GEOPAK V8i Edition

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SECTION 4: Geopak – GIS

4.1 - Set a Geographic Coordinate System in a Microstation DGN

Sharing a common coordinate allows DGN files to correctly reference each other. In order to have interoperability with other files, such as aerial photos, GIS files and other geo-referenced files, **there must be a geographically defined coordinate system.** Having known coordinate systems allows translation between source (i.e. aerial photo) and destination files (i.e. DGN horizontal alignment). Using MicroStation tools, DGN files can be assigned a known or custom *Geographic Coordinate System (GeoCS or GCS)*. There are many coordinate systems available to choose from. The **Survey and Mapping office has intimate knowledge of coordinate systems and should be consulted** before using GeoCS tools. They can assist in identifying the proper GeoCS.

Select a Geographic Coordinate System

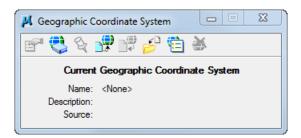
With MicroStation open, go to File > Geographic > Open as ToolBox. The Geographic menu appears.

Select the globe icon to Select Geographic Coordinate System.



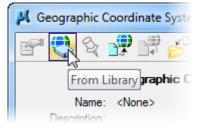
The **Geographic Coordinate System** menu appears. Note the dialog below shows that a GeoCS has not been assigned. There are several methods to select a GeoCS. The following three are described below:

- From Library
- From Reference
- From File



From Library

The From Library method involves choosing a GeoCS from a large library. Consult the Survey and Mapping office to identify the proper GeoCS.

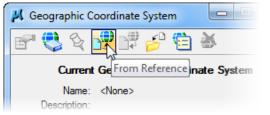


Below is an example of GeoCS list for the state of Montana. Generally, systems used will be from the *Library > Projected (northing, easting -) > North America > United States of America > State.*

📁 Favorites 🔺	Coordinate System	
	Name Description Projection Source Units First Standard Parallel	MT83IF NAD83 Montana State Planes, Lambert Conformal Conic Calculated from MT83 by Ment International Foot 49°00'00.0000"N
	Second Standard Parallel Origin Longitude Origin Latitude False Easting False Northing Quadrant Minimum Longitude	45°00'00.0000"N 109"30'00.0000"W 44*15'00.0000"N 1968503.937 0 Positive X and Y 116°45'00.0000"W
 Alabama Alaska Arizona Arizona Arizona Arizona Arizona Arizona Arizona Arizona 	Maximum Longitude Minimum Latitude Maximum Latitude Datum	103*15'00.0000"W 44*30'00.0000"N 49*30'00.0000"N
Colorado Connecticut Delaware Forida Georgia Georgia Hawaii	Name Description Source Conversion Method Ellipsoid	NAD83 North American Datum of 1983 US Defense Mapping Agency, NAD83 - no shift required
Idaho Idaho Ilinois Ilino	Name Description Equatorial Radius Polar Radius Eccentricity Source	GRS1980 Geodetic Reference System of 6378137 6356752.3141403478 0.081819191042830641 Stem, L.E., Jan 1989, State Pic
Coustanta Coustanta Coustanta Manne Manne Massachusetts Michigan Mississippi Mississipi Mississipi Mississipi Mississipi Mississippi		
MT-C - NAD27 Montana State Planes, Central Zone(2502), US Foot MT-N - NAD27 Montana State Planes, North Zone(2501), US Foot MT83F - NAD83 Montana State Planes, International Foot MT83IF - NAD83 Montana State Planes, International Foot EPSG-2256 - NAD83 / Montana & the Planes, International Foot		

From Reference

The **From Reference** method is the **easiest and the preferred method.** This method allows the inheritance of a GeoCS from an attached reference file that has a GeoCS defined. The preferred source file is the PLM file produced by the Survey and Mapping Department. Inquire with Survey and Mapping to asses if a GeoCS has been assigned.



Next **select the reference file to inherit the GeoCS from.** Then select OK. Note the GeoCS has been assigned to the project PLM file.

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From File

The **From File** method functions much like the *From Reference* method. Using this method requires selecting a file using a standard select file menu. As a best practice **use the project PLM file**.

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Name: <none></none>	

Select the appropriate file. Then Select Open. Inquire with Survey and Mapping to asses if a GeoCS has been assigned.

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Verification

Once a GeoCS has been selected the Geographic Coordinate System menu should be populated and appear similar to the dialog below.



The Reference menu will show the GeoCS name if assigned. Note; if the GeoCS column is not listed, Right-click on a column heading and add it.

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Google Earth Verification

Many users have Google Earth Pro installed. The Geographic Menu has Google Earth tools that can synchronize drawing locations in Google Earth and conversely, synchronize Google images in drawings.

Once the GeoCS has been assigned, **zoom into an area** that would be recognizable in an aerial view. Separately **open Google Earth Pro**. Then in MicroStation **select the Synchronize Google Earth View.** The Google Earth view should be updated to show the corresponding area in the drawing.



Now within your project parameters, **zoom to an area of interest in Google Earth Pro**. Use the **Follow Google Earth icon** to update your drawing view to correspond with the Google Earth view.



4.2 - Georeference Google Earth image into Microstation

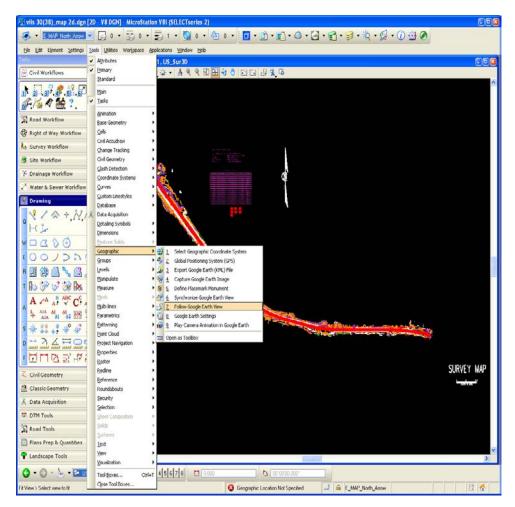
Georeferencing from Google was previously available only in Microstation GeoGraphics and Bentley Map.

Microstation V8i (SELECTseries 3) provides support for geographic coordinate system setup and onthe-fly reprojection of references in different coordinate systems. This geographic coordinate system support allows for easier integration with ArcView Shapefiles, Google Earth, and GPS devices.

Open the dgn file or model you want to reference the Google image into.

The dgn/model MUST be 3-D.

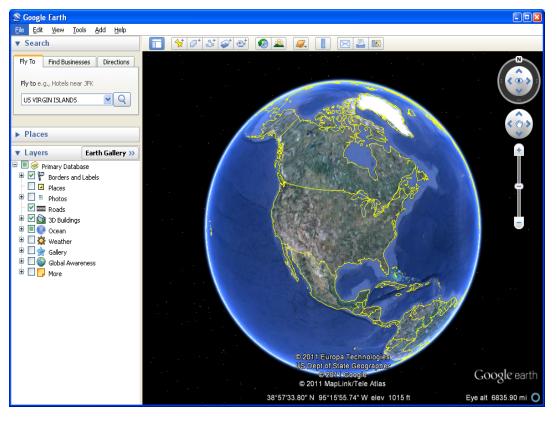
Start Google Earth by doubleclicking the desktop shortcut (if you have one) or start it in the cadd file by navigating to **Tools > Geographic > Follow Google Earth View**.

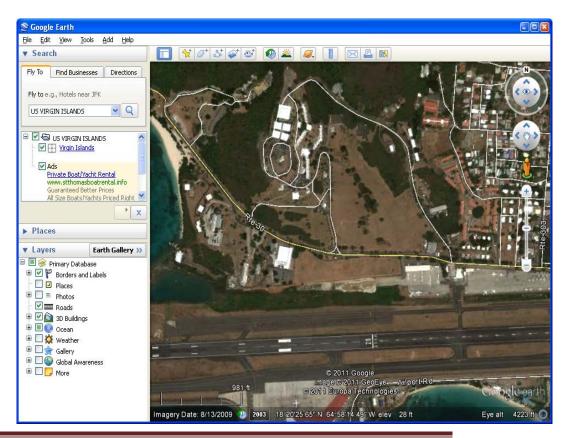


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In Google Earth, "fly to" the general area of the image you want to capture.

Toggle on or off, the layers you want displayed in the image; Roads, Parks, Water Boundaries, Labels, etc.





Zoom in or out as needed To fit the desired view area.

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Back in Microstation, you will need to set the proper Geographic Coordinate System.

Go to Tools > Geographic > Select Geographic Coordinate System

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Follow the steps above in Section 4.1 for selecting the Geographic Coordinate System.

To quickly check if you have selected the correct coordinate system, use the "Synchronize Google Earth View" tool;



This tool uses the coordinate system you've selected along with the current view in Microstation and will then "fly to" the same location in Google Earth.

To import the image into your dgn file, Go to Tools > Geographic > Capture Google Earth Image.

The Microstation prompt (at the bottom of your cadd window) instructs you to "Enter datapoint to capture the current Google Earth view"

Datapoint in the view.

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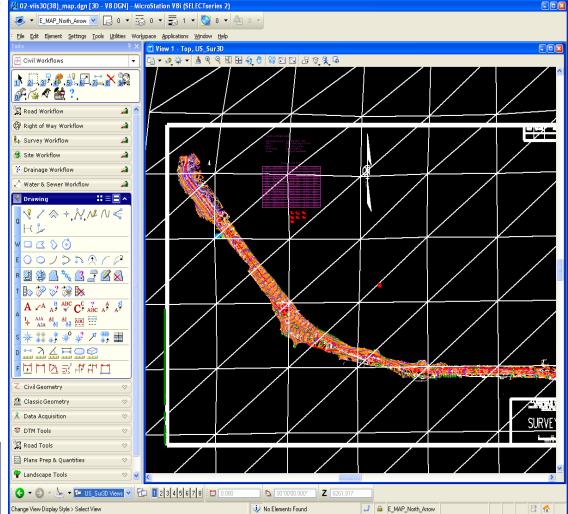
A grid will appear showing the limits of the Google Earth image.

(If the grid is not within the limits of the project, an incorrect coordinate system was probably used.)

Go to Settings > View Attributes.

Open the Display Style drop down and select **SMOOTH**.

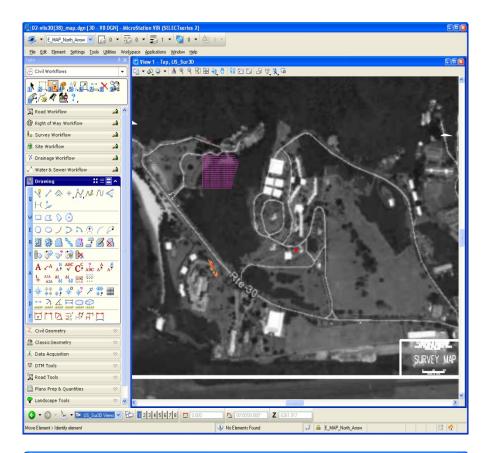




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The Google image is now showing, georeferenced into the cadd file at the correct coordinates, scale, projection and rotation.

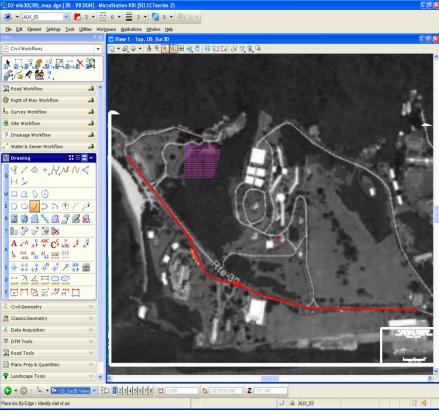
If your dgn/model had mapping or alignments active or referenced, the Google image may be on top of those elements. You may not be able to see them.



The reason you may not see your active dgn elements is that the 3D Google image you just referenced is at a HIGHER "Z" elevation than the active elements.

To correct this, fit the area in View 2 (the ISO view). You will see the grid in isometric view.

MOVE the grid to a lower elevation by using the AccuDraw Tool.



Select the grid with the MOVE command.

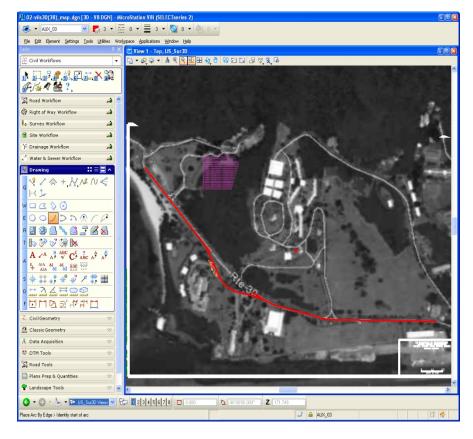
Hit "T" (for Top).

Enter value 0 in the X field, 0 in the Y field and -50 in the Z field.

This should move the referenced image BELOW your active elements.

WARNING:

Because of moving the image, you should not use the georeferenced image for identifying or labeling elevations.



4.3 - View Geotagged Photos in Google Earth

What is a geotagged photo?

A geotagged photo is a photo taken with a camera that has a GPS function that is turned on at the time the photo is taken, so that the geographic coordinates of the photo location are saved in the photo's data file.

To check whether a photo is geotagged, right-click on the photo name in Windows Explorer and select **Properties** from the drop-down menu. Click on the **Details** tab in the photo properties dialogue box that opens.

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File	RIMG0039.JPG	
Item type	JPEG image	
Folder path	C:\Users\Lana.Lau\Deskto	-
Remove Properties an	d Personal Information	
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Figure A-1

When you scroll down through the available Detail information, if your photo has latitude and longitude information (Figure A-1), it is a geotagged photo and can be used to create a shapefile.

A. Create a Shapefile from Geotagged Photos

- 1. Open ArcMap (either create a new map, or use an existing map).
- 2. Make sure that ArcCatalog has a connection to the folder where you saved the photos. To create a new folder connection, click on the icon at the top of the Catalog window that looks like a yellow folder with a plus sign (where the red arrow is pointing in Figure B-1).

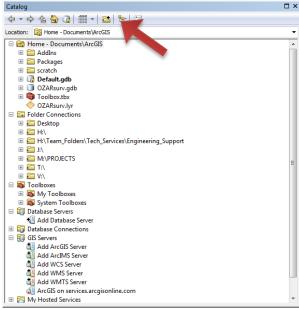


Figure B-1

Navigate to the folder you want to connect to and click on it (the folder's file path appears in the Folder entry box). Click OK. (Figure B-2)

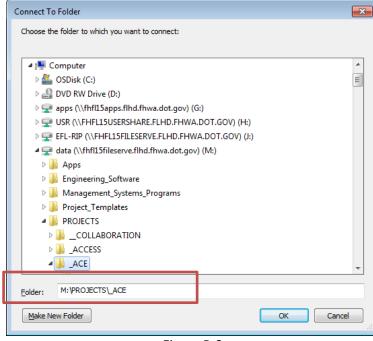


Figure B-2

 Open the GeoTagged Photos to Points tool in ArcToolbox by navigating to the tool in Data Management Tools → Photos, and double-clicking on the tool Figure B-3).

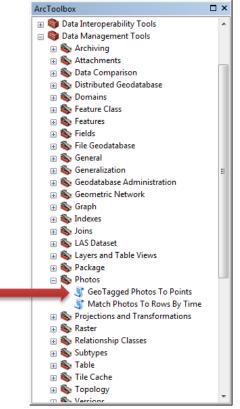


Figure B-3

Click on the folder icon next to the Input Folder entry box (Figure B-4) and navigate to the folder where your geotagged photos are saved. Click once on the folder so that the folder name appears in the Name box, and click Add (Figure B-5).

 Input Folder Output Feature Class Invald Photos Table (optional) Invald Photos Table (optional) Include Non-Geo Tagged Photos (optional) Add Photos As Attachments (optional) 	्र GeoTagged Photos To Points	
Output Feature Class Interfolder where photo files are located. This folder is scanned recursively for photo files; any photos in the base level of the folder, as well as in any subfolders, will be added to the output.		Input Folder
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Figure B-4

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Figure B-5

For the Output Feature Class entry box, select the folder where you want your new shapefile to be saved, and enter a name for your shapefile (Figure B-6). Click Save.

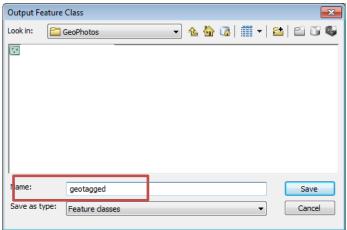


Figure B-6

In the GeoTagged Photos to Points dialog box, decide whether you want to include non-geo tagged photos in your shapefile, and check/uncheck the box accordingly (Figure B-7). Click OK to run the tool.

Input Folder	Add Photos As	
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When the tool finishes processing, your new shapefile should have been added to your map in the Table of Contents, and you will see some points on your map (Figure B-8).

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Figure B-8

4. You can add a basemap layer to check that your photos have been placed in the correct locations.

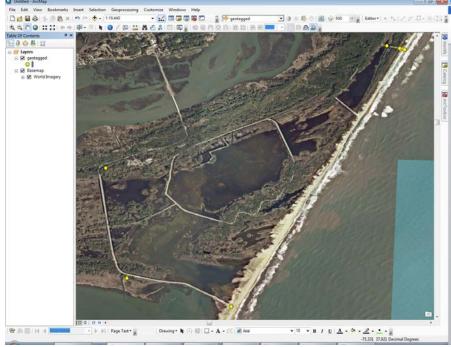


Figure B-9

5. Add new fields (columns) in the attribute table for latitude and longitude information, and photo description (optional). Open the attribute table by right-clicking on the shapefile name in the Table of Contents and selecting Open Attribute Table from the drop-down menu. Click on the icon located in the top left of the attribute table, and select Add Field... from the drop-down menu (figure B-10).

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	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0040.JPG	RIMG0040.JPG	2016:03:01 16:02:44	30.79	37.8894	-75.3431	Sandy beach where FWS is c
	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0041.JPG	RIMG0041.JPG	2016:03:01 16:14:11	142.79	37.8934	-75.357	
	B Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0042.JPG	RIMG0042.JPG	2016:03:01 16:14:18	197.39	37.8934	-75.357	
	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0043.JPG	RIMG0043.JPG	2016:03:01 16:15:14	250.63	37.8932	-75.357	
-	5 Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0044.JPG	RIMG0044.JPG	2016:03:01 16:15:18	280.55	37.8932	-75.357	
	6 Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0045.JPG	RIMG0045.JPG	2016:03:01 16:15:32	205.73	37.8932	-75.357	
	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0046.JPG	RIMG0046.JPG	2016:03:01 16:17:15	224.87	37.8932	-75.357	
	8 Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0047.JPG	RIMG0047.JPG	2016:03:01 16:25:09	269.87	37.8932	-75.357	
	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0048.JPG	RIMG0048.JPG	2016:03:01 16:25:17	269.33	37.8932	-75.357	
1	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0049.JPG	RIMG0049.JPG	2016:03:01 16:25:31	176.31	37.8932	-75.357	
1	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0050.JPG	RIMG0050.JPG	2016:03:01 16:25:43		37.8932	-75.357	
1	2 Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0051.JPG	RIMG0051.JPG	2016:03:01 16:25:50	182.26	37.8932	-75.357	
1	8 Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0052.JPG	RIMG0052.JPG	2016:03:01 16:53:00	227.83	37.9242	-75.3222	
1	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0053.JPG	RIMG0053.JPG	2016:03:01 16:53:05	129.59	37.9242	-75.3222	
1	5 Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0054.JPG	RIMG0054.JPG	2016:03:01 16:53:14			-75.3222	
1	6 Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0055.JPG	RIMG0055.JPG	2016:03:01 16:53:25	344.33	37.9242	-75.3222	
1	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0056.JPG	RIMG0056.JPG	2016:03:01 16:53:31	205.33	37.9242	-75.3222	
1		C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0057.JPG	RIMG0057.JPG	2016:03:01 16:56:01		37.9242	-75.3222	
1		C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0058.JPG	RIMG0058.JPG	2016:03:01 16:56:36			-75.3205	
2		C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0059.JPG	RIMG0059.JPG	2016:03:01 16:56:56			-75.3205	
2		C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0060.JPG	RIMG0060.JPG	2016:03:01 16:57:02			-75.3205	
2		C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0061.JPG	RIMG0061.JPG	2016:03:01 16:57:15		37.9238	-75.3201	
2		C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0062.JPG	RIMG0062.JPG	2016:03:01 16:58:34		37.9238	-75.3201	
2		C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0063.JPG	RIMG0063.JPG	2016:03:01 16:58:42		37.9237	-75.3199	
2		C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0064.JPG	RIMG0064.JPG	2016:03:01 16:58:48		37.9237	-75.3199	
2		C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0065.JPG	RIMG0065.JPG	2016:03:01 16:58:52	221.36	37.9237	-75.3199	
2		C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0066.JPG	RIMG0066.JPG	2016:03:01 17:07:58			-75.3223	
2	8 Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0067.JPG	RIMG0067.JPG	2016:03:01 17:08:06	206.53	37.9242	-75.3223	

Figure B-10

Enter LatDD for the field Name (for latitude in decimal degrees) and select the Type: Float (Figure B-11). Click OK. [N.B. Do not use spaces in the field names. You may use underscores.]

Add Field	×					
<u>N</u> ame:	LatDD					
<u>T</u> ype:	Float 🔹					
Field Properties						
Precisio	on O					
Scale	0					
	OK Cancel					

Figure B-11

Repeat for the LongDD field (longitude in decimal degrees). For the Description field, enter **Desc** for the field Name, and select the Type: Text. You must enter in the maximum number of characters that will be allowed in the Description field (e.g. 100 characters). This cannot be changed once the

field is created, but a larger number will increase the amount of disk space your shapefile will occupy. Therefore, carefully consider what is most appropriate for the character limit (Figure B-12).

Add Field	—					
<u>N</u> ame:	Description					
<u>T</u> ype:	Text 💌					
Field Prope	Field Properties					
Length	Length 100					
	OK Cancel					



Use ArcMap to populate the latitude/longitude information in the attribute table. ArcMap knows the lat/long of your pictures, since it has accurately placed them on the map. However, you need to direct ArcMap to "calculate" these values to fill in the attribute table.

Right-click on the latitude column header, LatDD, and select Calculate Geometry from the dropdown menu. You will receive a reminder that you are about to calculate outside an edit session. Click Yes. Make sure that the Property is set to "Y Coordinate of Point" (since you are calculating the latitude). The units will be in decimal degrees because of the coordinate system from the GPS camera (Figure B-13). Click OK. The LatDD column will be filled with the latitude information. Repeat these steps for the LongDD field, making sure that the Property is set to "X Coordinate of Point."

Calculate Geomet	ry	×				
Property:	Y Coordinate of Point	•				
Coordinate System						
	Our of the data source:					
GCS: WGS 1	GCS: WGS 1984					
Use coordinate system of the data frame:						
<u>U</u> nits:	Decimal Degrees	•				
Calculate selected records only						
About calculating geometry OK Cancel						

Figure B-13

7. Enter photo description information. To add photo description information to the attribute table, you must start an edit session. Right click on the shapefile name in the Table of Contents and move your cursor down to Edit Features, then select Start Editing.

If the Editor toolbar does not appear automatically, click on the Customize menu at the top of the ArcMap window and place your cursor over Toolbars. If the Editor toolbar is unchecked, click to check it. The Editor toolbar will appear (Figure B-14).



Figure B-14

Now you can edit information in your attribute table. Double-click on any row in the Description column, and a cursor will appear indicating that you can enter information.

Once you have completed all your edits, click on the Editor dropdown menu in the Editor toolbar, and select Stop Editing. If you have unsaved edits, the program will prompt you by asking whether you would like to save your edits. Click either Yes or No to stop editing.

1. The Identify tool (Figure B-15) can be used to see the attribute information for any point (photo location). Click on the Identify tool to activate it (Figure B-15).

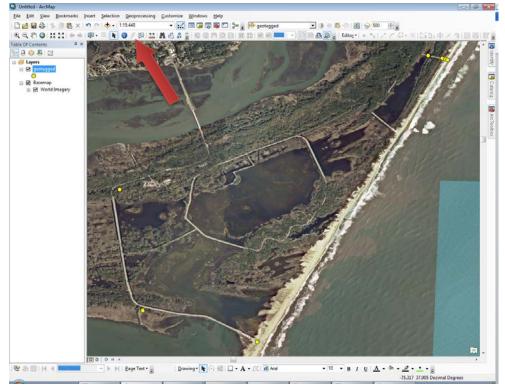


Figure B-15

The Identify window will open, containing attribute information for the point you clicked on (Figure B-16).

Identify		□ ×
Identify fro	om: <top-most layer=""></top-most>	×
⊡-geotag	ged MG0039.JPG	
Location:	-75.359808 37.908033 Decimal Degrees	
Field	Value	
FID	0	
Shape	Point ZM	
Path	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0039.JPG 🛛 🖇	
Name	RIMG0039.JPG	
DateTime	2016:03:01 16:02:33	
Direction	194.1	
LatDD	37.908	
LongDD	-75.3598	
Descr	Pool location with trees	
Identified :	1 feature	

Figure B-16

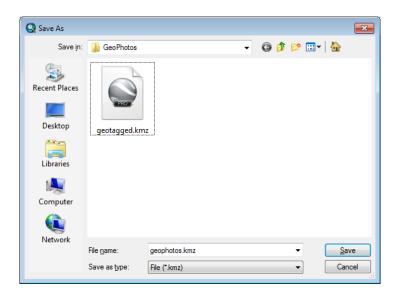
C. <u>Creating a KMZ for Display in GoogleEarth</u>

 Locate the Layer to KML tool in ArcToolbox → Conversion Tools → To KML → Layer to KML. Double-click on the tool to open the dialogue box. Select your shapefile (with the photo locations) from the Layer dropdown menu (or navigate to its location by clicking on the folder icon). (Figure C-1)

🐔 Layer To KML	- • ×
Layer geotagged Output File C:\Users\Lana.Lau\Documents\ArcGIS\geotagged_LayerToKML.kmz Layer Output Scale (optional) © Clamped features to ground (optional) © Data Content Properties © Extent Properties © Output Image Properties	Layer The feature or raster layer or layer file (.lyr) to be converted to KML.
OK Cancel Environments << Hide Help	Tool Help

Figure C-1

2. Click on the folder icon next to the Output File entry box and navigate to the folder location where you would like to save your KMZ. Enter a name for your KMZ file into the file name box (Figure C-2). Click Save.



3. In Windows Explorer, navigate to the folder where you saved the KMZ file. Double-click the KMZ file to launch GoogleEarth. Your photo locations will be shown as points. If you click on one of the points, a pop-up window will open containing the same information that was in the attribute table (Figure C-3).

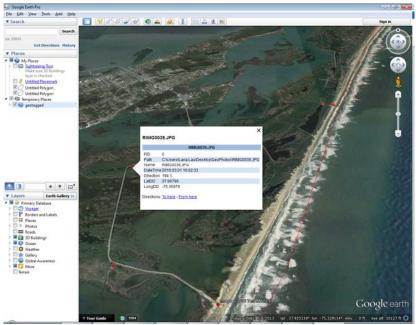


Figure C-3

It is possible to create a KMZ so that the **photo** appears in the GoogleEarth pop-up window when you click on a point. As this process is considerably more complicated, please contact Engineering Support for assistance if you would like to do that.

4.4 - Visualize the Horizontal Alignment (Chain) in Google Earth

Follow these steps to georeference the centerline chain in GoogleEarth;

In the Microstation design file that has the alignment centerline, set/verify that there is a geographic coordinate system (GCS) assigned to the drawing.

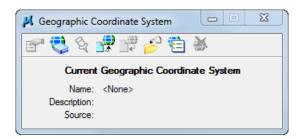
In the CADD file, go to File > Geographic > Open as ToolBox. The Geographic menu appears.

Select the globe icon to Select Geographic Coordinate System.



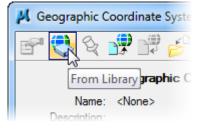
The **Geographic Coordinate System** menu appears. Note the dialog below shows that a GCS has not been assigned. There are several methods to select a GCS. The following three are described below:

- From Library
- From Reference
- From File



From Library;

The From Library method involves choosing a GCS from a large library. Consult the Survey and Mapping office or the delivered mapping .dgn to identify the proper GCS.



Below is an example of GCS list for the state of Montana. Generally, systems used will be from the *Library > Projected (northing, easting -) > North America > United States of America > State.*

Favorites		Coordinate System	
English Custom Coordinates English Custom Coordinates English Custom Coordinates English Custom Coordinates For Projected (northing, easting,) English Custom Artica English		Name Description Projection Source Units First Standard Parallel Second Standard Parallel Origin Longitude Origin Latitude	MT83IF NAD83 Montana State Planes, Lambert Conformal Conic Calculated from MT83 by Ment International Foot 49°00'00.0000"N 45°00'00.0000"N 109°30'00.0000"W 44°15'00.0000"N
Middle East North America Oranata United Mexican States (Mexico) Oranata	E	False Easting False Northing Quadrant Minimum Longitude Minimum Latitude Maximum Latitude	44 15 00.0000 "N 1968503.937 0 Positive X and Y 116*45'00.0000"W 103*15'00.0000"W 44*30'00.0000"N 49*30'00.0000"N
Arkansas Calfornia Colorado Delaware Forida Georgia Hawaii		Datum Name Description Source Conversion Method Ellipsoid	NAD83 North American Datum of 1983 US Defense Mapping Agency, NAD83 - no shift required
Hawaii Hawaii		Name Description Equatorial Radius Polar Radius Eccentricity Source	GRS 1980 Geodetic Reference System of 6378137 6356752.3141403478 0.081819191042830641 Stem, L.E., Jan 1989, State Pl
Maine Maryland Massachusetts Michigan Minnesota Mississippi Mississippi Missouri Montana Missouri Montana Mircs - NAD27 Montana State Planes, South Zone(2503), US Foot Mirc - NAD27 Montana State Planes, Central Zone(2501), US Foot MircN - NAD27 Montana State Planes, North Zone(2501), US Foot MircN - NAD27 Montana State Planes, North Zone(2501), US Foot			
MT83F - NAD83 Montana State Plane Zone, US Foot MT83IF - NAD83 Montana State Planes, International Foot MT83IF - NAD83 (Montana State Planes, International Foot MT83IF - NAD83 (Montana ft) TT	•		

Hit OK.

Verification

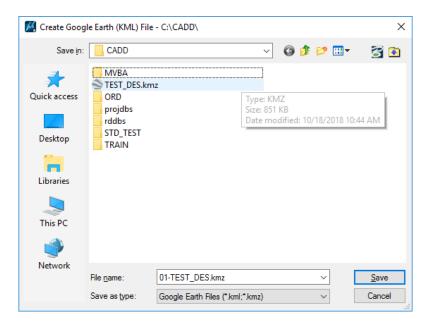
Once a GCS has been selected, the Geographic Coordinate System menu should be populated and appear similar to the dialog below.

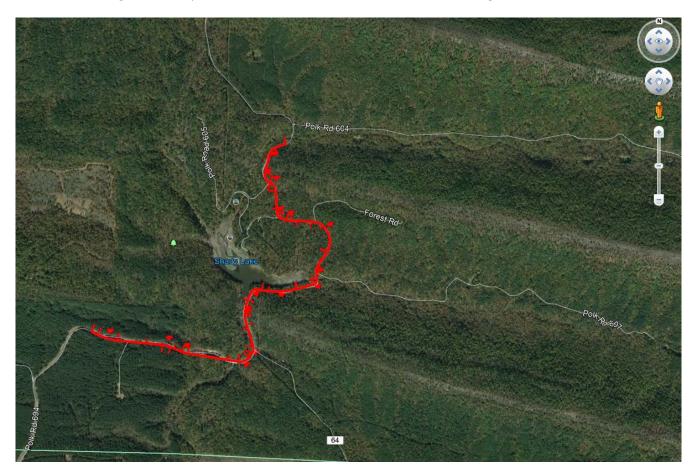
🔀 Geographic Coordinate System					
🚰 😍 🗞 🐙 🛱 🤔 🛅 🛎					
Current Geographic Coordinate System					
Name: AR83/2011-SF Description: NAD83/2011 Arkansas State Planes, South Source: Derived from AR83-S					

Now, fit the alignment centerline in the Microstation view.

Turn off any Reference File display and/or Levels of any elements you do not want shown in GoogleEarth.

Go to File > Export > GoogleEarth > Navigate to the destination path for the .kmzr.





Hit Save and GoogleEarth is opened and it zooms to the coordinates of the design file.