MONTANA MDT DEPARTMENT OF TRANSPORTATION

# Photogrammetry Section
## Findings & Recommendations

October 14, 2021

Prepared by:

U.S. CAD
ACHIEVE MORE.

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October 5, 2021

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Photogrammetry Section
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Thank you for taking the time to complete the U.S. CAD Discovery Process. During this journey your team has helped us gain a deeper understanding about the Photogrammetry Section. By taking the information you provided in the Discovery Workbook and through our Discovery Workshop we've compiled the information and a summary is contained within this document.

Our goal through this process is to help the Photogrammetry Section achieve more. We understand the challenges that exist within the industry and your significant investments to make your Department of Transportation great. Through this process we trust that you will have also gained more insight into your organization.

Below you will find our findings and recommendations. We trust that you will find this information useful in your pursuit to achieve more as a company.

We look forward to strengthening our partnership with MDT and the Photogrammetry Section.

Best Regards,

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# EXECUTIVE SUMMARY

Montana Department of Transportation (MDT) enlisted U.S. CAD to gather information about your organization and provide recommendations based on our experience and knowledge. Through our Discovery Process U.S. CAD was able to uncover insights about how the Photogrammetry Section performs business, technologies currently used, deliverables pain points, objectives, and goals. Information was gathered from the completed Discovery Workbook(s) and Discovery Workshop to help us best understand these areas of your department.

During our review of your Discovery Workbook and while performing the Discovery Workshop we identified/noted the following items:

- Leveraging Autodesk software in workflow
- Developing a Point Cloud workflow
- Creating Cardinal System Template for DXF file export

This report highlights our understanding of the items listed above and our proposed recommendations as a part of MDT CADD Implementation process.

This report is broken out into the following sections:

| | |
|---|---|
| **Discovery Findings** | This section highlights key elements uncovered during the Discovery Process. |
| **Department Profile** | The organizational structure of the department and interactions with internal and external teams. |
| **Current State** | Current processes and solutions used, including pain points, receivables, and deliverables. |
| **Desired State** | This section captures our understanding of the team's desire state, wish list items, goals, and objectives. |
| **Recommendations** | In this section we provide our specific recommendations on process and solutions based on our findings during the Discovery Process. |

# DISCOVERY FINDINGS

The following section highlights specific areas that were included in the Discovery process. Within each of the subsections below, U.S. CAD has made special notes regarding the challenges with the Photogrammetry Section, the current CAD software integration, and the collaboration of data between MDT Sections/Bureaus. These highlighted items are expanded upon in the Recommendations section further in the document.

The Discovery Findings have been summarized and included in the following sections:

- Department Profile,
- Current State, and
- Desired State.

The information documented in these sections provides the background for U.S. CAD's recommendations.

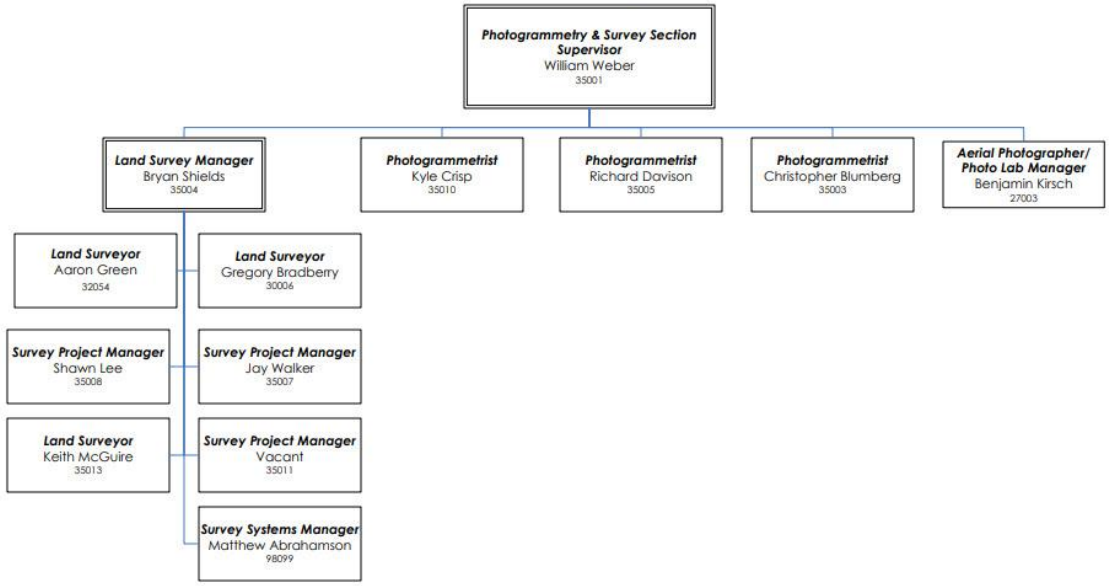
## DEPARTMENT PROFILE

The Customer Profile section provides our understanding of the organizational structure, key staff within the organization, departmental relationships, and how the Photogrammetry Section interacts with external consultants and agencies.

The major focus of the Photogrammetry Section is to prepare photogrammetric data for the consumption of the design functional areas. This process comprises of flight planning, collecting field data, compiling data in Cardinal System software, and exporting files to be imported into MicroStation for the creation of strip maps, surfaces, and orthorectified/orthomosaic imagery.

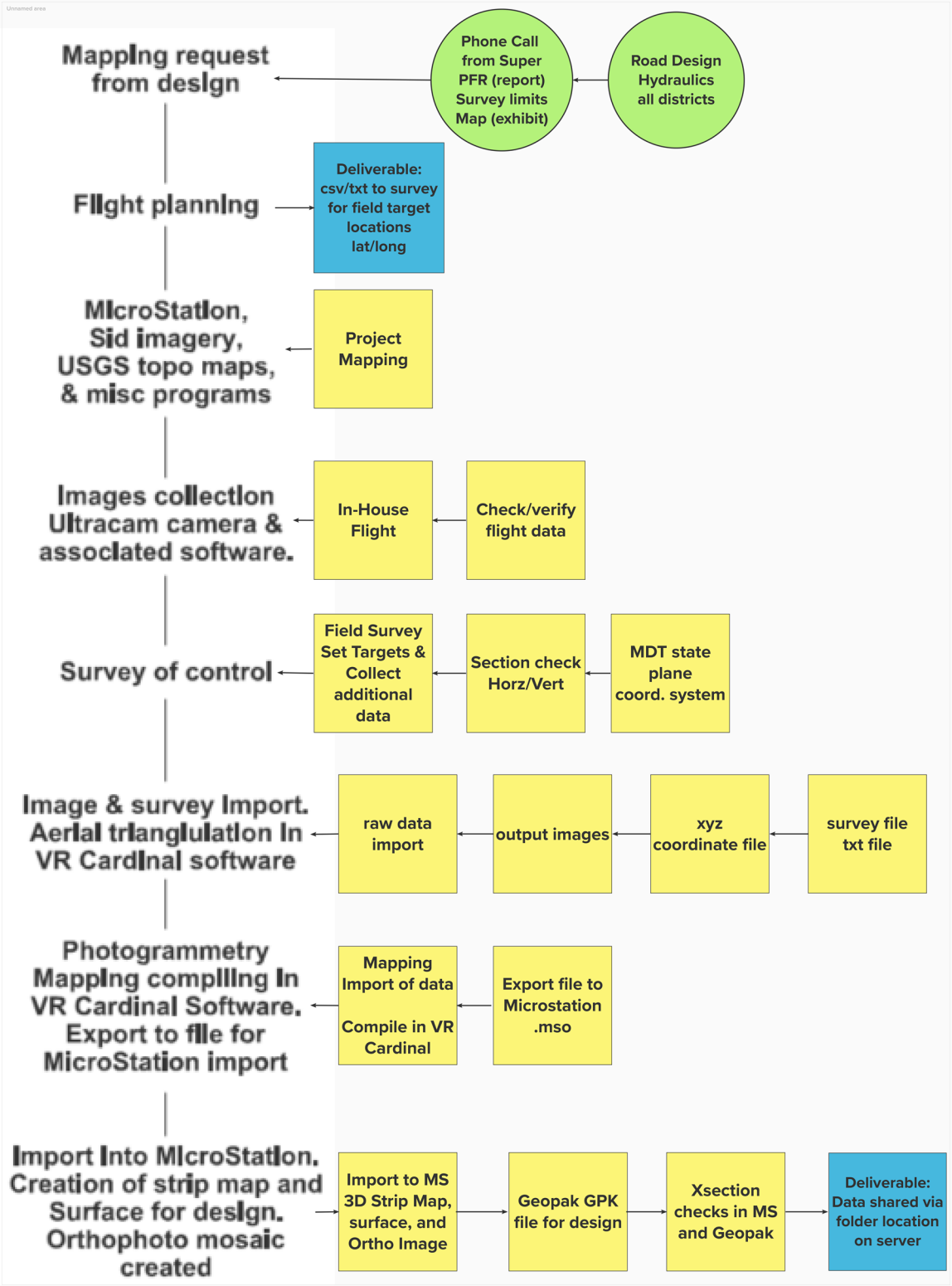
During the discovery process, U.S. CAD was introduced to Kyle Crisp who is an intricate component of the MDT Photogrammetry Section. Mr. Crisp's knowledge of the inner workings of the MDT Photogrammetry Section and industry expertise was very insightful throughout our meeting.

Organizational Chart of the MDT Photogrammetry Section provided by MDT.



# CURRENT STATE

The Current State section captures our understanding of the existing workflow, processes, and solutions used within the Photogrammetry Department:



**Photogrammetry Current Activity Table**

| Activity | Solution(s) | Additional Solution(s) |
|---|---|---|
| Flight Planning | MicroStation | |
| Image Collection | UltraCam Camera - Flight | |
| Photogrammetry data Compilation | Cardinal Systems VR2 | VR1 & VR3 |
| Strip Maps, Surfaces, Orthophoto Mosaic | MicroStation / GeoPak | |
| Deliverables | Internal Server Location | |

# DESIRED STATE

The Desired State section documents information shared by the Photogrammetry Section regarding the future desired workflows, processes, and solutions. While it is understood that not all items shared by the team members during the Discovery Process are addressed within this section, U.S. CAD has identified potential solutions and recommendations to help the Photogrammetry Section move closer to achieving their goals.

- Leveraging Autodesk software in workflow
- Developing a Point Cloud workflow
- Creating Cardinal System Template for DXF file export

During the Discovery Process a few desired items were mentioned. The utilization of Autodesk software to perform the Photogrammetry workflow was expressed to be a “Paint Point”. The need to develop a Point Cloud workflow was a desired topic since UAV (Drone) usage is increasing within the department. A Cardinal Systems template will need to be created to export DXF filetypes, for use by Autodesk products. Cardinal Systems is currently working with MDT to establish a template to transfer Cardinal System data to a consumable format for Autodesk products.

# RECOMMENDATIONS

Based on the information shared by the Photogrammetry Section through the Discovery Workbook and Discovery Workshop, U.S. CAD has prepared a summary of our recommendations. This information is prepared for you to consider as you make investments in moving forward toward your goals and objectives. We look forward to the discussions around these recommendations and next steps.

The Photogrammetry Section's current workflows are derived around capturing the existing data and site features of a project, creating strip maps, surfaces, orthorectified photo mosaics, validating data with cross sections, and delivering the data via a local server location to other functional areas within MDT. The methods being used to perform these tasks include flight planning, aerial photogrammetry, survey control, compiling the aerial data, create strip maps, surface and orthorectified imagery. The Photogrammetry Section has integrated very specific software to manage, analyze, and translate the data being captured using these approaches. U.S. CAD's recommendations are not intended to disrupt the current workflow, but to enhance it, making it more productive and efficient by utilizing the Autodesk AEC Collection.

By incorporating the Autodesk AEC Collection into the current workflows, the Photogrammetry Section will not only streamline their workflow but be able to collaborate with internal Sections/Bureaus and external consultants more efficiently. The software within the AEC Collection we anticipate the Photogrammetry Section leveraging most often will be Civil 3D, AutoCAD, InfraWorks, and BIM 360.

U.S. CAD believes that these recommendations will provide the essential tools and skills to perform their current workflows in a more timely and efficient manner. By incorporating the Autodesk AEC Collection set of tools, specifically Civil 3D, AutoCAD, InfraWorks, and BIM 360, the internal collaboration between functional areas will increase as well as the software compatibility with external consultants and agencies.

**Photogrammetry Recommended Activity Table**

The table below outlines the proposed solutions to be replaced by previous solutions as a part of the transition from Bentley to Autodesk. In some instances, no changes or replacements have been proposed, (i.e. Cardinal Systems).

| Activity | Solution(s) | Additional Solution(s) |
|---|---|---|
| Flight Planning | Civil 3D / InfraWorks | AutoCAD |
| Image Collection | UltraCam Camera - Flight | |
| Photogrammetry data Compilation | Cardinal Systems VR2 | VR1 & VR3 |
| Strip Maps, Surfaces, Orthophoto Mosaic | Civil 3D | |
| Deliverables / Collaboration | Civil 3D / BIM 360 | |

## Future Considerations

U.S. CAD recommends that the Photogrammetry Section be included in the MDT training implementation and focus on the topics of Civil 3D, AutoCAD, InfraWorks, and BIM 360 as part of their training program.

Photogrammetry data will be consumed by other departments, and it is recommended that workflows be created that address the handling/consumption of the data by leveraging external references and data shortcuts, as appropriate.

## Next Steps

An additional workflow shall be discussed with the Photogrammetry Section to ensure that the Autodesk solution, Recap, will be a suitable solution for compiling point cloud data collected from the departments UAV (Drone).