

# CAD: Lining Up CAD Data in ArcGIS

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Second Edition

The background of the slide is a topographic map with contour lines, rendered in various shades of blue and teal. The map is oriented with the top right corner showing more detail, including what appears to be a coastline or a river system.

# There are different methods to resolve alignment issues:

- 1] Georeference CAD files in ArcMap. (Excellent instructions for this process are found in the Help documentation.)
- 2] Apply Move and Scale options in the original CAD program.
- 3] Create a custom projection file to align CAD data in ArcMap.

# We will discuss three different methods for modifying the PRJ:

- **Modify False Easting and False Northing parameters to align data created in a local coordinate system**
- **Identify unusual units of measure used to create the data in the CAD program and**
  - **modify the PRJ, to apply those units to the data**
- **Apply a scale factor to the PRJ to adjust for data in ground coordinates**

# CAD data might not align because the data was created with....

- A local coordinate system
- Unusual units of measure
  - Inches
  - Centimeters
  - Miles
  - Kilometers
- Use of ground coordinates instead of grid

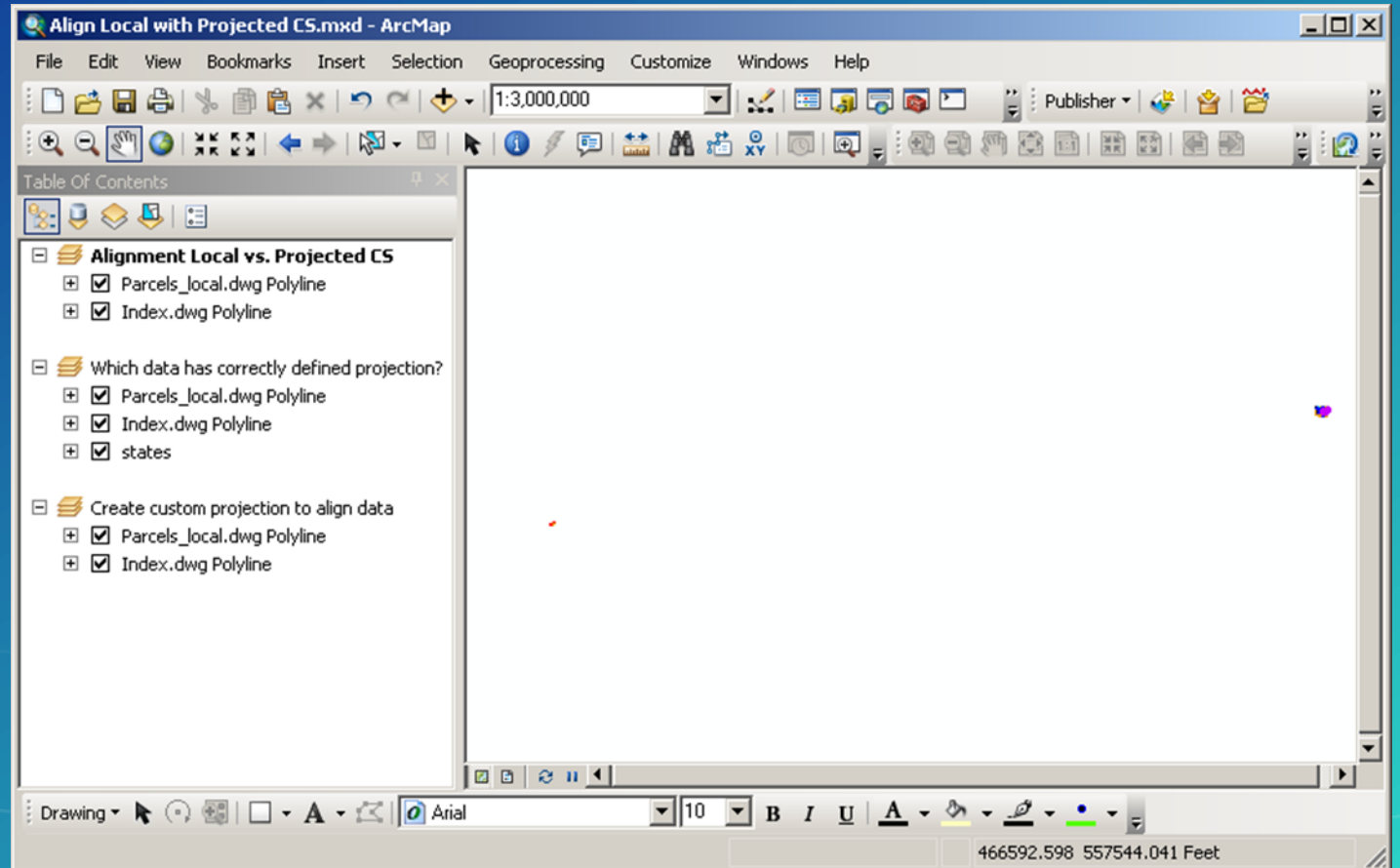


# Demonstrate 3 techniques to modify PRJ and align CAD data:

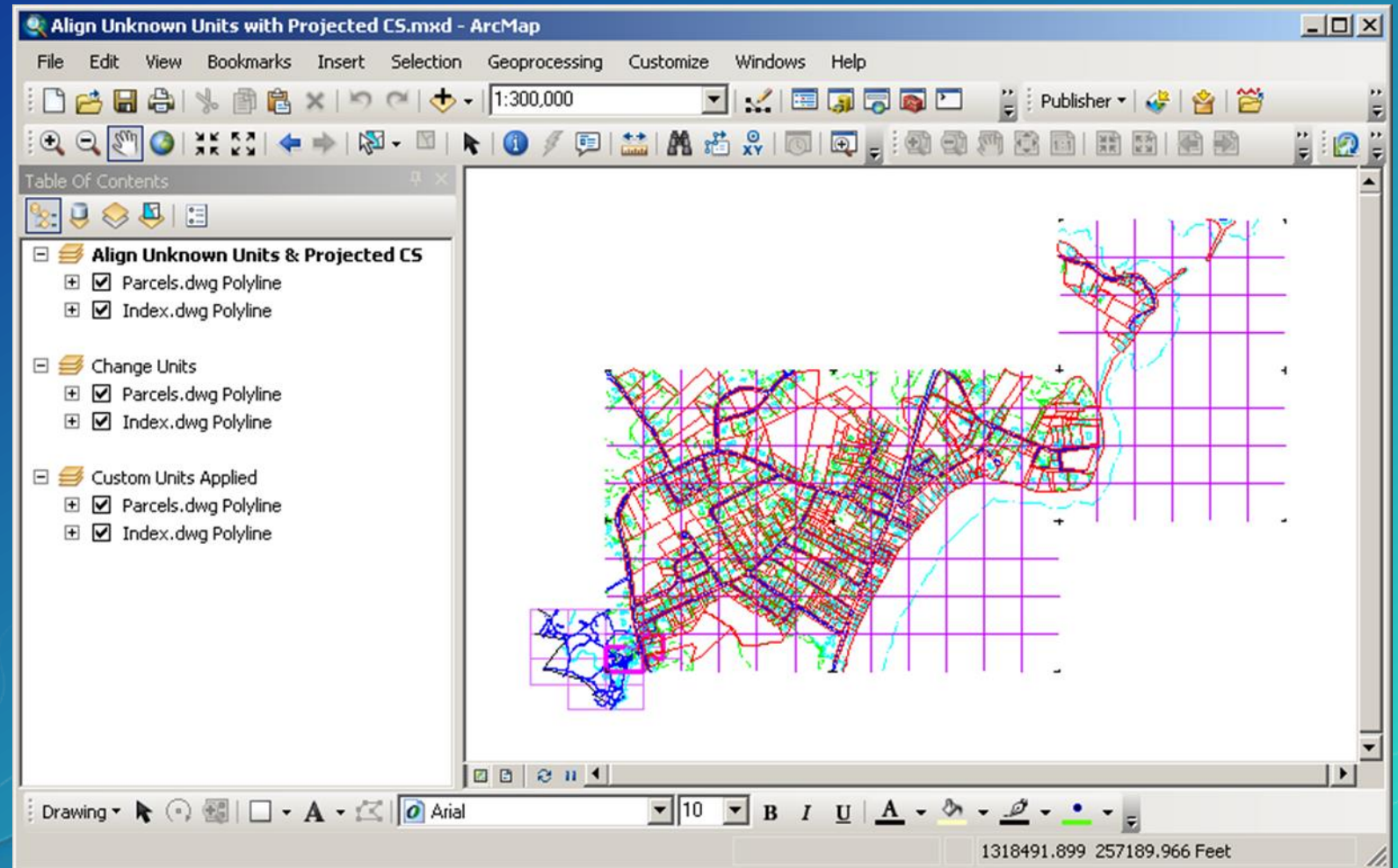
- Align CAD data that is offset from the proper location
- Identify and apply non-standard units to the projection file
- Apply a scale factor within the PRJ file to adjust for data drawn with ground coordinates instead of grid

Because of the distortion inherent in the Mercator projection, Which was calculated for navigation in the 16<sup>th</sup> century, we strongly advise using another more suitable projection for the following operations.

**Does this look familiar? This is an example of how CAD data created in local coordinates will display in relation to data in a projected coordinate system.**

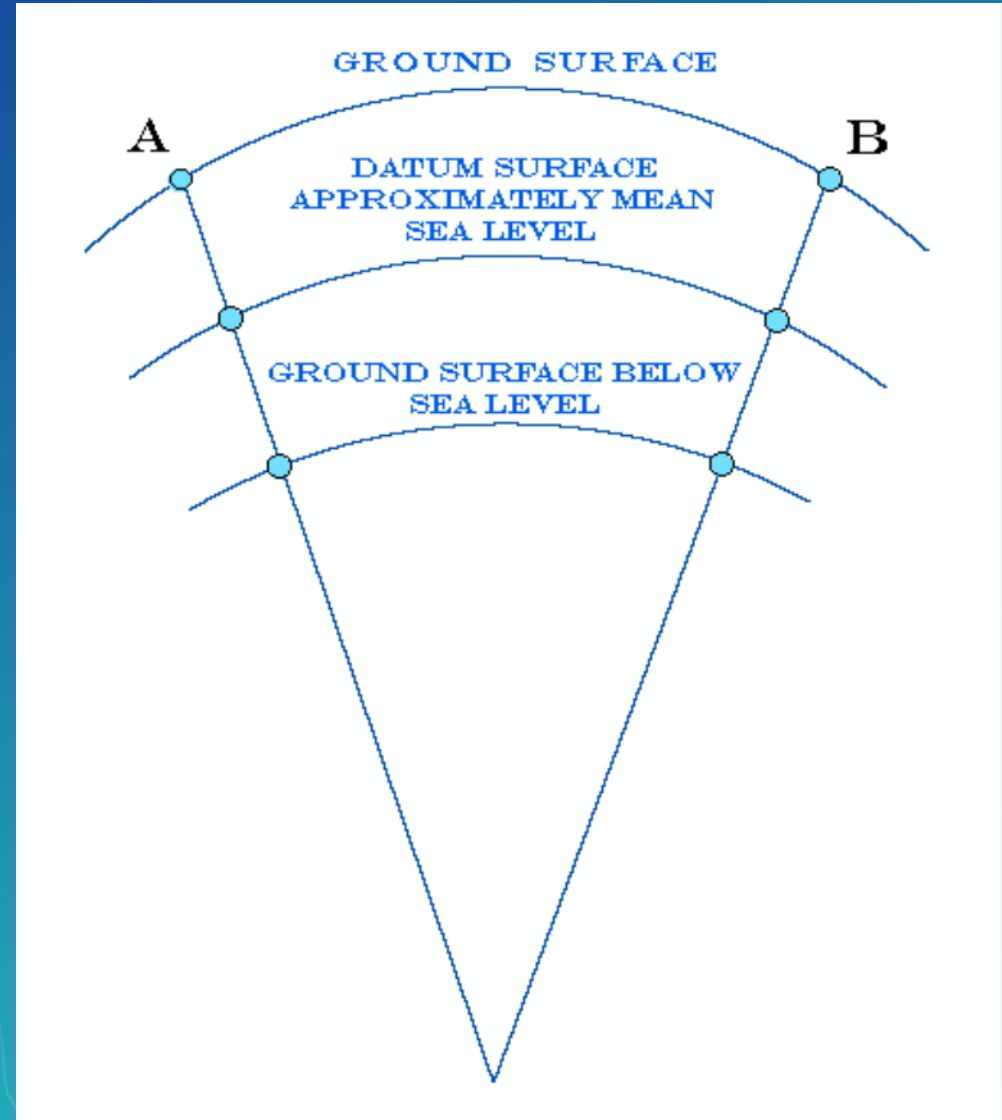


How about this?  
This CAD data was  
created with units  
of inches instead  
of feet



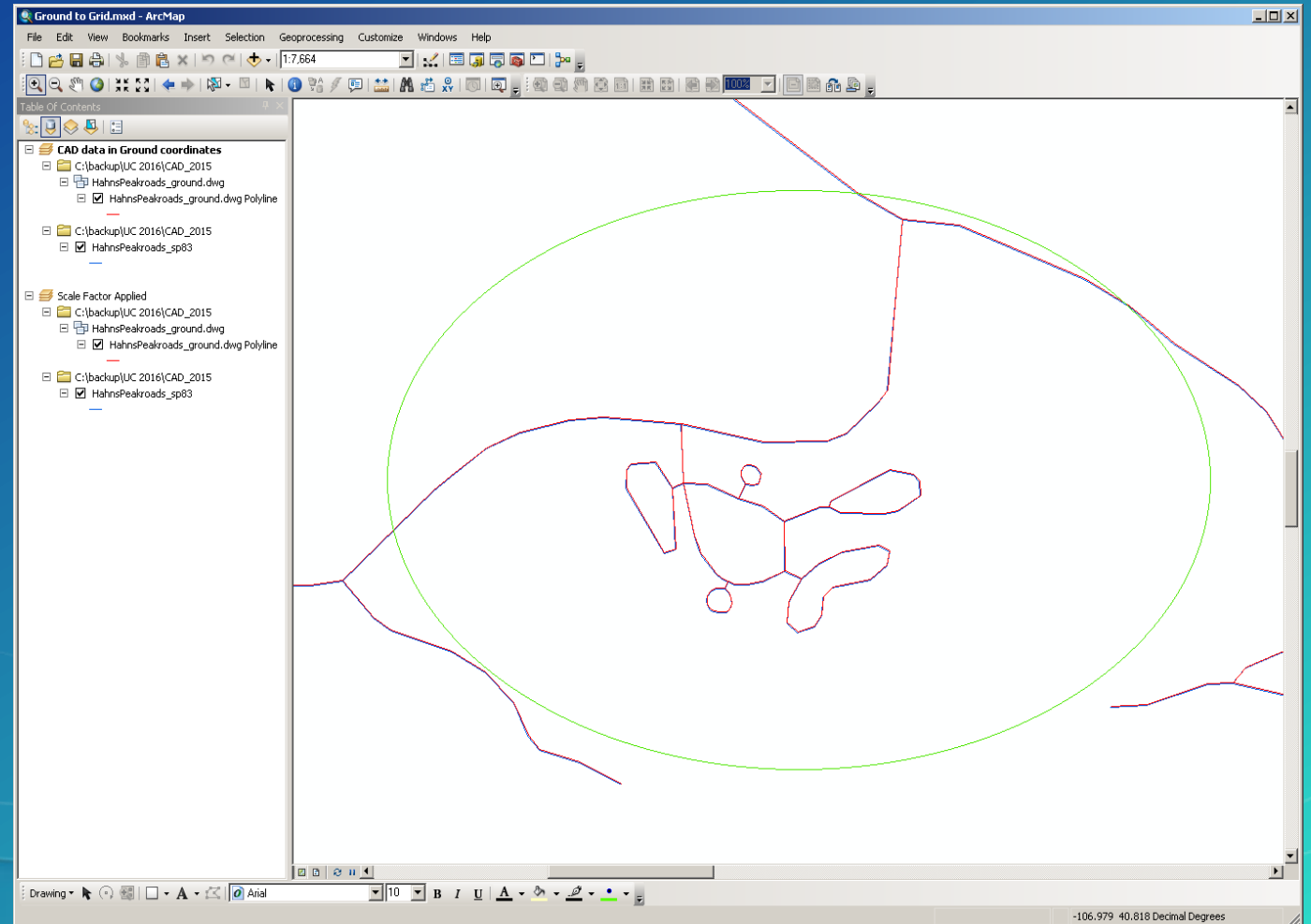
Data provided courtesy of the Rockingham County, New  
Hampshire Planning Department

What is ground to  
grid conversion?





Maybe you have  
seen this...  
This slight offset may be  
a scaling issue due to the  
difference between  
ground and grid  
coordinates.



# Where is the Scale Factor parameter inserted into the PRJ file?

```
PROJCS["HahnsPeak_ground",GEOGCS["GCS_North_American_1983",DATUM["D_N  
orth_American_1983",SPHEROID["GRS_1980",6378137.0,298.257222101]],PRIMEM["G  
reenwich",0.0],UNIT["Degree",0.0174532925199433]],PROJECTION["Lambert_Confor  
mal_Conic"],PARAMETER["False_Easting",3000124.500316083],PARAMETER["False_  
Northing",999844.25],PARAMETER["Central_Meridian",-  
105.5],PARAMETER["Standard_Parallel_1",39.71666666666667],PARAMETER["Standa  
rd_Parallel_2",40.78333333333333],PARAMETER["Scale_Factor",1.0003],PARAMETER  
["Latitude_Of_Origin",39.33333333333334],UNIT["Foot_US",0.3048006096012192]]
```

The parameter must be entered between the 2rd Standard Parallel and Latitude of Origin parameters when applying to the Lambert Conformal Conic projection.

# How may the Scale Factor affect the False Easting & False Northing?

```
NAD 1983 StatePlane Colorado North FIPS 0501 (US Feet).prj - Notepad
File Edit Format View Help
PROJCS["NAD_1983_StatePlane_Colorado_North_FIPS_0501_Feet",GEOGCS
["GCS_North_American_1983",DATUM["D_North_American_1983",SPHEROID
["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT
["Degree",0.0174532925199433]],PROJECTION["Lambert_Conformal_Conic"],PARAMETER
["False_Easting",3000000.000316083],PARAMETER
["False_Northing",999999.999996],PARAMETER["Central_Meridian",-105.5],PARAMETER
["Standard_Parallel_1",39.7166666666667],PARAMETER
["Standard_Parallel_2",40.7833333333333],PARAMETER
["Latitude_Of_Origin",39.3333333333334],UNIT
["Foot_US",0.3048006096012192],AUTHORITY["EPSG",2231]]
```

```
HahnsPeak_ground.prj - Notepad
File Edit Format View Help
PROJCS["HahnsPeak_ground",GEOGCS["GCS_North_American_1983",DATUM
["D_North_American_1983",SPHEROID
["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT
["Degree",0.0174532925199433]],PROJECTION
["Lambert_Conformal_Conic"],PARAMETER
["False_Easting",3000124.500316083],PARAMETER
["False_Northing",999844.25],PARAMETER["Central_Meridian",-
105.5],PARAMETER
["Standard_Parallel_1",39.7166666666667],PARAMETER
["Standard_Parallel_2",40.7833333333333],PARAMETER
["Scale_Factor",1.0003],PARAMETER
["Latitude_Of_Origin",39.3333333333334],UNIT
```



# What to request from the CAD operator:

## From AutoCAD:

- Create all data elements in Model Space.
- Add layout elements in Layout (Paper) Space, not in Model Space.
- Do not add Viewports to Model Space.
- Save the file in Model Space.
- Avoid use of Object data for entity creation.



# What to request from the CAD operator:

## From Microstation:

- When using Microstation v8, the DGN file must be compressed in Microstation or the data will not draw or convert in ArcGIS Desktop.
- The seed file used as a template to create the new DGN file must not contain features.
- Esri does not at this time support DGN files which are created in Microstation Connect (these files will display in ArcGIS if saved to AutoCAD DWG format).

# What to request from the CAD operator:

## From both CAD programs:

- Use underscores instead of spaces in the file name.
- Remove any rotation that has been applied to the file before saving in the CAD program.
- Find out what units were used to create the data, and what scale factor was applied, if any.
- Detach references from the file in the CAD program. These will not draw or convert in ArcGIS, and will distort the spatial extent of the data.

# Additional Resources:

Esri Support Center Knowledge Articles:

"Identify the spatial reference, projection, or coordinate system of data"

<http://arcg.is/2sWmMLN>

"Identify an unknown projected coordinate system using ArcMap"

<http://arcg.is/2uTQ13c>

"Create a custom projection file in ArcMap to align CAD data"

<http://arcg.is/2u1BYwa>

"Select a suitable map projection or coordinate system"

<http://arcg.is/2sWv1Hq>

"Select the correct geographic (datum) transformation method"

<http://arcg.is/2sWFhQb>

"Lining Up Data in ArcGIS: a guide to map projections, second edition" from Esri Press

<http://arcg.is/2tW5UIY>

# QUESTIONS

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esri

THE  
SCIENCE  
OF  
WHERE