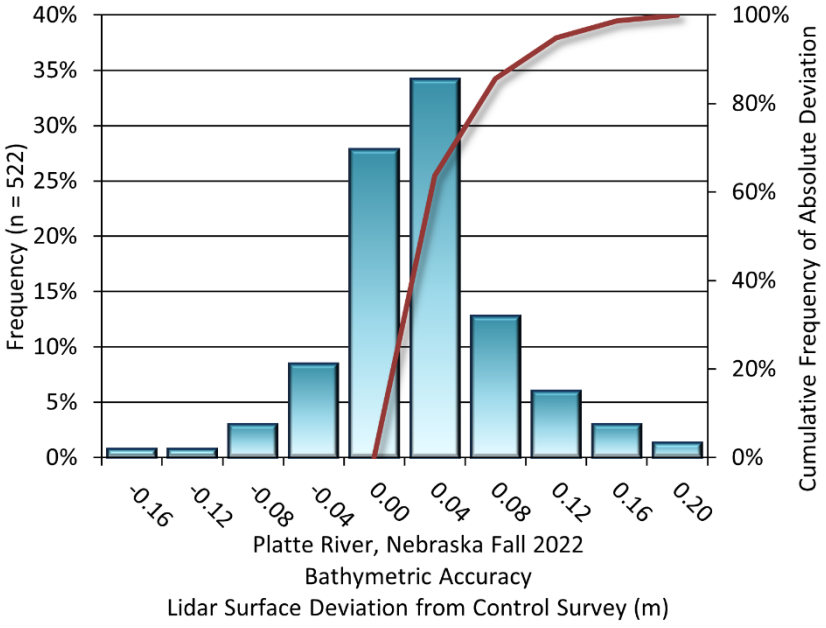


Figure 19: Frequency histogram for lidar surface deviation from submerged check point values

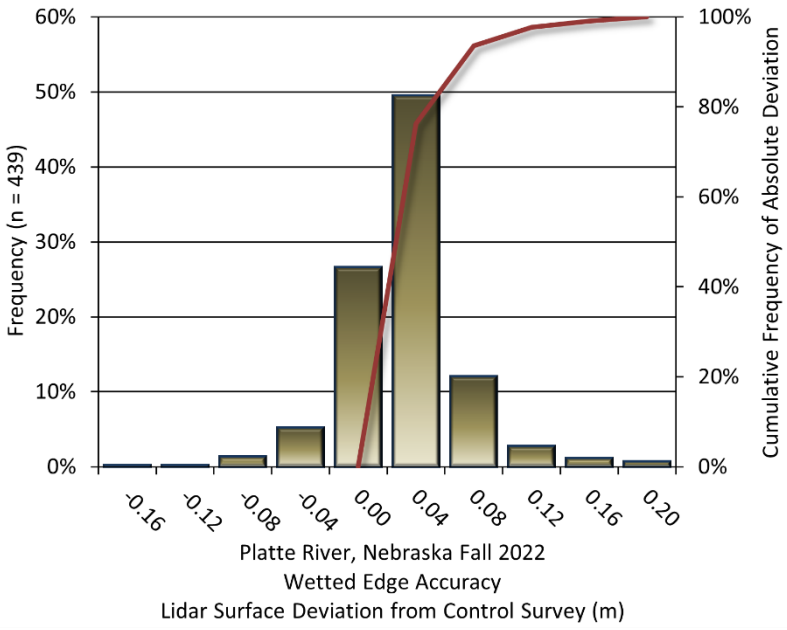


Figure 20: Frequency histogram for lidar surface deviation from wetted edge check point values

Lidar Relative Vertical Accuracy

Relative vertical accuracy refers to the internal consistency of the data set as a whole: the ability to place an object in the same location given multiple flight lines, GPS conditions, and aircraft attitudes. When the lidar system is well calibrated, the swath-to-swath vertical divergence is low (<0.10 meters). The relative vertical accuracy was computed by comparing the ground surface model of each individual flight line with its neighbors in overlapping regions. The average (mean) line to line relative vertical accuracy for the Platte River Fall 2022 lidar project was 0.022 feet (0.072 meters) (Table 16, Figure 21).

Table 16: Relative accuracy results

Relative Accuracy	
Sample	336 flight line surfaces
Average	0.072 ft 0.022 m
Median	0.071 ft 0.022 m
RMSE	0.072 ft 0.022 m
Standard Deviation (1σ)	0.006 ft 0.002 m
1.96σ	0.012 ft 0.004 m

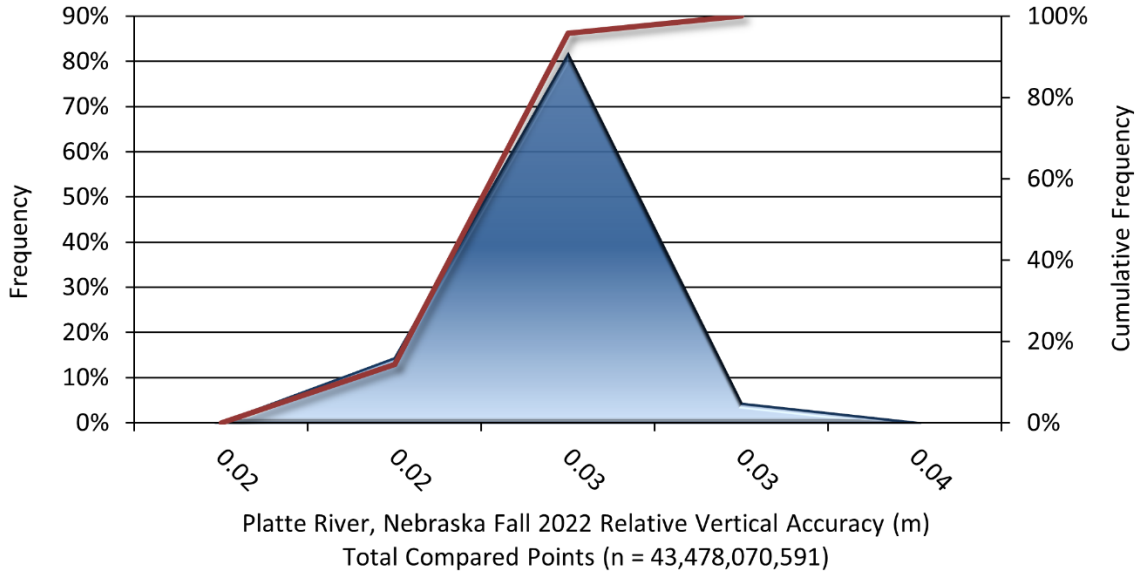


Figure 21: Frequency plot for relative vertical accuracy between flight lines

Lidar Horizontal Accuracy

Lidar horizontal accuracy is a function of Global Navigation Satellite System (GNSS) derived positional error, flying altitude, and INS derived attitude error. The obtained $RMSE_r$ value is multiplied by a conversion factor of 1.7308 to yield the horizontal component of the National Standards for Spatial Data Accuracy (NSSDA) reporting standard where a theoretical point will fall within the obtained radius 95 percent of the time. Based on a flying altitude of 450 meters, an IMU error of 0.002 decimal degrees, and a GNSS positional error of 0.023 meters, this project was produced to meet 0.21 feet (0.06 m) horizontal accuracy at the 95% confidence level (Table 17).

Table 17: Horizontal Accuracy

Horizontal Accuracy	
$RMSE_r$	0.12 ft 0.04 m
ACC_r	0.21 ft 0.06 m

CERTIFICATIONS

NV5 provided lidar services for the Platte River Fall 2022 project as described in this report.

I, Tucker Selko, have reviewed the attached report for completeness and hereby state that it is a complete and accurate report of this project.

Tucker Selko
Tucker Selko (May 11, 2023 12:00 PDT)

May 11, 2023

Tucker Selko
Project Manager
NV5

I , Steven J. Hyde, PLS, being duly registered as a Professional Land Surveyor in and by the state Nebraska, hereby certify that the methodologies, static GNSS occupations used during airborne flights and ground surver point collection were performed using commonly accepted Standard Practices. Work for the Fall 2022 airborne survey was conducted between November 3rd through the 9th, 2022. Field work for the Fall 2022 ground survey was conducted on November 7 – 21, 2022.

Accuracy statistics shown in the Accuracy Section of this Report have been reviewed by me and found to meet the " National Standard for Spatial Data Accuracy."

Steven J. Hyde Digitally signed by Steven J. Hyde Date: 2023.05.18 19:02:00 -04'00'

Steven J. Hyde
NE PLS # 769
St. Petersburg, FL 33716

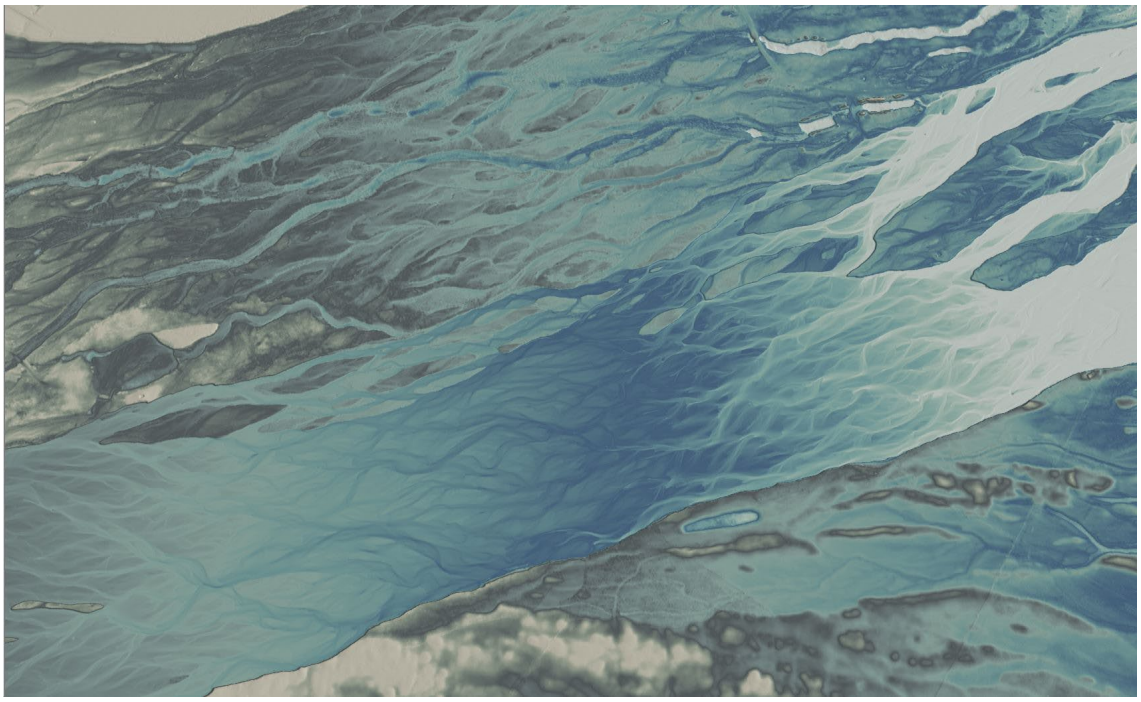


Figure 22: A northwest view of a section of the Platte River topobathymetric model, colored by elevation

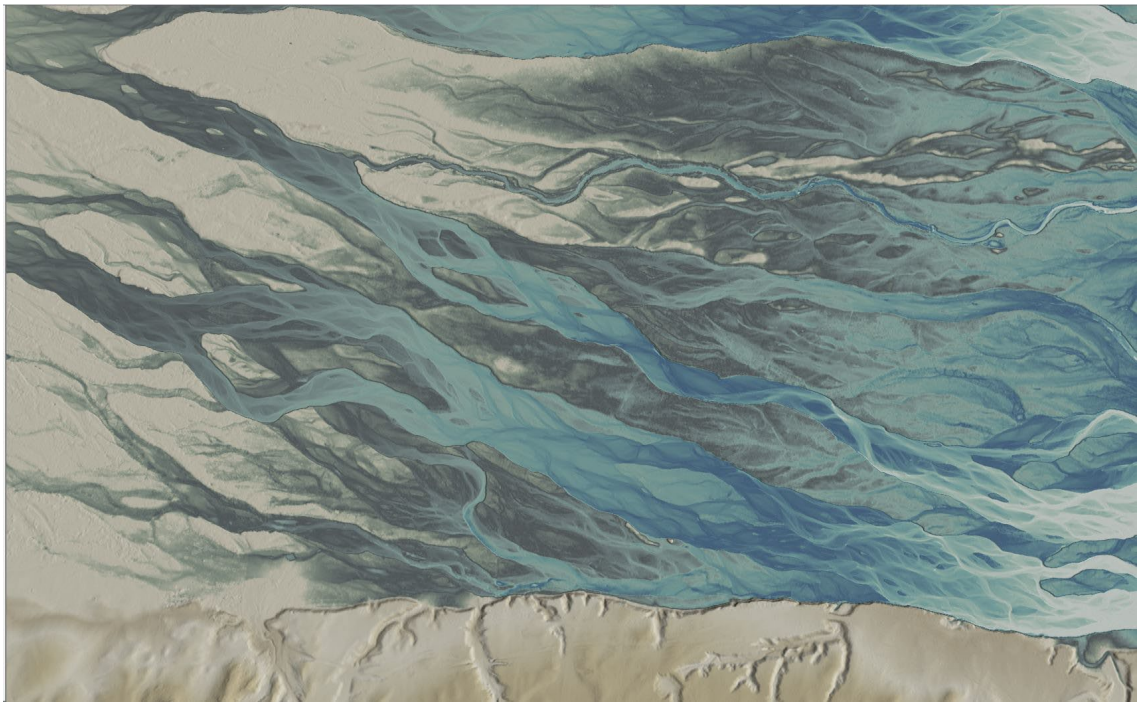


Figure 23: A northwest view of a section of the Platte River topobathymetric model, colored by elevation

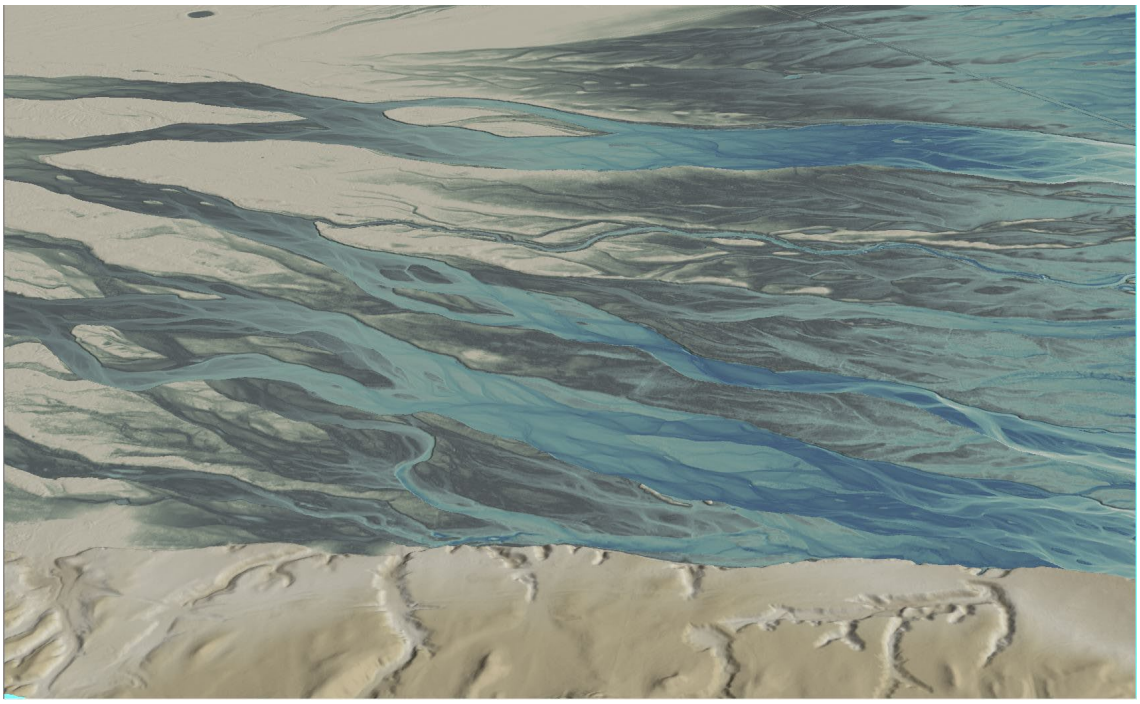


Figure 24: A northwest view of a section of the Platte River topobathymetric model, colored by elevation

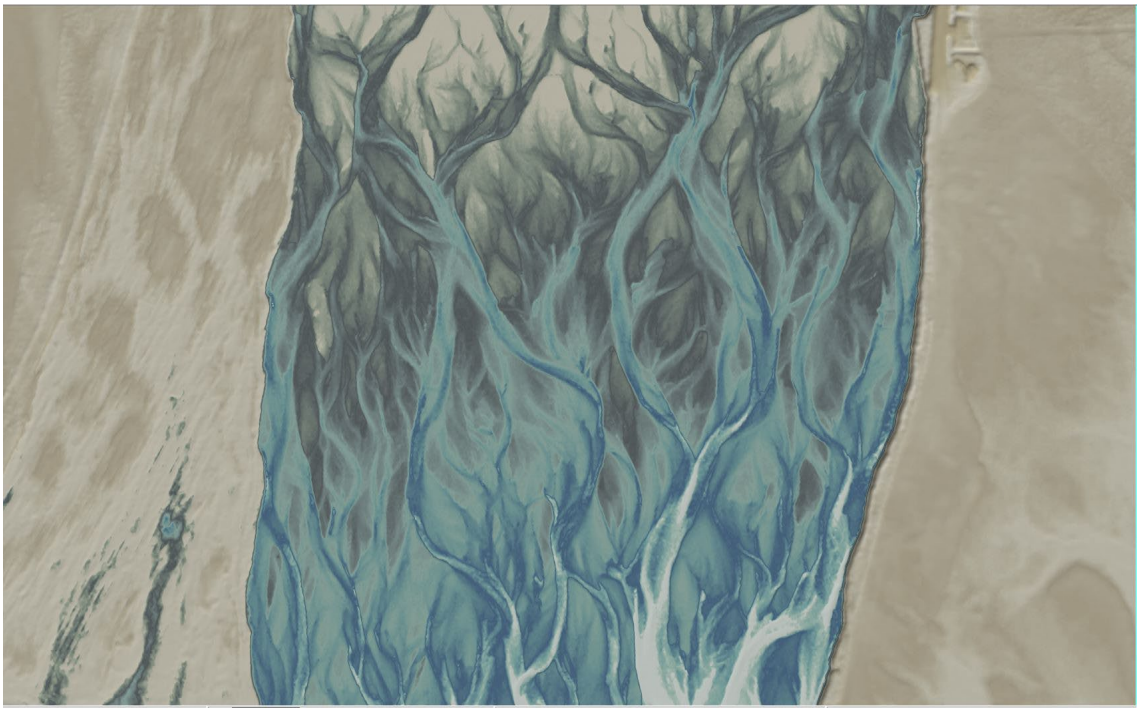


Figure 25: A southwest view of a section of the Platte River topobathymetric model, colored by elevation

GLOSSARY

1-sigma (σ) Absolute Deviation: Value for which the data are within one standard deviation (approximately 68th percentile) of a normally distributed data set.

1.96 * RMSE Absolute Deviation: Value for which the data are within two standard deviations (approximately 95th percentile) of a normally distributed data set, based on the FGDC standards for Non-vegetated Vertical Accuracy (FVA) reporting.

Accuracy: The statistical comparison between known (surveyed) points and laser points. Typically measured as the standard deviation (sigma σ) and root mean square error (RMSE).

> **Absolute Accuracy:** The vertical accuracy of Lidar data is described as the mean and standard deviation (sigma σ) of divergence of LiDAR point coordinates from ground survey point coordinates. To provide a sense of the model predictive power of the dataset, the root mean square error (RMSE) for vertical accuracy is also provided. These statistics assume the error distributions for x, y and z are normally distributed, and thus we also consider the skew and kurtosis of distributions when evaluating error statistics.
>
> **Relative Accuracy:** Relative accuracy refers to the internal consistency of the data set; i.e., the ability to place a laser point in the same location over multiple flight lines, GPS conditions and aircraft attitudes. Affected by system attitude offsets, scale and GPS/IMU drift, internal consistency is measured as the divergence between points from different flight lines within an overlapping area. Divergence is most apparent when flight lines are opposing. When the Lidar system is well calibrated, the line-to-line divergence is low (<10 cm).
>
> **Root Mean Square Error (RMSE):** A statistic used to approximate the difference between real-world points and the LiDAR points. It is calculated by squaring all the values, then taking the average of the squares and taking the square root of the average.

Data Density: A common measure of Lidar resolution, measured as points per square meter.

Digital Elevation Model (DEM): File or database made from surveyed points, containing elevation points over a contiguous area. Digital terrain models (DTM) and digital surface models (DSM) are types of DEMs. DTMs consist solely of the bare earth surface (ground points), while DSMs include information about all surfaces, including vegetation and man-made structures.

Intensity Values: The peak power ratio of the laser return to the emitted laser, calculated as a function of surface reflectivity.

Nadir: A single point or locus of points on the surface of the earth directly below a sensor as it progresses along its flight line.

Overlap: The area shared between flight lines, typically measured in percent. 100% overlap is essential to ensure complete coverage and reduce laser shadows.

Pulse Rate (PR): The rate at which laser pulses are emitted from the sensor; typically measured in thousands of pulses per second (kHz).

Pulse Returns: For every laser pulse emitted, the number of wave forms (i.e., echoes) reflected back to the sensor. Portions of the wave form that return first are the highest element in multi-tiered surfaces such as vegetation. Portions of the wave form that return last are the lowest element in multi-tiered surfaces.

Real-Time Kinematic (RTK) Survey: A type of surveying conducted with a GPS base station deployed over a known monument with a radio connection to a GPS rover. Both the base station and rover receive differential GPS data and the baseline correction is solved between the two. This type of ground survey is accurate to 1.5 cm or less.

Scan Angle: The angle from nadir to the edge of the scan, measured in degrees. Laser point accuracy typically decreases as scan angles increase.

Native Lidar Density: The number of pulses emitted by the Lidar system, commonly expressed as pulses per square meter.

Relative Accuracy Calibration Methodology:

Manual System Calibration: Calibration procedures for each mission require solving geometric relationships that relate measured swath-to-swath deviations to misalignments of system attitude parameters. Corrected scale, pitch, roll and heading offsets were calculated and applied to resolve misalignments. The raw divergence between lines was computed after the manual calibration was completed and reported for each survey area.

Automated Attitude Calibration: All data was tested and calibrated using TerraMatch or StripAlign automated sampling routines. Ground points were classified for each individual flight line and used for line-to-line testing. System misalignment offsets (pitch, roll and heading) and scale were solved for each individual mission and applied to respective mission datasets. The data from each mission were then blended when imported together to form the entire area of interest.

Automated Z Calibration: Ground points per line were used to calculate the vertical divergence between lines caused by vertical GPS drift. Automated Z calibration was the final step employed for relative accuracy calibration.

Lidar accuracy error sources and solutions:

Type of Error	Source	Post Processing Solution
GPS (Static/Kinematic)	Long Base Lines	None
	Poor Satellite Constellation	None
	Poor Antenna Visibility	Reduce Visibility Mask
Relative Accuracy	Poor System Calibration	Recalibrate IMU and sensor offsets/settings
	Inaccurate System	None
Laser Noise	Poor Laser Timing	None
	Poor Laser Reception	None
	Poor Laser Power	None
	Irregular Laser Shape	None

Operational measures taken to improve relative accuracy:

Low Flight Altitude: Terrain following was employed to maintain a constant above ground level (AGL). Laser horizontal errors are a function of flight altitude above ground (about 1/3000th AGL flight altitude).

Focus Laser Power at narrow beam footprint: A laser return must be received by the system above a power threshold to accurately record a measurement. The strength of the laser return (i.e., intensity) is a function of laser emission power, laser footprint, flight altitude and the reflectivity of the target. While surface reflectivity cannot be controlled, laser power can be increased and low flight altitudes can be maintained.

Reduced Scan Angle: Edge-of-scan data can become inaccurate. The scan angle was reduced to a maximum of ±20^{o} from nadir, creating a narrow swath width and greatly reducing laser shadows from trees and buildings.

Quality GPS: Flights took place during optimal GPS conditions (e.g., 6 or more satellites and PDOP [Position Dilution of Precision] less than 3.0). Before each flight, the PDOP was determined for the survey day. During all flight times, a dual frequency DGPS base station recording at 1 second epochs was utilized and a maximum baseline length between the aircraft and the control points was less than 13 nm at all times.

Ground Survey: Ground survey point accuracy (<1.5 cm RMSE) occurs during optimal PDOP ranges and targets a minimal baseline distance of 4 miles between GPS rover and base. Robust statistics are, in part, a function of sample size (n) and distribution. Ground survey points are distributed to the extent possible throughout multiple flight lines and across the survey area.

50% Side-Lap (100% Overlap): Overlapping areas are optimized for relative accuracy testing. Laser shadowing is minimized to help increase target acquisition from multiple scan angles. Ideally, with a 50% side-lap, the nadir portion of one flight line coincides with the swath edge portion of overlapping flight lines. A minimum of 50% side-lap with terrain-followed acquisition prevents data gaps.

Opposing Flight Lines: All overlapping flight lines have opposing directions. Pitch, roll and heading errors are amplified by a factor of two relative to the adjacent flight line(s), making misalignments easier to detect and resolve.

APPENDIX B – FALL 2020 GROUND SURVEY POINT TABLES

Table 18: NVA – Platte River Fall 2022 Lidar vs. Fall 2020 survey points

Fall 2020 NVA Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
1	552437.142	4518923.851	581.458	581.450	-0.008	-0.026
2	552439.746	4518280.483	576.321	576.300	-0.021	-0.069
5	552449.714	4516859.587	577.059	577.050	-0.009	-0.030
6	534825.462	4511518.174	599.286	599.270	-0.016	-0.052
7	542793.323	4515402.871	587.832	587.830	-0.002	-0.007
8	542809.774	4513993.173	587.814	587.800	-0.014	-0.046
9	504094.868	4502807.443	640.061	640.080	+0.019	0.062
11	492733.141	4501319.214	654.291	654.290	-0.001	-0.003
12	478341.540	4501137.546	673.478	673.480	+0.002	0.007
13	504117.074	4504235.311	638.944	638.940	-0.004	-0.013
16	467848.879	4502436.063	686.588	686.640	+0.052	0.171
17	454319.902	4504478.512	707.616	707.550	-0.066	-0.217
19	454357.821	4502541.912	703.888	703.890	+0.002	0.007
20	454361.562	4502367.965	703.281	703.280	-0.001	-0.003

Table 19: **GCP Accuracy - Platte River Fall 2022 Lidar vs. Fall 2020 survey points**

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
1	534735.878	4511910.447	598.112	598.090	-0.022	-0.072
2	571885.587	4537569.270	541.926	541.940	0.014	0.046
3	574928.709	4537793.891	564.330	outside	*	NA
4	534740.848	4511954.338	598.018	598.020	0.002	0.007
5	574855.152	4537788.663	564.712	outside	*	NA
6	571830.946	4537617.791	541.749	541.760	0.011	0.036
7	552433.797	4518864.599	580.831	580.810	-0.021	-0.069
8	552434.296	4518804.720	579.933	579.920	-0.013	-0.043
9	571777.009	4537666.455	541.450	541.450	0.000	0.000
10	534746.118	4511998.005	598.010	598.000	-0.010	-0.033
11	574779.122	4537786.175	565.255	outside	*	NA
12	534766.794	4512706.867	598.447	598.440	-0.007	-0.023
13	571721.796	4537716.138	541.068	541.090	0.022	0.072
14	552437.356	4518746.728	578.683	578.640	-0.043	-0.141
15	574705.228	4537784.055	566.213	outside	*	NA
16	552435.501	4518687.921	577.514	577.490	-0.024	-0.079
17	571669.756	4537770.546	540.526	540.530	0.004	0.013
18	574636.857	4537781.998	567.303	567.360	0.057	0.187
19	534757.541	4512662.297	599.959	599.980	0.021	0.069
20	534757.573	4512617.558	602.023	602.040	0.017	0.056
21	571622.269	4537831.997	540.613	540.620	0.007	0.023
22	552440.789	4518648.060	576.849	576.820	-0.029	-0.095
23	574561.367	4537779.751	567.530	567.570	0.040	0.131
24	552440.309	4518587.355	576.771	576.740	-0.031	-0.102

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
25	534761.825	4512572.586	603.783	603.790	0.007	0.023
26	571597.198	4537903.227	540.169	540.190	0.021	0.069
27	574489.319	4537779.754	565.541	565.540	-0.001	-0.003
28	552440.854	4518525.523	576.677	576.660	-0.017	-0.056
29	571581.726	4537976.907	539.959	539.960	0.001	0.003
30	534762.689	4512527.199	604.571	598.120	-6.451	-21.165
31	574417.385	4537777.046	562.471	562.500	0.029	0.095
32	571567.686	4538052.373	540.013	540.020	0.007	0.023
33	534763.320	4512484.240	604.565	604.600	0.035	0.115
34	552438.249	4518461.889	576.561	576.550	-0.011	-0.036
35	574345.368	4537774.508	558.972	558.980	0.008	0.026
36	571554.151	4538124.197	539.999	539.990	-0.009	-0.030
37	534764.285	4512441.618	603.834	603.870	0.036	0.118
38	552438.793	4518401.321	576.467	576.440	-0.027	-0.089
39	574273.505	4537768.714	556.207	556.220	0.013	0.043
40	571539.971	4538200.017	540.080	540.070	-0.010	-0.033
41	574202.697	4537766.508	553.653	553.680	0.027	0.089
42	552439.374	4518341.012	576.427	576.400	-0.027	-0.089
43	534764.577	4512397.644	602.170	602.180	0.010	0.033
44	574132.815	4537763.845	551.224	551.240	0.016	0.052
45	571524.757	4538281.144	540.058	540.070	0.012	0.039
46	534765.459	4512353.310	600.170	600.190	0.020	0.066
47	534772.703	4512309.570	598.569	598.620	0.051	0.167
48	574061.511	4537761.117	549.284	549.310	0.026	0.085
49	571513.135	4538357.059	539.876	539.890	0.014	0.046

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
50	552440.303	4518218.633	576.214	576.200	-0.014	-0.046
51	534765.701	4512266.192	598.253	598.280	0.027	0.089
52	552440.592	4518166.069	576.151	576.130	-0.021	-0.069
53	573989.944	4537758.612	547.997	548.030	0.033	0.108
54	571509.625	4538434.669	539.647	539.670	0.023	0.075
55	552440.951	4518104.224	576.173	576.150	-0.023	-0.075
56	573918.222	4537756.556	546.367	546.390	0.023	0.075
57	534767.035	4512222.552	597.985	598.000	0.015	0.049
58	571505.026	4538511.343	539.607	539.630	0.023	0.075
59	573844.378	4537753.786	544.961	545.000	0.039	0.128
60	552441.559	4518043.218	576.303	576.290	-0.013	-0.043
61	534763.531	4512177.230	598.054	598.070	0.016	0.052
62	571504.441	4538589.935	539.712	539.750	0.038	0.125
63	571503.954	4538664.070	539.730	539.740	0.010	0.033
64	573769.832	4537751.369	544.337	544.360	0.023	0.075
65	552441.892	4517983.504	576.522	576.510	-0.012	-0.039
66	534761.295	4512133.413	598.094	598.120	0.026	0.085
67	552442.222	4517923.516	576.741	576.730	-0.011	-0.036
68	534757.838	4512092.395	598.095	598.110	0.015	0.049
69	573698.958	4537748.827	543.778	543.790	0.012	0.039
70	571503.579	4538742.167	539.760	539.790	0.030	0.098
71	573626.952	4537746.421	542.666	542.690	0.024	0.079
72	552442.478	4517875.871	576.895	576.890	-0.005	-0.016
73	534752.392	4512048.288	598.035	598.040	0.005	0.016
74	571503.165	4538817.764	539.786	539.830	0.044	0.144

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
75	573553.153	4537744.293	542.378	542.410	0.032	0.105
76	571502.748	4538894.607	539.762	539.790	0.028	0.092
77	552421.012	4520227.853	574.911	574.870	-0.041	-0.135
78	571502.214	4538968.971	539.742	539.780	0.038	0.125
79	573480.861	4537741.811	542.455	542.500	0.045	0.148
80	552421.926	4520166.881	575.367	575.350	-0.017	-0.056
81	573407.610	4537739.302	542.346	542.370	0.024	0.079
82	552422.572	4520107.313	575.681	575.660	-0.021	-0.069
83	571913.913	4537539.027	542.056	542.090	0.034	0.112
84	573336.906	4537733.281	542.020	542.040	0.020	0.066
85	552423.285	4520046.934	575.880	575.850	-0.030	-0.098
86	571970.950	4537492.490	542.279	538.150	-4.129	-13.547
87	573241.653	4537714.006	541.656	541.630	-0.026	-0.085
88	552423.554	4520015.040	575.875	slope	*	NA
89	552424.228	4519953.331	575.901	571.230	-4.671	-15.325
90	572080.136	4537394.284	542.229	538.120	-4.109	-13.481
91	573173.181	4537692.421	541.494	541.540	0.046	0.151
92	572134.726	4537344.780	542.160	542.170	0.010	0.033
93	573107.208	4537663.830	541.232	541.270	0.038	0.125
94	552424.695	4519895.700	575.897	575.870	-0.027	-0.089
95	572190.685	4537293.610	541.985	542.010	0.025	0.082
96	573044.663	4537629.565	541.295	541.300	0.005	0.016
97	552425.474	4519834.145	575.978	575.950	-0.028	-0.092
98	572245.880	4537244.451	541.703	541.720	0.017	0.056
99	552426.082	4519773.308	575.976	575.940	-0.036	-0.118

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
100	572985.467	4537589.534	541.465	541.490	0.025	0.082
101	572925.985	4537545.425	541.689	541.720	0.031	0.102
102	552426.625	4519710.139	575.999	575.950	-0.049	-0.161
103	572290.164	4537197.051	542.133	542.170	0.037	0.121
104	552427.022	4519650.394	575.978	575.950	-0.028	-0.092
105	572359.791	4537217.550	541.883	541.910	0.027	0.089
106	572420.705	4537243.540	542.046	542.070	0.024	0.079
107	552427.327	4519590.674	576.001	571.660	-4.341	-14.242
108	572488.845	4537272.801	542.251	542.260	0.009	0.030
109	552428.118	4519531.171	575.969	575.930	-0.039	-0.128
110	552429.999	4519469.682	575.939	575.910	-0.029	-0.095
111	572554.510	4537304.746	542.309	542.320	0.011	0.036
112	572622.614	4537335.819	542.339	542.360	0.021	0.069
113	552429.532	4519408.400	575.981	575.950	-0.031	-0.102
114	572686.045	4537370.552	542.198	542.240	0.042	0.138
115	552430.718	4519354.145	576.302	576.270	-0.032	-0.105
116	552433.287	4519291.960	577.088	577.070	-0.018	-0.059
117	572747.367	4537419.574	542.221	542.240	0.019	0.062
118	572808.707	4537460.093	542.442	542.460	0.018	0.059
119	552433.849	4519232.514	578.304	578.270	-0.034	-0.112
120	552431.053	4519175.325	579.683	579.650	-0.033	-0.108
121	552433.599	4519113.856	580.749	580.710	-0.039	-0.128
122	552433.561	4519051.929	581.486	581.460	-0.026	-0.085
123	552433.993	4518992.847	581.781	574.480	-7.301	-23.953
124	552415.604	4520665.568	573.122	573.120	-0.002	-0.007

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
125	552416.243	4520607.308	573.090	573.130	0.040	0.131
126	552417.005	4520547.019	573.062	573.080	0.018	0.059
127	552417.817	4520486.782	573.140	573.110	-0.030	-0.098
128	552418.474	4520426.773	573.339	573.320	-0.019	-0.062
129	552419.327	4520365.852	573.707	573.700	-0.007	-0.023
130	552419.970	4520307.238	574.209	574.170	-0.039	-0.128
131	552420.665	4520254.874	574.677	574.650	-0.027	-0.089
132	542805.621	4513549.299	589.357	585.860	-3.497	-11.473
133	542806.837	4513421.715	589.552	585.990	-3.562	-11.686
134	542807.604	4513357.922	588.879	588.880	0.001	0.003
135	542817.831	4512119.820	589.598	589.570	-0.028	-0.092
136	542821.364	4512184.639	589.454	589.400	-0.054	-0.177
137	542817.136	4512255.130	589.186	589.130	-0.056	-0.184
138	542816.327	4512323.869	588.582	588.530	-0.052	-0.171
139	542816.134	4512393.044	588.359	588.330	-0.029	-0.095
140	542815.610	4512463.876	588.347	588.320	-0.027	-0.089
141	542814.943	4512532.956	588.137	588.110	-0.027	-0.089
142	542814.558	4512600.562	588.254	588.240	-0.014	-0.046
143	542814.120	4512669.935	588.177	588.130	-0.047	-0.154
144	542813.554	4512738.175	588.287	588.240	-0.047	-0.154
145	542812.663	4512800.228	588.417	588.370	-0.047	-0.154
146	542812.231	4512869.327	588.387	588.360	-0.027	-0.089
147	542811.257	4512935.203	588.399	588.370	-0.029	-0.095
148	542810.715	4512997.449	588.336	588.320	-0.016	-0.052
149	542810.126	4513068.685	588.517	588.490	-0.027	-0.089

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
150	542809.324	4513138.001	588.622	588.610	-0.012	-0.039
151	542809.021	4513208.045	588.716	588.680	-0.036	-0.118
152	542808.374	4513276.182	588.682	588.670	-0.012	-0.039
153	542807.405	4513353.232	588.824	588.810	-0.014	-0.046
154	535030.558	4510904.512	600.237	600.240	0.003	0.010
155	535043.095	4510866.468	599.727	599.730	0.003	0.010
156	535056.285	4510827.051	599.197	599.210	0.013	0.043
157	535069.194	4510787.718	598.845	598.850	0.005	0.016
158	535082.079	4510748.393	598.684	598.690	0.006	0.020
159	535090.741	4510706.320	598.508	598.520	0.012	0.039
160	535105.755	4510665.963	598.667	598.660	-0.007	-0.023
161	535117.295	4510623.360	598.766	598.780	0.014	0.046
162	535126.923	4510581.676	598.551	598.570	0.019	0.062
163	535137.114	4510539.207	598.203	598.210	0.007	0.023
164	535145.999	4510499.868	598.032	598.010	-0.022	-0.072
165	535155.645	4510458.893	597.862	597.870	0.008	0.026
166	535165.619	4510416.907	597.841	597.860	0.019	0.062
167	535175.597	4510374.426	597.824	597.830	0.006	0.020
168	552447.955	4517090.599	577.265	577.240	-0.025	-0.082
169	535185.401	4510332.883	597.851	597.880	0.029	0.095
170	535195.656	4510288.800	597.871	597.890	0.019	0.062
171	552445.765	4517030.978	577.496	572.950	-4.546	-14.915
172	552448.732	4516967.920	577.487	573.330	-4.157	-13.638
173	535205.622	4510246.311	597.784	597.820	0.036	0.118
174	535216.097	4510203.254	597.735	597.760	0.025	0.082

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
175	552449.178	4516914.008	577.348	577.330	-0.018	-0.059
176	535226.392	4510160.783	597.707	597.750	0.043	0.141
177	552450.304	4516804.605	576.649	576.650	0.001	0.003
178	535235.952	4510120.848	597.701	597.740	0.039	0.128
179	552452.242	4516748.233	576.259	576.250	-0.009	-0.030
180	535246.383	4510077.988	597.664	597.710	0.046	0.151
181	535256.082	4510035.921	597.643	597.680	0.037	0.121
182	552451.296	4516693.187	575.880	575.870	-0.010	-0.033
183	535266.214	4509993.400	597.731	597.770	0.039	0.128
184	552451.790	4516637.452	575.616	575.610	-0.006	-0.020
185	535276.395	4509950.087	597.786	597.810	0.024	0.079
186	552452.456	4516582.039	575.528	575.520	-0.008	-0.026
187	535286.658	4509907.599	597.839	597.860	0.021	0.069
188	552452.968	4516532.075	575.578	575.570	-0.008	-0.026
189	535293.422	4509864.203	597.890	outside	*	NA
190	552453.604	4516475.529	575.662	575.650	-0.012	-0.039
191	535306.854	4509825.867	597.816	outside	*	NA
192	552454.157	4516418.864	575.764	575.760	-0.004	-0.013
193	535324.038	4509775.414	597.804	outside	*	NA
194	552454.572	4516362.690	575.850	575.850	0.000	0.000
195	552455.159	4516306.749	575.930	575.930	0.000	0.000
196	535018.930	4510941.316	600.570	596.100	-4.470	-14.665
197	552455.694	4516250.718	576.007	576.010	0.003	0.010
198	535001.220	4510982.689	600.791	596.210	-4.581	-15.030
199	534986.569	4511027.428	600.839	596.800	-4.039	-13.251

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
200	552442.430	4517844.610	576.991	576.940	-0.051	-0.167
201	534972.233	4511069.868	600.655	596.360	-4.295	-14.091
202	552443.058	4517786.360	577.071	577.050	-0.021	-0.069
203	552445.770	4517724.654	577.023	577.000	-0.023	-0.075
204	534957.292	4511115.835	600.283	600.280	-0.003	-0.010
205	552444.151	4517672.820	577.004	576.990	-0.014	-0.046
206	534942.909	4511160.962	599.815	599.790	-0.025	-0.082
207	534928.543	4511203.708	599.353	599.330	-0.023	-0.075
208	552444.281	4517617.473	576.829	576.810	-0.019	-0.062
209	534914.507	4511246.432	598.982	598.970	-0.012	-0.039
210	552444.892	4517561.911	576.566	576.530	-0.036	-0.118
211	534899.456	4511292.138	598.777	598.740	-0.037	-0.121
212	552445.113	4517505.769	576.280	576.250	-0.030	-0.098
213	534885.194	4511335.985	598.727	598.690	-0.037	-0.121
214	552445.509	4517451.032	576.003	575.980	-0.023	-0.075
215	552446.110	4517395.223	575.746	575.710	-0.036	-0.118
216	534870.782	4511379.919	598.683	598.670	-0.013	-0.043
217	534856.114	4511425.101	598.710	598.680	-0.030	-0.098
218	552446.181	4517353.299	575.705	575.680	-0.025	-0.082
219	552446.538	4517302.906	575.801	575.770	-0.031	-0.102
220	534840.489	4511473.057	598.916	598.910	-0.006	-0.020
221	552446.757	4517261.783	576.043	576.010	-0.033	-0.108
222	534814.641	4511563.638	599.683	599.670	-0.013	-0.043
223	552447.072	4517213.950	576.413	576.390	-0.023	-0.075
224	534801.040	4511593.561	599.873	599.890	0.017	0.056

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
225	552444.656	4517164.980	576.891	576.870	-0.021	-0.069
226	552447.633	4517126.107	577.099	577.080	-0.019	-0.062
227	534785.504	4511639.687	599.976	595.660	-4.316	-14.160
228	534767.536	4511694.377	599.875	599.870	-0.005	-0.016
229	534751.138	4511735.244	599.680	599.670	-0.010	-0.033
230	534741.795	4511779.710	599.330	599.350	0.020	0.066
231	534734.266	4511824.180	598.955	598.940	-0.015	-0.049
232	534731.006	4511870.522	598.569	598.550	-0.019	-0.062
233	558390.863	4526429.505	562.333	562.310	-0.023	-0.075
234	542717.865	4516411.310	590.737	590.740	0.003	0.010
235	558477.798	4526430.261	562.308	562.290	-0.018	-0.059
236	542719.776	4516350.225	587.909	587.890	-0.019	-0.062
237	542715.362	4516286.188	586.451	586.450	-0.001	-0.003
238	558565.138	4526431.198	562.313	562.320	0.007	0.023
239	542709.966	4516221.887	586.745	586.730	-0.015	-0.049
240	558652.448	4526432.372	562.346	562.330	-0.016	-0.052
241	542708.582	4516158.225	586.790	586.800	0.010	0.033
242	558739.696	4526435.314	562.307	562.300	-0.007	-0.023
243	558846.043	4526438.045	562.266	562.260	-0.006	-0.020
244	542707.983	4516093.812	586.646	586.630	-0.016	-0.052
245	558934.821	4526434.529	562.423	562.420	-0.003	-0.010
246	542711.121	4516032.466	587.105	587.110	0.005	0.016
247	542718.346	4515969.964	587.636	587.630	-0.006	-0.020
248	559020.638	4526434.716	562.363	562.340	-0.023	-0.075
249	542726.479	4515906.994	587.898	584.130	-3.768	-12.362

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
250	559105.391	4526435.011	562.278	562.280	0.002	0.007
251	542734.952	4515843.707	587.971	584.100	-3.871	-12.700
252	559192.100	4526435.728	562.222	562.220	-0.002	-0.007
253	542743.525	4515781.436	587.803	587.800	-0.003	-0.010
254	559278.467	4526436.242	562.171	562.160	-0.011	-0.036
255	542754.895	4515721.816	587.638	587.650	0.012	0.039
256	559366.170	4526436.809	562.126	562.130	0.004	0.013
257	559440.610	4526437.280	562.129	562.120	-0.009	-0.030
258	542763.130	4515659.224	587.722	587.700	-0.022	-0.072
259	542771.828	4515594.631	587.769	587.760	-0.009	-0.030
260	559524.254	4526436.257	562.314	562.300	-0.014	-0.046
261	560438.299	4525033.717	563.219	563.210	-0.009	-0.030
262	542779.602	4515532.485	587.842	587.830	-0.012	-0.039
263	542788.131	4515468.661	587.916	587.930	0.014	0.046
264	560375.321	4525098.196	562.948	562.970	0.022	0.072
265	560321.725	4525166.289	562.518	562.530	0.012	0.039
266	542801.255	4515341.576	587.716	587.720	0.004	0.013
267	560275.548	4525240.446	562.058	562.070	0.012	0.039
268	560238.552	4525317.711	561.687	561.710	0.023	0.075
269	542810.039	4515277.667	587.860	587.850	-0.010	-0.033
270	560209.575	4525401.143	561.466	561.460	-0.006	-0.020
271	542816.550	4515215.850	587.852	587.830	-0.022	-0.072
272	542817.377	4515148.924	587.989	587.960	-0.029	-0.095
273	560190.054	4525486.027	561.143	561.150	0.007	0.023
274	542817.201	4515084.021	587.742	587.720	-0.022	-0.072

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
275	560165.749	4525572.083	560.836	560.860	0.024	0.079
276	560143.585	4525659.786	560.763	560.760	-0.003	-0.010
277	542816.921	4515018.794	587.791	587.760	-0.031	-0.102
278	560121.904	4525746.086	560.741	560.760	0.019	0.062
279	542816.373	4514954.386	587.759	587.720	-0.039	-0.128
280	560100.651	4525830.674	560.741	560.730	-0.011	-0.036
281	542819.662	4514888.887	587.799	587.740	-0.059	-0.194
282	542819.213	4514825.577	587.738	587.750	0.012	0.039
283	560078.779	4525917.466	560.716	560.690	-0.026	-0.085
284	542818.918	4514760.378	587.765	587.770	0.005	0.016
285	559591.462	4526429.928	562.221	562.210	-0.011	-0.036
286	542818.213	4514681.838	587.890	587.880	-0.010	-0.033
287	559676.713	4526409.897	562.120	562.090	-0.030	-0.098
288	559759.101	4526377.188	561.980	561.950	-0.030	-0.098
289	542817.785	4514616.872	587.871	587.860	-0.011	-0.036
290	559833.750	4526333.141	561.874	561.840	-0.034	-0.112
291	542817.473	4514555.074	587.923	587.880	-0.043	-0.141
292	542816.848	4514492.063	587.956	587.940	-0.016	-0.052
293	559902.086	4526277.745	561.709	561.680	-0.029	-0.095
294	542815.869	4514429.352	587.856	587.860	0.004	0.013
295	559968.899	4526202.998	561.587	561.560	-0.027	-0.089
296	542815.124	4514368.538	587.893	587.880	-0.013	-0.043
297	560014.875	4526131.952	561.410	561.400	-0.010	-0.033
298	542814.421	4514307.154	587.882	587.870	-0.012	-0.039
299	560053.497	4526044.460	561.299	561.260	-0.039	-0.128

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
300	560072.968	4525979.496	561.044	560.990	-0.054	-0.177
301	542813.527	4514245.204	587.793	587.780	-0.013	-0.043
302	542812.619	4514181.587	587.835	587.870	0.035	0.115
303	561787.048	4524641.152	570.922	570.920	-0.002	-0.007
304	561698.733	4524622.501	570.607	570.590	-0.017	-0.056
305	542811.969	4514119.090	587.750	587.750	0.000	0.000
306	542811.035	4514055.753	587.837	587.820	-0.017	-0.056
307	561609.025	4524603.972	571.389	571.390	0.001	0.003
308	561521.237	4524585.704	572.168	572.160	-0.008	-0.026
309	542806.098	4513930.447	587.872	587.840	-0.032	-0.105
310	561434.331	4524569.698	572.098	572.090	-0.008	-0.026
311	561349.443	4524548.844	570.560	570.570	0.010	0.033
312	542805.341	4513866.919	588.019	587.970	-0.049	-0.161
313	561262.360	4524539.306	567.375	567.380	0.005	0.016
314	542804.608	4513802.932	588.129	588.100	-0.029	-0.095
315	561170.947	4524541.665	564.548	564.550	0.002	0.007
316	542807.404	4513739.306	588.438	588.430	-0.008	-0.026
317	542804.216	4513672.145	588.529	588.500	-0.029	-0.095
318	561089.416	4524559.260	563.059	563.040	-0.019	-0.062
319	561009.156	4524587.066	562.650	562.630	-0.020	-0.066
320	542804.921	4513608.409	588.734	588.700	-0.034	-0.112
321	560929.071	4524623.501	562.664	562.660	-0.004	-0.013
322	560853.839	4524666.706	562.754	562.730	-0.024	-0.079
323	560783.338	4524716.145	562.965	562.950	-0.015	-0.049
324	560715.043	4524773.027	563.242	563.220	-0.022	-0.072

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
325	560675.621	4524810.337	563.250	563.220	-0.030	-0.098
326	560610.877	4524871.733	563.511	559.060	-4.451	-14.603
327	560543.702	4524934.814	563.562	559.090	-4.472	-14.672
328	560487.130	4524987.975	563.374	559.050	-4.324	-14.186
329	492824.343	4499919.197	654.293	654.290	-0.003	-0.010
330	478390.807	4502997.555	673.555	673.530	-0.025	-0.082
331	504097.245	4503277.433	639.900	639.900	0.000	0.000
332	504093.965	4503221.515	639.987	639.990	0.003	0.010
333	478390.557	4502952.216	675.500	675.490	-0.010	-0.033
334	492817.696	4499962.125	654.292	654.300	0.008	0.026
335	492809.641	4500005.385	654.296	654.290	-0.006	-0.020
336	504093.937	4503161.441	639.996	640.020	0.024	0.079
337	478390.082	4502905.049	677.667	677.700	0.033	0.108
338	492802.904	4500048.039	654.169	654.150	-0.019	-0.062
339	478389.892	4502859.334	679.115	679.140	0.025	0.082
340	504094.091	4503102.307	639.935	639.970	0.035	0.115
341	504094.046	4503041.740	640.020	640.030	0.010	0.033
342	492789.645	4500091.092	654.152	654.150	-0.002	-0.007
343	478392.752	4502762.962	679.339	679.370	0.031	0.102
344	504094.110	4502983.831	640.008	640.040	0.032	0.105
345	492779.701	4500132.690	654.136	654.130	-0.006	-0.020
346	478392.400	4502717.962	678.105	678.140	0.035	0.115
347	492768.977	4500175.983	654.172	654.160	-0.012	-0.039
348	478391.876	4502672.644	676.085	676.110	0.025	0.082
349	504094.348	4502924.506	640.028	640.070	0.042	0.138

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
350	492762.714	4500221.341	653.972	653.970	-0.002	-0.007
351	478391.440	4502626.853	674.218	674.220	0.002	0.007
352	504094.869	4502866.140	640.049	640.080	0.031	0.102
353	478391.499	4502581.455	673.437	673.440	0.003	0.010
354	492748.081	4500263.682	654.090	654.090	0.000	0.000
355	504094.917	4502746.151	640.099	640.130	0.031	0.102
356	478391.142	4502534.863	673.436	673.450	0.014	0.046
357	492739.030	4500307.833	654.179	654.180	0.001	0.003
358	478390.800	4502487.639	673.608	673.570	-0.038	-0.125
359	492731.785	4500352.310	654.299	654.290	-0.009	-0.030
360	504095.075	4502687.532	640.088	640.100	0.012	0.039
361	492726.439	4500396.327	654.478	654.490	0.012	0.039
362	478390.248	4502444.022	673.530	673.530	0.000	0.000
363	504099.007	4502625.105	639.944	639.970	0.026	0.085
364	504095.135	4502568.759	640.053	640.080	0.027	0.089
365	492722.402	4500441.356	654.723	654.730	0.007	0.023
366	478386.255	4502396.991	673.600	673.600	0.000	0.000
367	478384.576	4502351.596	673.590	673.620	0.030	0.098
368	504095.267	4502509.680	640.059	640.090	0.031	0.102
369	492720.018	4500486.745	655.056	655.060	0.004	0.013
370	504095.268	4502450.063	640.056	640.080	0.024	0.079
371	492719.820	4500530.989	655.392	655.400	0.008	0.026
372	478383.035	4502307.841	673.580	673.570	-0.010	-0.033
373	504095.788	4502391.154	640.034	640.080	0.046	0.151
374	492720.633	4500572.292	655.760	655.750	-0.010	-0.033

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
375	478381.474	4502264.772	673.527	673.550	0.023	0.075
376	504096.742	4502332.024	640.024	640.040	0.016	0.052
377	492720.824	4500614.370	656.003	656.020	0.017	0.056
378	478380.058	4502220.861	673.551	673.540	-0.011	-0.036
379	504096.048	4502275.335	640.062	640.100	0.038	0.125
380	478381.337	4502176.378	673.519	673.530	0.011	0.036
381	492721.208	4500660.440	656.325	651.950	-4.375	-14.354
382	492721.886	4500707.023	656.491	651.350	-5.141	-16.867
383	504095.945	4502215.084	640.098	640.140	0.042	0.138
384	478379.379	4502133.510	673.546	673.580	0.034	0.112
385	478378.040	4502089.736	673.524	673.580	0.056	0.184
386	492722.689	4500752.125	656.589	651.360	-5.229	-17.156
387	504095.968	4502156.533	640.152	640.190	0.038	0.125
388	513052.536	4505658.160	633.241	633.260	0.019	0.062
389	513052.568	4505719.021	633.547	627.130	-6.417	-21.053
390	492723.396	4500797.280	656.575	651.370	-5.205	-17.077
391	478376.406	4502046.803	673.521	673.560	0.039	0.128
392	504096.123	4502101.175	640.106	640.170	0.064	0.210
393	478371.347	4502001.220	673.510	673.510	0.000	0.000
394	492724.224	4500842.720	656.467	651.380	-5.087	-16.690
395	513048.567	4505775.141	632.452	632.480	0.028	0.092
396	504096.138	4502045.825	640.126	640.170	0.044	0.144
397	504096.282	4501986.404	640.160	640.200	0.040	0.131
398	513048.667	4505833.149	630.018	630.050	0.032	0.105
399	478369.613	4501958.078	673.565	673.580	0.015	0.049

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
400	492726.738	4500935.808	655.932	655.940	0.008	0.026
401	478368.043	4501915.177	673.710	673.720	0.010	0.033
402	513044.162	4505891.452	627.645	627.660	0.015	0.049
403	504096.332	4501931.818	640.153	640.180	0.027	0.089
404	492727.903	4500978.705	655.606	655.610	0.004	0.013
405	513045.169	4505949.626	626.862	626.880	0.018	0.059
406	504096.612	4501870.895	640.158	640.210	0.052	0.171
407	478365.965	4501865.653	674.062	671.160	-2.902	-9.521
408	492729.905	4501020.863	655.322	655.330	0.008	0.026
409	478364.054	4501821.668	674.553	670.250	-4.303	-14.117
410	513048.440	4506007.907	626.847	626.860	0.013	0.043
411	504096.848	4501813.750	640.149	640.180	0.031	0.102
412	478362.323	4501778.253	674.784	671.280	-3.504	-11.496
413	504096.897	4501754.723	640.170	640.210	0.040	0.131
414	513044.597	4506069.021	626.719	626.730	0.011	0.036
415	492731.464	4501062.341	655.078	655.100	0.022	0.072
416	513048.694	4506077.275	626.779	626.780	0.001	0.003
417	478360.800	4501734.266	674.881	670.350	-4.531	-14.865
418	492732.678	4501104.540	654.782	654.790	0.008	0.026
419	504097.192	4501695.751	640.168	640.200	0.032	0.105
420	513048.616	4506136.213	626.742	626.760	0.018	0.059
421	492733.609	4501145.570	654.536	654.560	0.024	0.079
422	504097.258	4501636.854	640.199	640.230	0.031	0.102
423	478358.968	4501690.371	674.766	670.170	-4.596	-15.079
424	521907.769	4507055.804	617.259	616.600	-0.659	-2.162

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
425	492734.292	4501188.669	654.381	654.400	0.019	0.062
426	478357.533	4501646.548	674.505	671.140	-3.365	-11.040
427	504097.277	4501576.773	640.254	640.290	0.036	0.118
428	513048.729	4506193.723	626.727	626.740	0.013	0.043
429	492735.027	4501230.800	654.256	654.270	0.014	0.046
430	513049.182	4506228.357	626.715	outside	*	NA
431	478355.905	4501603.506	674.043	670.180	-3.863	-12.674
432	521907.413	4507100.689	617.392	613.390	-4.002	-13.130
433	504097.525	4501517.391	640.358	640.360	0.002	0.007
434	504097.419	4501460.145	640.394	640.400	0.006	0.020
435	478354.379	4501563.454	673.631	673.640	0.009	0.030
436	492736.410	4501274.169	654.228	654.240	0.012	0.039
437	512919.430	4504365.366	628.790	628.820	0.030	0.098
438	521907.207	4507145.299	617.484	613.410	-4.074	-13.366
439	512922.491	4504424.265	628.949	628.990	0.041	0.135
440	504097.532	4501398.551	640.374	640.380	0.006	0.020
441	478353.318	4501519.336	673.512	673.480	-0.032	-0.105
442	521906.456	4507187.331	617.517	613.390	-4.127	-13.540
443	478354.561	4501475.805	673.443	673.430	-0.013	-0.043
444	521906.172	4507230.464	617.518	613.450	-4.068	-13.346
445	512927.177	4504452.767	629.032	629.040	0.008	0.026
446	504097.523	4501339.315	640.438	640.430	-0.008	-0.026
447	492737.175	4501362.217	654.183	654.180	-0.003	-0.010
448	492734.229	4501405.407	654.297	654.300	0.003	0.010
449	521905.784	4507275.730	617.439	613.170	-4.269	-14.006

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
450	512926.497	4504525.631	629.046	slope	*	NA
451	504097.727	4501279.418	640.456	640.480	0.024	0.079
452	478353.451	4501438.821	673.442	673.480	0.038	0.125
453	521905.446	4507319.947	617.304	613.210	-4.094	-13.432
454	492738.742	4501447.765	654.201	654.180	-0.021	-0.069
455	512928.472	4504583.295	628.918	628.960	0.042	0.138
456	478351.730	4501396.672	673.469	673.490	0.021	0.069
457	504097.821	4501218.664	640.551	640.570	0.019	0.062
458	492739.376	4501489.947	654.197	654.200	0.003	0.010
459	478349.621	4501354.364	673.505	673.540	0.035	0.115
460	512930.529	4504643.504	628.426	628.450	0.024	0.079
461	521908.936	4507365.963	617.154	617.190	0.036	0.118
462	504097.980	4501157.500	640.770	640.780	0.010	0.033
463	504101.337	4501094.634	640.973	637.740	-3.233	-10.607
464	512933.289	4504701.836	628.138	628.210	0.072	0.236
465	492741.403	4501533.275	654.215	654.230	0.015	0.049
466	478348.428	4501312.542	673.542	673.570	0.028	0.092
467	521908.285	4507410.500	616.858	616.890	0.032	0.105
468	492740.377	4501577.795	654.204	654.200	-0.004	-0.013
469	512935.486	4504760.824	628.043	628.120	0.077	0.253
470	478346.672	4501267.587	673.507	673.520	0.013	0.043
471	521908.000	4507454.539	616.663	616.650	-0.013	-0.043
472	492741.150	4501620.330	654.209	654.220	0.011	0.036
473	478345.057	4501223.613	673.499	673.510	0.011	0.036
474	512937.535	4504821.095	628.044	628.080	0.036	0.118

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
475	504101.459	4500969.824	641.073	637.440	-3.633	-11.919
476	521907.464	4507500.078	616.413	616.390	-0.023	-0.075
477	492742.138	4501664.656	654.200	654.200	0.000	0.000
478	504101.537	4500907.751	640.890	637.330	-3.560	-11.680
479	478343.156	4501180.385	673.482	673.490	0.008	0.026
480	521907.278	4507546.665	616.158	616.150	-0.008	-0.026
481	512940.586	4504879.541	628.115	628.170	0.055	0.180
482	512949.193	4504938.078	628.096	628.140	0.044	0.144
483	521906.964	4507591.402	615.986	615.960	-0.026	-0.085
484	504098.487	4500845.575	640.677	640.680	0.003	0.010
485	492742.765	4501707.285	654.285	654.280	-0.005	-0.016
486	521906.394	4507635.115	615.891	615.860	-0.031	-0.102
487	512966.131	4504996.641	627.997	628.060	0.063	0.207
488	478340.423	4501093.337	673.471	673.490	0.019	0.062
489	492743.485	4501750.914	654.672	654.660	-0.012	-0.039
490	504098.830	4500783.222	640.497	640.490	-0.007	-0.023
491	512991.965	4505048.426	627.817	627.870	0.053	0.174
492	478340.263	4501049.855	673.458	673.490	0.032	0.105
493	492741.828	4501795.064	655.469	655.480	0.011	0.036
494	521905.887	4507684.437	615.834	615.830	-0.004	-0.013
495	504099.115	4500723.825	640.503	640.510	0.007	0.023
496	513016.732	4505103.705	627.766	627.770	0.004	0.013
497	521902.144	4507727.749	615.874	615.870	-0.004	-0.013
498	492745.780	4501839.171	656.427	656.440	0.013	0.043
499	478340.341	4501006.482	673.468	673.490	0.022	0.072

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
500	504099.026	4500662.651	640.412	640.410	-0.002	-0.007
501	478340.404	4500963.185	673.463	673.490	0.027	0.089
502	504099.464	4500602.721	640.368	640.370	0.002	0.007
503	492746.136	4501887.744	657.826	657.820	-0.006	-0.020
504	513036.200	4505160.379	627.683	627.740	0.057	0.187
505	521901.541	4507772.027	615.702	615.700	-0.002	-0.007
506	478340.218	4500920.712	673.459	673.490	0.031	0.102
507	504099.197	4500541.790	640.368	640.380	0.012	0.039
508	521901.402	4507815.470	615.779	615.770	-0.009	-0.030
509	513044.403	4505217.203	627.395	627.420	0.025	0.082
510	492746.882	4501932.890	659.098	659.100	0.002	0.007
511	504099.230	4500480.798	640.323	640.330	0.007	0.023
512	478340.313	4500878.564	673.369	673.400	0.031	0.102
513	521900.949	4507859.157	615.793	615.780	-0.013	-0.043
514	513048.099	4505279.510	627.371	627.420	0.049	0.161
515	492749.578	4502103.831	660.231	660.240	0.009	0.030
516	478340.122	4500835.818	673.338	673.320	-0.018	-0.059
517	492750.272	4502147.361	659.552	659.550	-0.002	-0.007
518	504099.526	4500419.604	640.268	640.260	-0.008	-0.026
519	521900.467	4507904.952	615.770	615.730	-0.040	-0.131
520	513048.009	4505339.662	627.409	627.420	0.011	0.036
521	513051.618	4505402.703	627.063	627.060	-0.003	-0.010
522	492751.191	4502190.469	658.495	658.510	0.015	0.049
523	478340.119	4500784.891	673.200	673.210	0.010	0.033
524	504099.932	4500356.233	640.212	640.230	0.018	0.059

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
525	521900.272	4507948.610	615.446	615.400	-0.046	-0.151
526	521899.478	4507983.697	615.493	615.470	-0.023	-0.075
527	504096.662	4500214.238	640.134	640.160	0.026	0.085
528	513047.884	4505464.838	627.182	627.160	-0.022	-0.072
529	513047.854	4505518.394	628.139	628.130	-0.009	-0.030
530	521898.910	4508042.801	616.755	616.760	0.005	0.016
531	504112.036	4504175.130	639.692	639.690	-0.002	-0.007
532	521902.799	4508084.208	616.378	616.350	-0.028	-0.092
533	513056.124	4505591.262	631.092	631.100	0.008	0.026
534	504111.720	4504116.557	641.786	641.800	0.014	0.046
535	504107.599	4504058.741	644.195	644.200	0.005	0.016
536	512847.088	4502273.136	628.619	628.660	0.041	0.135
537	521901.945	4508127.202	615.750	615.720	-0.030	-0.098
538	521911.639	4507010.700	617.230	617.210	-0.020	-0.066
539	504100.082	4503911.485	644.435	644.430	-0.005	-0.016
540	512844.922	4502333.680	628.796	628.860	0.064	0.210
541	512846.581	4502393.517	628.854	628.910	0.056	0.184
542	504096.200	4503854.904	642.240	642.240	0.000	0.000
543	521912.139	4506963.636	616.918	616.900	-0.018	-0.059
544	512847.999	4502453.107	628.828	628.900	0.072	0.236
545	504097.907	4503799.380	640.724	640.740	0.016	0.052
546	521912.163	4506919.189	616.680	616.680	0.000	0.000
547	454363.817	4503149.695	704.857	704.830	-0.027	-0.089
548	512852.663	4502509.593	628.858	628.900	0.042	0.138
549	521912.492	4506872.369	616.448	616.450	0.002	0.007

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
550	504092.519	4503741.217	640.527	640.560	0.033	0.108
551	504095.325	4503682.314	640.712	636.330	-4.382	-14.377
552	512850.359	4502571.458	628.892	628.950	0.058	0.190
553	521913.196	4506779.670	616.161	616.180	0.019	0.062
554	504095.696	4503622.636	640.654	slope	*	NA
555	512852.497	4502631.345	629.139	629.180	0.041	0.135
556	521913.278	4506732.184	616.087	616.110	0.023	0.075
557	521913.586	4506687.430	616.075	616.100	0.025	0.082
558	504097.007	4503563.198	640.353	640.360	0.007	0.023
559	512854.502	4502692.005	629.340	629.390	0.050	0.164
560	521914.051	4506643.339	616.021	616.040	0.019	0.062
561	512856.583	4502749.579	629.365	626.060	-3.305	-10.843
562	504093.157	4503506.501	640.394	640.410	0.016	0.052
563	512859.261	4502810.220	629.407	629.420	0.013	0.043
564	504093.270	4503448.149	640.201	640.220	0.019	0.062
565	521914.195	4506597.573	615.991	616.010	0.019	0.062
566	521914.826	4506552.453	615.991	616.010	0.019	0.062
567	504093.511	4503390.482	640.091	640.080	-0.011	-0.036
568	512861.674	4502871.095	629.454	629.480	0.026	0.085
569	512864.064	4502930.397	629.431	625.950	-3.481	-11.421
570	504093.724	4503332.425	640.028	640.030	0.002	0.007
571	521914.840	4506504.770	616.008	616.020	0.012	0.039
572	521914.949	4506459.599	615.970	615.970	0.000	0.000
573	521915.256	4506411.989	615.994	615.990	-0.004	-0.013
574	512868.413	4503043.889	629.222	629.280	0.058	0.190

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
575	512874.045	4503098.722	628.817	628.860	0.043	0.141
576	521915.262	4506362.190	616.045	616.040	-0.005	-0.016
577	512872.598	4503156.554	628.442	628.490	0.048	0.157
578	521915.638	4506313.999	616.069	616.070	0.001	0.003
579	521916.438	4506267.314	616.139	616.130	-0.009	-0.030
580	512874.989	4503216.217	628.348	628.420	0.072	0.236
581	521916.211	4506223.020	616.168	616.190	0.022	0.072
582	512877.148	4503275.710	628.205	628.280	0.075	0.246
583	512879.667	4503336.511	628.139	628.190	0.051	0.167
584	521916.844	4506178.950	616.189	616.200	0.011	0.036
585	512885.196	4503391.166	628.143	628.200	0.057	0.187
586	521916.900	4506132.991	616.219	616.230	0.011	0.036
587	512887.803	4503449.614	628.012	628.060	0.048	0.157
588	521917.085	4506086.759	616.297	616.330	0.033	0.108
589	521917.329	4506070.554	616.307	616.340	0.033	0.108
590	512886.212	4503510.132	628.028	628.060	0.032	0.105
591	512889.467	4503587.571	628.035	628.080	0.045	0.148
592	467910.693	4504904.063	687.616	outside	*	NA
593	521912.830	4506248.067	616.153	616.160	0.007	0.023
594	512891.937	4503645.524	628.052	628.110	0.058	0.190
595	467908.856	4504853.828	687.439	687.360	-0.079	-0.259
596	521911.686	4506434.383	615.964	615.960	-0.004	-0.013
597	512893.392	4503694.883	628.091	628.130	0.039	0.128
598	521910.764	4506623.396	616.002	616.010	0.008	0.026
599	467908.660	4504803.435	687.190	687.140	-0.050	-0.164

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
600	521909.882	4506758.468	616.127	616.110	-0.017	-0.056
601	467907.844	4504753.070	687.239	687.200	-0.039	-0.128
602	512896.175	4503750.251	628.104	628.170	0.066	0.217
603	521909.998	4506829.307	616.243	616.250	0.007	0.023
604	467905.631	4504696.902	687.938	687.890	-0.048	-0.157
605	512898.230	4503804.380	628.077	628.160	0.083	0.272
606	512900.414	4503860.009	628.026	628.100	0.074	0.243
607	521908.233	4506988.397	617.035	617.040	0.005	0.016
608	467907.020	4504644.807	689.342	689.320	-0.022	-0.072
609	467899.123	4504590.550	691.087	691.030	-0.057	-0.187
610	512903.234	4503930.992	628.070	628.130	0.060	0.197
611	467903.008	4504537.188	692.658	692.640	-0.018	-0.059
612	512909.197	4503986.843	628.082	628.140	0.058	0.190
613	467901.870	4504489.678	693.622	693.610	-0.012	-0.039
614	512907.386	4504038.542	628.124	628.160	0.036	0.118
615	512909.456	4504089.663	628.095	628.160	0.065	0.213
616	512911.335	4504140.826	628.052	628.110	0.058	0.190
617	467897.751	4504389.789	694.098	686.920	-7.178	-23.550
618	512916.692	4504187.040	628.035	628.090	0.055	0.180
619	467895.352	4504340.354	693.599	693.580	-0.019	-0.062
620	467892.260	4504287.962	692.576	692.560	-0.016	-0.052
621	512915.306	4504238.268	628.165	628.240	0.075	0.246
622	467886.055	4504234.170	690.976	690.950	-0.026	-0.085
623	512917.392	4504291.818	628.403	628.470	0.067	0.220
624	512919.307	4504344.029	628.647	628.730	0.083	0.272

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
625	467884.753	4504190.183	689.528	689.530	0.002	0.007
626	467882.038	4504142.141	688.337	688.320	-0.017	-0.056
627	467878.892	4504092.427	687.527	687.490	-0.037	-0.121
628	467875.186	4504044.130	687.132	687.110	-0.022	-0.072
629	467875.057	4503994.914	687.043	687.040	-0.003	-0.010
630	467872.667	4503945.258	687.002	686.970	-0.032	-0.105
631	467870.851	4503895.822	687.069	687.050	-0.019	-0.062
632	467869.748	4503845.193	687.286	687.280	-0.006	-0.020
633	467869.072	4503793.583	687.683	687.640	-0.043	-0.141
634	467868.283	4503743.262	688.045	688.030	-0.015	-0.049
635	467864.429	4503693.821	688.390	688.380	-0.010	-0.033
636	467863.688	4503642.517	688.789	684.290	-4.499	-14.760
637	467862.943	4503591.632	689.060	684.260	-4.800	-15.748
638	467862.433	4503542.611	689.216	684.790	-4.426	-14.521
639	467861.913	4503491.251	689.178	684.390	-4.788	-15.709
640	467861.126	4503440.175	689.027	684.390	-4.637	-15.213
641	467860.605	4503390.289	688.723	684.320	-4.403	-14.446
642	467859.505	4503338.941	688.339	688.340	0.001	0.003
643	467861.899	4503290.451	687.952	687.970	0.018	0.059
644	467860.910	4503240.015	687.553	687.550	-0.003	-0.010
645	467860.180	4503191.970	687.136	687.140	0.004	0.013
646	467859.344	4503144.045	686.829	686.840	0.011	0.036
647	467858.681	4503093.980	686.655	686.650	-0.005	-0.016
648	467858.039	4503043.992	686.535	686.570	0.035	0.115
649	467857.346	4502994.071	686.542	686.550	0.008	0.026

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
650	467856.289	4502944.225	686.581	686.590	0.009	0.030
651	467855.692	4502894.152	686.605	686.610	0.005	0.016
652	467854.877	4502844.706	686.597	686.590	-0.007	-0.023
653	467854.109	4502789.053	686.594	686.620	0.026	0.085
654	467853.242	4502739.644	686.568	686.590	0.022	0.072
655	467852.549	4502689.746	686.571	686.600	0.029	0.095
656	467851.811	4502637.652	686.615	686.610	-0.005	-0.016
657	467851.081	4502587.412	686.601	686.610	0.009	0.030
658	467850.339	4502537.682	686.619	686.640	0.021	0.069
659	467849.682	4502486.241	686.608	686.660	0.052	0.171
660	454307.471	4505425.311	705.091	705.090	-0.001	-0.003
661	437499.518	4510661.563	727.925	727.900	-0.025	-0.082
662	437489.724	4510600.273	728.915	728.890	-0.025	-0.082
663	454307.549	4505386.938	704.986	704.980	-0.006	-0.020
664	437484.713	4510533.215	731.177	731.160	-0.017	-0.056
665	454307.973	4505348.885	704.944	704.940	-0.004	-0.013
666	437468.279	4510472.311	733.013	732.980	-0.033	-0.108
667	454308.234	4505311.378	704.870	704.860	-0.010	-0.033
668	437453.936	4510411.848	734.449	734.430	-0.019	-0.062
669	454308.833	4505272.335	704.829	704.820	-0.009	-0.030
670	437439.537	4510349.408	734.747	outside	*	NA
671	454309.166	4505233.082	704.784	704.780	-0.004	-0.013
672	437423.907	4510281.217	733.734	733.710	-0.024	-0.079
673	454309.793	4505193.157	704.759	704.770	0.011	0.036
674	437410.322	4510223.041	731.995	731.960	-0.035	-0.115

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
675	454310.300	4505152.841	704.697	704.700	0.003	0.010
676	454310.499	4505114.568	704.621	704.630	0.009	0.030
677	437390.651	4510154.090	729.795	729.760	-0.035	-0.115
678	454310.939	4505074.884	704.510	704.490	-0.020	-0.066
679	437372.646	4510098.352	728.451	728.390	-0.061	-0.200
680	437350.559	4510040.909	728.227	728.190	-0.037	-0.121
681	454311.402	4505035.536	704.468	704.450	-0.018	-0.059
682	454311.834	4504995.362	704.358	704.340	-0.018	-0.059
683	437326.931	4509984.583	728.407	728.390	-0.017	-0.056
684	454312.369	4504956.008	704.350	704.340	-0.010	-0.033
685	437307.030	4509927.195	728.553	728.530	-0.023	-0.075
686	454312.726	4504915.851	704.298	704.290	-0.008	-0.026
687	437285.150	4509869.003	728.683	728.650	-0.033	-0.108
688	437257.879	4509808.470	728.749	728.720	-0.029	-0.095
689	454313.484	4504875.326	704.151	704.120	-0.031	-0.102
690	437234.963	4509748.959	728.949	728.920	-0.029	-0.095
691	454314.422	4504836.997	704.379	704.350	-0.029	-0.095
692	454317.219	4504797.098	705.232	705.190	-0.042	-0.138
693	437086.381	4509387.059	729.082	729.060	-0.022	-0.072
694	454317.666	4504758.213	706.796	706.760	-0.036	-0.118
695	437060.866	4509326.197	728.951	728.930	-0.021	-0.069
696	454318.131	4504717.977	708.726	708.690	-0.036	-0.118
697	437031.535	4509269.329	728.725	728.720	-0.005	-0.016
698	454311.698	4504680.221	710.268	710.250	-0.018	-0.059
699	437007.101	4509214.972	729.122	729.110	-0.012	-0.039

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
700	454316.330	4504556.663	710.725	710.670	-0.055	-0.180
701	436966.801	4509166.283	729.059	729.060	0.001	0.003
702	454319.849	4504516.802	709.372	709.310	-0.062	-0.203
703	436920.040	4509120.758	729.012	729.020	0.008	0.026
704	436872.385	4509080.994	729.119	729.130	0.011	0.036
705	454310.643	4504438.433	705.803	705.730	-0.073	-0.240
706	436818.543	4509046.592	729.169	729.180	0.011	0.036
707	436776.027	4509024.923	729.176	729.170	-0.006	-0.020
708	454307.967	4504400.096	704.687	704.650	-0.037	-0.121
709	454318.321	4504361.465	704.175	704.100	-0.075	-0.246
710	436731.529	4509006.111	728.946	728.940	-0.006	-0.020
711	454318.570	4504320.757	704.169	704.100	-0.069	-0.226
712	436686.368	4509002.364	728.670	728.680	0.010	0.033
713	454318.922	4504282.170	704.396	704.340	-0.056	-0.184
714	436642.053	4508984.416	728.661	728.660	-0.001	-0.003
715	436597.198	4508967.391	728.625	728.620	-0.005	-0.016
716	454319.913	4504243.513	704.506	704.490	-0.016	-0.052
717	454321.105	4504204.666	704.510	704.490	-0.020	-0.066
718	436551.314	4508954.332	728.572	728.570	-0.002	-0.007
719	454321.998	4504163.399	704.522	704.510	-0.012	-0.039
720	436504.503	4508945.510	728.596	728.590	-0.006	-0.020
721	454323.626	4504124.462	704.565	704.550	-0.015	-0.049
722	436456.912	4508941.047	728.726	728.730	0.004	0.013
723	454325.938	4504085.377	704.597	704.540	-0.057	-0.187
724	436397.000	4508940.535	728.775	728.770	-0.005	-0.016

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
725	454327.658	4504043.586	704.597	704.600	0.003	0.010
726	436333.184	4508941.444	728.768	728.770	0.002	0.007
727	454329.572	4504002.853	704.668	704.660	-0.008	-0.026
728	436269.365	4508942.025	728.731	728.740	0.009	0.030
729	436205.548	4508942.743	728.681	728.670	-0.011	-0.036
730	454331.549	4503966.047	704.743	704.740	-0.003	-0.010
731	436142.107	4508943.365	728.730	728.720	-0.010	-0.033
732	454333.064	4503927.693	704.882	704.860	-0.022	-0.072
733	436083.294	4508940.816	728.799	728.800	0.001	0.003
734	454334.856	4503888.192	705.015	704.990	-0.025	-0.082
735	454337.156	4503849.469	705.158	705.130	-0.028	-0.092
736	436023.958	4508941.278	728.806	728.800	-0.006	-0.020
737	454338.561	4503810.687	705.374	705.340	-0.034	-0.112
738	435964.997	4508941.858	728.903	728.900	-0.003	-0.010
739	454340.576	4503771.981	705.517	705.510	-0.007	-0.023
740	435907.635	4508942.417	729.026	729.030	0.004	0.013
741	454342.347	4503732.234	705.662	705.670	0.008	0.026
742	435849.178	4508943.465	729.061	729.070	0.009	0.030
743	454344.076	4503693.685	705.748	705.740	-0.008	-0.026
744	435790.756	4508947.466	729.081	729.110	0.029	0.095
745	454344.843	4503654.069	705.706	703.280	-2.426	-7.959
746	435734.284	4508944.997	729.249	729.270	0.021	0.069
747	435674.164	4508945.809	729.365	729.380	0.015	0.049
748	454347.284	4503596.029	705.894	700.800	-5.094	-16.713
749	435618.137	4508946.621	729.360	729.380	0.020	0.066

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
750	454348.686	4503568.967	705.942	700.790	-5.152	-16.903
751	435560.407	4508947.494	729.473	729.480	0.007	0.023
752	454349.980	4503524.741	705.987	outside	*	NA
753	435501.394	4508948.293	729.631	729.640	0.009	0.030
754	435444.750	4508949.292	729.695	729.710	0.015	0.049
755	454351.632	4503485.568	705.962	701.320	-4.642	-15.230
756	435385.780	4508950.056	729.779	729.810	0.031	0.102
757	454353.371	4503446.635	705.913	702.230	-3.683	-12.083
758	435328.739	4508954.075	729.743	729.740	-0.003	-0.010
759	454354.923	4503407.368	705.807	701.450	-4.357	-14.295
760	454356.410	4503366.268	705.738	705.710	-0.028	-0.092
761	435269.427	4508951.603	729.931	729.930	-0.001	-0.003
762	454358.020	4503327.410	705.608	705.580	-0.028	-0.092
763	435211.495	4508952.527	730.036	730.020	-0.016	-0.052
764	454359.836	4503284.234	705.450	705.410	-0.040	-0.131
765	435153.052	4508956.488	730.176	730.180	0.004	0.013
766	454361.375	4503240.614	705.230	705.230	0.000	0.000
767	435105.027	4508957.258	730.161	730.160	-0.001	-0.003
768	454362.824	4503193.201	705.056	705.020	-0.036	-0.118
769	435054.532	4508954.920	730.313	730.310	-0.003	-0.010
770	435003.552	4508955.909	730.419	730.420	0.001	0.003
771	454361.166	4503108.103	704.661	704.630	-0.031	-0.102
772	434952.112	4508956.942	730.505	730.510	0.005	0.016
773	454360.746	4503061.868	704.452	704.440	-0.012	-0.039
774	434897.894	4508961.125	730.516	730.520	0.004	0.013

Fall 2020 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
775	434849.856	4508962.080	730.682	730.690	0.008	0.026
776	454360.184	4503018.202	704.325	704.300	-0.025	-0.082
777	454359.848	4502976.401	704.233	704.240	0.007	0.023
778	434805.049	4508959.888	730.910	outside	*	NA
779	454359.051	4502933.570	704.190	704.200	0.010	0.033
780	434754.128	4508964.239	730.859	outside	*	NA
781	454359.146	4502878.478	704.264	704.240	-0.024	-0.079
782	434703.831	4508961.871	731.028	outside	*	NA
783	434658.556	4508966.254	731.027	outside	*	NA
784	454361.258	4502836.213	704.222	704.230	0.008	0.026
785	454360.700	4502795.300	703.973	703.970	-0.003	-0.010
786	434617.248	4508967.526	731.097	outside	*	NA
787	454360.589	4502752.852	703.869	703.880	0.011	0.036
788	454359.960	4502711.395	703.909	703.900	-0.009	-0.030
789	454359.302	4502668.683	703.891	703.890	-0.001	-0.003
790	454358.987	4502626.490	703.972	703.970	-0.002	-0.007
791	454358.293	4502584.891	704.015	704.040	0.025	0.082
792	454357.379	4502500.066	703.799	703.810	0.011	0.036
793	454357.114	4502456.189	703.746	703.770	0.024	0.079
794	454356.599	4502412.719	703.619	703.640	0.021	0.069

***These points were outside the Laser Z and, therefore, the Dz was unable to be calculated.**

APPENDIX C – FALL 2022 GROUND SURVEY POINT TABLES

Table 20: NVA – Platte River Fall 2022 Lidar vs.Fall 2022 survey points

Fall 2022 NVA Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
1	561166.257	4524540.796	564.440	564.460	0.020	0.066
2	542805.985	4513476.541	589.693	585.890	-3.803	-12.477
3	534894.943	4511318.178	598.683	598.700	0.017	0.056
4	542817.449	4515090.541	587.751	587.760	0.009	0.030
5	535337.558	4509737.200	598.223	outside	*	NA
6	572098.351	4537378.146	542.255	538.190	-4.065	-13.337
7	571683.667	4537753.912	540.745	540.690	-0.055	-0.180
8	571528.082	4538262.235	540.117	537.890	-2.227	-7.306
9	571510.457	4538405.332	539.742	539.690	-0.052	-0.171
10	521902.692	4507677.865	615.821	615.830	0.009	0.030
11	521907.610	4507027.206	617.284	617.290	0.006	0.020
12	504085.943	4502584.898	639.863	639.890	0.027	0.089
13	521912.064	4506945.432	616.781	616.810	0.029	0.095
14	454316.062	4504686.434	710.055	710.040	-0.015	-0.049
15	513047.682	4505498.340	627.603	627.620	0.017	0.056
16	478350.593	4501439.633	673.478	673.490	0.012	0.039
17	512868.177	4503035.653	629.325	629.340	0.015	0.049
18	467852.681	4502847.647	686.531	686.550	0.019	0.062
19	437204.402	4509665.819	729.614	724.660	-4.954	-16.253
20	435984.768	4508942.599	728.810	728.850	0.040	0.131

***These points were outside the Laser Z and, therefore, the Dz was unable to be calculated.**

Table 21: NVA – Platte River Fall 2022 Bare Earth DEM vs. Fall 2022 survey points

Fall 2022 NVA Points vs.Fall 2022 Bare Earth DEM Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**DEM Z**	**Dz (meters)**	**Dz (feet)**
1	561166.257	4524540.796	564.440	564.460	0.020	0.066
3	534894.943	4511318.178	598.683	598.700	0.017	0.056
4	542817.449	4515090.541	587.751	587.750	0.009	0.030
7	571683.667	4537753.912	540.745	540.690	-0.055	-0.180
9	571510.457	4538405.332	539.742	539.690	-0.052	-0.171
10	521902.692	4507677.865	615.821	615.840	0.009	0.030
11	521907.610	4507027.206	617.284	617.290	0.006	0.020
12	504085.943	4502584.898	639.863	639.890	0.027	0.089
13	521912.064	4506945.432	616.781	616.810	0.029	0.095
14	454316.062	4504686.434	710.055	710.040	-0.015	-0.049
15	513047.682	4505498.340	627.603	627.620	0.017	0.056
16	478350.593	4501439.633	673.478	673.480	0.012	0.039
17	512868.177	4503035.653	629.325	629.330	0.015	0.049
18	467852.681	4502847.647	686.531	686.550	0.019	0.062
20	435984.768	4508942.599	728.810	728.840	0.040	0.131

Table 22: GCP Accuracy - Platte River Fall 2022 Lidar vs. Fall 2022 Control Points

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
1	542811.068	4512970.153	588.284	588.290	0.006	0.020
2	534758.505	4512247.973	598.115	598.130	0.015	0.049
3	561037.552	4524578.201	562.613	562.630	0.017	0.056
4	542810.289	4513046.402	588.439	588.460	0.021	0.069
5	534754.057	4512093.607	597.970	597.980	0.010	0.033
6	560935.102	4524622.705	562.647	562.650	0.003	0.010
7	534730.471	4511875.901	598.531	598.550	0.019	0.062
8	542809.698	4513119.381	588.491	588.560	0.069	0.226
9	534807.981	4511571.348	599.742	599.730	-0.012	-0.039
10	560866.680	4524660.233	562.718	562.720	0.002	0.007
11	542808.943	4513206.532	588.644	588.680	0.036	0.118
12	560807.451	4524695.512	562.818	562.830	0.012	0.039
13	534874.031	4511370.664	598.696	598.670	-0.026	-0.085
14	542807.066	4513367.154	588.983	589.000	0.017	0.056
15	560740.651	4524754.250	563.088	563.080	-0.008	-0.026
16	542806.911	4513422.458	589.566	585.970	-3.596	-11.798
17	534944.712	4511153.866	599.836	599.860	0.024	0.079
18	560694.002	4524796.966	563.265	563.260	-0.005	-0.016
19	535033.050	4510885.404	600.013	600.000	-0.013	-0.043
20	535104.198	4510658.973	598.636	598.620	-0.016	-0.052
21	542805.096	4513545.950	589.321	585.880	-3.441	-11.289
22	560632.685	4524854.693	563.468	559.120	-4.348	-14.265
23	535164.358	4510407.316	597.868	597.880	0.012	0.039
24	560594.167	4524890.770	563.561	559.190	-4.371	-14.341

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
25	542804.810	4513624.700	588.561	588.570	0.009	0.030
26	535126.969	4510580.666	598.557	598.550	-0.007	-0.023
27	542803.873	4513689.552	588.473	588.500	0.027	0.089
28	560549.699	4524933.250	563.591	558.990	-4.601	-15.095
29	535073.322	4510774.451	598.816	598.790	-0.026	-0.085
30	542803.357	4513779.877	588.216	588.240	0.024	0.079
31	560508.847	4524971.751	563.482	559.120	-4.362	-14.311
32	542805.338	4513897.213	587.891	587.900	0.009	0.030
33	560480.461	4524998.320	563.348	558.980	-4.368	-14.331
34	534965.506	4511105.072	600.371	597.510	-2.861	-9.386
35	560446.926	4525030.008	563.222	563.210	-0.012	-0.039
36	542807.001	4513993.111	587.731	587.790	0.059	0.194
37	534921.670	4511246.185	598.918	598.920	0.002	0.007
38	560390.411	4525082.001	563.097	563.090	-0.007	-0.023
39	542807.856	4514112.638	587.715	587.730	0.015	0.049
40	542809.546	4514209.648	587.827	587.830	0.003	0.010
41	560360.819	4525119.223	562.810	562.830	0.020	0.066
42	534838.194	4511492.165	599.010	599.030	0.020	0.066
43	534857.088	4511436.263	598.700	598.700	0.000	0.000
44	542810.636	4514308.195	587.822	587.880	0.058	0.190
45	560336.960	4525149.589	562.570	562.590	0.020	0.066
46	542811.622	4514379.293	587.812	587.880	0.068	0.223
47	534762.686	4511721.821	599.692	599.670	-0.022	-0.072
48	560315.029	4525181.110	562.383	562.400	0.017	0.056
49	542813.430	4514523.431	587.876	585.900	-1.976	-6.483

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
50	534746.630	4511775.919	599.147	599.150	0.003	0.010
51	560290.687	4525218.618	562.158	562.180	0.022	0.072
52	542815.697	4514843.484	587.722	587.710	-0.012	-0.039
53	560270.829	4525255.013	561.910	561.930	0.020	0.066
54	534737.764	4511830.825	598.623	598.640	0.017	0.056
55	542816.853	4514995.319	587.766	587.760	-0.006	-0.020
56	560244.500	4525296.205	561.683	561.700	0.017	0.056
57	534735.808	4511855.111	598.397	598.420	0.023	0.075
58	534739.464	4511940.471	597.988	598.010	0.022	0.072
59	560227.288	4525353.781	561.542	561.560	0.018	0.059
60	534747.319	4512003.708	597.980	597.990	0.010	0.033
61	542817.847	4515193.521	587.908	587.930	0.022	0.072
62	560208.225	4525417.757	561.346	561.360	0.014	0.046
63	534752.768	4512049.490	598.026	598.050	0.024	0.079
64	560196.073	4525463.868	561.241	561.240	-0.001	-0.003
65	542804.200	4515320.163	587.704	587.730	0.026	0.085
66	542787.017	4515450.521	587.855	587.880	0.025	0.082
67	534762.489	4512148.212	598.084	598.120	0.036	0.118
68	560181.501	4525522.045	561.010	561.010	0.000	0.000
69	534763.710	4512193.965	597.986	598.030	0.044	0.144
70	560168.266	4525574.022	560.923	560.930	0.007	0.023
71	542773.452	4515551.414	587.772	587.790	0.018	0.059
72	542762.403	4515637.710	587.690	587.720	0.030	0.098
73	560147.777	4525655.234	560.863	560.870	0.007	0.023
74	535238.679	4510098.465	597.692	597.730	0.038	0.125

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
75	560133.672	4525709.906	560.824	560.810	-0.014	-0.046
76	542749.735	4515733.947	587.642	587.680	0.038	0.125
77	535458.235	4509573.806	598.272	outside	*	NA
78	560115.919	4525779.884	560.804	560.800	-0.004	-0.013
79	542737.133	4515825.846	587.873	584.990	-2.883	-9.459
80	560099.474	4525847.177	560.802	560.790	-0.012	-0.039
81	542724.896	4515921.008	587.795	587.810	0.015	0.049
82	542712.638	4516013.147	587.296	587.340	0.044	0.144
83	560085.856	4525901.638	560.781	560.770	-0.011	-0.036
84	542705.224	4516081.897	586.668	586.700	0.032	0.105
85	552386.428	4520669.432	573.037	573.060	0.023	0.075
86	560067.164	4525974.183	560.911	560.890	-0.021	-0.069
87	560050.794	4526031.912	560.931	560.920	-0.011	-0.036
88	542711.950	4516154.106	586.799	586.810	0.011	0.036
89	552387.431	4520562.757	572.921	572.930	0.009	0.030
90	552387.847	4520486.605	572.998	573.010	0.012	0.039
91	560027.788	4526090.376	560.951	560.940	-0.011	-0.036
92	559998.477	4526147.342	561.083	561.080	-0.003	-0.010
93	552306.872	4520256.686	573.845	573.860	0.015	0.049
94	552306.529	4520179.815	574.070	574.050	-0.020	-0.066
95	559960.619	4526202.838	561.179	561.190	0.011	0.036
96	552361.776	4520109.670	574.713	574.720	0.007	0.023
97	572052.572	4537419.567	542.393	538.170	-4.223	-13.855
98	552310.382	4520009.836	574.349	574.350	0.001	0.003
99	552229.962	4519894.365	574.151	574.150	-0.001	-0.003

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
100	572028.762	4537441.101	542.438	538.270	-4.168	-13.675
101	571986.529	4537479.093	542.448	538.140	-4.308	-14.134
102	552393.010	4520147.561	575.334	575.360	0.026	0.085
103	571948.067	4537513.680	542.311	538.150	-4.161	-13.652
104	552394.092	4520034.575	575.786	575.810	0.024	0.079
105	571913.499	4537544.124	542.145	542.060	-0.085	-0.279
106	552395.936	4519853.668	575.870	575.880	0.010	0.033
107	552395.080	4519742.079	575.871	575.880	0.009	0.030
108	571867.850	4537585.174	541.997	541.930	-0.067	-0.220
109	571820.214	4537627.742	541.784	541.700	-0.084	-0.276
110	552397.866	4519571.233	575.966	571.410	-4.556	-14.948
111	552399.244	4519502.937	575.977	575.980	0.003	0.010
112	571776.513	4537666.653	541.534	541.470	-0.064	-0.210
113	552396.665	4519360.860	576.181	576.170	-0.011	-0.036
114	571736.332	4537702.752	541.278	541.190	-0.088	-0.289
115	552402.936	4519137.631	580.403	580.380	-0.023	-0.075
116	571639.779	4537813.675	540.357	540.320	-0.037	-0.121
117	552400.843	4518919.659	581.486	581.500	0.014	0.046
118	552406.557	4518748.108	578.701	578.700	-0.001	-0.003
119	571607.369	4537872.833	540.304	540.260	-0.044	-0.144
120	552407.633	4518610.689	576.810	576.840	0.030	0.098
121	571591.620	4537926.501	540.163	540.090	-0.073	-0.240
122	552399.507	4518471.140	576.356	576.360	0.004	0.013
123	571582.145	4537974.372	540.015	539.970	-0.045	-0.148
124	571575.711	4538009.804	540.034	539.960	-0.074	-0.243

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
125	552410.526	4518326.734	576.377	576.400	0.023	0.075
126	571574.393	4538016.397	540.057	539.980	-0.077	-0.253
127	552411.961	4518113.264	576.202	576.200	-0.002	-0.007
128	571564.624	4538084.966	540.095	540.020	-0.075	-0.246
129	552412.598	4517989.210	576.501	576.510	0.009	0.030
130	552413.153	4517885.210	576.882	576.890	0.008	0.026
131	571553.848	4538143.814	540.054	539.990	-0.064	-0.210
132	552409.581	4517711.224	576.984	576.970	-0.014	-0.046
133	571540.840	4538195.857	540.127	540.070	-0.057	-0.187
134	552415.831	4517547.908	576.462	576.490	0.028	0.092
135	571516.855	4538328.177	540.065	540.050	-0.015	-0.049
136	552416.900	4517407.827	575.763	575.760	-0.003	-0.010
137	552417.809	4517268.355	575.951	575.930	-0.021	-0.069
138	571510.886	4538375.874	539.862	539.830	-0.032	-0.105
139	552418.463	4517145.237	576.917	576.940	0.023	0.075
140	571505.888	4538436.499	539.804	539.780	-0.024	-0.079
141	571508.744	4538474.599	539.611	539.600	-0.011	-0.036
142	552419.482	4517043.564	577.448	572.950	-4.498	-14.757
143	571508.408	4538549.999	539.732	539.710	-0.022	-0.072
144	552420.356	4516900.382	577.175	577.150	-0.025	-0.082
145	552421.054	4516747.351	576.208	576.200	-0.008	-0.026
146	571504.258	4538631.752	539.749	539.700	-0.049	-0.161
147	552423.074	4516578.316	575.486	575.490	0.004	0.013
148	571507.689	4538687.109	539.773	539.690	-0.083	-0.272
149	571507.231	4538760.716	539.837	539.780	-0.057	-0.187

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
150	571506.707	4538825.968	539.857	539.810	-0.047	-0.154
151	571506.489	4538863.707	539.844	539.800	-0.044	-0.144
152	571504.375	4538609.026	539.766	539.720	-0.046	-0.151
153	571558.368	4538111.861	540.039	540.000	-0.039	-0.128
154	571590.312	4537947.099	539.962	539.920	-0.042	-0.138
155	571898.366	4537555.471	542.065	541.990	-0.075	-0.246
156	571973.466	4537489.560	542.385	538.210	-4.175	-13.698
157	572154.315	4537326.239	542.193	542.140	-0.053	-0.174
158	572230.101	4537258.417	541.897	541.840	-0.057	-0.187
159	572301.093	4537200.084	542.319	542.250	-0.069	-0.226
160	521899.994	4507941.388	615.446	615.460	0.014	0.046
161	454357.994	4502577.509	704.002	704.010	0.008	0.026
162	504115.688	4504208.322	639.047	639.050	0.003	0.010
163	492722.374	4502172.281	659.044	659.070	0.026	0.085
164	504108.563	4504085.146	643.191	643.200	0.009	0.030
165	521904.750	4507864.169	615.755	615.750	-0.005	-0.016
166	492720.907	4502001.145	660.294	660.330	0.036	0.118
167	454360.007	4502706.928	703.874	703.900	0.026	0.085
168	492717.650	4501898.080	658.166	658.170	0.004	0.013
169	504094.042	4503892.599	643.779	643.790	0.011	0.036
170	454361.923	4502857.912	704.168	704.210	0.042	0.138
171	521900.755	4507778.447	615.681	615.690	0.009	0.030
172	504085.536	4503738.219	640.513	640.500	-0.013	-0.043
173	454363.392	4502998.405	704.230	704.260	0.030	0.098
174	492715.325	4501774.137	655.012	655.000	-0.012	-0.039

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
175	504088.299	4503583.614	640.554	640.540	-0.014	-0.046
176	521903.545	4507532.037	616.225	616.240	0.015	0.049
177	492713.429	4501652.672	654.176	654.180	0.004	0.013
178	454363.020	4503193.634	705.026	705.030	0.004	0.013
179	504088.888	4503486.788	640.338	640.340	0.002	0.007
180	492710.374	4501493.724	654.177	654.180	0.003	0.010
181	454357.824	4503332.590	705.597	705.610	0.013	0.043
182	521904.485	4507389.797	617.016	617.020	0.004	0.013
183	504089.242	4503343.093	640.027	640.040	0.013	0.043
184	492708.176	4501362.316	654.162	654.150	-0.012	-0.039
185	521906.376	4507264.347	617.458	613.230	-4.228	-13.871
186	454356.106	4503376.259	705.662	705.500	-0.162	-0.531
187	504086.855	4503209.716	639.918	639.940	0.022	0.072
188	492705.998	4501221.747	654.635	654.640	0.005	0.016
189	454353.995	4503462.932	705.880	702.230	-3.650	-11.975
190	521907.425	4507139.040	617.476	613.390	-4.086	-13.406
191	504090.215	4503078.373	640.012	640.040	0.028	0.092
192	454350.274	4503552.024	705.927	700.720	-5.207	-17.083
193	492711.531	4501086.368	654.954	654.940	-0.014	-0.046
194	521908.746	4506935.078	616.709	616.730	0.021	0.069
195	504090.321	4502964.935	640.045	640.060	0.015	0.049
196	492716.151	4500968.283	655.681	655.640	-0.041	-0.135
197	454343.320	4503696.668	705.787	705.750	-0.037	-0.121
198	504090.648	4502875.954	640.089	640.090	0.001	0.003
199	521909.333	4506845.741	616.287	616.300	0.013	0.043

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
200	454343.320	4503696.668	705.786	705.750	-0.036	-0.118
201	492715.584	4500766.170	656.627	651.450	-5.177	-16.985
202	492710.484	4500597.854	655.940	655.940	0.000	0.000
203	454344.988	4503660.523	705.681	705.470	-0.211	-0.692
204	521909.707	4506775.459	616.138	616.170	0.032	0.105
205	504090.760	4502785.667	640.092	640.110	0.018	0.059
206	504090.776	4502665.854	640.089	640.120	0.031	0.102
207	492714.959	4500409.820	654.922	654.920	-0.002	-0.007
208	521910.484	4506653.722	616.027	616.030	0.003	0.010
209	454338.816	4503819.800	705.303	705.290	-0.013	-0.043
210	454336.671	4503858.142	705.110	705.100	-0.010	-0.033
211	521911.148	4506556.083	615.967	616.000	0.033	0.108
212	492734.353	4500232.052	653.962	653.950	-0.012	-0.039
213	521912.051	4506464.985	615.954	615.980	0.026	0.085
214	454335.043	4503902.716	704.937	704.930	-0.007	-0.023
215	504091.431	4502491.087	640.056	640.100	0.044	0.144
216	492772.048	4500121.485	654.174	654.150	-0.024	-0.079
217	504091.662	4502367.613	640.058	640.110	0.052	0.171
218	492805.417	4499975.381	654.031	654.020	-0.011	-0.036
219	521912.352	4506397.682	615.984	616.000	0.016	0.052
220	454329.800	4504005.262	704.690	704.660	-0.030	-0.098
221	454326.799	4504075.898	704.585	704.540	-0.045	-0.148
222	504091.670	4502289.810	640.051	640.070	0.019	0.062
223	521913.656	4506616.284	615.995	616.020	0.025	0.082
224	492823.278	4499809.555	654.140	654.120	-0.020	-0.066

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
225	504092.160	4502172.223	640.163	640.190	0.027	0.089
226	492821.203	4500050.219	654.108	654.090	-0.018	-0.059
227	454322.431	4504152.848	704.535	704.520	-0.015	-0.049
228	521913.058	4506836.384	616.258	616.280	0.022	0.072
229	504091.962	4502048.963	640.164	640.170	0.006	0.020
230	492830.960	4500192.118	654.094	654.090	-0.004	-0.013
231	454320.243	4504231.895	704.504	704.470	-0.034	-0.112
232	454322.770	4504310.233	704.162	704.120	-0.042	-0.138
233	504092.260	4501936.852	640.178	640.200	0.022	0.072
234	492761.339	4500229.429	654.002	653.980	-0.022	-0.072
235	521909.056	4507359.514	617.194	617.200	0.006	0.020
236	454318.660	4504374.828	704.220	704.210	-0.010	-0.033
237	521907.724	4507456.193	616.664	616.660	-0.004	-0.013
238	504092.727	4501796.324	640.178	640.200	0.022	0.072
239	492729.393	4500361.179	654.389	654.390	0.001	0.003
240	521906.878	4507593.917	615.975	615.960	-0.015	-0.049
241	504093.221	4501610.577	640.264	640.250	-0.014	-0.046
242	454318.217	4504440.894	705.931	705.900	-0.031	-0.102
243	492719.700	4500479.181	655.024	655.030	0.006	0.020
244	521906.165	4507721.152	615.892	615.880	-0.012	-0.039
245	492721.461	4500736.055	656.572	651.540	-5.032	-16.509
246	454317.304	4504515.822	709.380	709.350	-0.030	-0.098
247	504093.357	4501457.979	640.400	640.390	-0.010	-0.033
248	504093.517	4501327.724	640.453	640.450	-0.003	-0.010
249	521904.830	4507814.880	615.767	615.770	0.003	0.010

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
250	492723.897	4500875.698	656.365	651.360	-5.005	-16.421
251	454314.454	4504846.298	704.251	704.240	-0.011	-0.036
252	492729.692	4501035.008	655.304	655.280	-0.024	-0.079
253	504093.990	4501175.224	640.702	640.700	-0.002	-0.007
254	521904.117	4507967.428	615.415	615.440	0.025	0.082
255	504094.333	4501023.202	641.196	637.410	-3.786	-12.421
256	513048.421	4506012.129	626.863	626.850	-0.013	-0.043
257	478389.900	4502914.675	677.295	677.300	0.005	0.016
258	478388.347	4502720.480	678.195	678.220	0.025	0.082
259	513045.899	4505940.796	626.902	626.910	0.008	0.026
260	504094.534	4500852.401	640.727	640.710	-0.017	-0.056
261	513047.715	4505809.212	631.160	631.160	0.000	0.000
262	504094.517	4500687.453	640.465	640.440	-0.025	-0.082
263	478384.801	4502618.654	673.921	673.910	-0.011	-0.036
264	513047.602	4505592.055	631.204	631.220	0.016	0.052
265	504095.219	4500568.754	640.388	640.370	-0.018	-0.059
266	478382.280	4502531.600	673.261	673.270	0.009	0.030
267	504095.313	4500413.915	640.240	640.240	0.000	0.000
268	478386.143	4502412.476	673.598	673.590	-0.008	-0.026
269	478381.439	4502266.281	673.566	673.540	-0.026	-0.085
270	513047.449	4505427.151	627.066	627.080	0.014	0.046
271	478378.083	4502188.346	673.530	673.520	-0.010	-0.033
272	513047.425	4505356.895	627.207	627.210	0.003	0.010
273	513048.171	4505282.983	627.425	627.430	0.005	0.016
274	478371.295	4502002.259	673.532	673.510	-0.022	-0.072

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
275	513047.045	4505210.533	627.622	627.610	-0.012	-0.039
276	478367.343	4501900.573	673.801	673.800	-0.001	-0.003
277	478361.790	4501765.510	674.832	670.230	-4.602	-15.098
278	512994.664	4505062.610	627.821	627.820	-0.001	-0.003
279	478359.148	4501687.418	674.762	670.170	-4.592	-15.066
280	512945.917	4504922.013	628.150	628.160	0.010	0.033
281	478357.257	4501633.410	674.359	670.170	-4.189	-13.743
282	512936.968	4504789.584	628.110	628.110	0.000	0.000
283	512931.883	4504671.898	628.316	628.310	-0.006	-0.020
284	478354.950	4501565.446	673.665	673.680	0.015	0.049
285	512927.252	4504550.358	629.078	629.070	-0.008	-0.026
286	512922.776	4504431.255	628.997	629.010	0.013	0.043
287	478347.178	4501351.735	673.510	673.530	0.020	0.066
288	512917.424	4504354.180	628.731	628.750	0.019	0.062
289	478341.411	4501207.365	673.513	673.520	0.007	0.023
290	478336.969	4501076.340	673.467	673.470	0.003	0.010
291	512913.182	4504190.753	628.078	628.100	0.022	0.072
292	512905.241	4503977.702	628.141	628.160	0.019	0.062
293	478337.684	4500940.365	673.522	673.530	0.008	0.026
294	478340.450	4500764.596	673.151	673.160	0.009	0.030
295	512898.531	4503816.632	628.128	628.140	0.012	0.039
296	478339.965	4500932.808	673.535	673.520	-0.015	-0.049
297	512894.177	4503711.767	628.131	628.150	0.019	0.062
298	478343.506	4501122.479	673.384	673.380	-0.004	-0.013
299	512883.314	4503442.568	628.069	628.060	-0.009	-0.030

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
300	512877.511	4503285.980	628.263	628.280	0.017	0.056
301	478346.900	4501270.441	673.520	673.520	0.000	0.000
302	512872.947	4503164.762	628.488	628.480	-0.008	-0.026
303	478357.353	4501452.282	673.344	673.350	0.006	0.020
304	478370.482	4501891.447	673.851	673.850	-0.001	-0.003
305	478377.418	4502076.110	673.581	673.550	-0.031	-0.102
306	512860.358	4502856.386	629.526	629.510	-0.016	-0.052
307	512895.719	4502647.775	627.466	627.460	-0.006	-0.020
308	467898.551	4504717.598	687.317	687.290	-0.027	-0.089
309	467905.112	4504635.439	689.620	689.600	-0.020	-0.066
310	512847.481	4502437.825	628.912	628.900	-0.012	-0.039
311	467902.394	4504515.739	693.129	693.070	-0.059	-0.194
312	467896.311	4504355.287	693.793	693.790	-0.003	-0.010
313	467889.181	4504269.611	692.024	692.020	-0.004	-0.013
314	467884.073	4504172.951	689.054	689.030	-0.024	-0.079
315	467871.247	4504038.216	686.958	686.950	-0.008	-0.026
316	467868.468	4503906.803	686.954	686.960	0.006	0.020
317	467864.054	4503715.065	688.159	688.170	0.011	0.036
318	467863.887	4503591.472	689.072	684.260	-4.812	-15.787
319	467862.197	4503460.516	689.111	684.270	-4.841	-15.883
320	467860.119	4503321.690	688.275	688.270	-0.005	-0.016
321	467857.805	4503196.394	687.100	687.120	0.020	0.066
322	467855.979	4503072.699	686.562	686.560	-0.002	-0.007
323	467851.105	4502964.114	686.395	686.390	-0.005	-0.016
324	467850.915	4502732.992	686.533	686.540	0.007	0.023

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
325	467849.721	4502652.103	686.550	686.560	0.010	0.033
326	467861.813	4502902.620	686.552	686.550	-0.002	-0.007
327	467864.747	4503113.891	686.691	686.690	-0.001	-0.003
328	467866.968	4503250.136	687.603	687.590	-0.013	-0.043
329	467874.927	4503809.947	687.496	687.450	-0.046	-0.151
330	467880.791	4503872.913	686.834	686.820	-0.014	-0.046
331	467890.558	4504030.375	686.794	686.780	-0.014	-0.046
332	467899.897	4504215.271	690.404	690.380	-0.024	-0.079
333	437495.461	4510619.894	728.484	728.510	0.026	0.085
334	437478.158	4510513.084	731.660	731.690	0.030	0.098
335	437459.768	4510434.991	733.925	733.960	0.035	0.115
336	437433.745	4510320.681	734.504	734.510	0.006	0.020
337	437404.565	4510196.331	731.176	731.170	-0.006	-0.020
338	437389.976	4510143.789	729.574	729.560	-0.014	-0.046
339	437359.622	4510058.543	728.219	728.250	0.031	0.102
340	437321.631	4509990.429	728.248	728.250	0.002	0.007
341	437278.984	4509861.153	728.572	728.600	0.028	0.092
342	437237.578	4509747.611	728.962	729.030	0.068	0.223
343	437138.333	4509505.612	729.935	725.700	-4.235	-13.894
344	437087.409	4509386.416	729.087	729.120	0.033	0.108
345	437032.572	4509267.853	728.775	728.820	0.045	0.148
346	436973.549	4509186.081	728.666	728.690	0.024	0.079
347	436910.205	4509122.877	728.642	728.660	0.018	0.059
348	436831.917	4509066.707	728.594	728.630	0.036	0.118
349	436747.291	4509025.016	728.686	728.700	0.014	0.046

Fall 2022 Control Points vs. Fall 2022 Classified LAS Projection: UTM 14 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID03) Units: Meters						
Number	**Easting**	**Northing**	**Known Z**	**Laser Z**	**Dz (meters)**	**Dz (feet)**
350	436640.188	4508981.310	728.774	728.760	-0.014	-0.046
351	436562.477	4508954.761	728.690	728.730	0.040	0.131
352	436432.666	4508940.615	728.753	728.780	0.027	0.089
353	436324.403	4508939.419	728.840	728.820	-0.020	-0.066
354	436240.259	4508940.048	728.755	728.790	0.035	0.115
355	436134.135	4508940.948	728.780	728.810	0.030	0.098

***These points were outside the Laser Z and, therefore, the Dz was unable to be calculated.**