



GIS Section

Findings & Recommendations

October 14, 2021

Prepared by:



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Confidential

October 5, 2021

Montana Department of Transportation
GIS Section
2701 Prospect Avenue
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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 GIS Section. By taking the information you provided in the Discovery Workbook and through our Discovery Workshop we've compiled the information and summarized the finding within this document.

Our goal through this process is to help the GIS Section achieve more. We understand the challenges that exist within the industry and your significant investments to make your company 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 Department of Transportation.

We look forward to strengthening our partnership with MDT and the GIS 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 GIS 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 better understand these areas of your organization.

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

- GIS Section staff are experienced ESRI users
- Currently, GIS and CAD integration/collaboration is a challenge
- Other functional areas are using outdated GIS data when creating project documentation

This report highlights our understanding of the items listed above and our proposed recommendations as a part of the 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 division 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 made specific notes regarding the current challenges GIS faces, the current CAD software integration, and the collaboration of data between MDT functional areas. 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

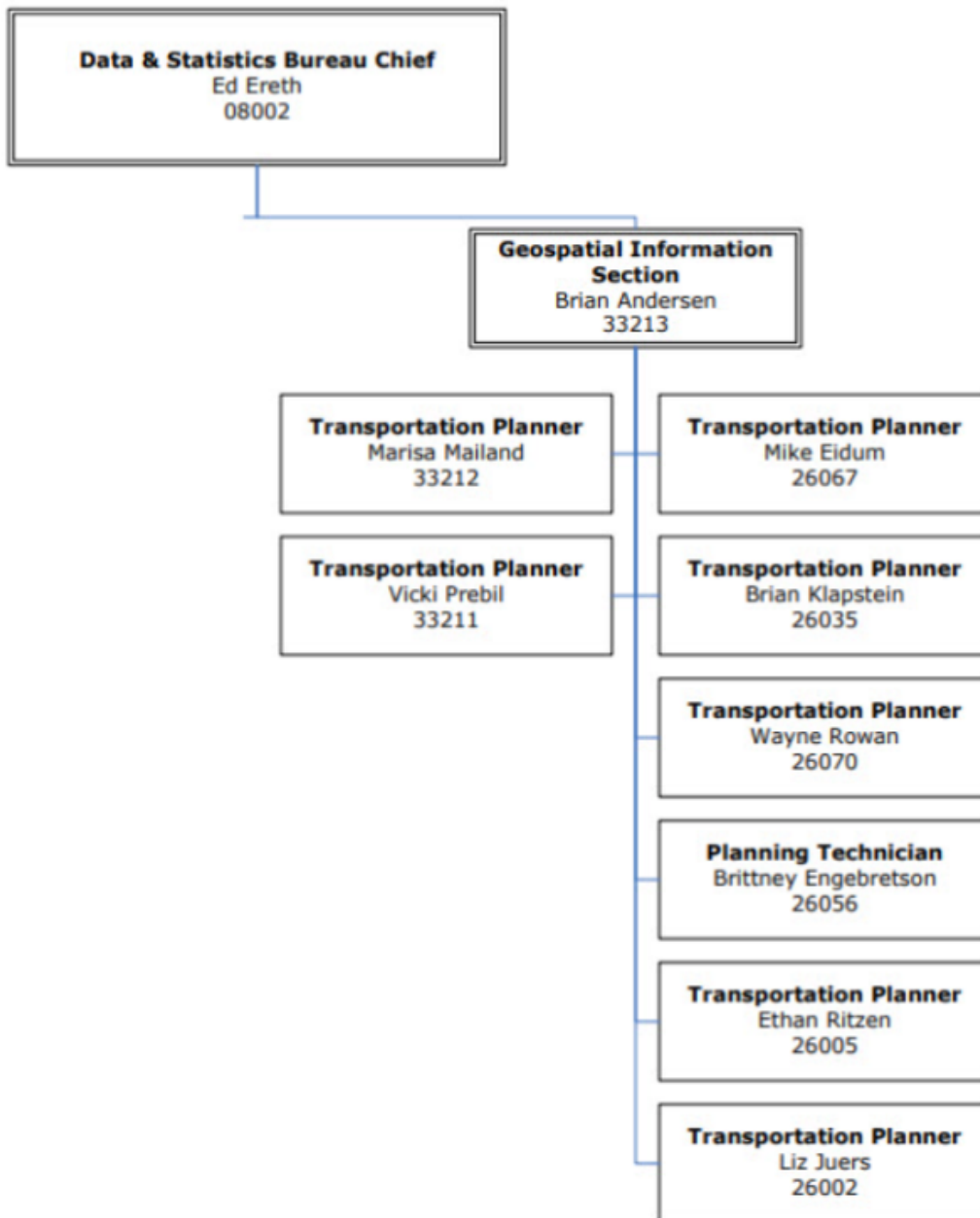
The Department Profile section provides our understanding of the organizational structure, key staff within the organization, departmental relationships, and how the GIS Section interacts with external consultants and agencies.

During the discovery process, U.S. CAD was introduced to three (3) key staff members who are integral components of the MDT GIS Department; Brian Andersen, Brian Klapstein and Ethan Ritzen. All these employees have immense knowledge and skills working within the GIS ecosystem.

All the key staff members, along with the additional GIS staff, create, consume, and share GIS data with internal functional areas and external consultants, agencies, and the public. Some of the tools used by the GIS Section include ESRI, Oracle, ALTIS, Trimble. As-Built plans are leveraged for data as well.

During the workshop it was noted that vehicles equipped with LiDAR technology will be introduced to the data gathering process as early as spring of 2022. Aerial imagery of the state of Montana is flown every two (2) years as well.

GIS Organizational Chart



CURRENT STATE

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

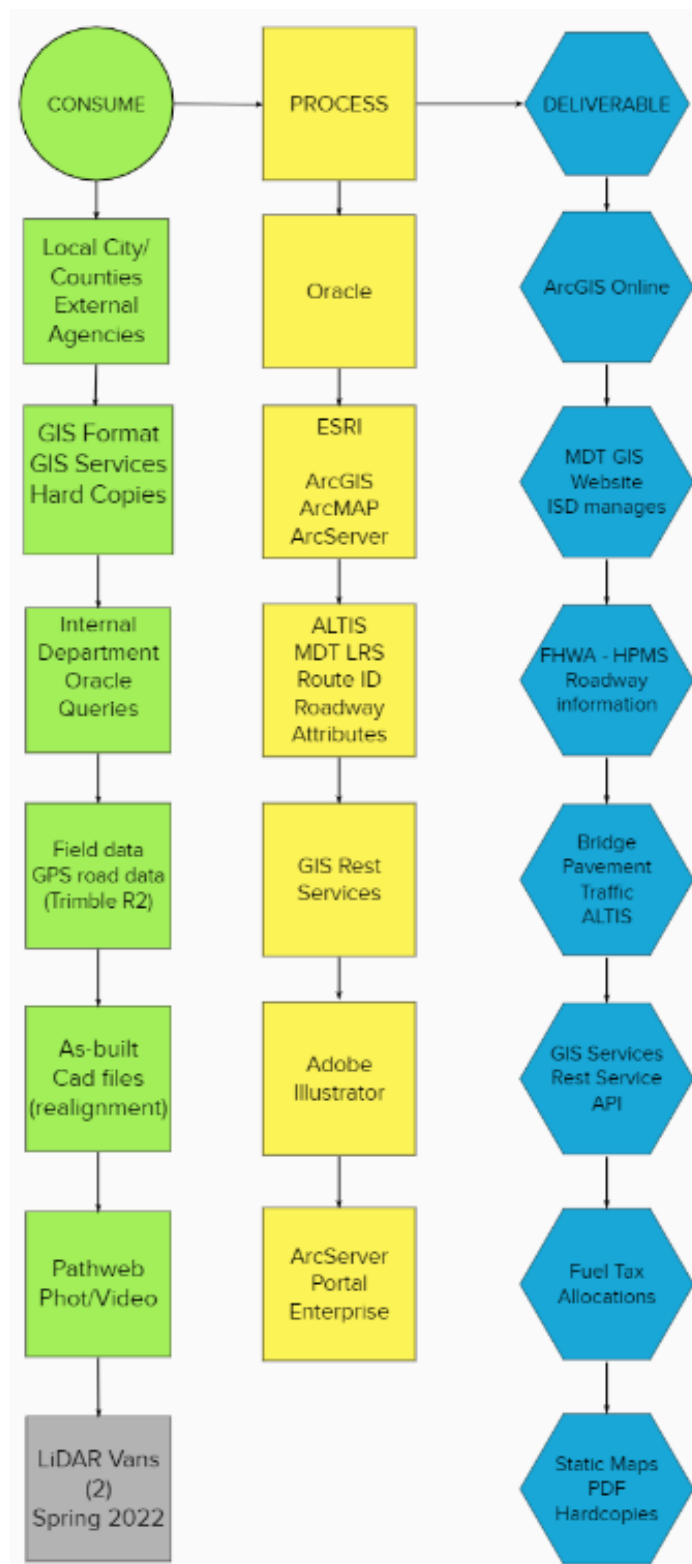
The GIS Section is focused on consuming and creating GIS data to be leveraged internally and externally. They commonly gather data from other agencies as well as different areas within MDT (Preconstruction, Construction, Civil Rights), utilize a Trimble R2 receiver to collect field data, leverage as-built plans (printed or PDF's), and query an internal Oracle database. Some of the deliverables include ArcGIS data hosted on the MDT Featured Maps webpage (<https://mdt.maps.arcgis.com/home/index.htm>), ALTIS*, GIS Service, Fuel tax Allocations and PDF's or hardcopies.

*Advanced Linear Transportation Information System (ALTIS) is a foundational Linear Referencing System (LRS) and database for use by all MDT business entities reliant on highway attributes and roadway characteristics that reflect the current extent and spatial location of Montana's highway system. Being the authoritative core LRS for MDT, it maintains associated roadway attributes, supports Federal and State reporting requirements, visualization of the LRS and attributes in a GIS, and provides the ability to perform spatial analysis. It is interfaced via web services, with all applicable MDT management systems as the core LRS as to ensure data and locational integrity used to manage unique highway features and systems.

MDT is using ALTIS as the central authoritative database for all locations and attributes on Montana's roadways. Utilizing the LRS, MDT database systems now can work together using the spatial location on the roadway to ensure data and locational integrity. This also provides MDT employees the ability to look

GIS Section – Current In-House Workflow

The graphic shown below represents our understanding of the current workflow. The graphic was created using an on-line whiteboard during the Discovery Workshop with key GIS Section staff.



DESIRED STATE

The Desired State section documents information shared by the GIS 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 GIS Section move closer to achieving their goals.

- Collaborative workflow for GIS and Design data
- Ability to consume digital design plans and as-builts
- Begin to leverage Point Cloud data

Throughout the discovery process with the GIS Section, the need for digital collaboration between the Section and engineering design was expressed. Currently the GIS Section is receiving non-digital design plans and as-builts. A more effective and efficient method of sharing data is preferred.

LiDAR point cloud data will begin to be consumed by the GIS Section in the near future. An internal process for creating, processing, utilizing, and delivering LiDAR point cloud data will be necessary.

It should be noted that MDT and ESRI are teaming up to establish a partnership during their CADD implementation process. The result of this partnership should produce productive and efficient workflows that benefit both the GIS Department as well as the design departments. Autodesk has already incorporated ESRI tools into their software, bridging the gap between the GIS Section and design functional areas.

RECOMMENDATIONS

Based on the information shared by the GIS 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 GIS Section gathers data from numerous sources, creates data, and shares data through various channels, both internal and external. The discovery process provided insight and awareness of the GIS Section current workflows, processes, and procedures. The intent of these recommendations is to create a stronger alignment and efficient collaboration between the GIS Section and Design functional areas. The GIS Section does not currently utilize CAD software, so the inclusion of them in the MDT training opportunities would be solely to give the department a greater understanding of what GIS tools are available within the Autodesk software and what to expect from receivables during their consumption of data from the Design functional areas.

U.S. CAD believes that by implementing the following three key components, that the GIS and Design functional areas can create an aligned and collaborative work environment. With these three implementations the Design functional areas will be able to leverage GIS data as well as create and deliver GIS data to the GIS Section. Autodesk Map 3D, Civil 3D, and Infraworks can use GIS data through various file types and database connections. These products can access GIS data through Oracle, ESRI, SQL, and additional connections and data stores. Civil 3D can consume and publish ArcGIS data as well.

- Demonstrate to the GIS Department how Autodesk software imports/exports GIS data
- Training Design functional areas to utilize Autodesk software to import/export GIS data
- Create workflow(s) allowing the GIS Department to consume CAD data

Future Considerations

U.S. CAD proposes that after the knowledge transfer is completed, a workflow should be outlined and documented for both the GIS Section and Design functional areas to be used in future collaborative efforts. A pilot project shall be identified during the implementation process that would allow the utilization of GIS data, as well. This would allow the Design functional areas and GIS Section to identify workflow solutions in conjunction with creating an efficient roadmap for sharing data on future projects.

Next Steps

U.S. CAD would like to demonstrate the tools within the Autodesk products to the GIS Section to give them further insight on what file types can be imported and exported. With this knowledge, U.S. CAD feels the GIS Section will have a better understanding on what the Design functional areas capabilities are for consuming, leveraging and delivering GIS data.

By exposing the GIS tools included in the Autodesk AEC Collection to the Design functional areas during training engagements, it will allow the Design functional areas to collaborate more efficiently and effectively with the GIS Section. Providing the Design functional areas the tools to import GIS data, utilize the GIS data in their current workflows, and how to export to a format capable of being consumed by the GIS Section is key.