## Coordinate Systems in PLS-CADD

The purpose of this technical note is to discuss the use of coordinate systems within **PLS-CADD**. When version 8 of **PLS-CADD** was released it was the first version with the capability of designating a project coordinate system. Having a project coordinate system allowed **PLS-CADD** to make cartographic calculations which convert the XYZ points system that **PLS-CADD** uses into longitude and latitude. This functionality allows users to export to Google Earth, download imagery for their project area, and several other features which will be described later.

Getting Started with Coordinate Systems

To define the coordinate system for a project you will use the **Terrain/ Coordinate System/ Define** command. This command opens the coordinate system selection dialog shown to the right. The coordinate system to be selected was defined during survey point collection. If there is any question as to what coordinate system was used during data collection, consult the provider of the survey data.
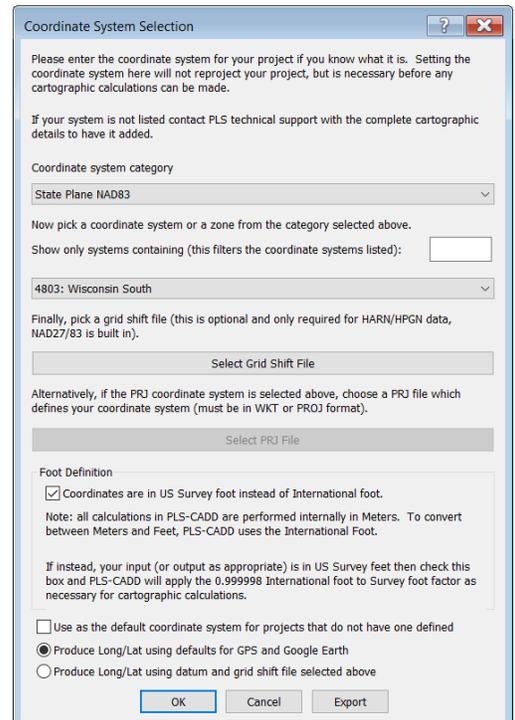
Coordinate System Categories:

1. **Unknown or unavailable:** The default for all old projects. Cartographic calculations will be disabled if coordinate system is unknown.
2. **State Plate NAD27:** State Plate using the North American Datum of 1927.
3. **State Plate NAD83:** State Plate using the North American Datum of 1983.
4. **Custom:** Coordinate systems developed by a utility, or those that were added by Power Line Systems.
5. **UTM:** Universal Transverse Mercator projection using various ellipsoids (WGS84, International and Clark 1866)
6. **EPSG:** European Petroleum Survey Group which defines thousands of coordinate systems around the world. (Note: use the *Show only systems containing* filter to help find coordinate systems).
7. **ESRI:** Various coordinate systems used in conjunction with the ESRI GIS software.
8. **World:** Random coordinate systems the source of which is unknown.
9. **PRJ:** An option to select a ".prj" file where you can define a coordinate system. This file must contain WKT or a PROJ string. When this option is selection the Select PRJ File button is available.

Note: Initial experience with the ESRI and World categories has not been positive. If at all possible, we recommend you select from EPSG instead.

Defining Your Coordinate System:

Start by choosing the coordinate system category. If the coordinate system category pertaining to the project is not available, the user will need to either create a custom coordinate system or, preferably, use the PRJ option.

Next the user selects the coordinate system zone. The user can limit the number of zones
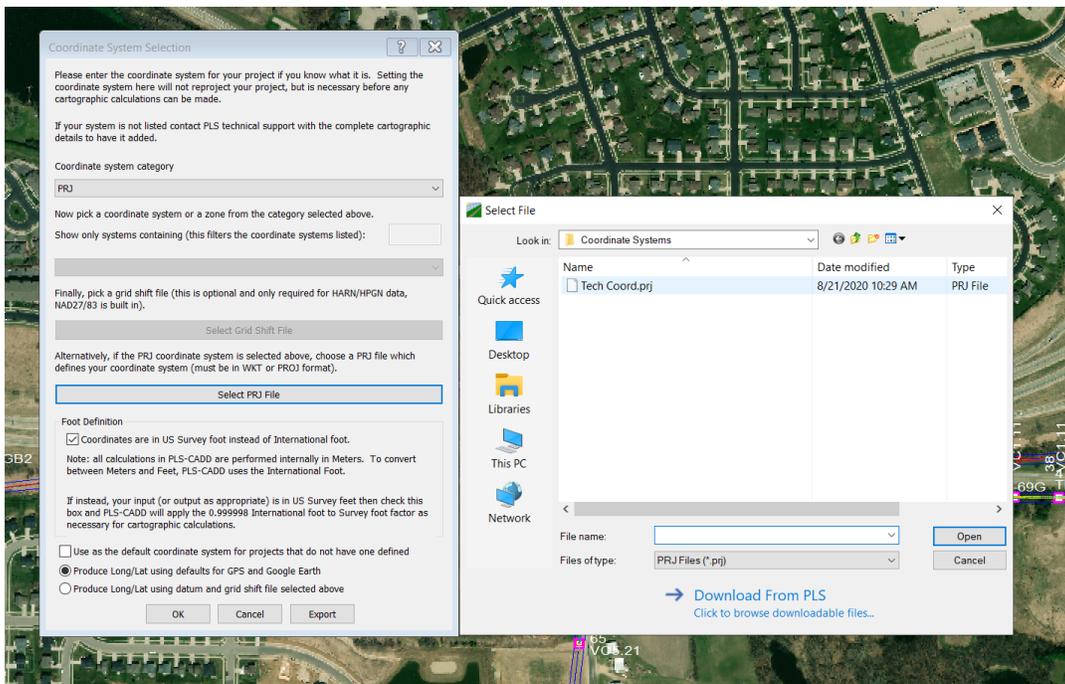
available by entering text into the filter to the right of "Show only systems...". After consulting with their Survey/GIS group, users may wish to select a datum grid shift file by clicking on the Grid Shift File selection button. Grid shift files provide for more accurate coordinate system conversions where available. Users in the United States will need to check the "Coordinates are in US Survey Foot" option

if their project was built with data in US Survey Feet. By default **PLS-CADD** uses the international definition of a foot.

You can select the coordinate system to use as the default coordinate system for new or existing projects by selecting the option at the bottom of the dialog box. This default can be removed from your project by visiting the Settings section of the **File/ Preferences** menu. The radio button at the bottom of the dialog allows you to choose whether reports containing longitude and latitude have their conversion based on GPS and Google Earth datum WGS84 or the project datum that is selected in the dialog box.
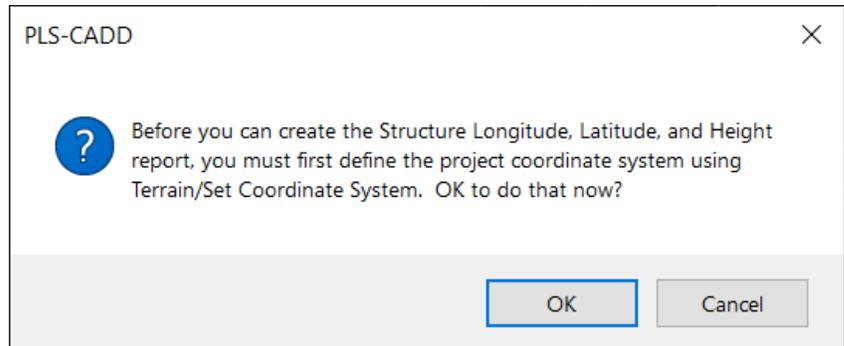
Creating a Coordinate System:

Previously, a custom coordinate system could only be created by emailing Power Line Systems support with coordinate system information. One example of where a custom coordinate system is necessary, is GA95 which is the Georgia Power 1995 system. GA95 and all other coordinate systems that are not defined by and included with the PROJ system are stored in the *Custom* category. This option is still available, and useful for locations where a custom coordinate system has historically been used.

Version 16.50 of PLS-CADD gives users the option of importing a *.prj* file. This functionality reduces the need to have custom coordinate systems created. This button becomes available in the dialogue box if the PRJ coordinate system category is selected.

Validating a Coordinate System

Before making use of any of the cartographic functionality you enabled in **PLS-CADD** by selecting your project's coordinate system, you should first validate that system. To do this we recommend generating the **Lines/ Reports/ Structure Longitude and Latitude Report**. You can then do a quick sanity check by using your GIS, Google Earth or other mapping software to jump to the location of one of the structures in your line. If the location appears to match then you are ready for the second phase of validation. In the second phase you should print out the Structure Longitude and Latitude Report as well as the **Lines/ Reports/ Construction Staking Table** and ask your Survey or GIS group to verify that the Easting and Northing from the latter report matches the Longitude and Latitude from the former.

The coordinate system functionality in **PLS-CADD** is based on the PROJ system originally developed by Gerald Evenden of the USGS. As such, we have considerable confidence in the State Plane coordinate system conversions. There is less experience with the various EPSG, ESRI and World systems so we recommend additional verification prior to using one of those systems. For more information on PROJ please see http://trac.osgeo.org/proj/

Coordinate System Functionality

The list of coordinate system uses in **PLS-CADD** is long. There are many situations, such as searching for potential structure locations with a GPS or importing survey data, where it is necessary to project information from the curved earth onto a plane. Many of these features do not get utilized on a day to day basis, but below are a few that do.

KMZ Export: Coordinate systems allow **PLS-CADD** users to export their designs to Google Earth through a KMZ file. This function gives users the ability to perform virtual walk-downs, share potential designs with clients and much more. The Google Earth Technical Note on the Power Line Systems website goes into more detail about using KMZ exports.

PLS-CADD: Google Earth Integration Tips

Vegetation Work Sites: In areas where vegetation management work is required, **PLS-CADD** gives users the ability to create work site centroids. This information can be exported as an XML, shared with GIS, and shared with vegetation management teams.

Attachments: Attachments such as DXF files or imagery from web mapping services use coordinate geometry to correctly locate the attachments in a model. Both raster images and vector drawings can be imported into **PLS-CADD** as attachments. Once attached to the model, these files can be used to create points, show aerial imagery for spotting, and display information from other parties such as underground utilities or environmentally sensitive areas. Photos can also be geotagged and imported to show the current condition of a structure.