

InRoads – Converting CAiCE Data to InRoads

Overview

There are two main types of data that is converted from a standard WSDOT CAiCE project into a standard WSDOT InRoads project: **design geometry** and **survey data**.

This process workflow includes writing database elements to translator files, and then deleting them to isolate the remaining element types. Below is a short overview of each data type and the conversion process for each.

Design Geometry

Design geometry includes survey generated elements indicating right-of-way geometry and control, design proposed horizontal alignments, offset geometry, and design profiles as well as supplemental geometry objects (curves, spirals, lines, etc.) and proposed single-point elements (catch basins, luminaires, etc.).

It is important to account for all data elements, and each element should be considered for including in the process. The intent is to create a base clean, workable, and efficient project dataset in InRoads.

After backing up the project, superelevation reports for each alignment will be backed up (see the [Known Issues](#) section of this document) and LandXML files will be generated for subsets containing specific types of data. They will then be imported into an InRoads Geometry Project. Lastly, the InRoads data sets will be saved in their respective file types for use in InRoads.

After translating design geometry, the data written to LandXML will be deleted from the project.

Survey Data

Survey data consists of elements representing 3D terrain information and 2D feature elements typically collected by field survey crews and Photogrammetry. These features will be converted into an InRoads surface or Digital Terrain Model (DTM) file.

Survey and Photogrammetry are the only types of CAiCE data that should be converted using this method. For all other data, see the Converting Geometry section of this document.

This procedure relies heavily on the integrity of the survey dataset in CAiCE. It starts by isolating the CAiCE survey dataset (survey points and survey chains), and then brings all known codes up to current standards. Once all of the known codes are dealt with, the unknown or non-standard codes must be evaluated and addressed.

After all of the codes are within current standards or otherwise addressed, check to make sure that all survey chain points are accounted for. Next, an SRV file is created and converted to a 'WAS' ASCII file for import into InRoads Survey.

This process uses InRoads Survey to convert current CAiCE standard feature codes to InRoads expanded level feature styles.

Known issues with this procedure:

LandXML Writer does not successfully export Parcel data

- The **LandXML Writer** in CAiCE writes alignment chains as Alignments and Roadways while non-alignment chains, such as **EPP** and **LEP**, are considered parcels.
- Alignments are successfully written to the XML file and may include vertical profiles. InRoads will import alignments and associated profiles as long as the profiles do not contain vertical overlaps.
- Parcels that include curve and spiral data will be **incomplete**.

A WSDOT custom utility called **XML Export** will write all selected geometry chains as alignments for converting to InRoads.

Superelevation tables will not transfer from CAiCE to InRoads

- Superelevation tables are not compatible between the two applications. The CAiCE to InRoads procedures below describe the process of backing up CAiCE superelevation tables into CSV format ASCII files. These files make excellent documentation and backup for CAiCE superelevation information. They are also compatible with Microsoft Excel (with a little help) and can be manipulated and refined in this application.
- For regenerating superelevation tables for InRoads, either use the internal tools within InRoads or use the **Superelevation Calculator**, which is a WSDOT application-neutral superelevation table generator utility that is located in the *C:\Users\Public\cae\Standards\WSDOT\Utilities* folder.

Non-Standard Codes Will Not be Recognized

It is imperative that all non-standard codes have been addressed and brought to standards per the CAiCE **WA_0003.ftb** feature table. All unrecognized features will be consolidated into one feature called **Default** in InRoads.

Point AND Survey Chain capabilities versus Point OR Survey Chain

In CAiCE, a feature can depict a single instance point or a chain of points independently based on Point or Line attributes (For example, a single point spot check on the **EL** does not need to connect to the next **EL** survey chain point). InRoads feature styles do not have this point vs. line separation. Each feature style is either a point or a line. Therefore if a dataset has single point instances of a feature code that is typically used as a chain feature, InRoads will graphically draw a line between these points.

Invalid alpha codes or numeric codes in the WSDOT resources

Currently, there are a few standard CAiCE feature codes that are alpha-numeric (16SEC, C4F, CB7FL, etc.). These codes are included in the WSDOT CAiCE feature table **WA_0003.ftb**. InRoads accept alpha codes and numeric codes, but not alpha-numeric codes. Our process to convert survey data to Inroads will account for any STANDARD alpha-numeric codes, however, any design generated or non-standard alpha-numeric codes must be revised to a standard alpha code in order to be converted.

Clean up the CAiCE project

In CAiCE:

1. Archive the project

NOTE: The **WSDOT Project Cleanup** utility is useful for identifying appropriate CAiCE data.

2. Review ALL geometry (geometry chains, profiles points, and survey chains) for current standard feature codes and delete all non-relevant or temporary geometry chains.
3. Create superelevation CSV files for each alignment. This creates a backup file for use in CAiCE and MS Excel.
 - Select *Geometry > Geometry Chains > Edit Superelevation for Alignment*
 - Enter the alignment name and click on **Load**
 - Right-click in the spreadsheet *Smart Grid* at the bottom of the dialog
 - Select *Table > Export to CSV*
4. Create a KCM file of all remaining curves, spirals, and spiral-curve-spirals for backup purposes.
5. It is optional at this time to delete all curves, spirals, and spiral-curve-spirals from the project.
6. Review all remaining points for control and design features such as BM, CP, GPS, IS, MON, TCP, EPP, MHP, or UPP.
7. All control or cadastral points should be written to an XML file
8. Any proposed feature present at this step that represents a linear element such as **EPP** or **ELP** should be evaluated. Typically, these points should have been deleted along with the Geometry Chains that contain them. If they are present and not necessary, delete them at this point.
9. Delete all temporary points.

Converting CAiCE Design Geometry Using LandXML

Export the geometry data using the LandXML process. There are two methods for exporting the data:

Method 1

Use the **WSDOT XML Export** utility in CAiCE to write the geometry chains to an XML file:

1. Select the *Window > Explorer Center/Snap Bar* command.
2. Select the **Toolbox Explorer** tab.
3. Double-click to open the **WSDOTMacroToolbox**.
4. Click the **+** to expand the *Utilities* category, and click **XML Export** to view the macro's description.
5. Double-click on **XML Export** a second time to run the application.
6. In the XML Export dialog, enter the path and name of the new XML file.
7. Click the **Geometry Chains** button to select which chains will be exported, and click the **Points** button to select which points will be exported.

8. Click **Export** to generate the XML file.

Method 2

Use the CAiCE LandXML Writer to write all geometry chains to an XML file:

1. Revise all geometry chains by toggling on the **Alignment Chain** check box in the *Geometry > Geometry Chains > Store/Edit* command.

NOTE: This can also be done by writing out a KCM, modifying the KCM, and reading the KCM back in to the project.

2. Select the *Window > Explorer Center/Snap Bar* command.
3. Select the **Toolbox Explorer** tab.
4. Double-click to open the **LandXML Toolbox**.
5. Click the "+" to expand Visual LandXML, and click on **Visual LandXML Writer** to view the description.
6. Double-click on **Visual LandXML Writer** a second time to run the application.
7. In the **LandXML Writer**, deselect Survey Chains, DTM's and Parcels.
8. Toggle on the **Points and Alignments/Roadways** boxes and click the **Selection Criteria** button.

- Points: select all control, cadastral, and proposed point features
- Geometry Chains: Click on the **All** button to select all geometry chains
- Indicate associated Design Vertical Profiles

NOTE: if the vertical profile includes a vertical overlap (consequential VPI or event stations), it will not be imported in InRoads correctly.

9. Give the XML file a name similar to **Projname_All Geometry Chains and Profiles.xml**.
10. Toggle on the **Format on separate lines** option.
11. Click **Export**.

Converting CAiCE Vertical Profiles

Export vertical profiles from CAiCE by loading the profile into the *Geometry > Profile > Store/Edit* command. In the table grid portion, right-click and select *Table > Export to CSV*

Importing Vertical Alignments Into InRoads

In InRoads:

1. Set the active horizontal alignment.
2. Select the *File > Text Import Wizard* command.
3. First set the *Data Type* to **Vertical Alignment**, and then set the *Wizard Name* to **Classic File**.

4. For the *File Name*, use the picker to browse to and select the CSV file that was exported from CAiCE.
5. Click **OK**.
6. Input the *Name*, *Description* and *Style*.
7. Click **OK**.
8. Verify that the **<ProjectName>_WSDOT_standards.xin** file listed available *<ProjectName>\EngDataDesign_Standards* folder.
9. Create a new geometry project by selecting *File > New* and click on the *Geometry* tab.
Verify the *Type* as **Geometry Project**.
10. Enter a project a name such as *Projname_Design* and a description such as *Design Data from CAiCE*.
11. Click **Apply** and then close the dialog.

Import the Design geometry:

1. Select the *File > Translators > LandXML Translator* command.
2. On the *Import* tab, click in the *File Name:* field and select **Browse....**
3. Navigate to the geometry chain XML file that was stored previously.
4. Highlight the file, click on **Open** to select it, and then **Cancel** to complete the selection.
NOTE: The filename is displayed in the LandXML command.
5. Click on **Apply** and keep the dialog open.
6. Repeat these steps for the XML that contains the design points, if applicable.
7. Close the dialog and review the results.
 - In the **InRoads Explorer** navigate to the *Geometry tab* in the left pane.
 - Click on the **+** sign next to the geometry project that was created earlier.
 - **NOTE:** The Cogo Buffer can be expanded to show all the proposed points, and all of the CAiCE geometry chains are included.

Converting CAiCE survey to InRoads surface

In CAiCE:

1. Archive the project
NOTE: The **WSDOT Project Cleanup** utility is useful for identifying appropriate CAiCE data
2. Isolate the survey data by converting design data to InRoads using the process that was described previously in this document

Bring all feature codes to current standards:

3. In the **Toolbox Explorer**, open the **WSDOTMacroToolbox**.
4. Expand the *Utilities* category.
5. Run the **Change Features** tool.
6. Use the **Update Survey.txt** conversion file in the *C:\CAE_rsc\CAiCE_V10\Table* folder.
7. Click **Update**.

Check for non-standard and non-coded survey data:

8. Verify that the current WSDOT feature table **WA_0003.ftb** is attached.
9. Set the default color to Color 8 (pink).
10. View all points and survey chains and look for any pink colored elements.

Address all pink colored elements – these have non-standard codes:

11. Review the list of point features by selecting the *View > Points* command.
12. Click on the **?** next to the *Feature* field.
13. Look for proposed features such as **EPSP**, and **LEP**. These indicate proposed elements that should be removed or are miscoded features

Finding elements with no codes requires writing out a KCM of the points. The KCM file can be reviewed to show all points with a feature of "".

NOTE: Only the standard elements will be recognized during the conversion process, so it is important that all elements are accounted for.

CLEAN UP ALL CODES!

Check for data integrity:

14. Clear the CAiCE view and select the *Window > Text Display* command.
15. Click on the **Text Window Errors** tab and clear all the contents by highlighting all text and pressing the **<Delete>** key.
16. View all survey chains.
17. Review the *Text Window Errors* tab for any issues while displaying survey chains.

This will show missing points.
18. Address all errors and check for alpha-numeric codes.

Alpha-numeric codes are not valid in InRoads and must be addressed prior to translation.

Create and SRV file:

19. Select the *File > Save > Points and Survey Chains as SRV file* command.
20. Select the **All** button.

21. Click **No** in the Point Interpolation dialog to prevent CAiCE from creating extra points.

NOTE: use the SRV file command in the CAiCE File menu only! Do not use the SRV file command in the DTM menu, because this creates an SRV that with a format that is incompatible with the WSDOT CAE **SRVtoWAS.exe** conversion utility.

Create a WAS file:

1. Navigate to the *C:\CAE_rsc\InRoads Utilities* folder and run the **SRVtoWAS.exe** file.
2. Enter the SRV file created above as the *Input SRV File*.
3. Enter the same name but revise the file extension to **.was** as the *Output WAS File*.

In InRoads:

1. Access the InRoads Survey module by selecting the *Tools > Product Add-ins* command.
2. Toggle **ON** the *InRoads Survey* option and click **OK** to close the dialog box.
Reference the **wsdot_standards.xin** file in the *C:\CAE_rsc\InRoads\Standards* folder.
3. Create an InRoads survey book by selecting the *File > New > Survey Data* command.
4. Enter a name, such as *L1234_CAICESurveyData*, and then click **Apply**.

Import the WAS file into the survey book:

5. Select *the File > Import > Survey Data* command.
NOTE: the Linear Units setting defaults to US Feet.
6. Using the WSDOT InRoads resources, the default *Files of Type* will be ***.WAS**.
7. Browse to the ***.WAS** file created earlier and then click **Import**.
8. Click **Close**.

Check for non-standard codes:

9. Select *the Survey > Fieldbook Data* command.
10. Browse through the list of survey points and look for red codes, and note these codes for support purposes.
11. Change those codes that were missed during the CAiCE review to standard codes.
12. Create a surface by selecting *the File > New > Surface* command.
Load the survey data into a surface by selecting the *Survey > Survey to Surface* command, and accept the defaults.
13. Triangulate the surface by selecting the *Surface > Triangulate* command.
14. Review surface by selecting the *Surface > View Surface > [triangles] [feature]* command.

For questions or comments on this tech note, contact your regional CAE Support Coordinator or the WSDOT CAE Help Desk at (360) 709-**8013**.