LiDAR & Terrain Analysis

Golden Gate Park

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GEO342 Introduction to Remote Sensing

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American River College

Summary

LiDAR is unique in a sense that it is essentially many points put together on a grid in order to paint an image that we can recognize and analyze. This project overall was definitely a learning curve in trying to work with large datasets and new programs and program features that are still advancing as the years go by. I initially wanted to do some sort of terrain analysis of some random area, but decided to choose the Golden Gate Park just because it was something familiar and I had happened to stumble upon a couple of datasets to work with. After retrieving the data that I needed, I realized there wasn't much terrain to work with when it came to the park seeing that it barely had a significant slope to it. I decided on doing a comparative analysis between two programs, ArcMap and Quick Terrain Modeler. I was able to generate five different types of maps.

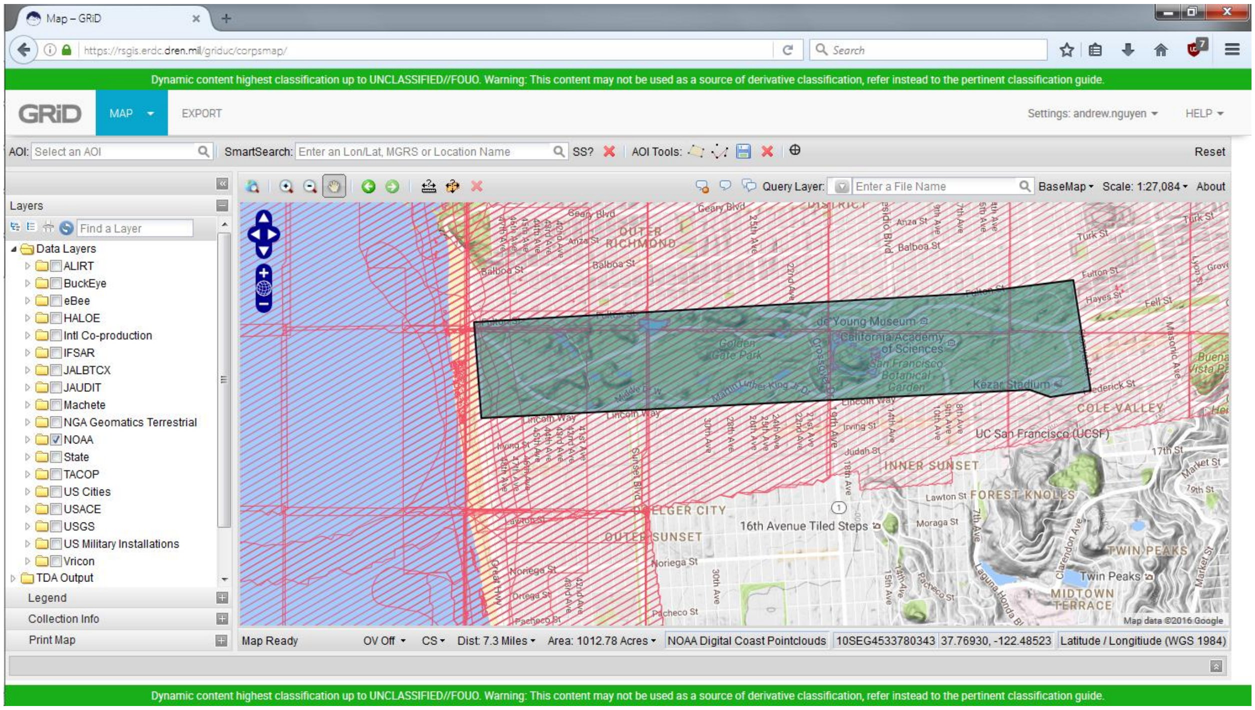
Overall, this was a great experience getting to learn what LiDAR is about. There are definitely much more intricate steps to learn about working with LiDAR, but this was enough just for the basics. The use for this type of technology can definitely change the way we see the world if it were broadly used and widely available to the average consumer.

Purpose

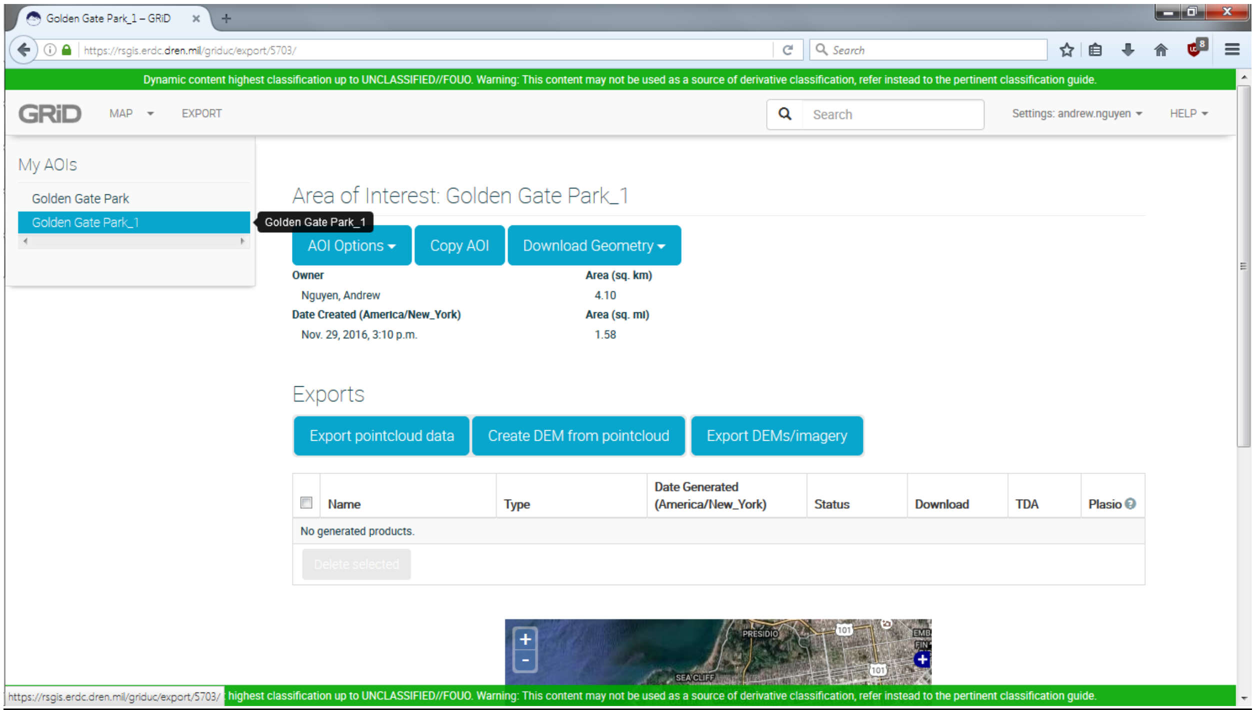
The purpose of this project was to explore the ins and outs of LiDAR. It isn't a subject that I have too much background in which is why it was intriguing to explore. I want to compare ArcMap and Quick Terrain Modeler in the ease of use between the two. I will be creating a Digital Elevation Model, Profile Analysis, Line of Sight Analysis, Slope Analysis, and an Interactive 3D Model using both ArcMap and Quick Terrain Modeler. High Resolution Terrain Information Viewer and Google Earth will be used in conjunction with the programs in order to create my product. This project will show the capabilities of LiDAR and the differences between two programs that can be used to manipulate it. It will also show the types of output that you can generate with LiDAR data.

<u>Description</u>

GRiD was my main source as a means of data acquisition, but I also used USGS' TNM Download as well to acquire data. GRiD's data was much better compared to what USGS had with a 1M resolution; therefore I ended up using the GRiD data for 2010.



Point clouds and Digital Elevation Models can be downloaded directly off of GRiD. The Digital Elevation Models are widely available for most areas which is great if you just need the DEM. This saves a couple steps in the process. I was also able to choose the different datasets that are available based on percentage of coverage and age of the data.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HELP
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Golden Gate Park_1
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Nguyen, Andrew
Area (sq. km)
4.10
Date Created (America/New_York)
Nov. 29, 2016, 3:10 p.m.
Area (sq. mi)
1.58
Exports
Export pointcloud data
Create DEM from pointcloud
Export DEMs/imagery
Name
Type
Date Generated (America/New_York)
Status
Download
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No generated products.
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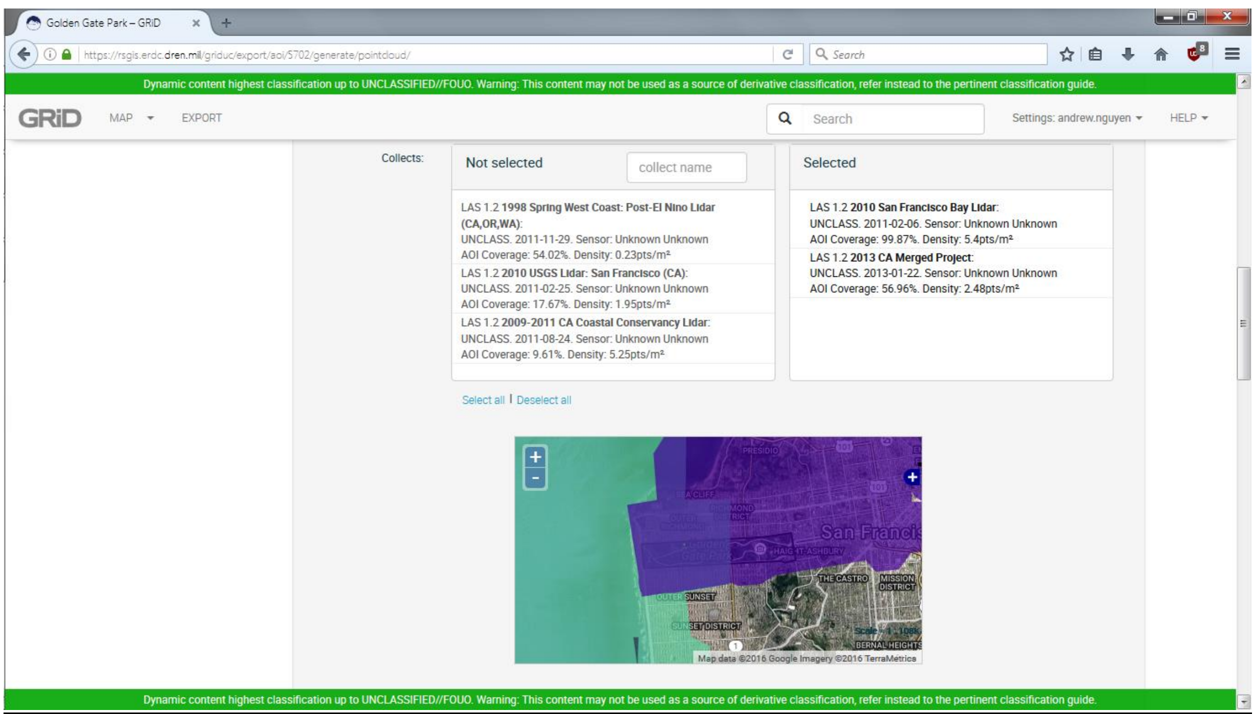
Golden Gate Park – GRiD
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AOI Coverage: 54.02%. Density: 0.23pts/m²
LAS 1.2 2010 USGS Lidar: San Francisco (CA):
UNCLASS. 2011-02-25. Sensor: Unknown Unknown
AOI Coverage: 17.67%. Density: 1.95pts/m²
LAS 1.2 2009-2011 CA Coastal Conservancy Lidar:
UNCLASS. 2011-08-24. Sensor: Unknown Unknown
AOI Coverage: 9.61%. Density: 5.25pts/m²
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LAS 1.2 2010 San Francisco Bay Lidar:
UNCLASS. 2011-02-06. Sensor: Unknown Unknown
AOI Coverage: 99.87%. Density: 5.4pts/m²
LAS 1.2 2013 CA Merged Project:
UNCLASS. 2013-01-22. Sensor: Unknown Unknown
AOI Coverage: 56.96%. Density: 2.48pts/m²
Select all
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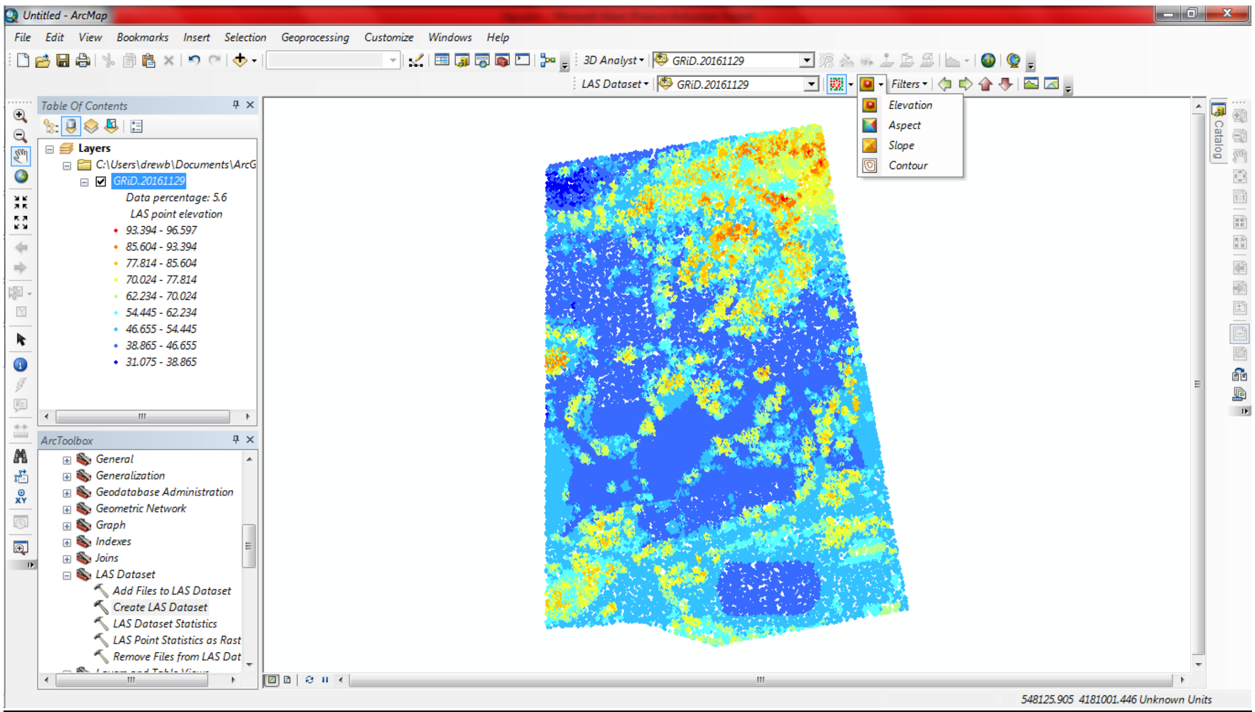
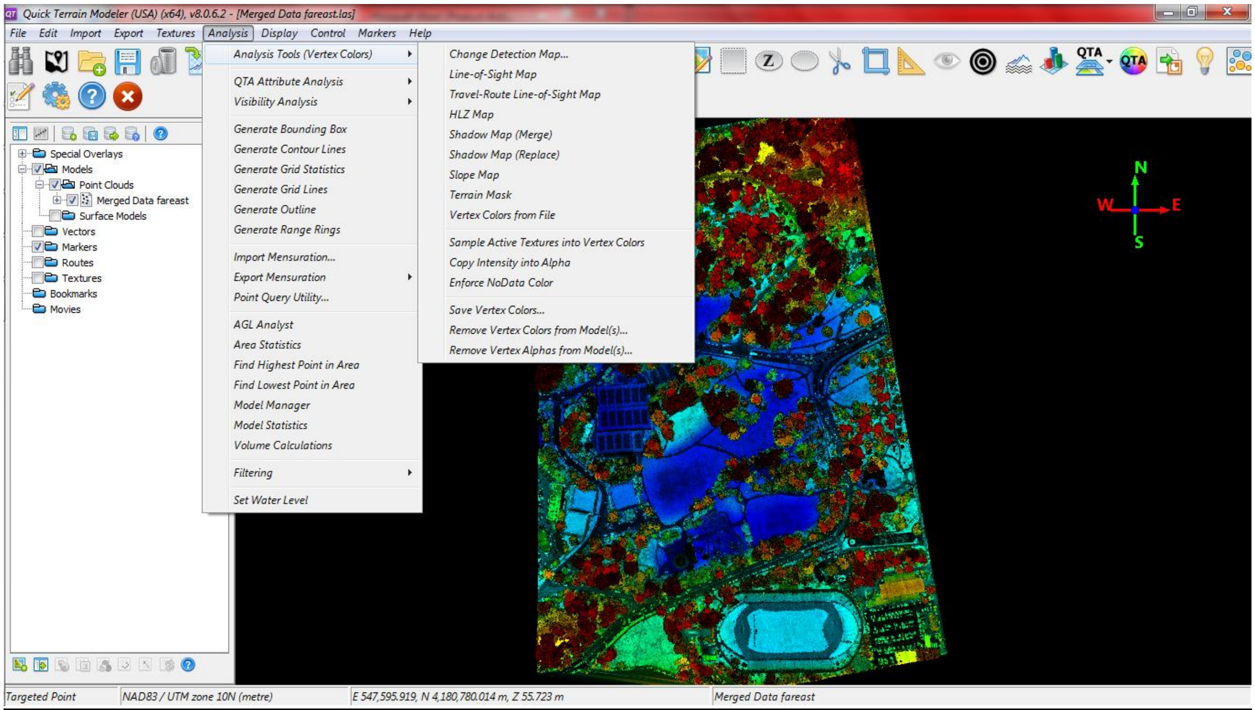
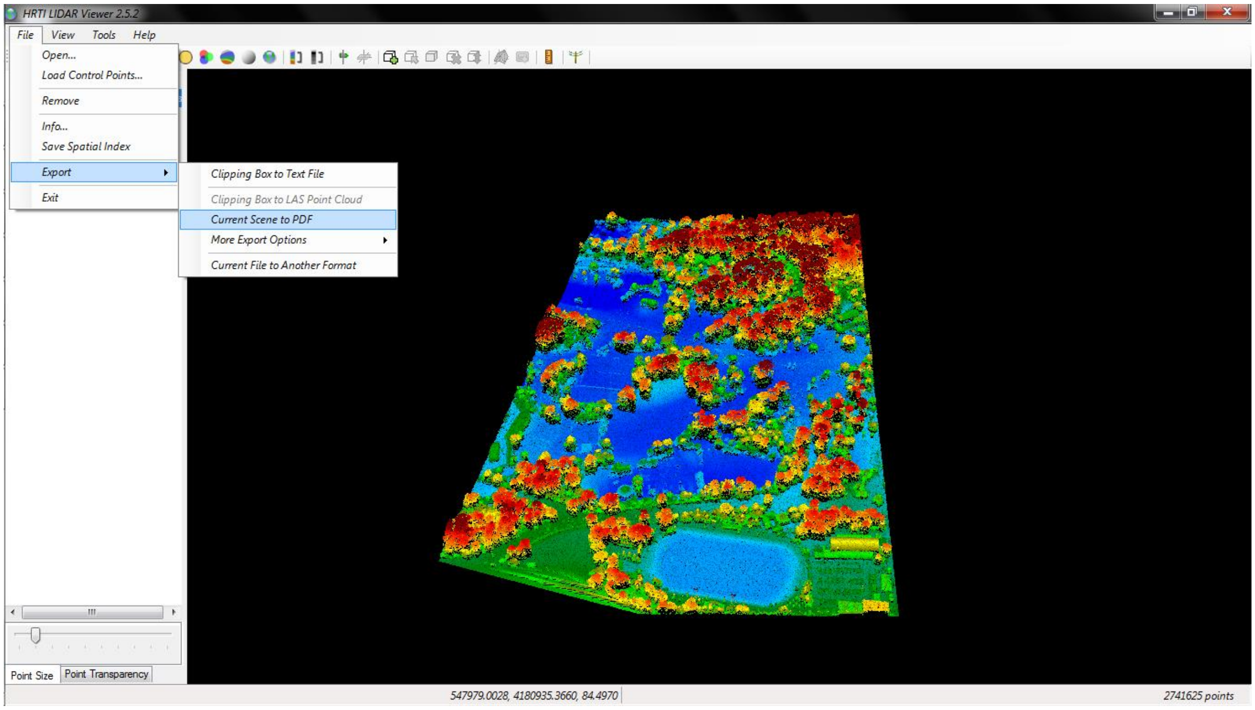
Map data ©2016 Google Imagery ©2016 TerraMetrics
Dynamic content highest classification up to UNCLASSIFIED//FOUO. Warning: This content may not be used as a source of derivative classification, refer instead to the pertinent classification guide.

The toolsets in ArcMap and Quick Terrain Modeler are very similar in a sense that they are easy to learn and use, but it’s the difference in resolution and quality of the output that separates them. I did have to convert my LAS Dataset to a .tin in order to create my Line Of Sight map using the 3D Analyst toolset. Everything else was done in the LAS Dataset tools. In Quick Terrain Modeler, you are able to work strictly with LAS datasets and create the different maps.



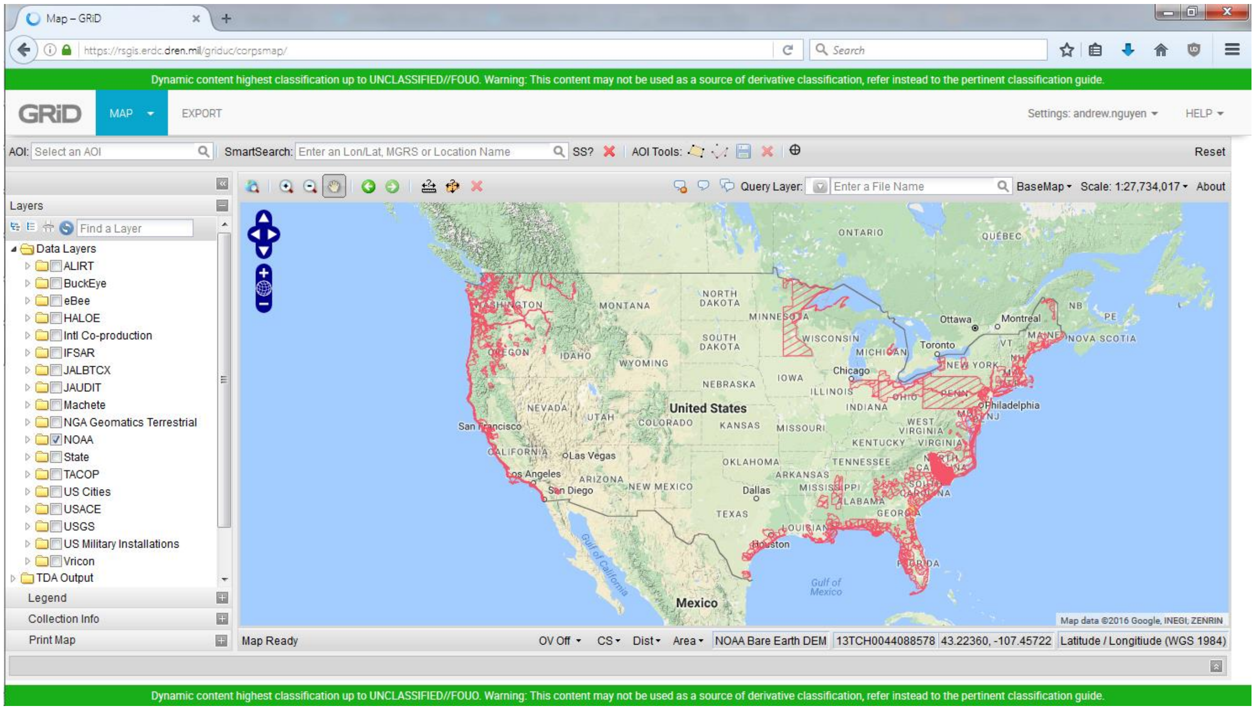


For the Interactive 3D Model, I had to export the as a LAS file type from Quick Terrain Modeler and open it up in HRTI Viewer. From there, I exported the scene as a PDF which is a usable format for the average person trying to open up your file. ArcMap definitely has a 3D view built into the LAS Dataset tools and you can use ArcScene to view datasets in 3D, but those all require the ArcGIS suite and the extensions to do so. You can say the same about Quick Terrain Modeler which is why it is helpful to be able to have a conversion to a file type that is universally used for presentations.



<u>Difficulties</u>

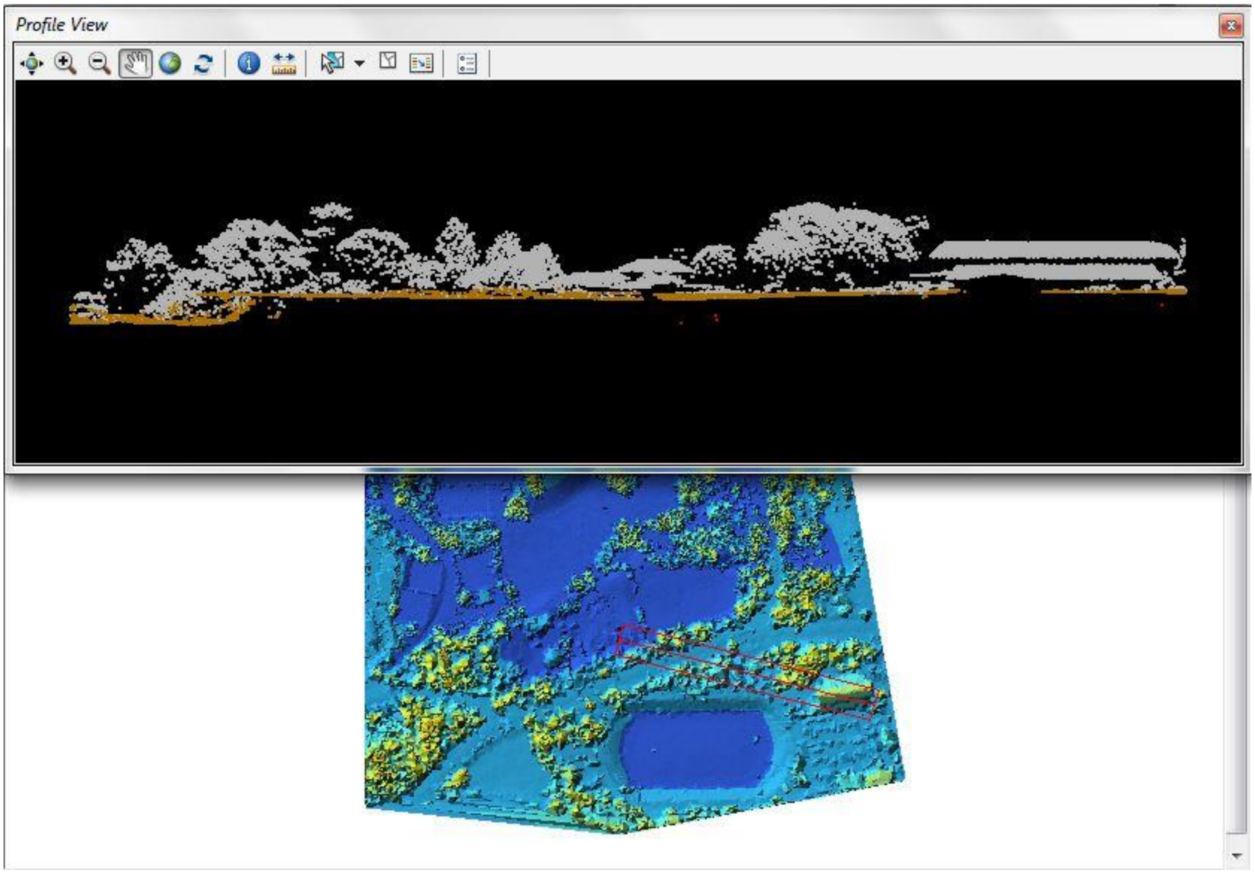
Working with LiDAR in general can be difficult due to the limited aspects of the topic in general. Instead of finding a location and trying to look for the data I did the complete opposite because LiDAR point cloud data is limited as it is. Instead, I pulled up data available and chose a location out of the data that was available because I knew there was a limited amount of datasets to work with. The image below shows the data available from the NOAA covering the coasts of the United States.

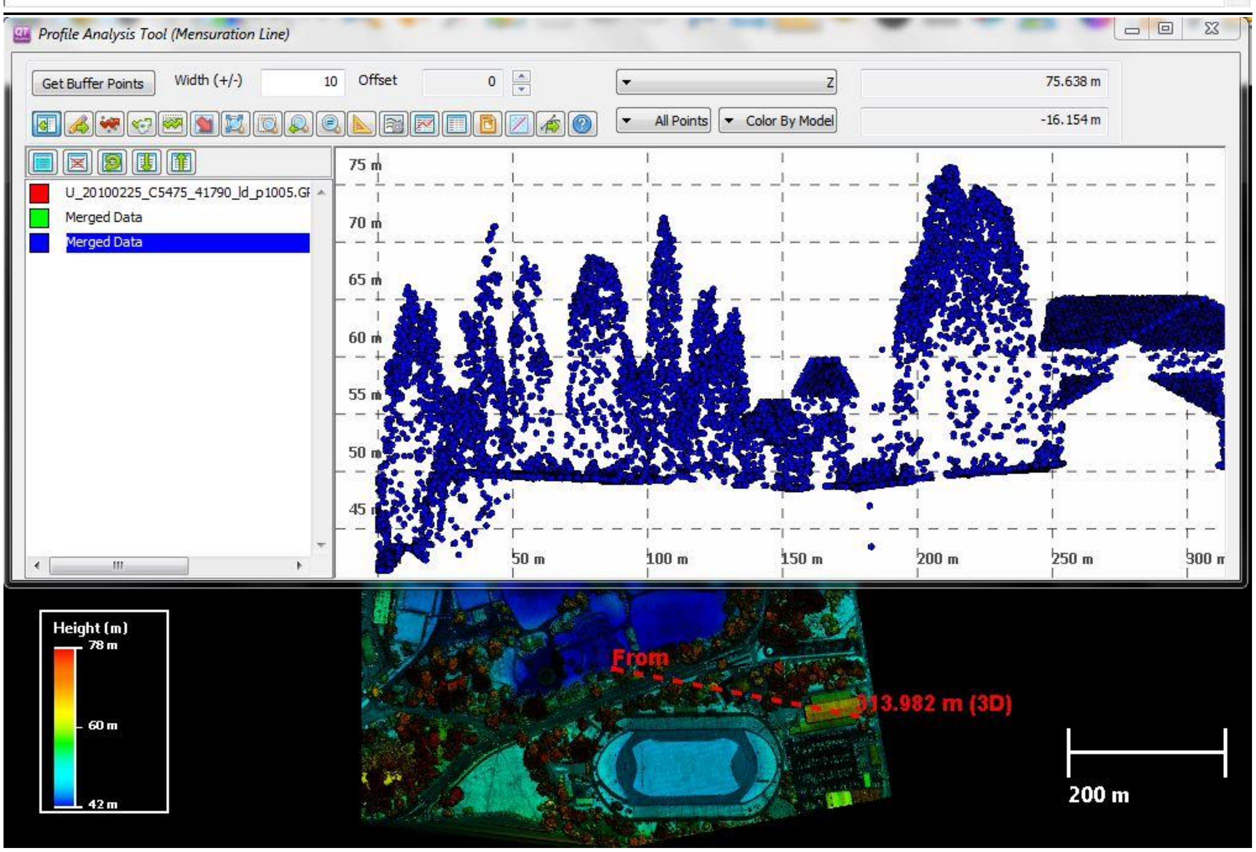


The file sizes involved with LiDAR data were also a big issue because you would need a super computer to process a large amount of it. This limited me to a small chip to the Golden Gate Park because if you were to work with anything larger it will indeed crash your computer. My chip size turned out to be approximately .5 square miles worth of data and that was large enough to slow my computer down and crashed it three times. The chip contained anywhere between 2-3 million points. I had tried the other chips and they were between 9-10 million.

<u>Output and Interpretation</u>

The Golden Gate Park was a good and bad example depending on which map was to be depicted of the landscape. The park is relatively flat which did not fare well for the slope map, but was great for everything else that was created. There was a mix of trees for a canopy view and buildings, roads, and open fields which made for interpreting elevation, profiles and line of sight easier. There was an issue with the Line of Sight results in ArcMap and Quick Terrain Modeler because they did not yield the same results. I could not figure out why either. The Interactive 3D Model could not be included in this document due to the nature of its size as well.


Profile View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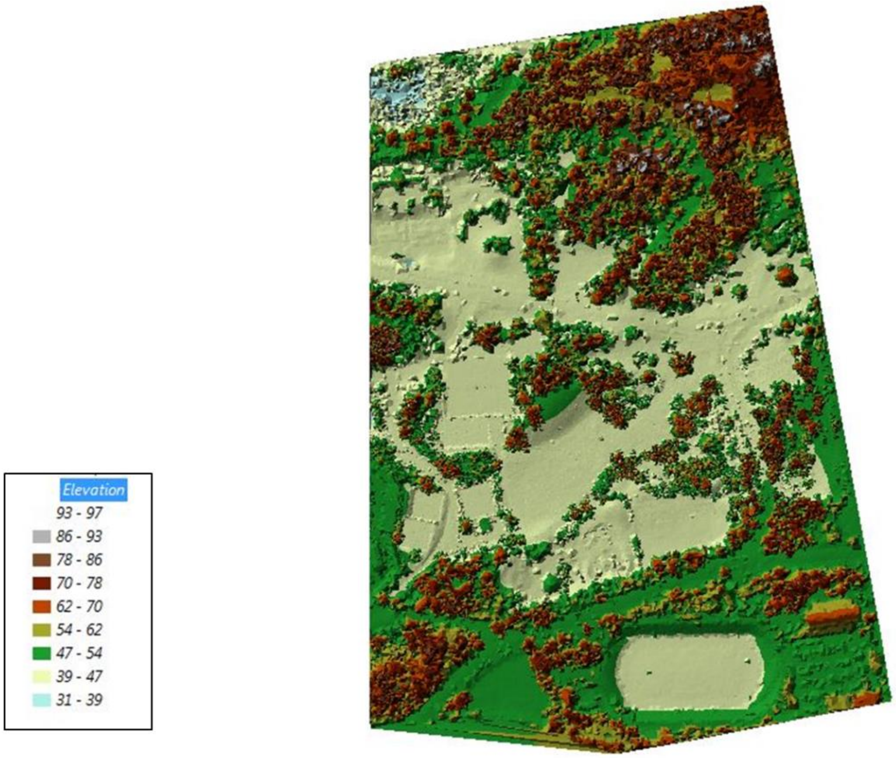
Elevation
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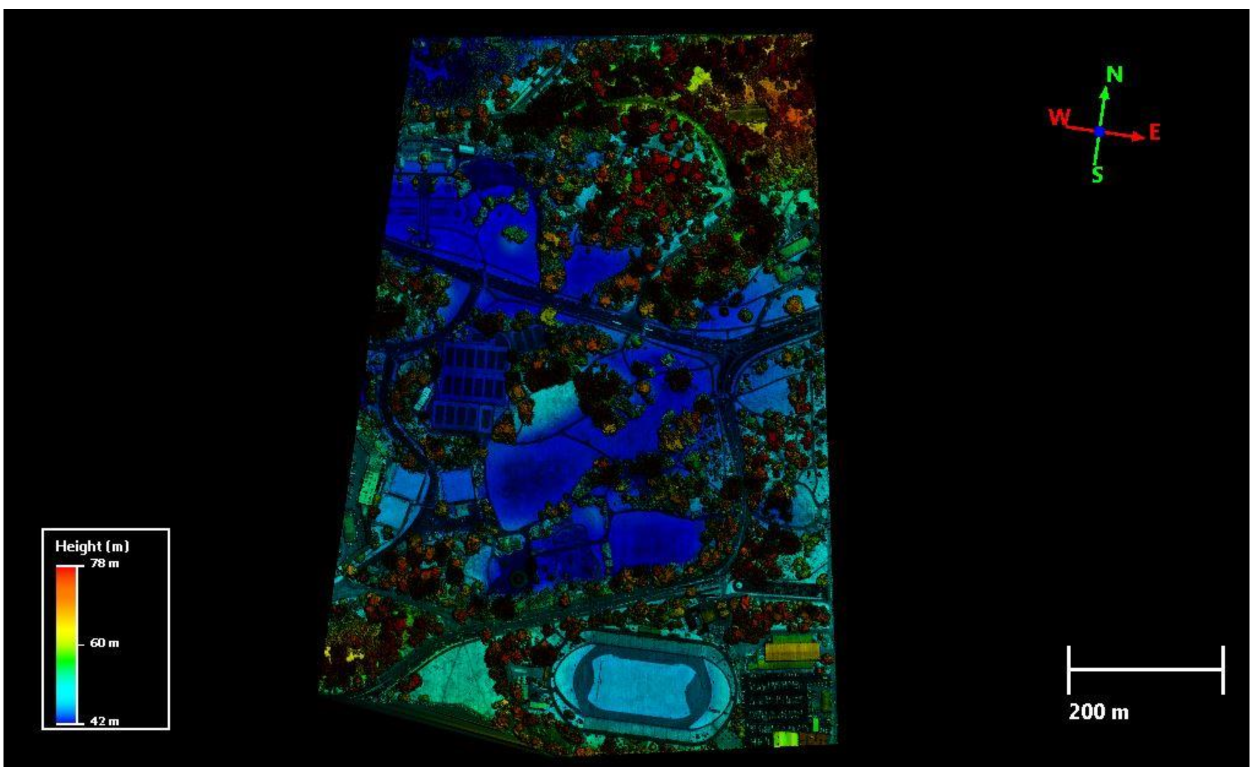
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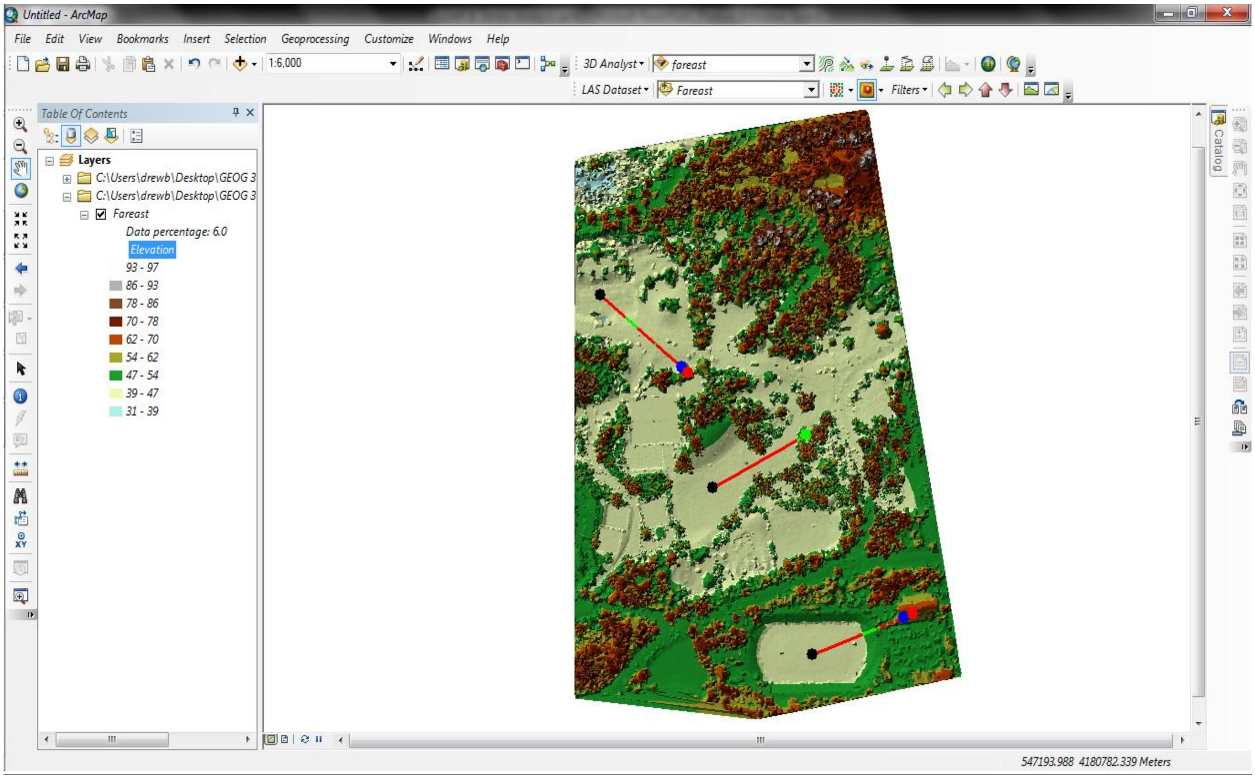
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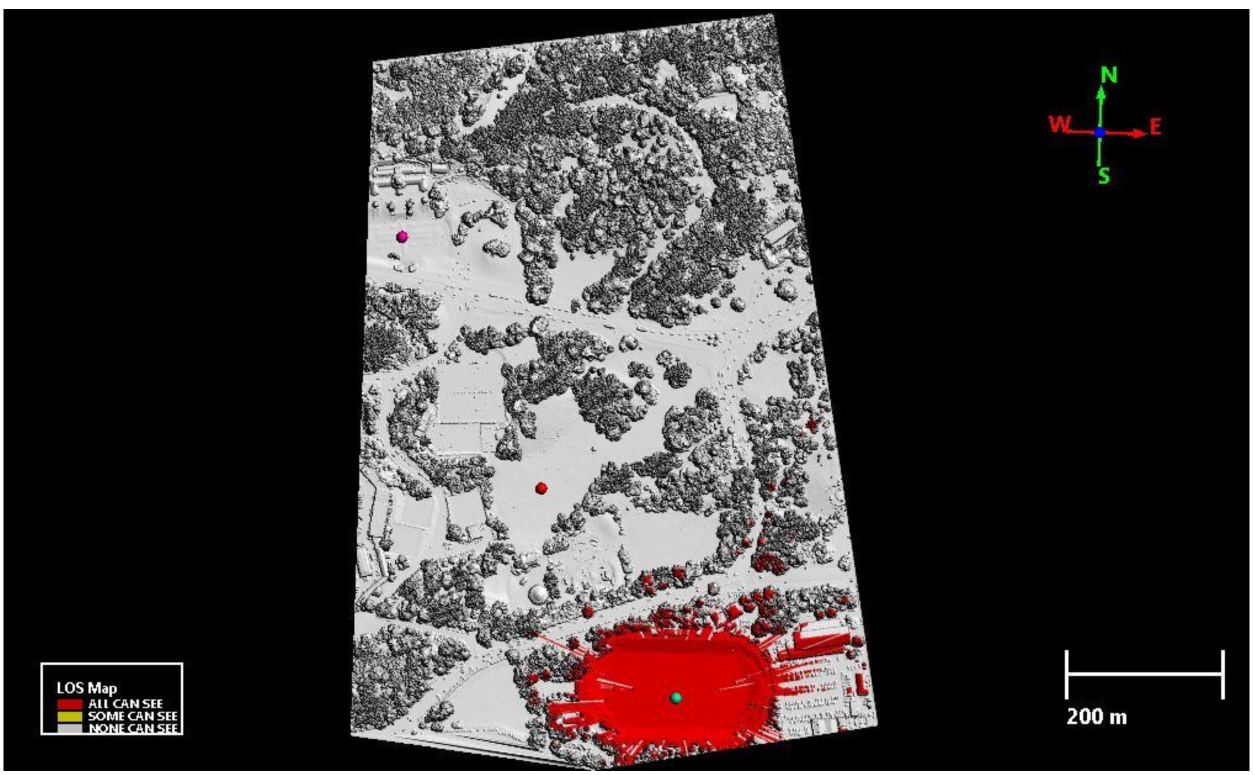
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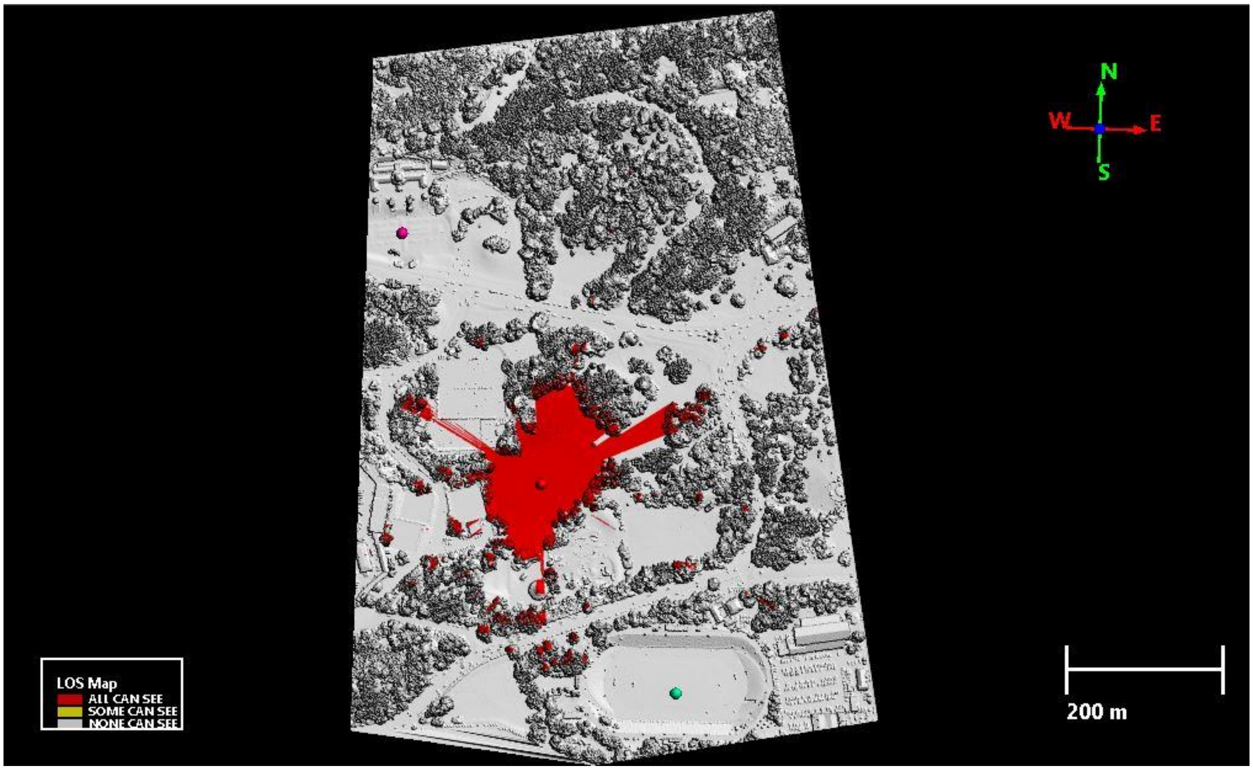
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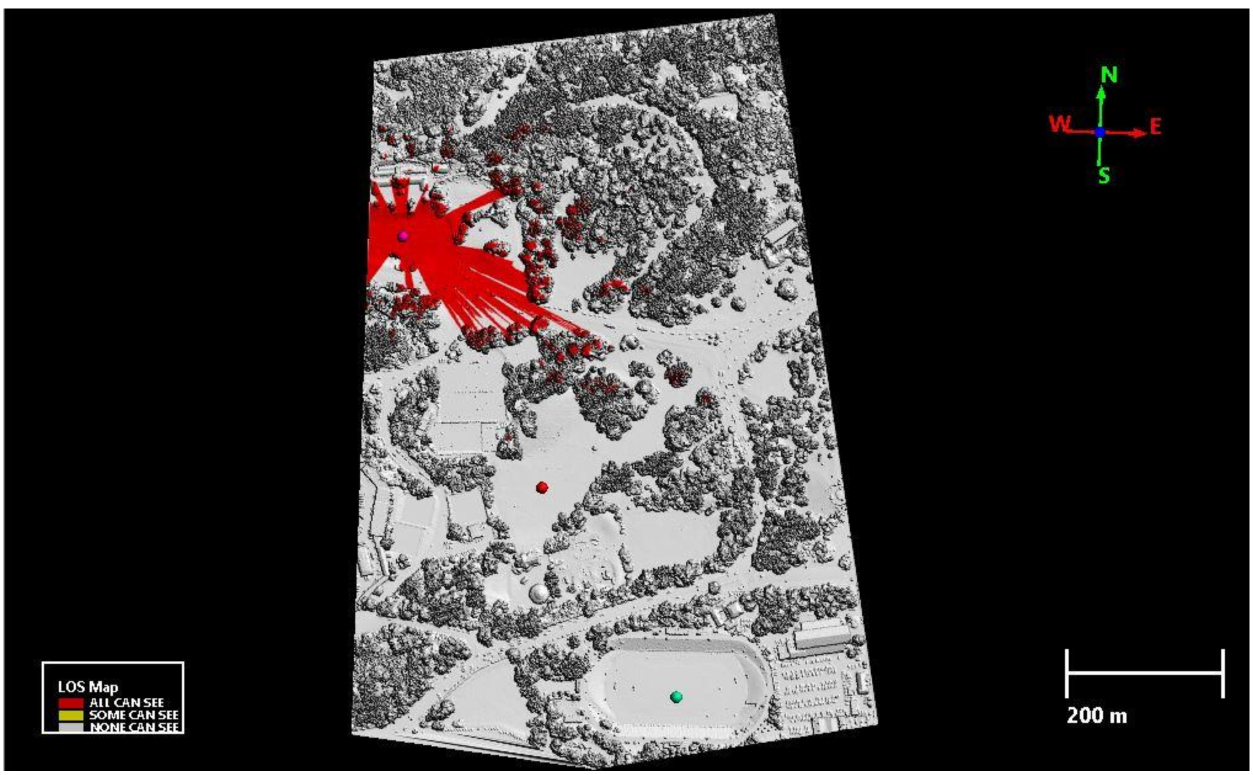
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LOS Map
ALL CAN SEE
SOME CAN SEE
NONE CAN SEE
200 m

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