

ATV Equipped with RTK for Tile Planning

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Problem Statement:

The task of planning tile layouts for Maple Drainage is a slow tedious process using a laser and receiver to collect elevation measurements.

Solution:

Create a topographic measuring vehicle to survey elevation for future clients and to create tile layout plans.

Deliverables:

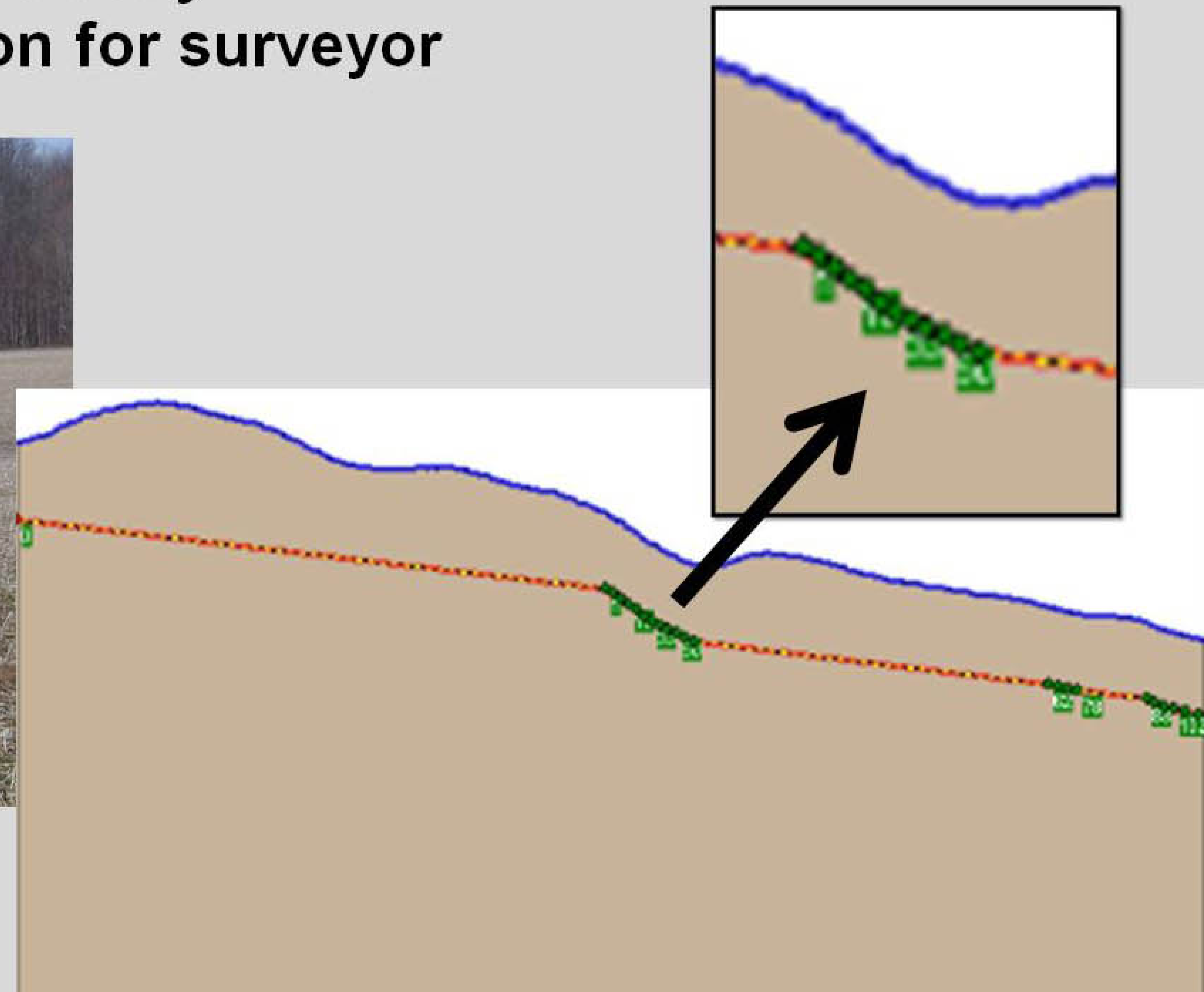
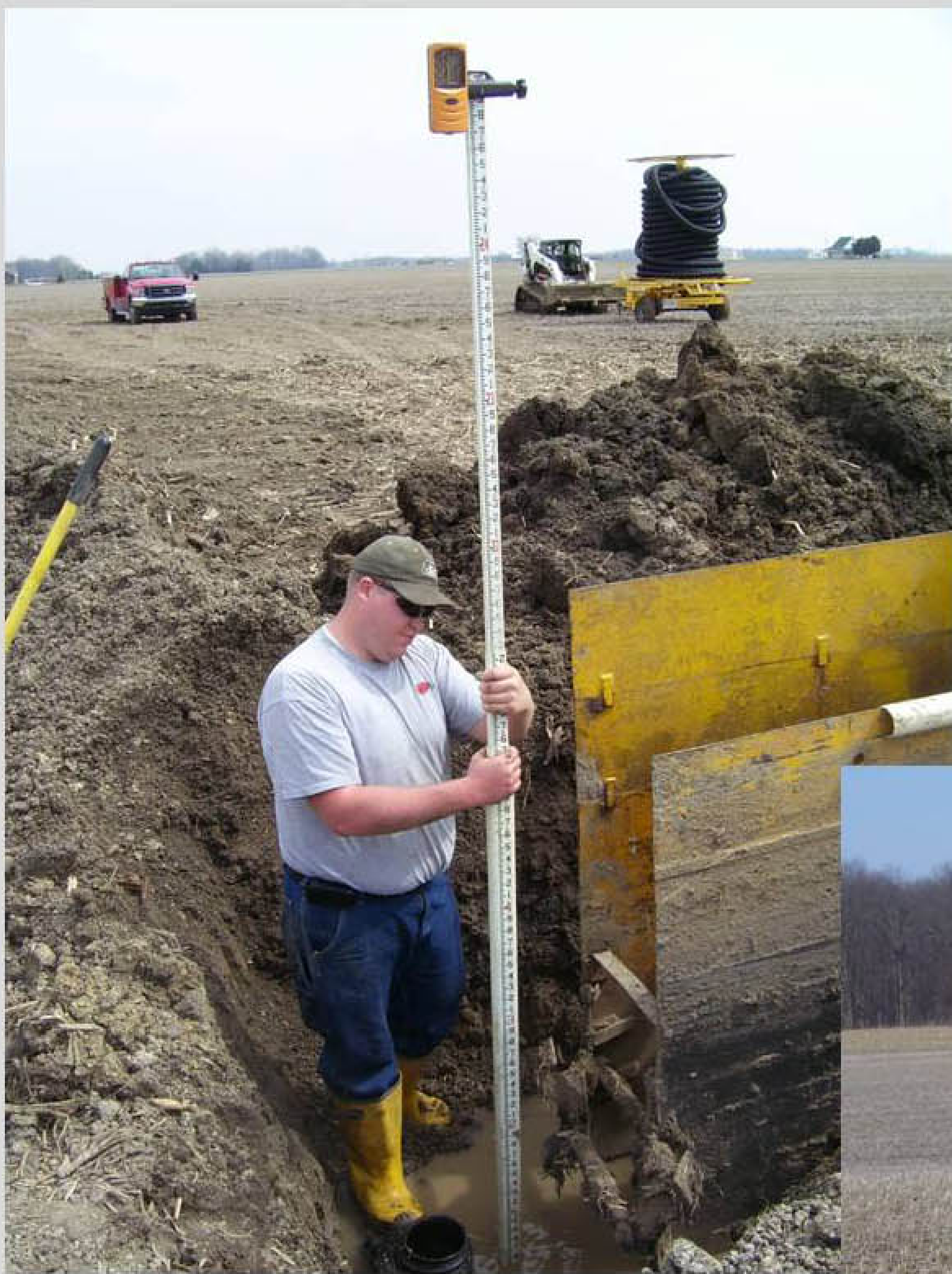
- A fully functional topographic measuring vehicle
- Drainage layout plan created for a future client
- Comparison analysis of both systems
- Cost analysis of system

Project Application:

Survey vehicle for Maple Drainage to record elevation and create tile layout plan. Be able to replace the laser system to speed up and enhance tile planning.

Laser Planning Problem:

- Slow process of scouting field by hand
- Weather can affect the accuracy
- Ditcher needs laser to install tile which causes conflict
- Possible mistakes while taking readings
- Laser only has a 2 dimensional plane, causing possible blind spots if set incorrectly
- Specific qualification for surveyor

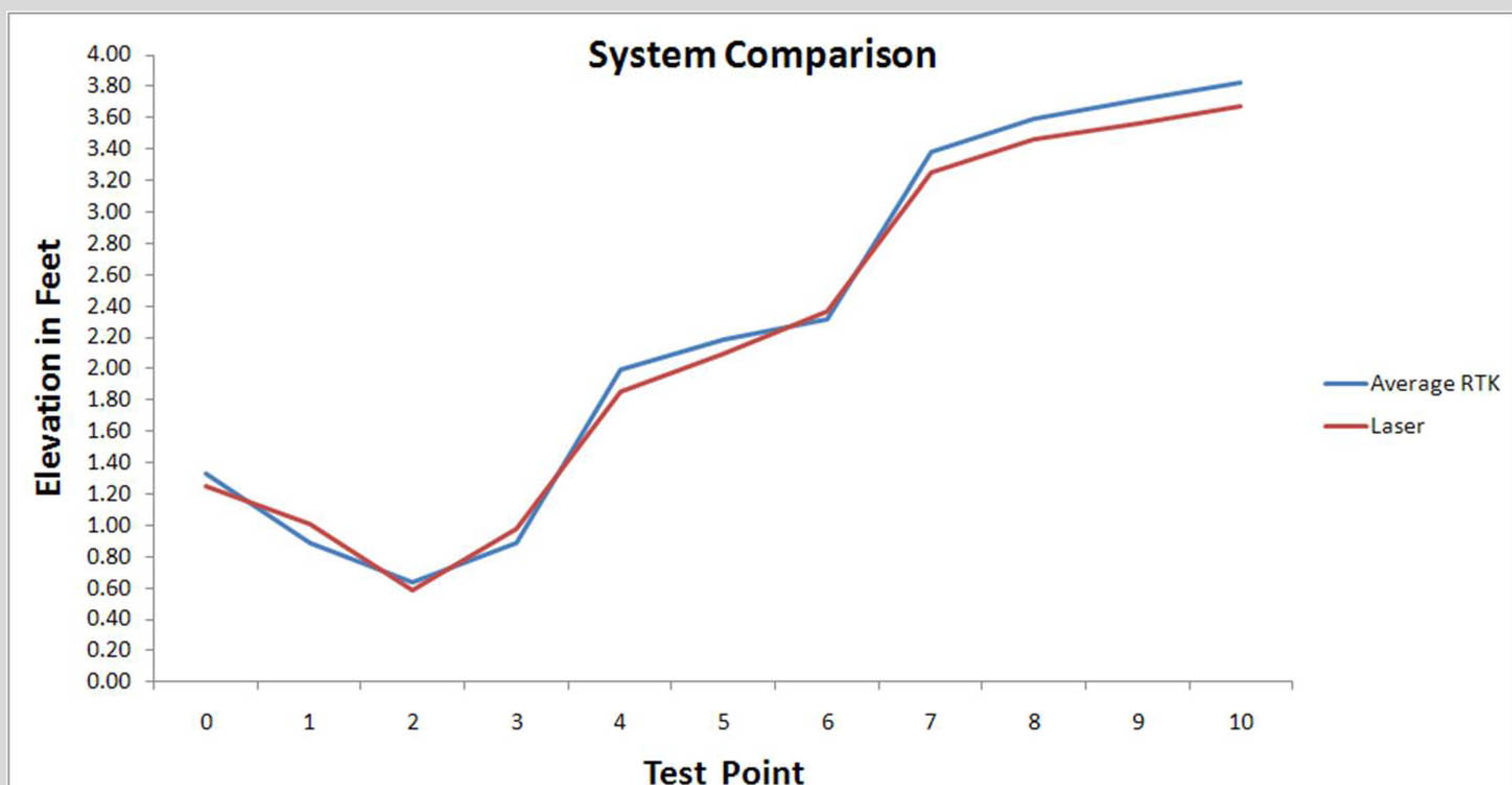


Why is this system better?

- Using this system is a faster and more efficient way to plan clients' fields
- Reduces the qualification needed for personnel who survey fields
- The John Deere Apex program will be used to plan the layout
- The best fit line feature is used to calculate a steeper slope to reduce the actual cutting depth overall while maintaining the minimal slope and minimum depth
- Once the field is mapped the elevation is saved for reference for future planning

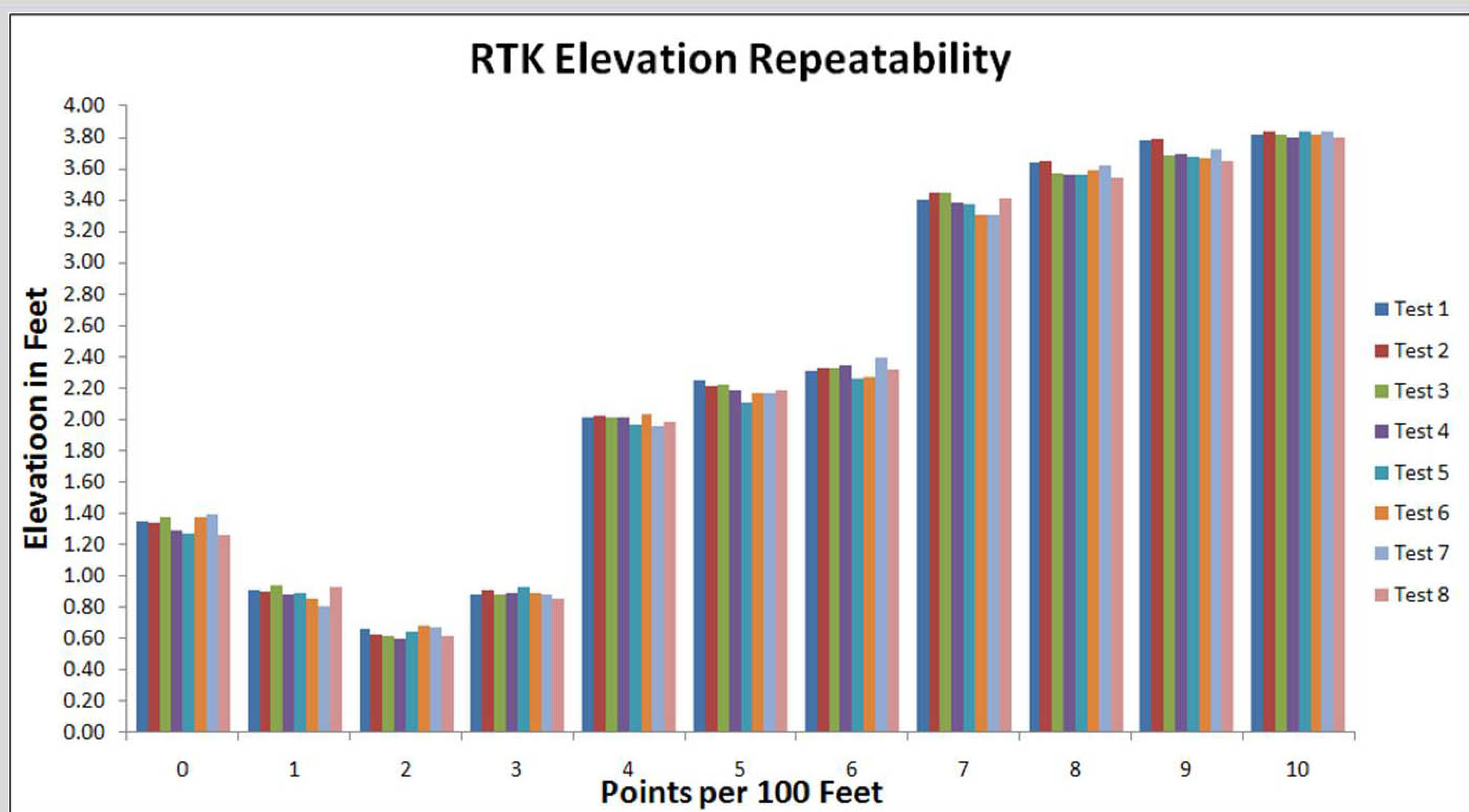
Comparison of Accuracy:

In the comparison of the systems we marked off 1000 feet in 100 foot increments, labeling each point 0 through 10, and set a data point with the ATV and recorded the laser's elevation readings. We then ran the ATV across that 1000 feet taking elevation. Once we had done this the data was compiled and examined.



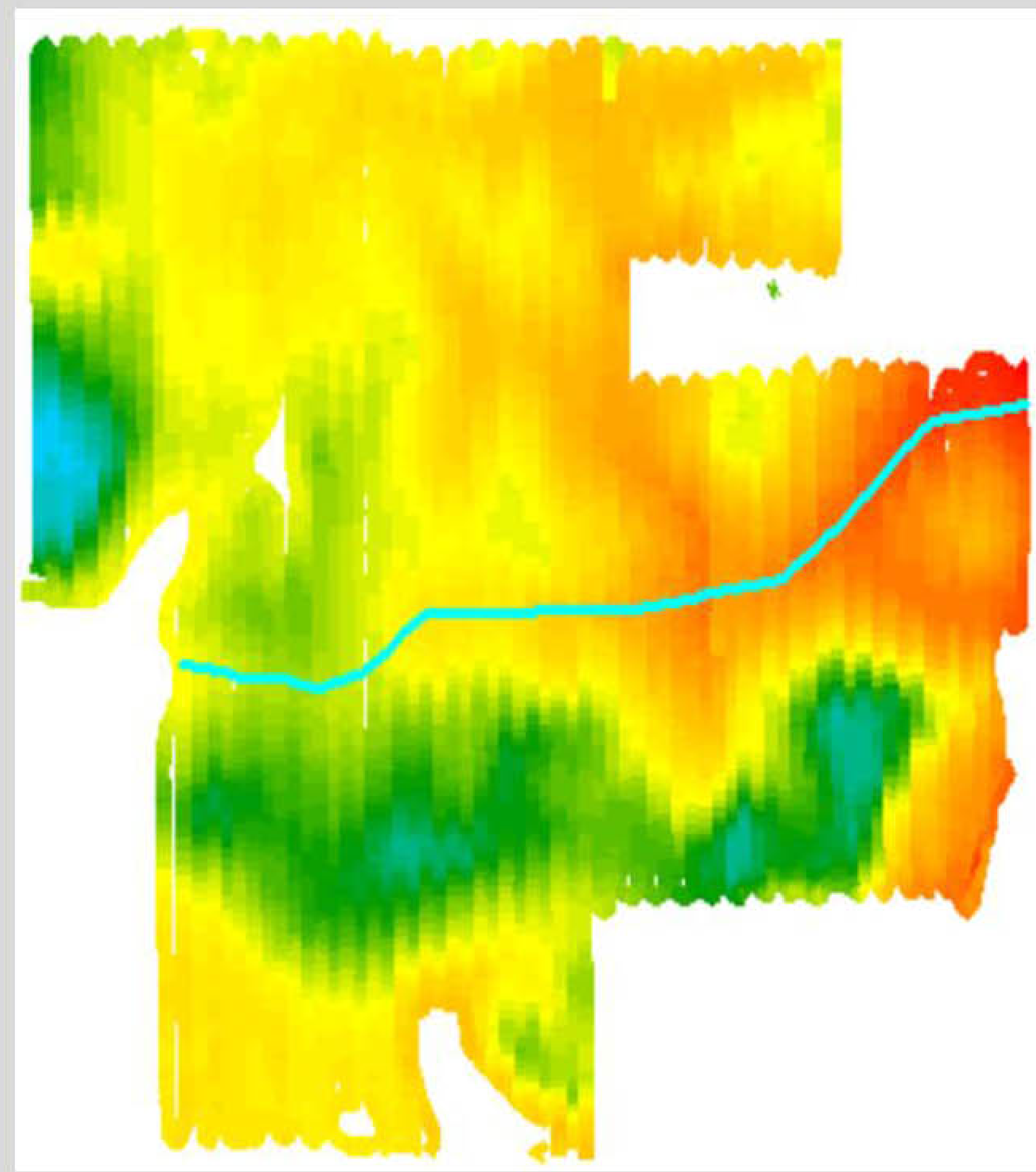
Repeatability Test:

We mapped the same 1000 feet and recorded the elevation on different days conditions and times of day to find how repeatable the accuracy of RTK elevation.



Planning a Tile Layout:

A client of Maple Drainage needs to drain a problem area of their field. We mapped the 160 acre field and then used John Deere's Apex program to find a possible tile line and see if this job was feasible. We found that this job is possible and did so without use of the laser system.



Cost Analysis of Systems:

This system can be run on any vehicle, but to replicate this model it would cost \$23,100. The cost of the system without the ATV would be \$13,000. The only cost incurred by Maple Drainage for this project was approximately \$400 for a wiring harness and mounting brackets. The old laser system cost would be \$7,500. In the old system the assistance of a utility vehicle is still needed. The cost difference would be \$5,500 more for the new system, but the advantages are worth the cost. This system will provide more descriptive planning for the firm allowing them to scout more clients with reduced labor and keep accurate records for future planning. This allows for more tile to be laid improving down time between clients. On average the firm can lay 20,000 feet a year, with better planning they can lay upwards to 30,000 feet. This increase in production leads to paying for the difference in one year, and the whole system in two years.

Special Thanks To:



Reynolds Farm Equipment



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