MINNEHAHA CREEK WATERSHED DISTRICT
QUALITY OF WATER, QUALITY OF LIFE

Meeting: Board of Managers
Meeting date: 10/20/2022
Agenda Item #: 11.4
Request for Board Action

Title:	Authorization to Contract for Stream Channel LiDAR Collection
Resolution number:	22-065
Prepared by:	Name: Kailey Cermak Phone: 952-641-4501 kcermak@minnehahacreek.org
Reviewed by:	Name/Title: Brian Beck/Research and Monitoring Program Manager
Recommended action:	Authorization to Contract for the collection of stream channel LiDAR
Schedule:	10-20-22: Contract approval November: aerial acquisition February: deliverables received
Budget considerations:	Fund name and code: Research and Monitoring Contracted Services 5-5001-4320 Fund budget: $421,468 Expenditures to date: $93,676.38 Requested amount of funding: $32,800
Past Board action:	Res # 22-038 Title: Authorization to Submit Proposal to LCCMR for Development of 2D Watershed Model

Background:
To evolve and meet the growing challenges of climate change, the District must develop new tools to collect and analyze data. Among the tools that need to be developed is a higher resolution watershed model that enables the District and its partners to predict future flooding in surface waters, in grid systems, and with groundwater.

Over the past 20 years, major advancements in computing power and the availability of new data make it possible for the District to develop a two-dimensional model (2D model), that integrates land surface data (land-use, LiDAR, and soils) with stormwater infrastructure data, to provide a high-resolution planning tool.

To pursue this work, on June 6th, 2022 the Minnehaha Creek Watershed District Board of Managers authorized staff to submit a proposal for $738,000 to the Legislative-Citizen Commission on Minnesota Resources (LCCMR) to develop a watershed wide 2D model. The LCCMR has placed MCWD's proposal in a category to be recommended for funding, with funds being made available July 2023.

Summary:

The upcoming watershed-wide 2D model build will draw from many existing high-resolution spatial datasets to develop a granular representation of the watershed system. However, staff did forecast that some additional data would need to be collected to verify, fill gaps, gain higher resolution, or to update dated information.

Accurate creek channel shape and topography are essential components when building hydrology and hydraulic models. The District's current cross-section dataset is dated and largely is sourced from the watershed-wide stream assessments in 2003 and 2012. Channels naturally change over time, particularly after significant flooding events. Staff anticipated obtaining updated cross-sections through manual survey work during 2023, through LCCMR grant funding.

Staff's monitoring efforts along the creek revealed that drought conditions over the past two years have left the channel bed fully dry in most locations. Similar conditions were last observed in 2012. This presented an opportunity to capture high-resolution creek morphology data along Minnehaha Creek using LiDAR. LiDAR is a data collection method, often collected through fixed wing aircraft, that relies on the reflection of laserlight pulses aimed at the ground. However, airborne LiDAR pulses can't penetrate water, and won't provide information about a lake or creek bed if water is present. Therefore, the ideal time to fly LiDAR is during dry conditions.

Staff obtained feedback from multiple modeling experts who provided unanimous feedback that high-resolution LiDAR collection of Minnehaha Creek's channel would be extremely valuable to obtain. It would provide a seamless dataset of the entire creek compared to profiles of the channel at discrete locations.

Staff reached out to state experts on LiDAR data collection at both the Minnesota Department of Natural Resources and the Minnesota Department of Transportation to obtain information about the typical costs and specifications associated with a LiDAR collection of this size. Working with MnDOT allowed MCWD staff to compare rates for manual cross-section surveys recommended for 2D models against the cost for LiDAR collection. This immediately showed that investing in the LiDAR collection would be less expensive than the manual effort and provide the District with much higher resolution of surface data than manual surveying.

Seeing the value in this time-sensitive LiDAR collection, MnDOT recommended the District contract through MnDOT to accomplish the task. This results in MNDOT overseeing vendor selection, scheduling and collection, and in MnDOT's overall project management, as it has often done with other public agencies. MnDOT places a high level of value on this dataset and has offered to conduct the ground surveying and vertical accuracy verification work (RTK survey), in exchange for a copy of the LiDAR dataset. All MnDOT's services related to the performance of the proposed scope would be at no charge to the District beyond the vendor's charge. Staff also obtained a direct quote from an approved MnDOT vendor, compared with which the price to contract through MnDOT is financially favorable.

The scope of work, to be performed by MnDOT's contracted vendor, includes the following key tasks:

- Placement of targeting and ground control points: create/identify known locations to ensure horizontal accuracy of imagery and LiDAR data
- Aerial acquisition: imagery and LiDAR data collection via fixed wing aircraft
    - Imagery will be collected at a resolution of 6cm
    - LiDAR will be collected at a point density of 30 points per meter, USGS quality level 0 (QL0)
- Processing and calibration: align imagery and LiDAR to ground control points

As mentioned above, MnDOT will provide the RTK survey work to ensure vertical accuracy of the data. The final deliverable will include one LiDAR file (.LAS format) and one imagery file (TIF format).

At the October 20, 2022, MCWD Board Meeting, staff will seek approval to contract for $32,800 with MNDOT to collect high-resolution LiDAR along the Minnehaha Creek corridor. Staff is recommending this contract be entered into with MNDOT without competitive solicitation due to MNDOT's (1) experience in LiDAR data collection and (2) access to annually established set pricing from pre-approved vendors, and on the basis of staff's additional finding that the District cost for the data collection, including MnDOT services and contract management, is favorable. For these reasons, District staff suggests that MNDOT is uniquely qualified to manage and oversee the LiDAR data collection effort.

Supporting documents (list attachments):
95West/MnDOT scope of work

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RESOLUTION

Resolution number: 22-065

Title: Authorization to Contract for Stream Channel LiDAR Collection

WHEREAS, climate change is measurably changing the distribution, frequency and intensity of rainfall in Minnesota;

WHEREAS watershed managers, in partnership with local communities, must accelerate efforts to monitor, evaluate and adapt to these changes in order to fulfill shared goals of managing flood risk and improving water quality;

WHEREAS a key pillar in Minnehaha Creek Watershed District's (MCWD) climate action strategy is to understand and predict the impacts of climate change using new data analytical and planning tools;

WHEREAS to support this strategy, the District has identified the need to develop a watershed-wide two dimensional (2D) model that incorporates high resolution stormwater infrastructure and land surface data to improve our ability to inform current and future water resource management decisions in the face of changing climate;

WHEREAS, In June 2022, the Board of Managers authorized staff to submit a proposal for $738,000 to the Legislative-Citizen Commission on Minnesota Resources to develop a watershed-wide model;

WHEREAS, an accurate portrayal of a creek's morphology is an essential component when building a hydrology and hydraulic model;

WHEREAS, the District's current cross-section dataset is dated and would need to be updated to support the watershed-wide model build;

WHEREAS, back to back drought conditions have left the Minnehaha Creek Channel bed dry, offering an opportunity to collect high-resolution creek morphology via LiDAR versus manual cross-section surveys;

WHEREAS, LiDAR would provide a seamless morphology dataset for the entire Minnehaha Creek and was deemed extremely valuable by multiple modeling experts;

WHEREAS, staff coordinated with the Minnesota Department of Transportation (MnDOT) and the Minnesota Department of Natural Resources to obtain information about typical costs and specifications associated with a LiDAR collection of this size;

WHEREAS, staff compared rates for manual cross-section surveys recommended for 2D models against the cost for LiDAR, which showed investing in LiDAR would be less expensive than the manual effort and provide a higher resolution dataset;

WHEREAS, MnDOT recommended the District contract through MnDOT for the LiDAR collection, as it has often served that role for other public agencies;

WHEREAS, MnDOT places value on this dataset and has offered to conduct the ground surveying and dataset verification work at no charge, in exchange for a copy of the dataset;

WHEREAS, staff have verified that the cost for acquiring LiDAR through MnDOT is favorable to use of another vendor;

WHEREAS, Internal Governance Policy #6: Executive Limitations states that the Administrator will not purchase professional services in excess of $25,000 without competitive process, but staff recommends, and the Board finds, that it is appropriate to deviate from that policy in light of MnDOT's experience in and structured approach to LiDAR data collection and its use of annually established set pricing from a group of pre-approved vendors;

NOW, THEREFORE, BE IT RESOLVED that the Minnehaha Creek Watershed District Board of Managers authorizes the District Administrator to contract, on advice of MCWD legal counsel, for a not to exceed amount of $32,800 with MnDOT for stream channel LiDAR collection in accordance with the proposed vendor/MnDOT scope.

Resolution Number 22-065 was moved by Manager _____, seconded by Manager _____. Motion to adopt the resolution ___ ayes, ___ nays, ___abstentions. Date: 10/20/2022

_____ Date: _____
Secretary

95WEST AERIAL MAPPING

3535 South 31st Street, Suite 202
Grand Forks ND 58201
701-795-1975

PROPOSAL FOR AERIAL MAPPING SERVICES

Mr. Adam Smith, CP, GISP
Minnesota Dept. of Transportation
395 John Ireland Blvd., MS 640
St. Paul, MN 55155

RE: Minnehaha Creek – Fall 2022 existing conditions survey

SUMMARY SCOPE OF WORK

- Target placement and ground control services performed by Widseth (subsidiary owner of 95West Aerial Mapping, LLC).
- Simultaneous Lidar and Imagery Acquisition. Acquisition to be performed when ground conditions are majority snow free (approximately late Nov or early Dec).
- Initial processing, calibrating and adjusting Lidar swaths to final ground control positions.
- Deliver Lidar swaths in XYZ format .CSV and/or .LAS formats as directed by MnDOT
- Initial RGB imagery processing and deliver individual frames in TIF format.
- Exterior orientation parameters delivered in final map coordinate system.
- **Deliver all data no later than 6 weeks after acquisition**.

Area of Interest (see Exhibit A)

Red Limits = 400’ buffer off centerline over approximately 17 miles along Minnehaha Creek from Grays Bay Dam to the Mississippi River.

95WEST AERIAL MAPPING SCOPE OF SERVICES

Lidar and Imagery Acquisition

Riegl 1560ii-s Lidar sensor with UltraCam Eagle large format imagery sensor

95West Aerial Mapping, LLC (hereafter 95West) will collect approximately 6cm GSD resolution RGB imagery and simultaneous Lidar data with a nominal point density of 30 points per meter. Data collection will not be conducted while there are inclement weather conditions (high winds, rain, fog, low cloud cover) that would significantly diminish the quality of the data. Ground conditions will be majority free of snow and ice with water levels at an acceptable level per direction from MNDOT.

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LAS Files Processing

GNSS/IMU Trajectory Post Processing

95West will utilize the Inertial Explorer post-processing software based on the principle of Precise Point Positioning (PPP). This processing technique utilizes precise orbits and clock corrections for the satellite geometry, together with advanced error modeling to produce positions with high level accuracy. The result is precise aircraft positioning with sub-centimeter accuracy. Taking advantage of the designed stability of the Riegl 1560ii-s and the Riegl Processing Software Suite, precise point locations are calculated to produce a Raw LAS point cloud. 95West will perform initial processing, calibration and adjust the Lidar data to ground control. All data edit, breakline delineation and bare earth terrain data processing will be performed by MnDOT or under separate work order with 95West should Minnehaha Creek and MnDOT wish to consult out those services. The Lidar data will be delivered in LAS format in calibrated swaths fully adjusted to targeted ground control data as supplied by Widseth.

Coordinate System and Survey Services

All data will be submitted (unless otherwise directed) NAD83 Datum in Hennepin County Coordinates, NAVD88 in US Survey Feet units - or as otherwise directed by MnDOT. Targeting and ground control services will be provided by Widseth via RTK methods for target locations as pre-determined by 95West. 95West anticipates roughly 30 ground control locations.

Deliverables Summary (both seasons)

- Fully calibrated Lidar swaths in XYZ (.csv) and LAS (.las) formats.
- Fully processed individual imagery frames in TIF format.
- Exterior Orientation data in the same coordinate system as determined by MnDOT.
- Ground control coordinates in text file or .csv format.

Cost

The total fee for the above scope of services is a lump sum of **$32,800**

Itemized fee breakdown as follows:

- Targeting and Ground Control Services for 30 GCP points and 10 QC points = $12,800
- Aerial acquisition = $11,550
- Initial processing and formatting of Lidar swaths, RGB imagery and exterior orientation parameters = $8450

**Fee includes survey services, Lidar and imagery acquisition and upfront processing only. All downstream processing and map editing can be offered up for an additional fee under separate work order.*

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Schedule

Aerial acquisition will commence upon NTP and as ground and weather conditions permit in Fall, 2022 prior to snow cover. 95West will work with MnDOT in monitoring and selecting suitable weather conditions to complete the acquisition in a timely manner. Final deliverables of the unedited digital data will be produced and delivered no later than six (6) weeks after successful acquisition.

Additional Information

95West Aerial Mapping's acquisition assets are synchronized for simultaneous Lidar and Imagery collection. Additionally, 95West's UltraCam Eagle imagery sensor captures data in 4-band format and can be made available should MNDOT ever need infrared imagery for Remote Sensing or Environmental purposes.

About 95West Aerial Mapping

95West Aerial Mapping, LLC is a wholly owned subsidiary of Widseth - a Minnesota Company. All assets and labor for this project will be completed in its entirety by 95West staff located in Minnesota and North Dakota. Additional information on 95West and Widseth can be found on the following company websites.

95westaerial.com
Widseth.com

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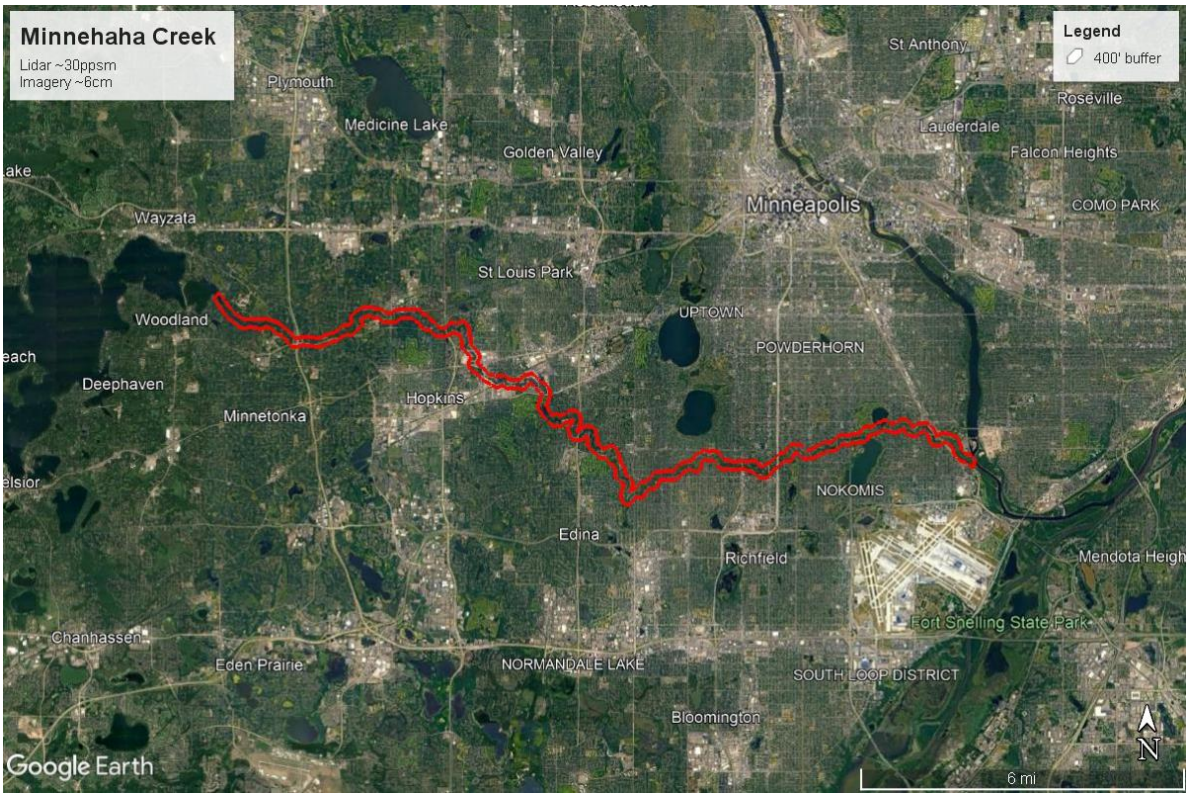
Exhibit A: Project Area – Minnehaha Creek



Red = Lidar and imagery limits (400’ buffer from centerline)

Proposal respectfully submitted by:

95West Aerial Mapping, LLC

Miles Strain, CP, RPP

Vice President