



Stumbling through Lidar

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City of Dallas



Where are we going with this?

- Overview
- What did we get in the box from the consultant.
- LAS Tool Bar and Tools
- Project Steps involved
- Products
- Contours
- Wrap up.

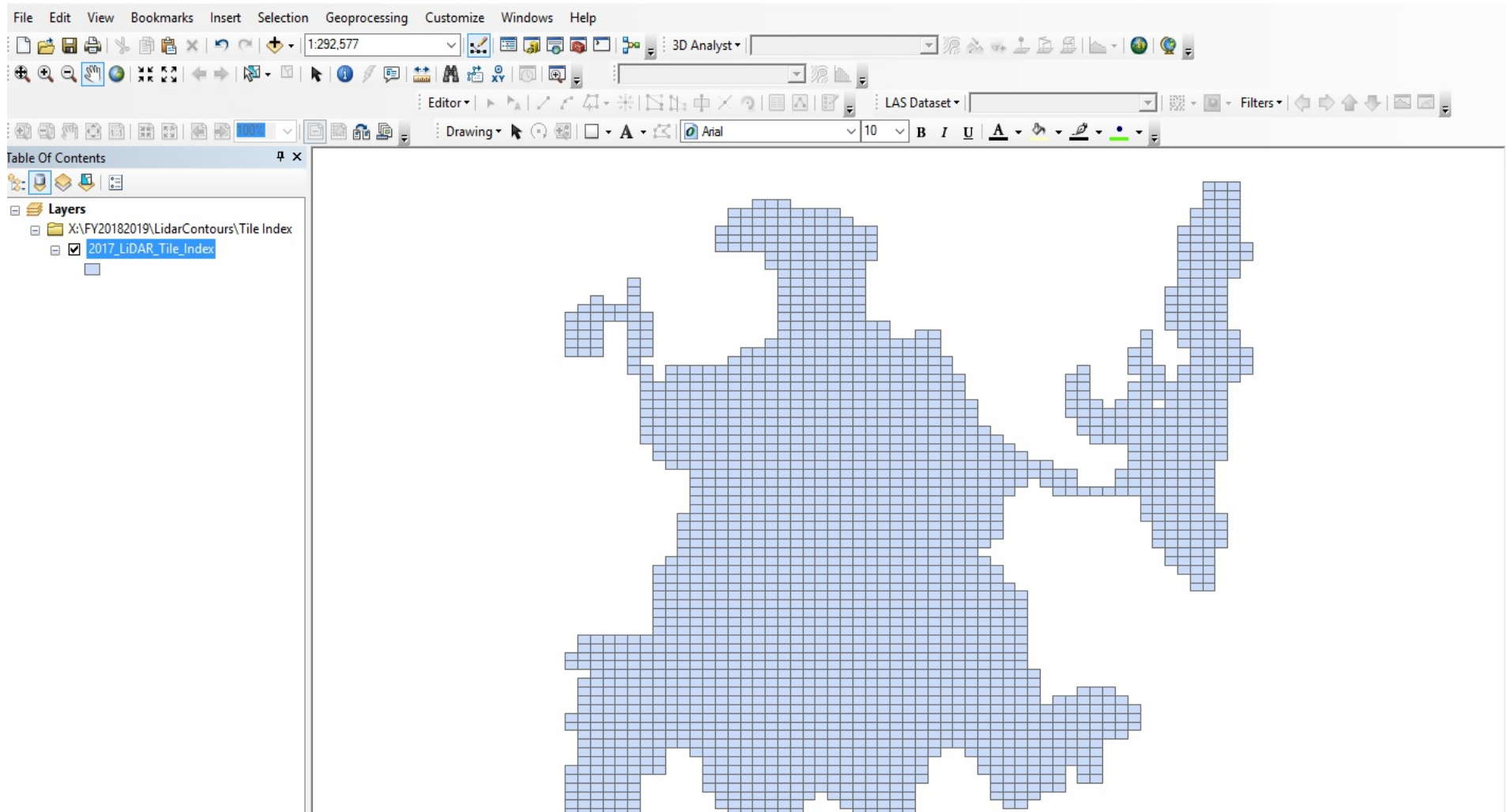
Overview

- Quick overview of what this presentation is all about:
 - Review the current project to make the tiled .LAS files available to the City of Dallas GIS consumers.
 - Construct a two foot contour map for the City of Dallas from the 2017 Lidar data.
 - Seems simple enough.

What we received from the consultant.

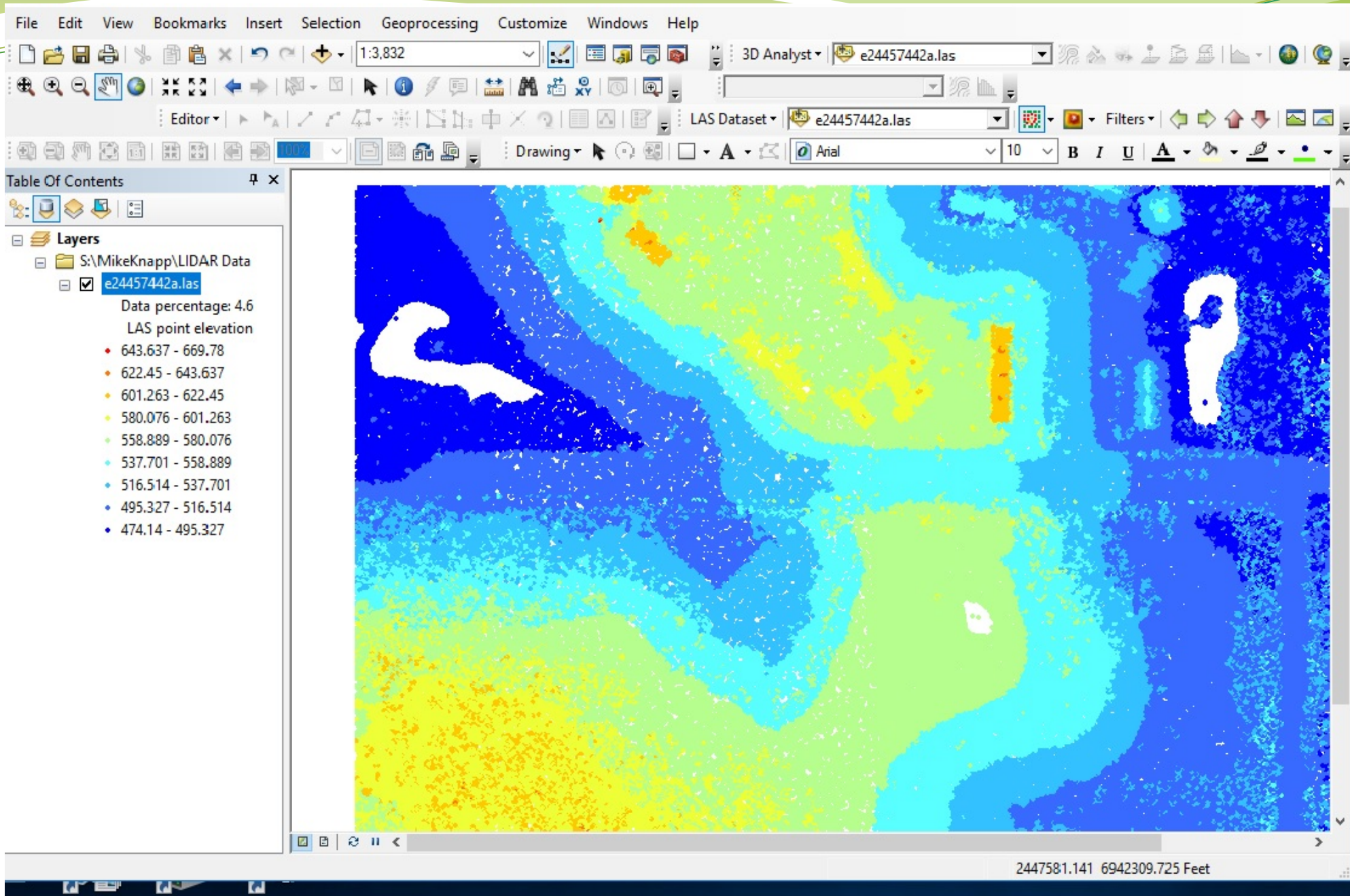
- The goodies from Woolpert. Our part of the 2017 Group Lidar Survey conducted by the North Central Council of Governments.
- 2167 .LAS files with All Returns
- 2167 .LAS files with Bare Earth only.
- Tile Index of the 2167 .LAS files

*Woolpert delivered 2167 .LAS files with 6,000,000 pixels per file.
Each tile is 3000 feet long(E-W) and 2000 feet wide (N-S).*



.LAS File Extension

- File created in the standard LAS format, which was developed by the American Society for Photogrammetry and Remote Sensing (ASPRS); stores Light Detection and Ranging (LIDAR) data that is collected by optical remote sensors; used to exchange LIDAR data between data providers and data consumers.
- The LAS file format (LIDAR Data Exchange file type) was developed in response to the growing number of proprietary LIDAR file formats. It also was designed to overcome some of the complexities in existing LIDAR data. LAS files are stored in a binary format.



1:518 3D Analyst e24457442a.las
Editor LAS Dataset e24457442a.las
Drawing Arial 10 B I U A

Table Of Contents

- Layers
 - X:\FY20182019\LidarContours\Tile In
 - 2017_LiDAR_Tile_Index
 - S:\MikeKnapp\LIDAR Data
 - e24457442a.las**
 - Data percentage: 34.2
 - LAS point elevation
 - 643.637 - 669.78
 - 622.45 - 643.637
 - 601.263 - 622.45
 - 580.076 - 601.263
 - 558.889 - 580.076
 - 537.701 - 558.889
 - 516.514 - 537.701
 - 495.327 - 516.514
 - 474.14 - 495.327

Identify

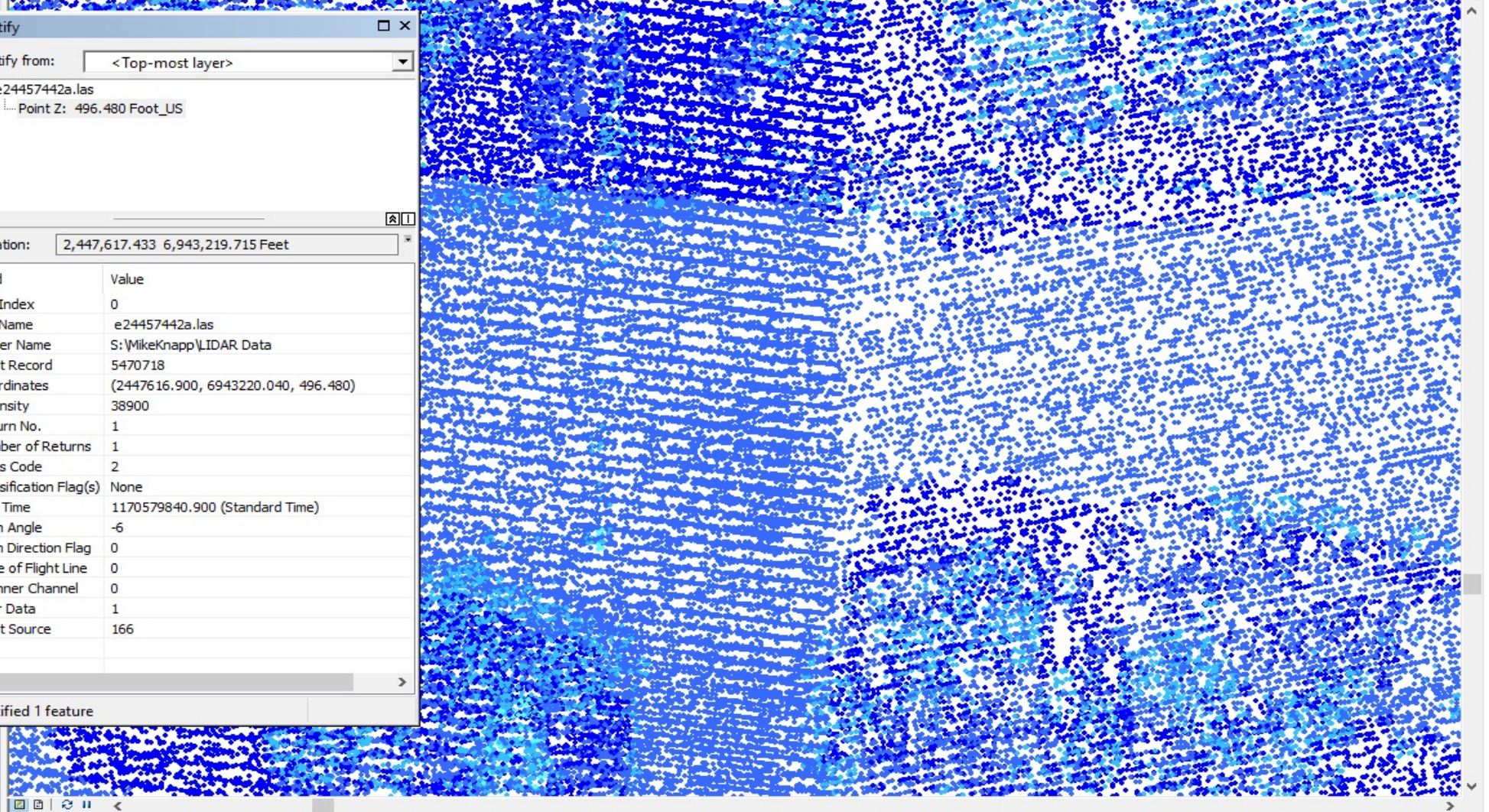
Identify from: <Top-most layer>

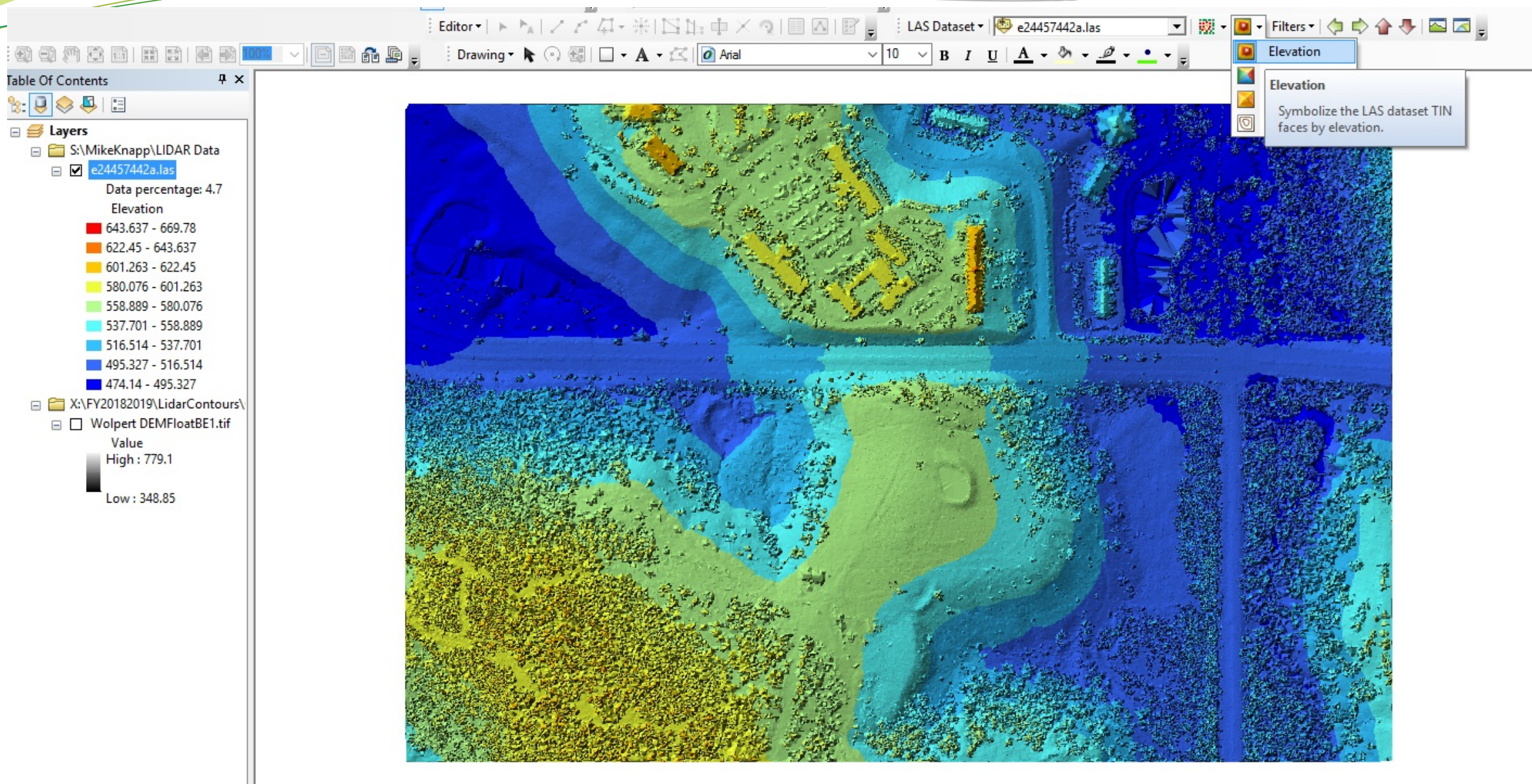
- e24457442a.las
 - Point Z: 496.480 Foot_US

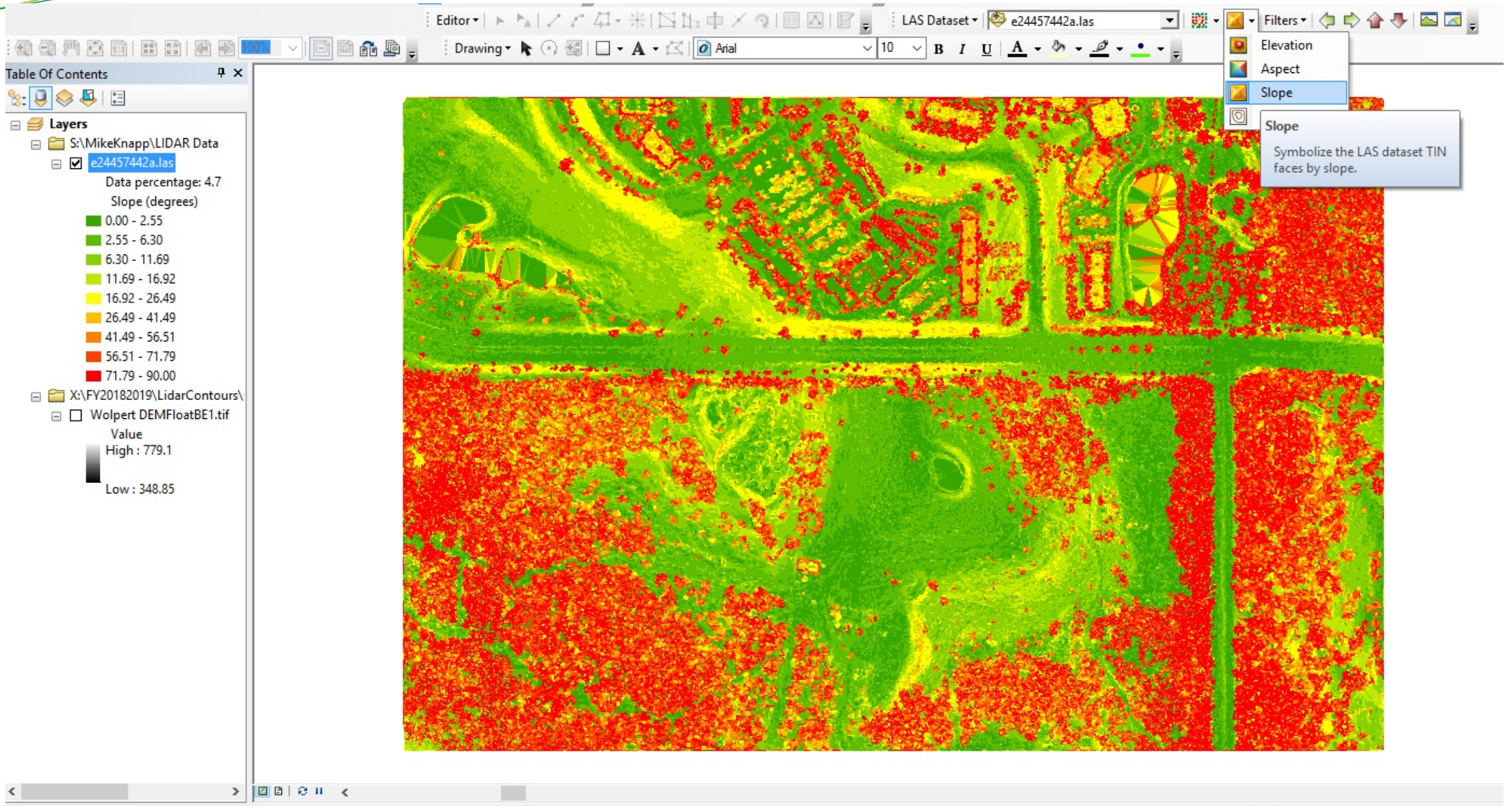
Location: 2,447,617.433 6,943,219.715 Feet

Field	Value
File Index	0
File Name	e24457442a.las
Folder Name	S:\MikeKnapp\LIDAR Data
Point Record	5470718
Coordinates	(2447616.900, 6943220.040, 496.480)
Intensity	38900
Return No.	1
Number of Returns	1
Class Code	2
Classification Flag(s)	None
GPS Time	1170579840.900 (Standard Time)
Scan Angle	-6
Scan Direction Flag	0
Edge of Flight Line	0
Scanner Channel	0
User Data	1
Point Source	166

Identified 1 feature





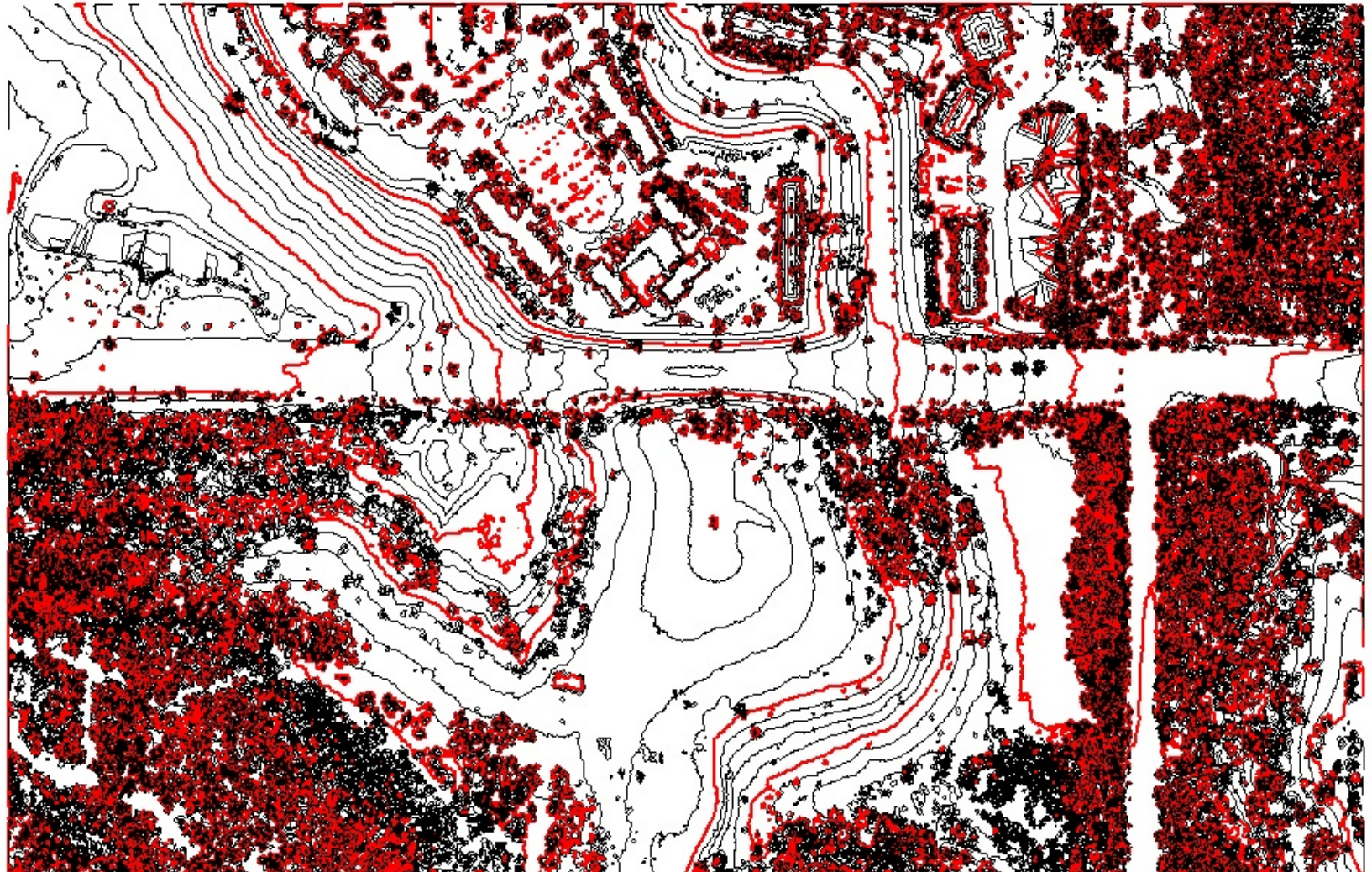


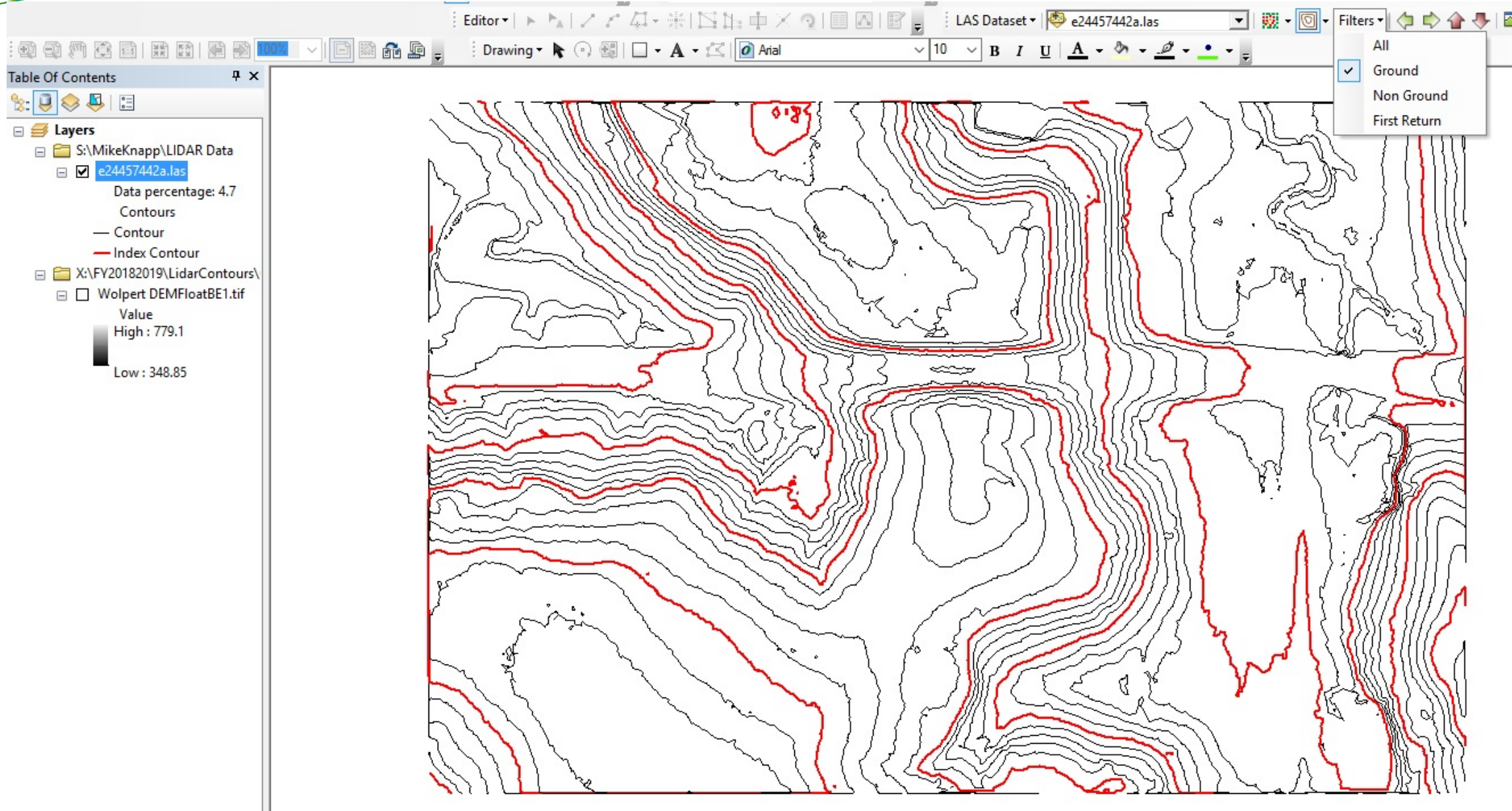
Editor | LAS Dataset | e24457442a.las | Filters | Drawing | Arial | 10 | B I U | A

Table Of Contents

Layers

- S:\MikeKnapp\LIDAR Data
 - e24457442a.las
 - Data percentage: 4.7
 - Contours
 - Contour
 - Index Contour
- X:\FY20182019\LidarContours\
 - Wolpert DEMFloatBE1.tif
 - Value
 - High : 779.1
 - Low : 348.85





Factoid

The 2167 .LAS files that cover the City of Dallas contain roughly 13,002,000,000 points

Assignment

Make a replacement for the 2000 contour lines dataset using the 2017 Lidar.

Contour Interval will be 2 feet.

Let's think about this...make a plan

Explore toolbox and see what tools are available and how they work.

Do some Research.

Make a plan. Think BIG and try to Make it Easy and Simple.

Steps involved to Convert Lidar to Contours

- General Project Steps
- .LAS to Rasters.
- Rasters to Raster Mosaic(DEM)
- DEM to Contours.

- Requires 3-D Analyst and Spatial Analyst Extensions.

- Copy original .LAS data to working set. Seems obvious.

.LAS Files to Raster

In Toolbox > Conversion Tools > To Raster > LAS Dataset to Raster.

Be sure to have the Output Data Type(optional) to be FLOAT.

If you chose INT(Integer) you will be sorry.

(Do you remember in 9th Grade Algebra when you asked your teacher, "When will we ever use this ? ")

Results in 2167 individual Rasters.

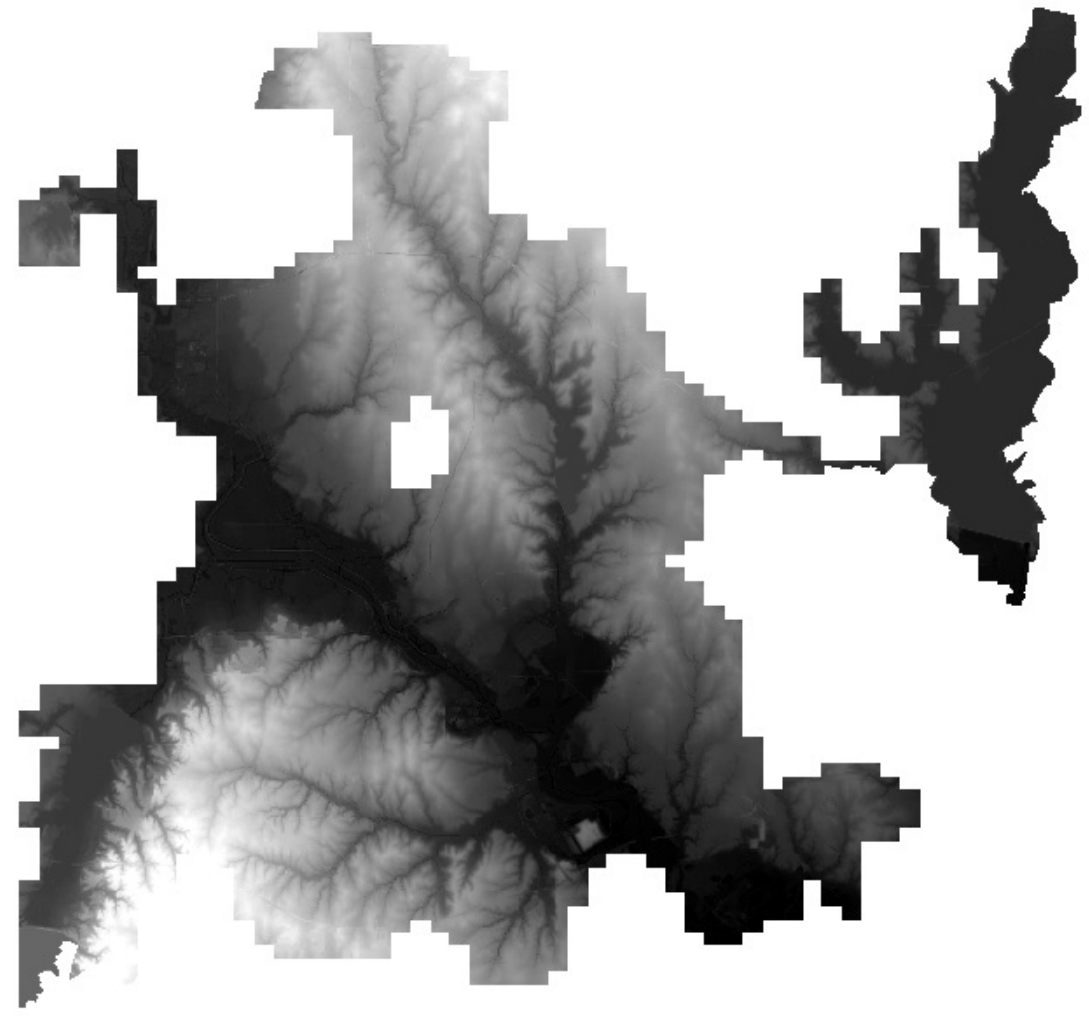
Make a Raster Mosaic

- Make a Raster Mosaic of the 2167 rasters that you converted from the .LAS files. This will make one GIANT raster from all of the smaller tiled rasters. It will become a DEM (Digital Elevation Model)
- In Toolbox: Data Management Tools > Raster Mosaic Dataset > Create Mosaic Dataset.
- In Toolbox: Data Management Tools > Raster Mosaic Dataset > Add Rasters to Mosaic Dataset.
- Let it run over night....this will take some time .

Table Of Contents

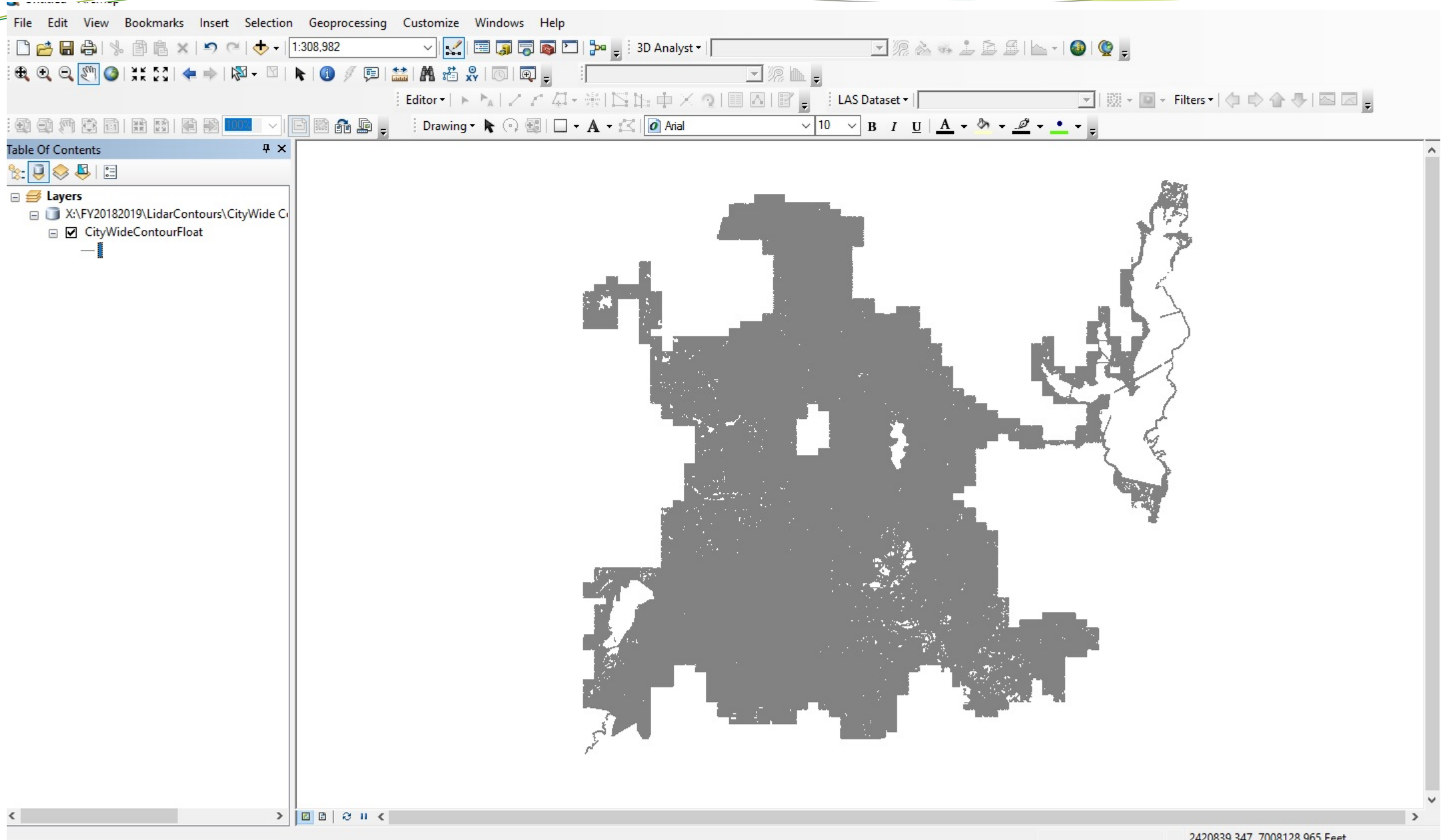
Layers

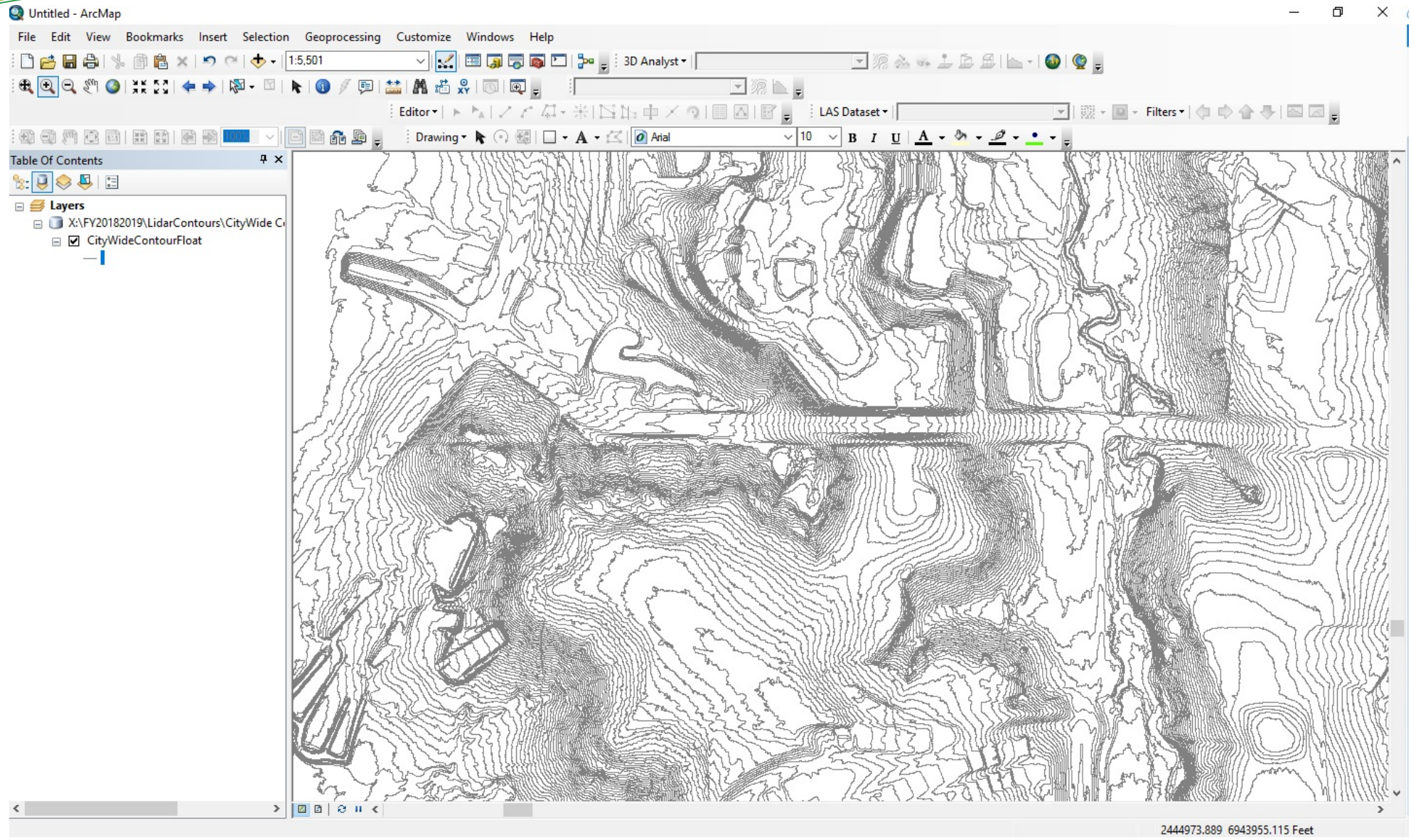
- S:\MikeKnapp\LIDAR Data
 - e24457442a.las
 - Data percentage: 4.6
 - Contours
 - Contour
 - Index Contour
- X:\FY20182019\LidarContours\
 - Wolpert DEMFloatBE1.tif
 - Value
 - High : 779.1
 - Low : 348.85

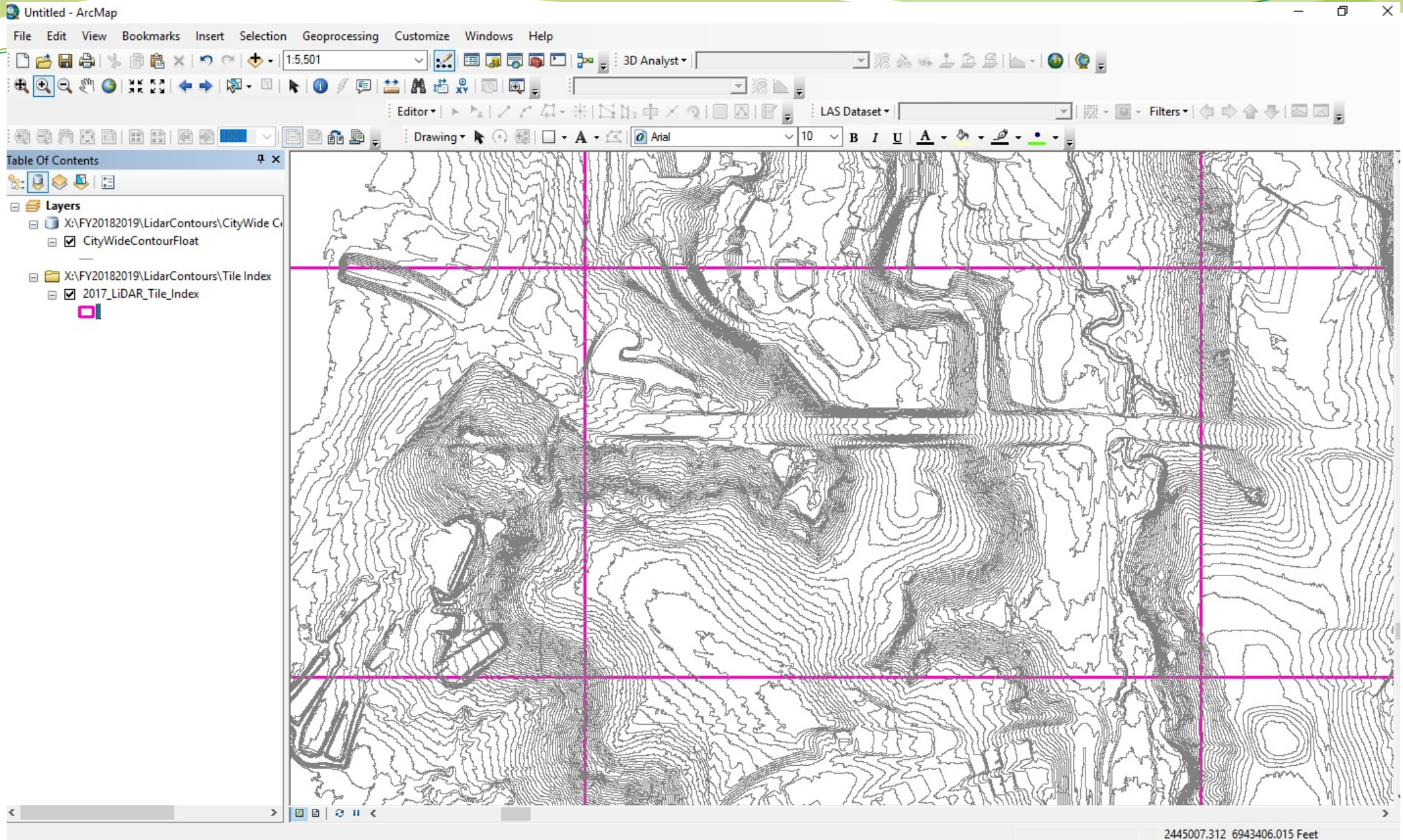


Contours

- *To build contours from a raster...*
- *Toolbox > Spatial Analyst Tools > Surface > Contour Tool or Contour with Barriers Tool. Go to lunch.*







2445007.312 6943406.015 Feet

Smooth Contour Lines

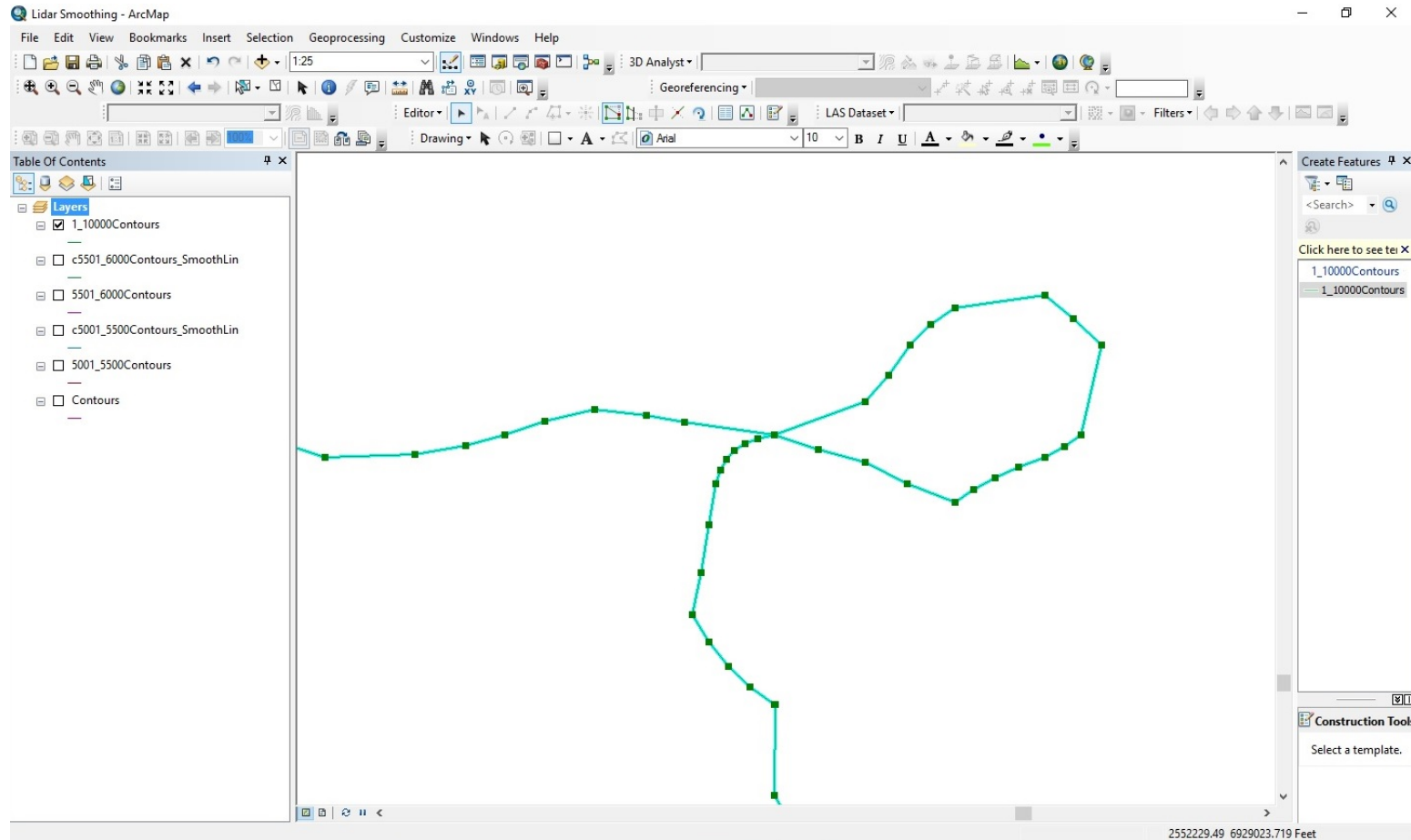
Next BIG Idea....

*To Smooth Lines: Toolbox > Cartography Tools >
Generalization > Smooth Line Tool(?)*

Smooth Lines

- Didn't Work...This time
- It made the contour lines more "Angular" and added dead end "Stems"
- NEXT

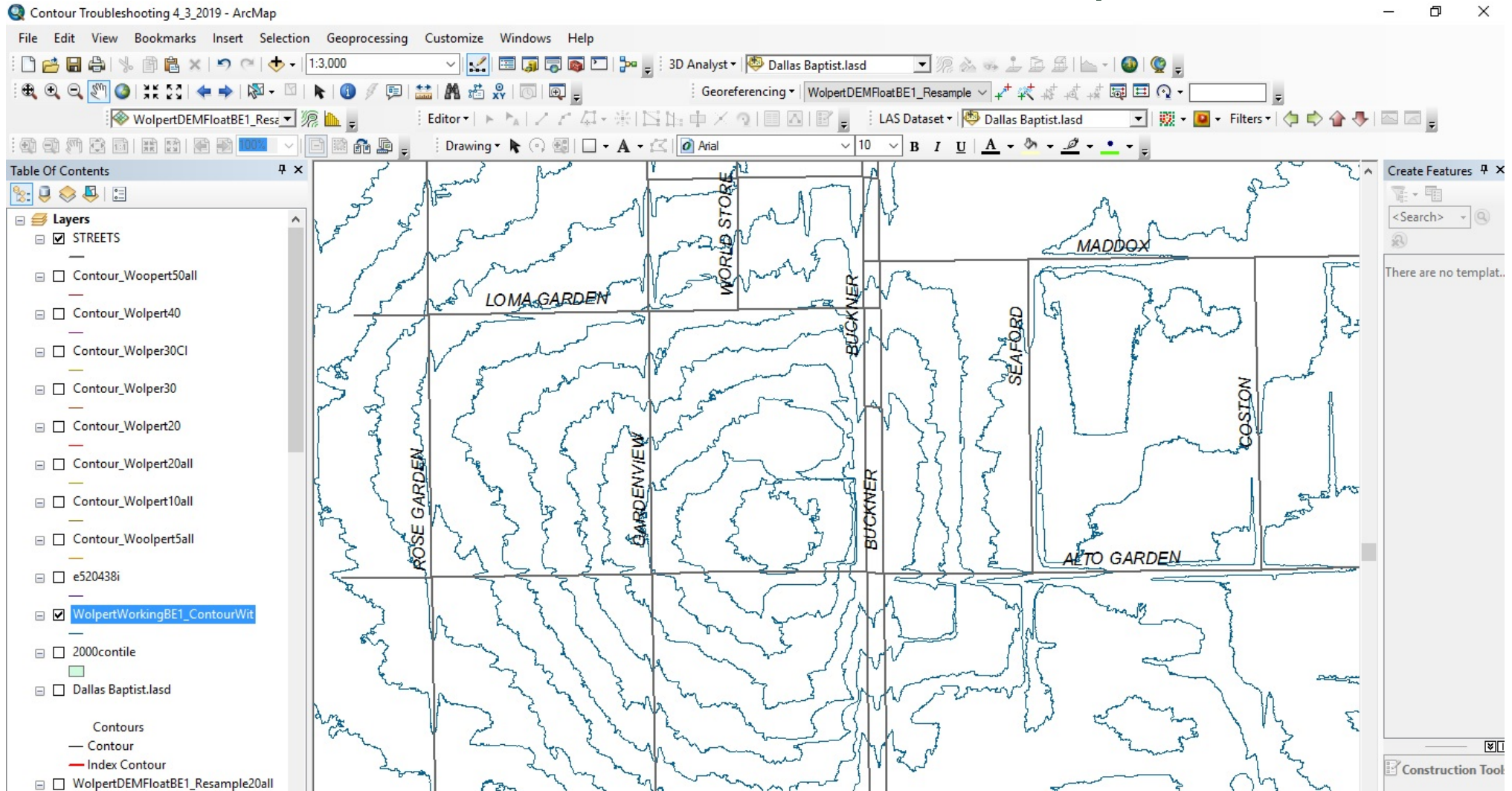
Quality Control



More Research

- One forum on a QGIS contour looping problem suggested that it could be eliminated by resampling the raster and contouring the results.
- Tool Box > Data Management > Raster > Raster Processing > Resample Tool. I selected various Raster Resample sizes and made new rasters.
- Tool Box > 3D Analyst > Raster Surface > Contour Tool.
Recontoured the Resampled rasters

Bare Earth Processed by Woolpert Contoured on one foot pixels

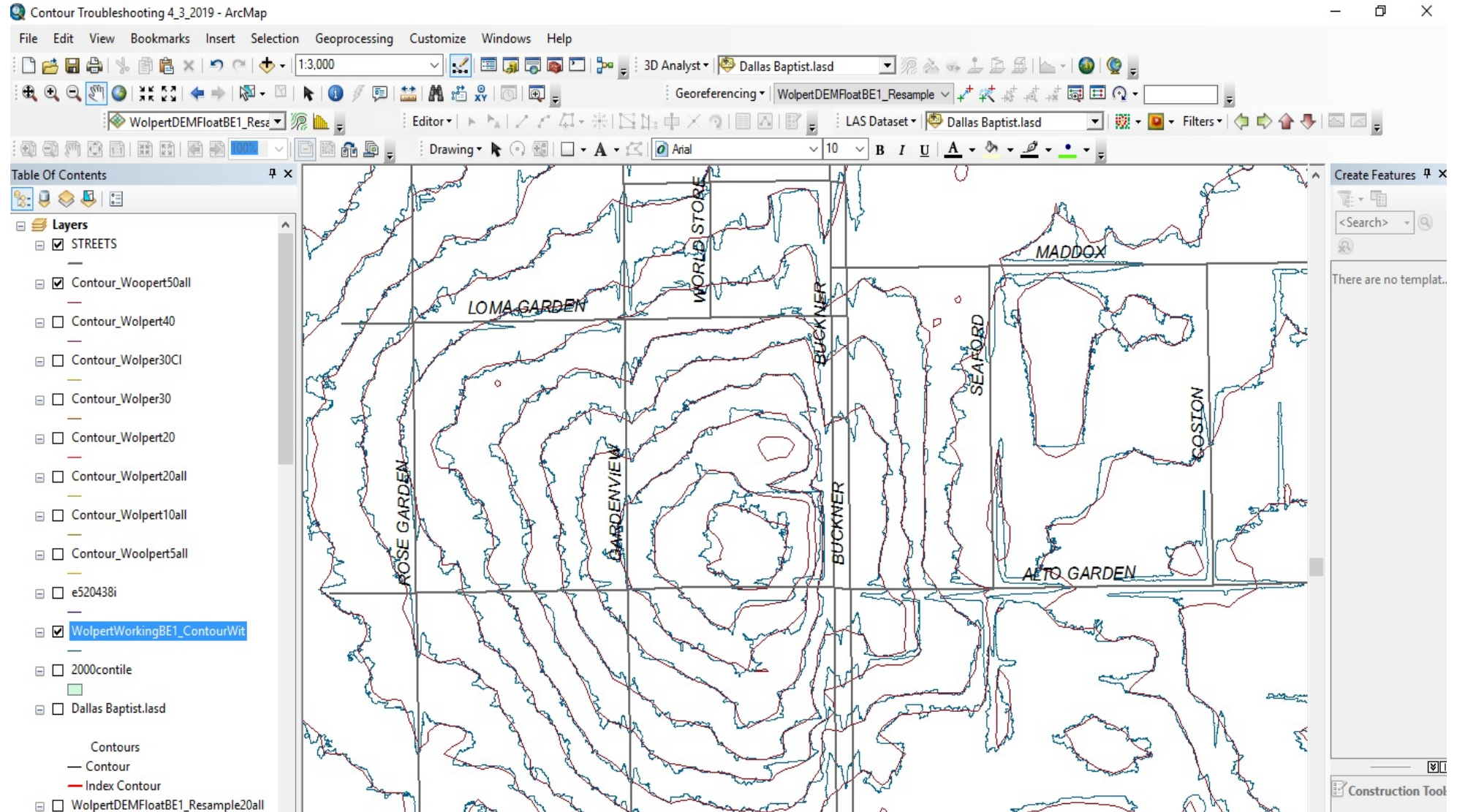


Contoured on Resampled pixels of 50 Feet

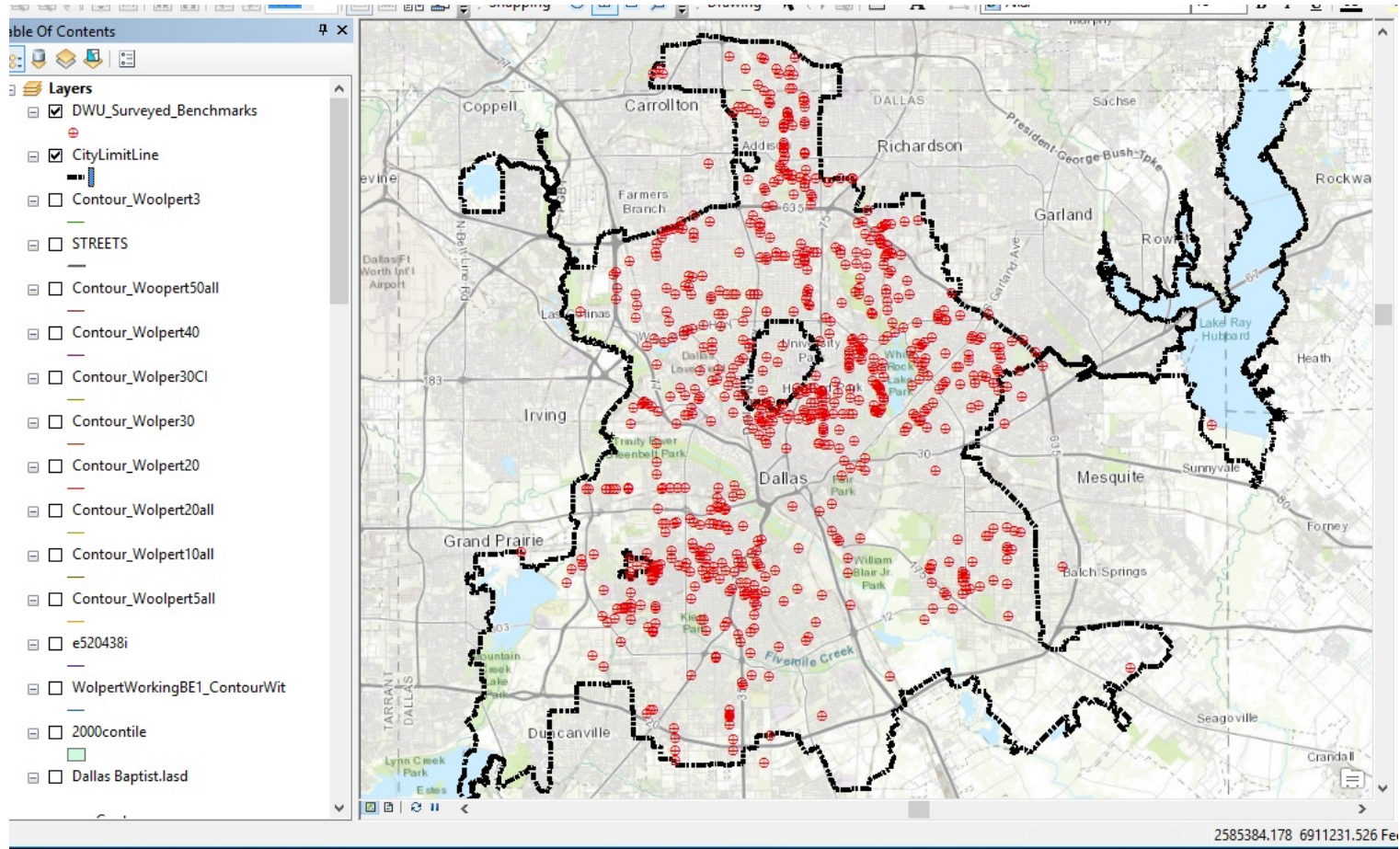
The screenshot displays the ArcMap interface with the following components:

- Title Bar:** Contour Troubleshooting 4_3_2019 - ArcMap
- Menu Bar:** File, Edit, View, Bookmarks, Insert, Selection, Geoprocessing, Customize, Windows, Help
- Toolbars:** Standard, 3D Analyst, Georeferencing, Editor, Drawing
- Map View:** A map showing a grid of streets and contour lines. The streets are labeled: LOMA GARDEN, ROSE GARDEN, GARDENVIEW, BUCKNER, BUCKNER, SEAFORD, MADDOX, and ALTO GARDEN. The contour lines are red and represent elevation contours.
- Table of Contents (Left Panel):**
 - Layers
 - STREETS
 - Contour_Woopert50all
 - Contour_Wolpert40
 - Contour_Wolper30CI
 - Contour_Wolper30
 - Contour_Wolpert20
 - Contour_Wolpert20all
 - Contour_Wolpert10all
 - Contour_Woolpert5all
 - e520438i
 - WolpertWorkingBE1_ContourWit
 - 2000contile
 - Dallas Baptist.lasd
 - Contours
 - Contour
 - Index Contour
 - WolpertDEMFloatBE1_Resample20all
- Right Panel:** Create Features (empty, showing "There are no templat...") and Construction Tool.

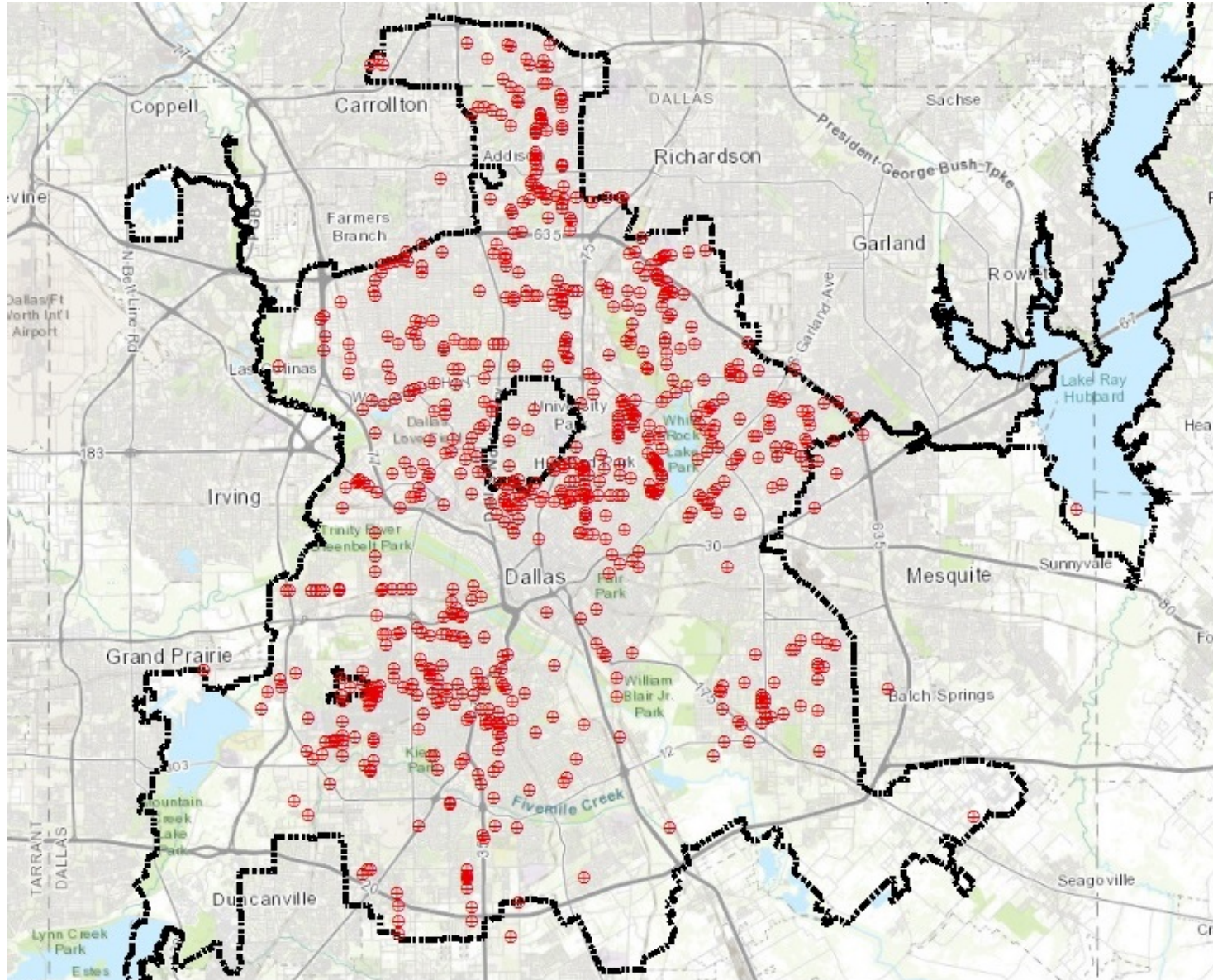
Combined for Comparison



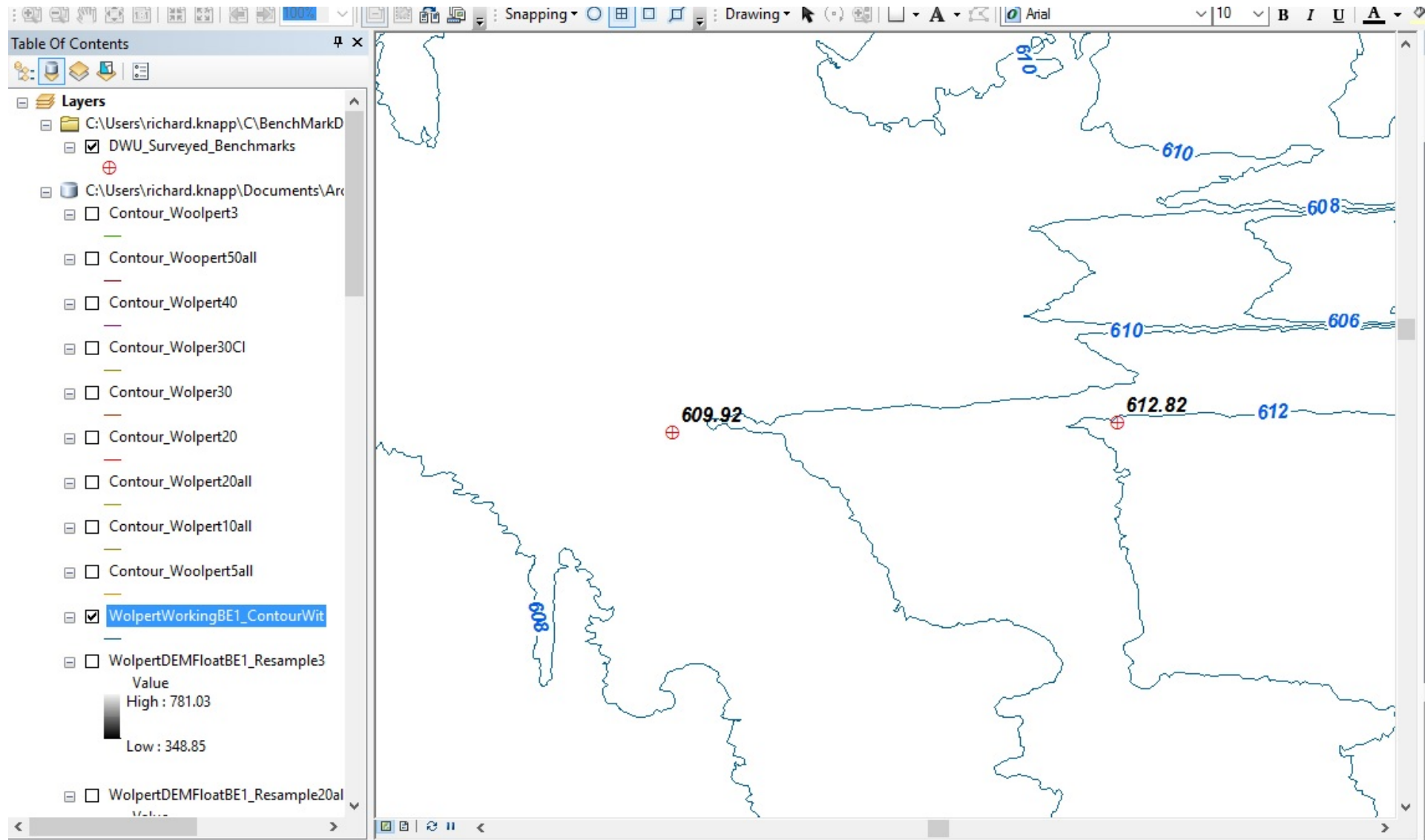
One More Ingredient



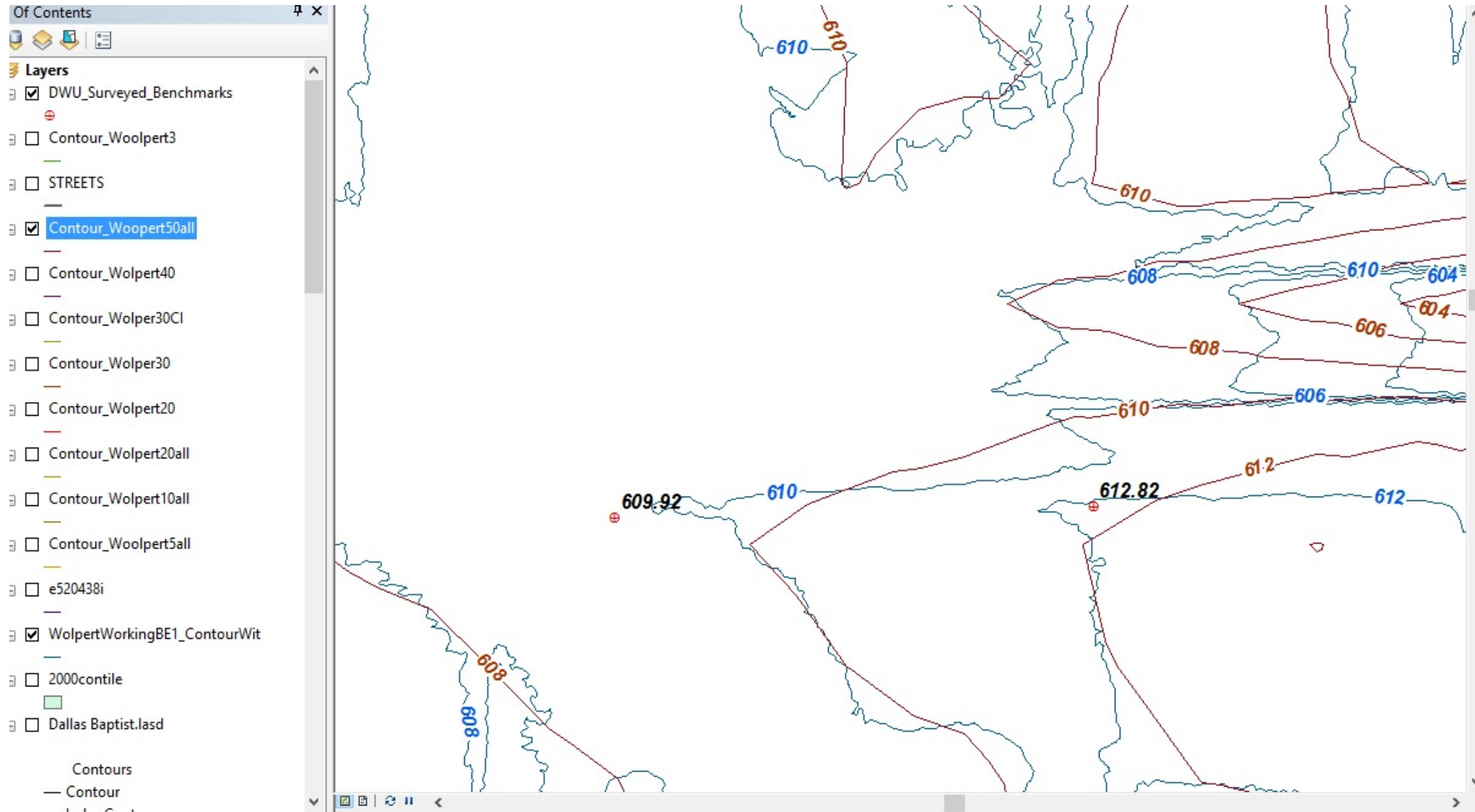
City Wide Benchmark Survey Data



Compare Benchmarks with Contours



Compare Bare Earth(Blue) and 50' Pixels(Maroon)





Still Not Satisfied with the Results

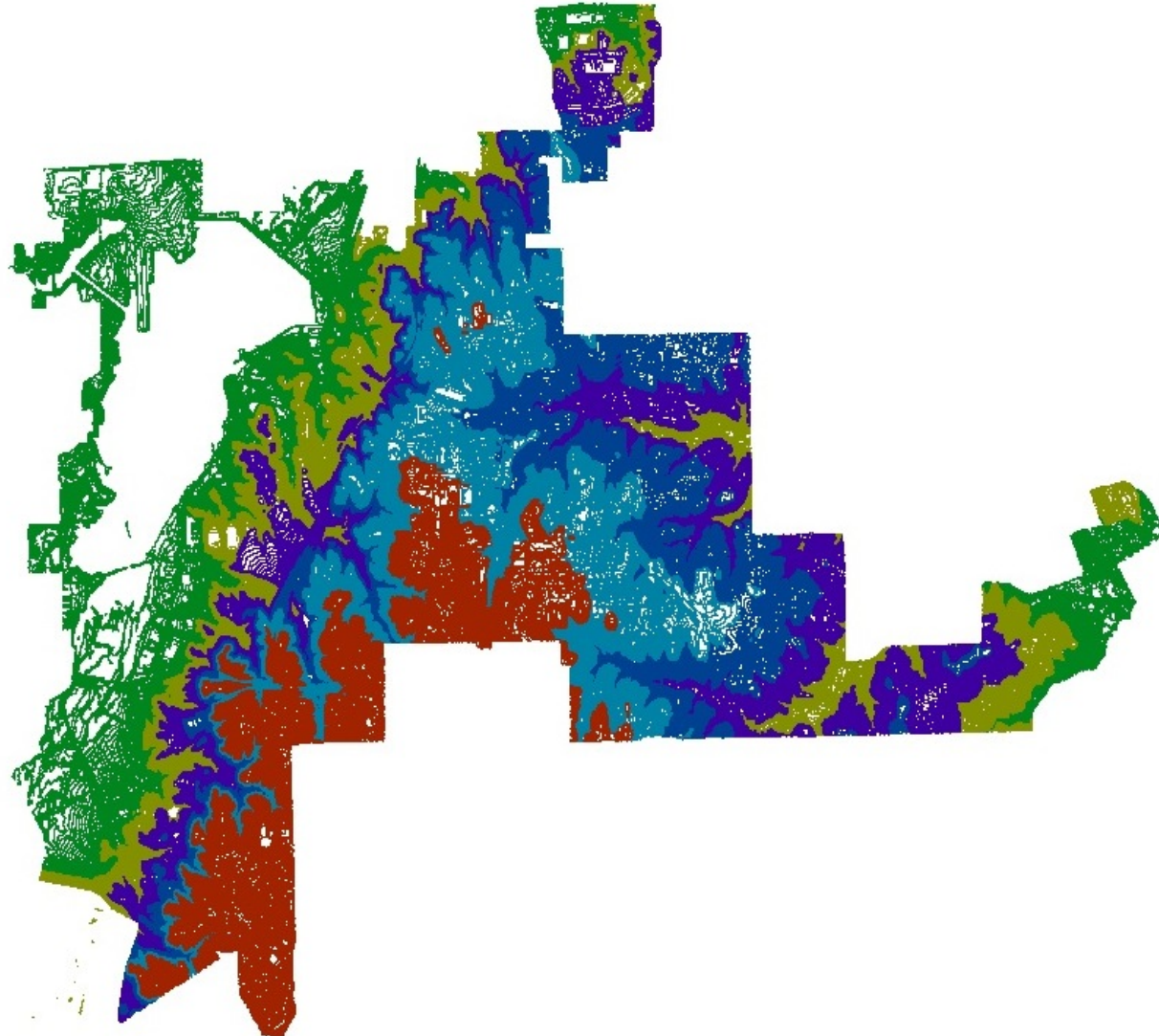
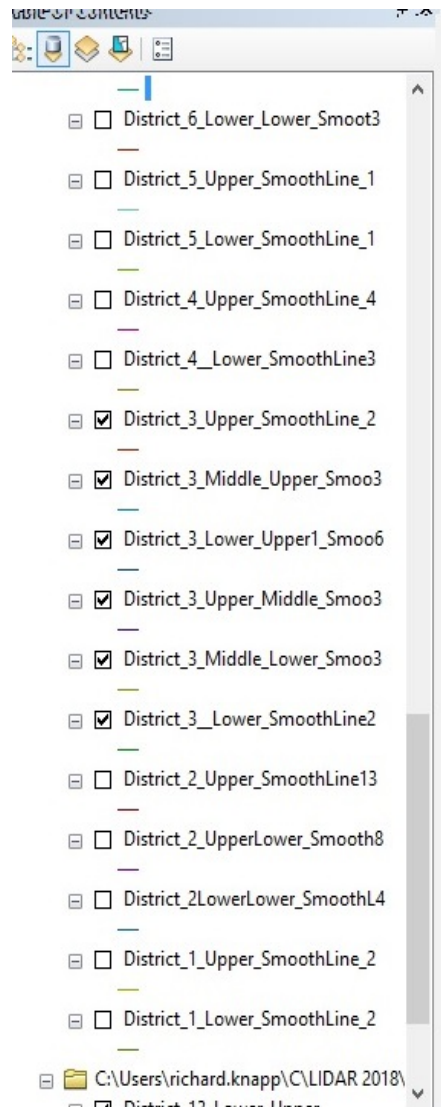


Divide Data into Manageable Bits

- Goal Use Smooth Tool
- Smooth no more than 1000 features at a time to Avoid Crashing.
- Remedy Plan. Clip By the 14 City Council Districts.
- Select and Export Data in < 1000 feature slices by elevation.

- Smooth Line
- Smooth Line
- Smooth Line

District 3 Divided by Six Elevation "Slices"



Smoothing Deux

Let's Smooth Again

Reminder

*To Smooth Lines: Toolbox > Cartography Tools >
Generalization > Smooth Line; Select Bezier Interpolation*

This time Run Smooth Line Tool Several Times

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- Layers
 - C:\Users\richard.knapp\Documents\ArcGIS\Defa
 - District_2_Upper_SmoothLine13
 - District_2_Upper_SmoothLine12
 - District_2_Upper_SmoothLine11
 - District_2_Upper_SmoothLine1
 - C:\Users\richard.knapp\C\LIDAR 2018\Council Di
 - District_2_Upper

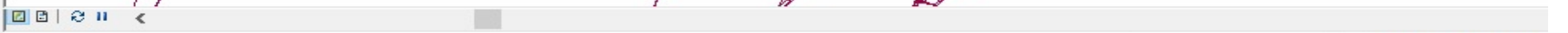


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Layers

- [-] C:\Users\richard.knapp\Documents\ArcGIS\Default.gdb
 - District_2_Upper_SmoothLine13
 - District_2_Upper_SmoothLine12
 - District_2_Upper_SmoothLine11
 - District_2_Upper_SmoothLine1
- [-] C:\Users\richard.knapp\C\LIDAR 2018\Council Districts.gdb
 - District_2_Upper



To Merge All of the District Smoothed Lines

Geoprocessing Toolbar > Merge

Result: One City Wide Smooth Line Contour Map.

*Requested:
Divide the Merged City Wide Smoothed
Lines by the Wolpert Tile Scheme*

Add Woolpert Tile Index .shp to .mxd

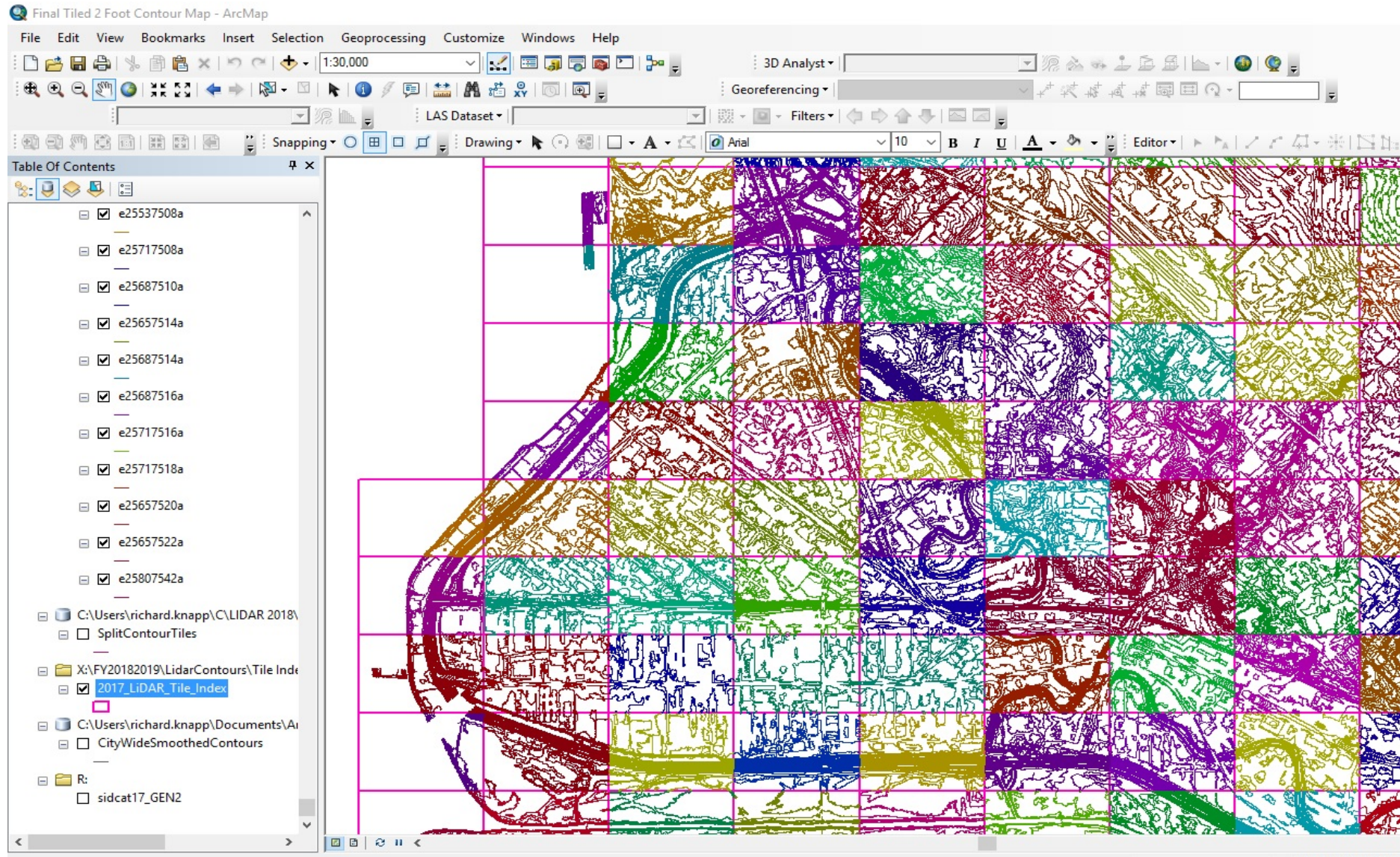
In ArcCatalogue, Make Geodatabase

Add a Destination Feature Class (Lines) for tiles

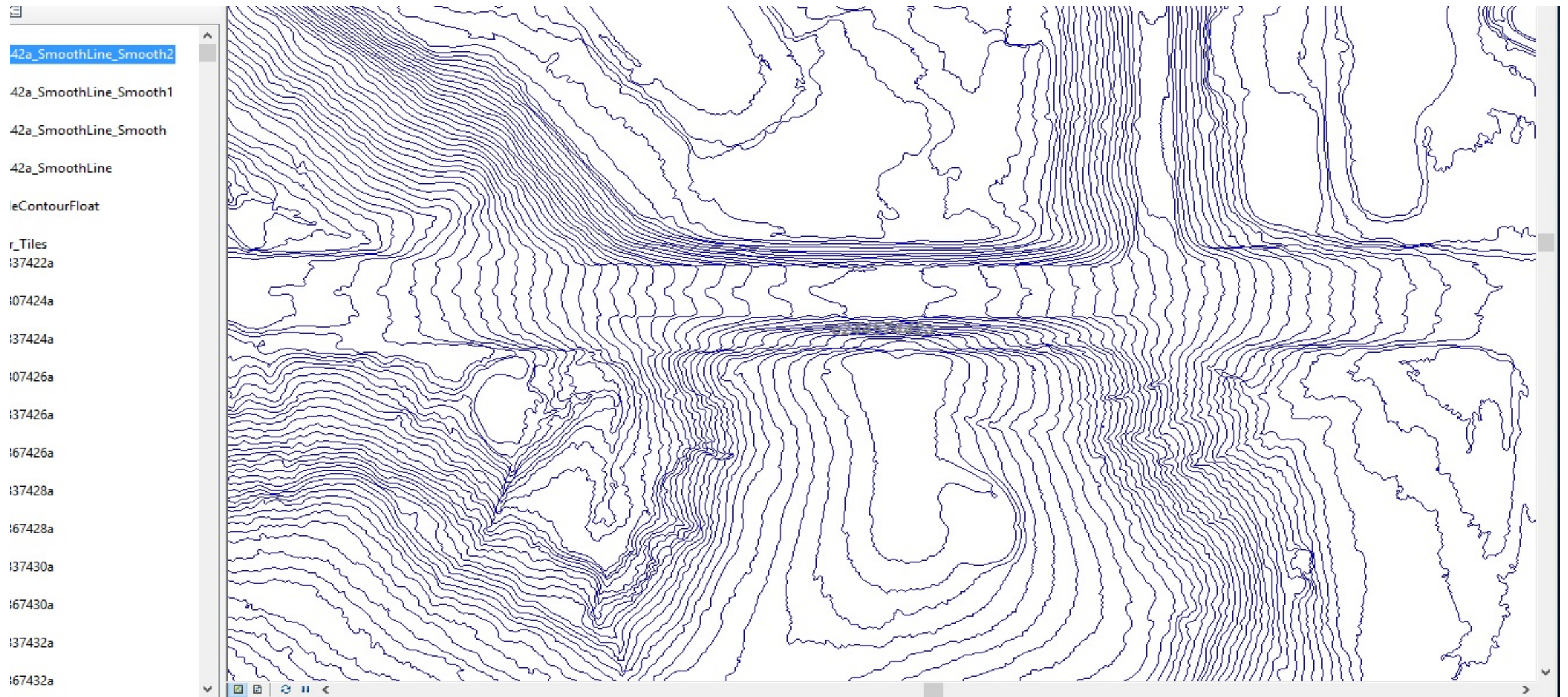
Toolbox > Analysis Tools > Extract > Split Tool

Go Home...

After Split by Tile



Where We Started



If I knew then.....Summary

- Get more RAM. Memory Issues Slowed the Project.
- Added 8GB DDR4. Still not quite enough.

The total of 32 GB RAM added to run the project was adequate until Line Smoothing operations.



Questions?
Prequntas?





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