

# Standard Operating Procedures for Converting Adobe Illustrator Maps to GIS in ArcMap 10.x

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## PURPOSE

Adobe Illustrator (AI) is a vector graphics program which first brought geologic mapping from analog brown line to digital, and remains essential to creating publication-ready products from GIS. Many maps created during the transition period, though, require conversion to GIS in order to be usable as spatial data. The process of converting a map from AI to GIS is typically straight-forward, but may have issues not addressed here if lines were digitized as Bezier curves or other anchor-based lines (there are existing [resources and plug-ins](#) to address this).

### Required systems/software

Adobe Illustrator

ArcGIS Desktop 10.1 or higher Advanced License

### Basic ArcGIS features used in this SOP

[Editing](#)

[Layer Properties](#)

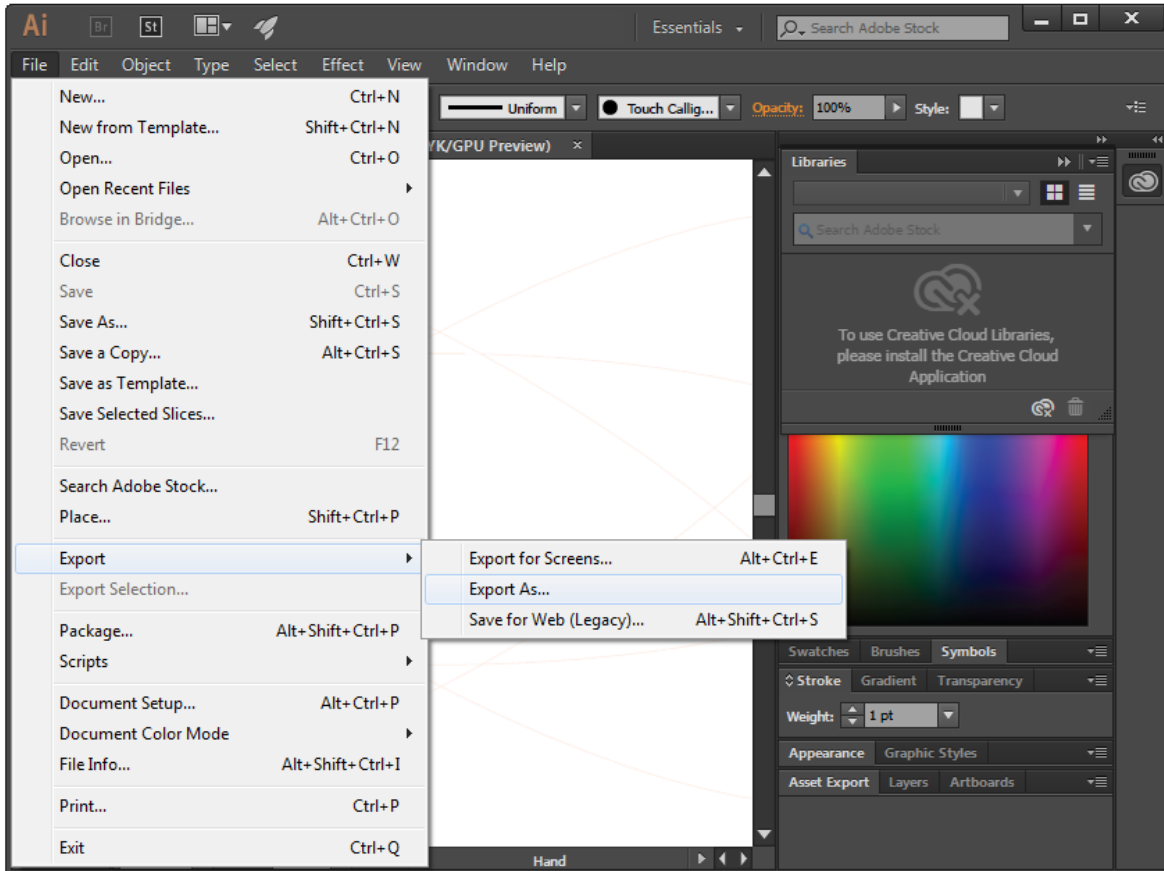
[Spatial Reference](#)

[Spatial Adjustment](#)

[Creating and Editing Metadata](#)

## Export Map from Adobe Illustrator

1) First, ensure viewing is enabled only for layers that are to be exported. Because the layer name is carried forward as an attribute called “Layer” in the output table it can be helpful to name/separate layers by feature type (i.e., contacts, geologic units, location features, surface features, structure). From the File menu select Export > Export As... and specify the DWG file format. ArcMap will read the data as an AutoCAD Feature Dataset with all geometry types, even if there are no features populated.

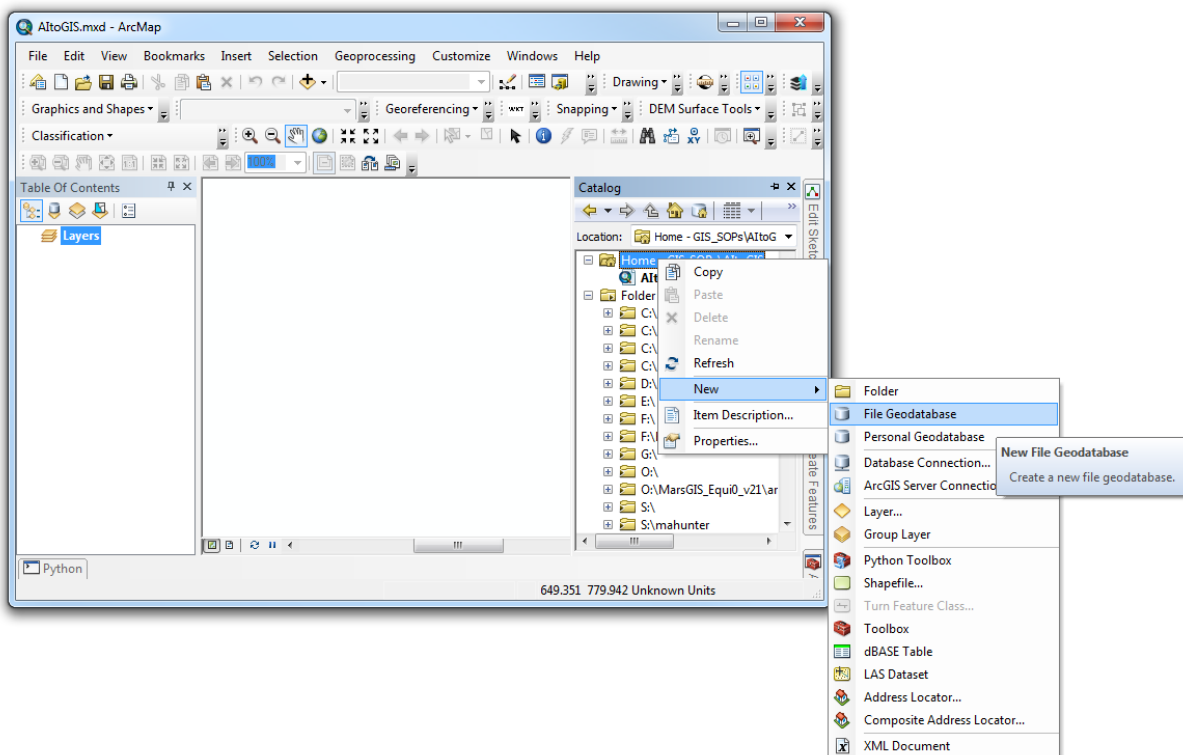


Export As... allows the user to select AutoCAD Drawing (\*.DWG) as output format.

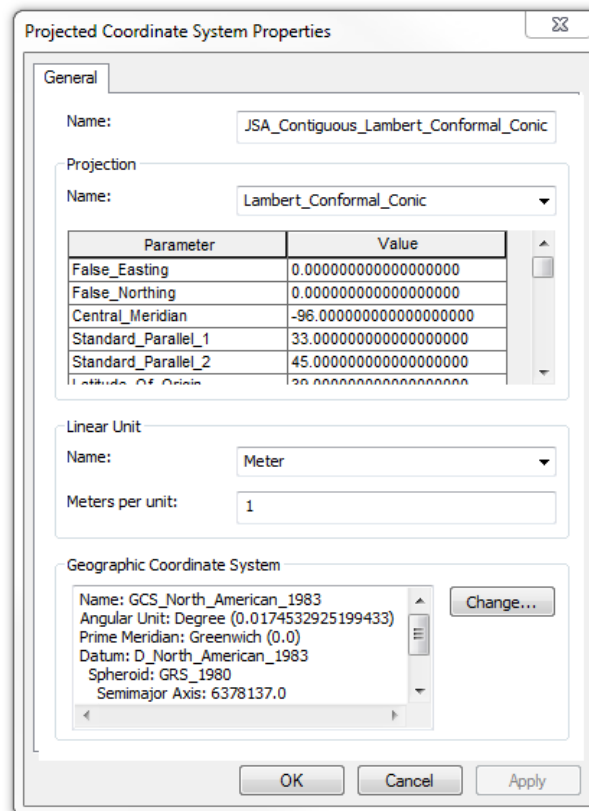
## Create GIS Project, Define Spatial Reference

2) The key to proper registration of the AI map is accurately defining the map boundary in the same spatial reference as the source map. Properly defined, a simple affine transformation tying the four corners of the source map to the boundary will put all features in place with correct area and geometry. Begin by creating a project directory, new ArcMap document and file geodatabase. Next, within the geodatabase create a new feature dataset (right-click > New > Feature Dataset...), which is essentially a sub-directory of like data that share a common spatial reference and scale (tolerance). The wizard will prompt the user to choose the spatial reference for the feature dataset, which will likely be unique to the map. If a projection file (\*.prj) or other dataset, such as a basemap, already has the correct projection then it may be imported and used directly, but if not then an existing projection will be to be modified with the required GCS and projection parameters.

For example, a mid-latitude map in the northern hemisphere of Mars using the Lambert Conformal Conic projection may begin with a terrestrial projection such as USA Contiguous Lambert Conformal Conic. Then by changing the central meridian, standard parallels and latitude of origin parameters to those of the source map, and underlying geographic coordinate system (GCS) to Mars 2000, it will be ready for the AI data. One common issue, though, is that maps do not always include ancillary information on projection parameters. In that case it is recommended to use an existing map GIS with the same projection and scale, and use those parameters as the base from which to test.



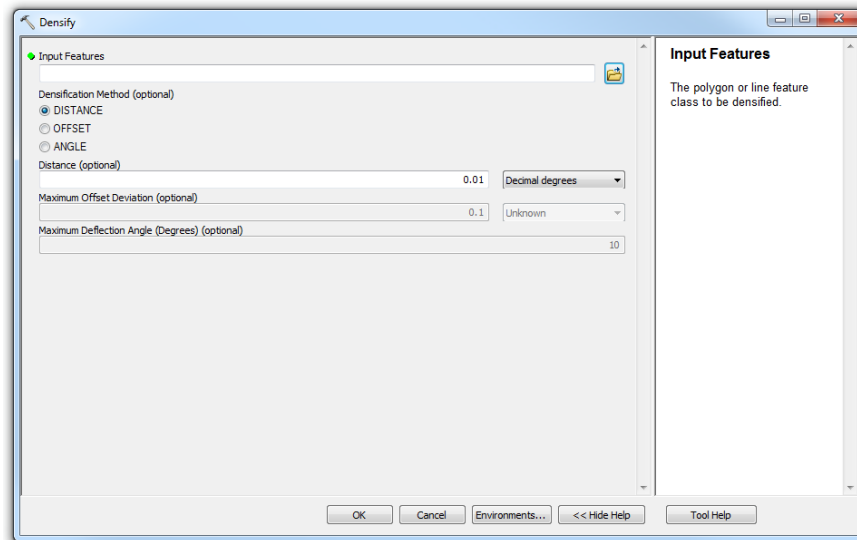
Right-click on the project directory and select New > File Geodatabase.



Spatial reference properties.

## Create Map Boundary

3) To do this, first create a polygon shapefile in the project directory with the GCS of the planetary body. Then, create a simple rectangle defined by the minimum/maximum coordinates of the map (note that many maps have a 0.1 degree margin which must be included). Save your edits, and then run the **Densify (Editing)** tool to insert vertices every 0.01 degrees; this will ensure the boundary will retain its shape once projected. With the boundary defined import the shapefile into the project's feature dataset which will automatically re-project the boundary. Lastly, bring the new boundary feature class into the map document, and ensure that the data frame uses the coordinate system of that layer (Data Frame > Properties > Coordinate System).



Densify tool.

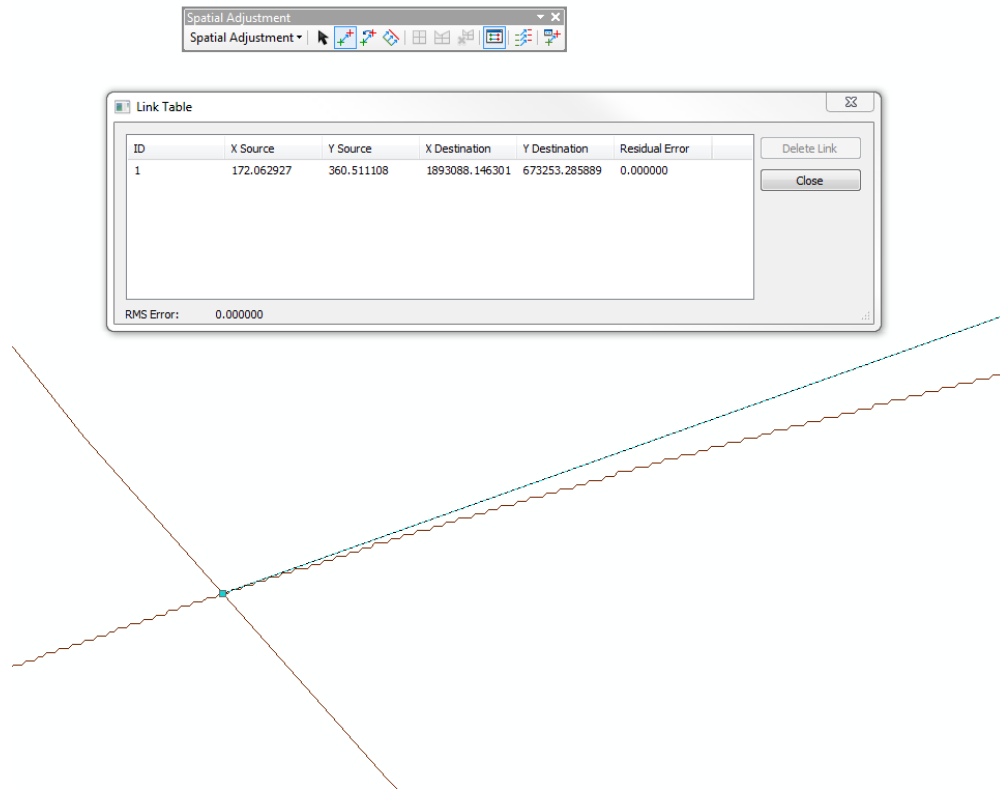
## Convert DWG to Shapefile

4) Now bring the AI datasets to be converted into ArcMap; because they have no spatial reference they will likely appear very small (helpful hint: use Zoom to Layer to go back and forth between the DWG data scale and map scale). DWG vector files are not directly editable in ArcMap so they must first be converted to shapefiles. Right-click on the layer and select Data > Export Data... to do this, and bring the shapefile into the map. At this point the DWG can be removed from the map document.

## Georeference Vector Data via Spatial Adjustment Toolbar

5) To begin creating links, open the Spatial Adjustment toolbar (Customize menu > Toolbars > Spatial Adjustment), and begin editing. Select the New Displacement Link Tool and zoom into near 1:1 scale of the unregistered map data to place the first link at the center of the first corner of the map, then zoom back out to the registered map boundary and click on the corresponding corner (snapping works well for this). Do this for each corner, or more as appropriate for irregular and polar maps. To review the residual error or delete any links select View Link Table button.

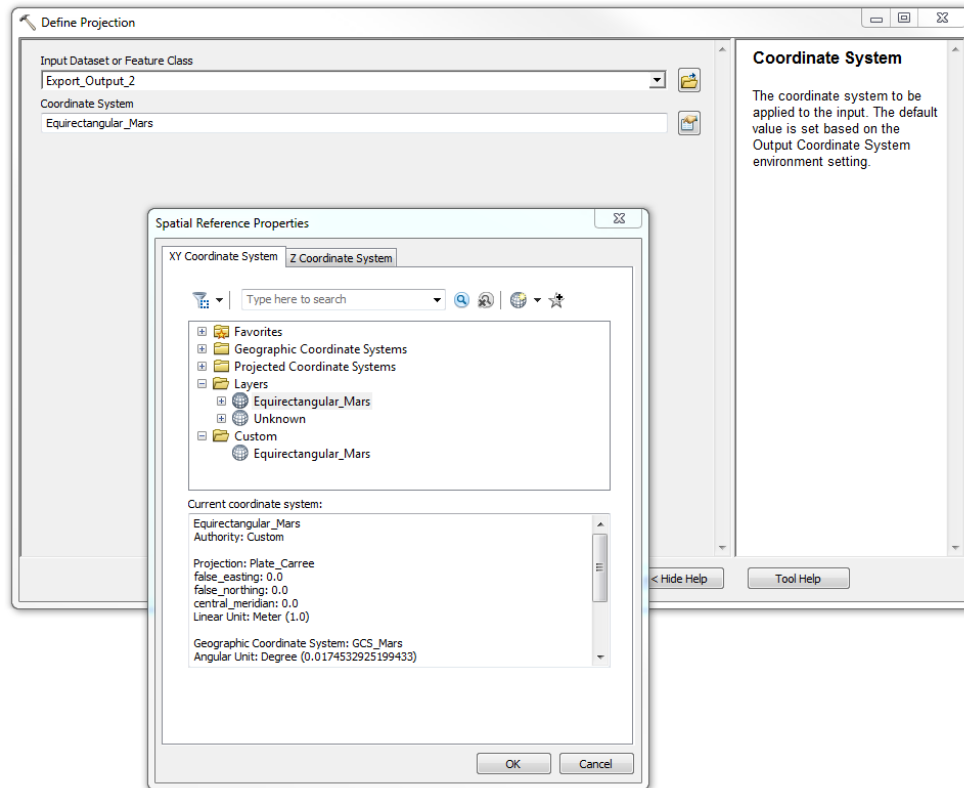
To perform the adjustment first open Select Adjust Data... under the Spatial Adjustment drop-down, and select all layers to which the adjustment is to be applied. Then verify under Adjustment Methods that Transformation – Affine is selected, and click Adjust. If the result is not as expected just use Undo, correct the links, and try again. Once a satisfactory result is achieved the link table may be saved out (Spatial Adjustment > Links > Save Links File...) for reference or to use for other layers. Finally, save edits end the edit session.



The link table provides information on the error of links between tie points.

### Define Projection of Adjusted Data

6) The map data have been scaled and placed to the map boundary, but are still missing a spatial reference. Use the **Define Projection (Data Management)** tool and, under Layers, select the map boundary feature class as the coordinate system. Now the map is ready to be imported into a geodatabase for completion or attribution.



The Define Projection tool may need to be ran more than once if multiple datasets were converted.

### Additional Steps (optional)

7) If the data requires cleaning (snapping and topology validation), attribution, symbology or packaging for release please refer to the SOP for Converting Geologic Maps to GIS with ArcScan Extension on the [MRCTR GIS Tutorials](#) website.

Please direct any questions, comments or improvements to:

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