MONTANA
Department of Transportation

CROSS SECTIONS IN AUTODESK

Contents

Overview

This document contains the workflows and information necessary for creating cross sections (section views) and related outputs in Civil 3D.

Process Provenance

- Date of development: 7/3/2025
- Revision date: *8/1/2025*
- Application/Tool(s): *AutoCAD / Civil 3D*
- Version(s): *Civil 3D 2024 and 2024 update versions*
- Environment(s): *MDT Civil 3D State Kit r2024 v2.2.0+*
- Author: *MDT EngOps Workflow Steering Committee*

Statement of Need

Workflows specific to cross sections were not covered in depth in the Civil 3D production training classes. For that reason, the Road Design Workflow Subcommittee identified the need for more thorough documentation covering the topic.

Acronyms/Definitions Used in This Document

ACC – Autodesk Construction Cloud, Autodesk's new cloud storage ecosystem with enhanced tools, which will replace BIM 360 when it is retired.

References

Coordinate System Settings Support Document

Earthworks Procedures

Disclaimer

The State Kit is continuously being updated and improved. Styles, layers, and/or naming conventions in the current version of the State Kit may vary from what is shown in this documentation.

Process Description and Examples

Section I. File Setup

Procedure – Create New Cross Section Drawing File

1. Create a new drawing file using the **design-start.dwt** drawing template.

2. **Save** the drawing file as: **[UPN#]RDXSF00x.dwg*** (for example, **9555000RDXSF001.dwg**) in the RD directory of the project on BIM 360/ACC.

   *If there are multiple corridors associated with the project, is recommended to create a separate cross section file for each corridor. The procedures in this document will need to be repeated for each file, except where otherwise noted.

3. Assign the project's coordinate system to the drawing according to the Coordinate System Settings support document.

4. Set the Working Folder that contains the project files. **Toolspace > Prospector tab > Right-click Data Shortcuts > Set Working Folder…**.

5. Set the Data Shortcuts Projects Folder for the Civil 3D Project. **Toolspace > Prospector tab > Right-click Data Shortcuts > Set Data Shortcuts Project Folder…**.

6. Associate the Civil 3D Project to the Current Drawing. **Toolspace > Prospector tab > Right-click Data Shortcuts > Associate Project to Current Drawing…**.

7. Create data references. **Toolspace > Prospector tab > Data Shortcuts > Right-click object name > Create Reference**.

   - Existing surface
     - Style: **MDT Exist-Border**
   - Corridor surfaces (top and bottom/datum)
     - Style: **_MDT-No Display**
   - Corridor(s)
     - Style: **MDT DES Corridor**
   - Pipe networks
     - Use appropriate parts list
   - R/W profiles
     - Profile style: **_No-Display**
     - Alignment style: **MDT ROW***
       *Use appropriate ROW alignment style for each alignment

8. **XREF** the following files:

    - DIMAP/CSMAP
    - ROMAP
    - BRMOD
    - ENWSU

9. Set the drawing (annotation) scale to **1" = 20'**.

    NOTE: Proper scale must be set before creating section views. Changing the scale after section views are created will result in incorrect display of cross sections.

Section II. Create Section Views

Procedure – Create Sample Lines

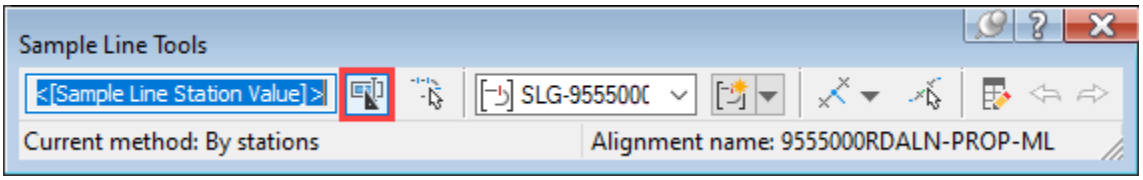
1. Create Sample Lines. **Ribbon > Home tab > Profile & Section Views panel > Sample Lines**.

2. Pick the alignment from model space or press the **<enter>** key to select the alignment from a list.

3. In the **Create Sample Line Group** dialog box, set the following:

    a. Leave the Sample Line Group name as default. (**SLG-<Parent Alignment Name]>**)
    b. Enter a Description. (optional)
    c. Set the Sample line style to **MDT-Sample Line**
    d. Set the Sample line label style to **MDT-Section Station**
    e. Set the Existing ground surface Section style to **MDT-Existing Ground**
    f. Set the Top corridor surface Section style to **MDT-Finished Ground**
    g. Set the Bottom or Datum corridor surface Section style to **MDT-Datum**
    h. Set the Corridor Code Set Style to **MDT-Section-Plan**
    i. If any sources **Update Mode** shows “Static”, select and change to “**Dynamic**”
    j. Select **OK**

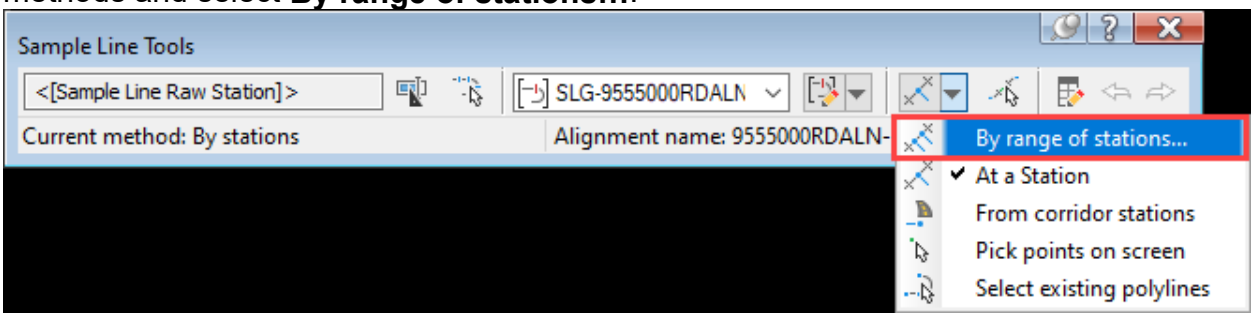
4. In the **Sample Line Tools** toolbar, select the name template button.



5. In the **Name Template** dialog box:

    a. Delete all the text in the **Name** text box.
    b. Select the dropdown for **Property fields** and select **Sample Line Raw Station**
    c. Select **Insert**
    d. Select **OK**

6. In the **Sample Line Tools** toolbar, select the dropdown for sample line creation methods and select **By range of stations…**.



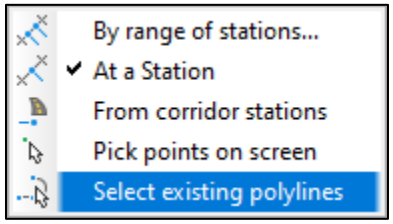
7. In the **Create Sample Lines - By Station Range** dialog box:

    a. Set the following in the **Station Range** section:
        i. From alignment start: **False**
        ii. Start Station: **Enter station value to begin the sample line range**
        iii. To alignment end: **False**
        iv. End Station: **Enter station value to end the sample line range**
    b. Set the following in the **Left Swath Width** section:
        i. Snap to an alignment: **False**
        ii. Width: **140.000'**
    c. Set the following in the **Right Swath Width** section:
        i. Snap to an alignment: **False**
        ii. Width: **140.000'**
    d. Set the following in the **Sampling Increments** section:
        i. Use Sampling Increments: **True**
        ii. Increment Relative To: **Absolute Station**
        iii. Increment Along Tangents: **50.000'**
        iv. Increment Along Curves: **50.000'**
        v. Increment Along Spirals: **50.000'**
    e. In the **Additional Sample Controls** section set all values to **True**
    f. Select **OK**

9. In the **Sample Line Tools** toolbar, select the dropdown for sample line creation methods and select **At a Station**.

10. Add additional stations to the sample line group. Turn object snaps on to select precise locations, such as:

    a. The beginning and end of the corridor.
    b. Pipe crossings at the centerline (For skewed pipes, draw a polyline along the length of the pipe, then extend it, so the ends of the polyline are at 140.000' offsets from the alignment. A sample line can be created by choosing **Select existing polylines** in the dropdown for sample line creation methods).



    c. Add any other locations as needed.

11. Press **<enter>** or **<esc>** when complete.

Procedure – Compute Materials

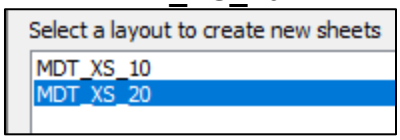
Refer to Section I in the Earthwork Procedures documentation for more information regarding selecting the appropriate volume computation method.

1. **Ribbon > Analyze tab > Volumes and Materials panel > Compute Materials**.
2. Select the alignment and sample line group.
3. Select **OK**.
4. In the Compute Materials dialog box, set the **Quantity takeoff criteria** to **Cut and Fill**. Set the **EG surface** to the existing ground surface and set the **Datum** surface to the datum or bottom surface.
5. Select **OK**.

Procedure – Create Multiple Section Views

1. Verify the drawing (annotation) scale is set to **1" = 20'**. Proper scale must be set before creating Section Views. Changing the scale after Section Views are created will result in incorrect display of cross sections.
2. **Ribbon > Home tab > Profile & Section Views panel > Section Views dropdown > Create Multiple Views**.
3. In the **General** page of the **Create Multiple Section Views** wizard, set the following:
    a. Select alignment: **Select the alignment**
    b. Sample line group name: **Select the sample line group name**
    c. Station range: **Automatic** (if sample line group runs the whole length of the alignment) **User specified** (if not)
    d. Section view name: **Leave default value**
    e. Description: **Type a description** (optional)
    f. Section view layer: **Leave default layer**
    g. Section view style: **MDT-Section**
4. Click **Next >**.
5. In the **Section Placement** page of the **Create Multiple Section Views** wizard, set the following:
    a. Placement Options: **Production**
    b. Set template for cross section sheet:
        i. Click the ellipsis […] button

ii. Browse to **C:\mdoh\StateKit\Civil 3D\2024\Templates\Sheets\XS-layouts.dwt**
iii. Select ***MDT_XS_20***



c. Set the Group Plot Style to **MDT-Section**

6. Click **Next >**.

7. In the **Offset Range** page of the **Create Multiple Section Views** wizard, set the following:

    a. Offset range: **Automatic**

8. Click **Next >**.

9. In the **Elevation Range** page of the **Create Multiple Section Views** wizard, set the following:

    a. Elevation range: **Automatic**

10. Click **Next >**.

11. In the **Section Display Options** page of the wizard, set the following:

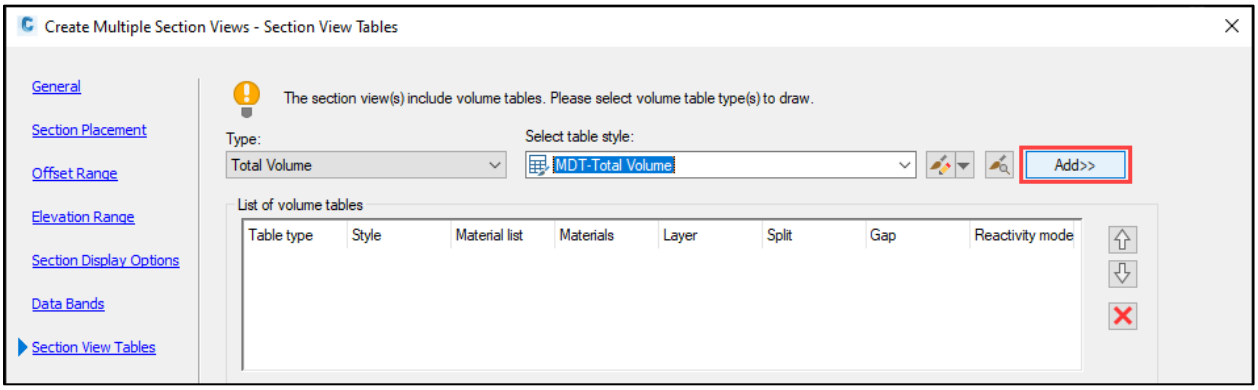
    a. Change the Label Set to **_MDT-No Labels** for all objects.
    b. Change the Style to the following:
        i. Existing Ground Surface: **MDT-Existing Ground**
        ii. Corridor Top Surface: **MDT-Finished Ground**
        iii. Corridor Datum (or Bottom) Surface: **MDT-Datum**
        iv. Corridor Code Set Style: **MDT-Section-Plan**
        v. Ground Removed: **Cut Material***
        vi. Ground Fill: **Fill Material***
        *These styles can be turned on/off as needed in the **Sections** tab in **Section View Properties** after the sections are created.

12. In the **Data Bands** page of the wizard, select the **_MDT-No Bands** band set.

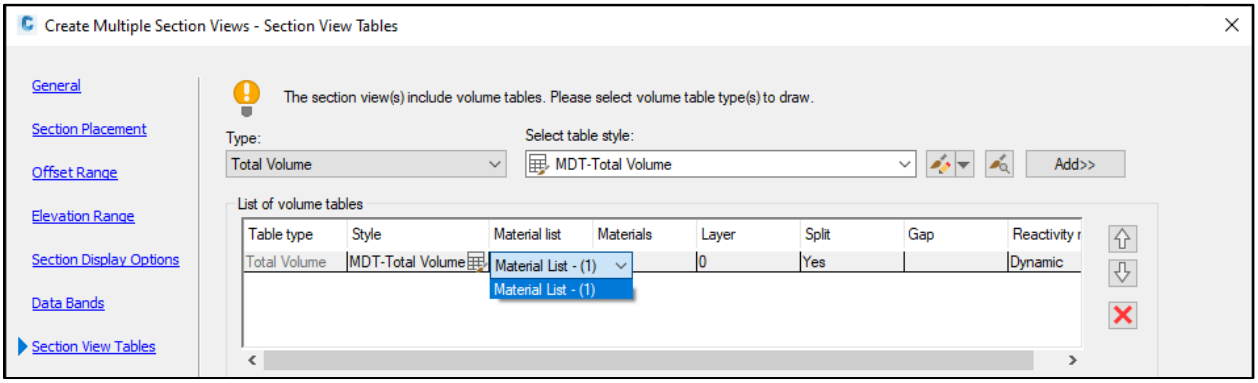
13. Click **Next >**.

14. In the **Section View Tables** page of the wizard, set the following:

    a. Type: **Total Volume**
    b. Select table style: **MDT-Total Volume**
    c. Then select **Add >>**

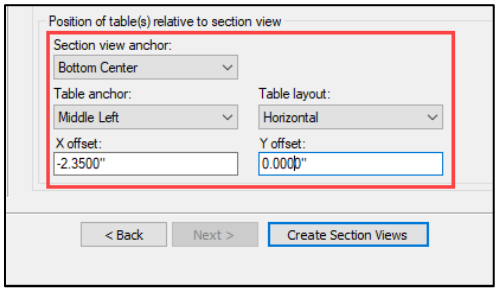


16. In the List of volume tables, change the material list to **Material List - (1)** (created in the Compute Materials procedure), if not already set.



17. Set the position of table(s) as below:

    a. Section view anchor: **Bottom Center**
    b. Table anchor: **Middle Left**
    c. Table layout: **Horizontal**
    d. X offset: **-2.3500"** *
    e. Y offset: **0.0000"** *



*The offset distances may need to be adjusted after the section views are created, but these values act as a good starting point.

18. Click **Create Section Views**.

19. There will be a prompt to pick a point in model space for the lower left corner of the first section view. The section views will generate in a single row from left to right, so pick a point above, below, or to the right of the model to place the section views.

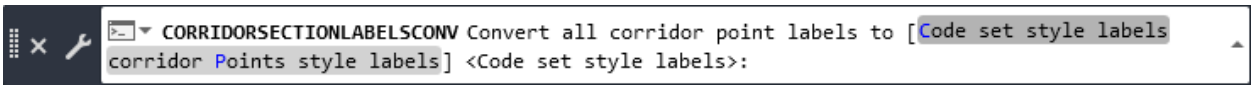
Procedure – Convert Corridor Section Labels for Staggering

Elevation/Offset labels may overlap due to close proximity with each other. Labels may be set up to use a Corridor Points label style set up for staggering the labels when they overlap.

1. At the command line type: **CORRIDORSECTIONLABELCONV**

2. Type **All** and press **<enter>** and press **<enter>** again.

3. Select **corridor Points style labels** from the command line options.



4. The **Select Label Set** dialog box will open.

5. Select **MDT XS-Elevation Offset** label set, then select **OK**.

   NOTE: CORRIDORSECTIONLABELCONV may be toggled back to **Code set style labels** at any time.

Section III. Create Section Sheets

Procedure – Create Sheet Set

1. Open the **Sheet Set Manager** palette and select the **Open…** dropdown menu.

2. Select **New Sheet Set…**.

3. In the **Begin** page of the **Create Sheet Set** wizard, select **An example sheet set**.

4. Click **Next >**.

5. In the **Sheet Set Example** page of the **Create Sheet Set** wizard, select **MDT_SSM** from the list.

    a. If it is not in the list, select **Browse to another sheet set to use as an example**.
    b. Click the ellipsis […] button.
    c. Browse to: **C:\mdoh\StateKit\Civil 3D\2024\Templates\Sheets\Sheet Sets\MDT_SSM.dst**

6. Click **Next >**.

7. In the **Sheet Set Details** page of the **Create Sheet Set** wizard, enter the following:

    a. Name of new sheet set: **[UPN#]RDPXS001**
    b. Description (optional): Enter a description, if desired.
    c. Store sheet set data file (.dst) here:
        i. Click the ellipsis […] button.
        ii. Browse to: **RD directory** for the project on BIM 360/ACC.

8. Select the **Sheet Set Properties button** and update the properties with the project information.

    NOTE: Setting the properties in this step will ensure that title block text fields are prepopulated when the section sheets are created.

9. Click **OK** in the Sheet Set Properties dialog box.

10. Click **Next >** in the **Create Sheet Set** wizard.

11. In the **Confirm** page of the **Create Sheet Set** wizard, verify the values in the Sheet Set Preview text box and select **Finish**.

    NOTE: Only one sheet set needs to be created for the cross sections, even if there are multiple cross section files representing each corridor.

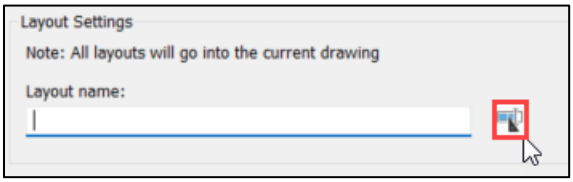
Procedure – Create Section Sheets

1. **Ribbon > Output tab > Plan Production panel > Create Section Sheets**.

2. Select the alignment, sample line group, and section view group.

3. Under **Layout Settings**, delete the existing text in the **Layout name** text box.

4. Select the name template button to the right of the **Layout name** text box.



   a. In the **Name Template** dialog box, delete the existing text in the **Name** text box.
   b. Type **[UPN#]RDXSF** in the **Name** text box.
   c. Select **Next Counter** from the Property fields dropdown.
   d. Select **Insert**.
   e. Text box should read**: [UPN#]RDXSF<[Next Counter]>**
   f. Set the following in **Incremental number format**:
      i. Number style: **001, 002, 003…**
      ii. Starting number: **1***
      iii. Incremental value: **1**
   g. Click **OK**.
      *If there are multiple files for the cross sections, set the starting number as the next number in the sequence (i.e., the last layout in [UPN#]RDXSF001.dwg is named [UPN#]RDXSF124, start at 125 for layouts in RDXSF002.dwg). This will help with renaming and renumbering the sheets in the sheet set.

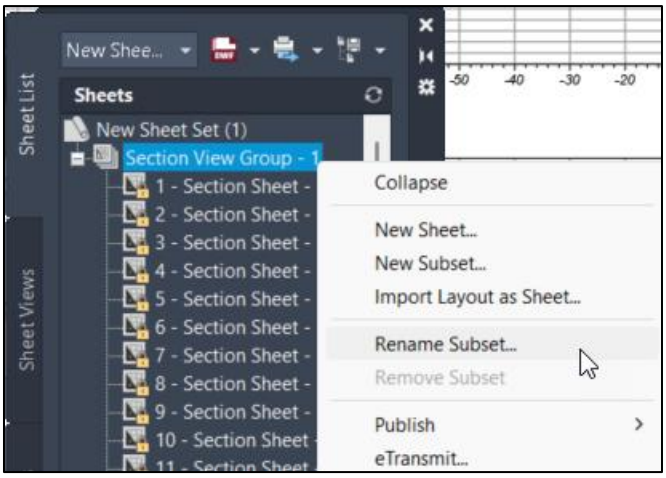
5. In the **Create Section Sheets** dialog box, select **Add to existing sheet set**
   a. Click the ellipsis […] button.
   b. Browse to the Sheet Set .dst file previously created for the section view sheets.
   c. The **Sheet set storage location** will automatically populate.

6. Select **Create Sheets**.

7. A dialog will appear, “To complete this process your current drawing will be saved”. Select **OK** and wait. The layouts will be created.

8. The Sheet Set Manager palette will appear. Dock it or set it off to the side for now.

9. At the command line type: **EDITVSBATCHPROPERTIES**.
10. Select all Section Views in Model Space and press **<enter>**. The **Section View Group Properties** dialog box will open.
11. Select the **Sections** tab.
12. Uncheck the **Draw** column for **Ground Removed** and **Ground Fill**.
13. Click **Apply**, then click **OK**.
14. Right-click on the "**MDT-TMP**" layout tab and select **Delete**. Press **OK** on the AutoCAD warning dialog box that appears.
17. Open the **Sheet Set Manager** palette and select the **Open…** dropdown menu.
18. Select **Open…**.
19. Browse to the **[UPN#]RDPXS001.dst** file previously created and select **Open**.
20. Right-click the subset name of the Section Sheets and select **Rename subset**. Change the subset name to "**CROSS SECTIONS**," then select **OK**.

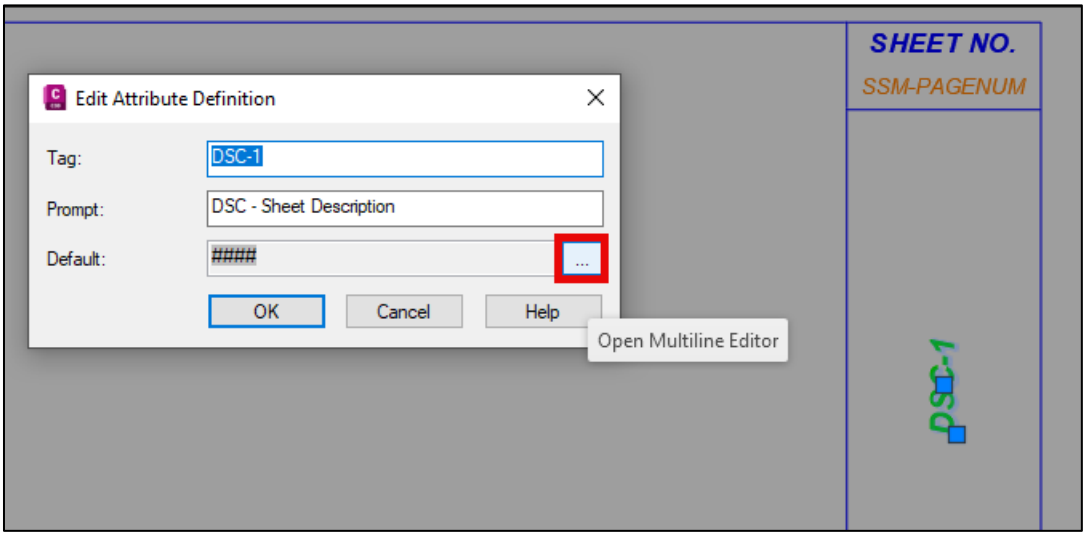


21. Type **REA** at the command line to regenerate to update the subset name in the title block.

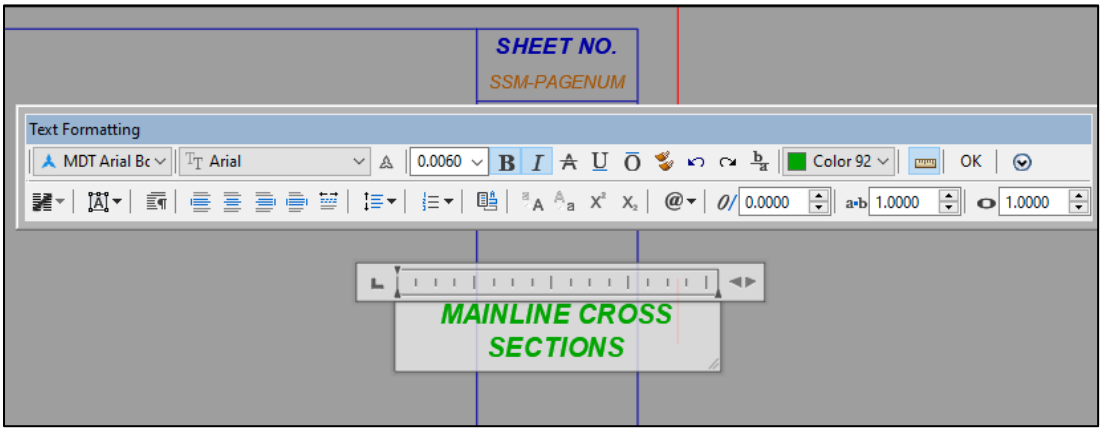
    NOTE: If a project has multiple cross sections files, a new subset will automatically be created each time sheets are added to the sheet set. Each subset can be named "**CROSS SECTIONS**". It will be necessary to renumber the sheets in each subsequent subset following the first one.

Procedure – Edit Sheet Description on All Layouts

1. Select a layout.
2. Select the **B-BorderRoad_11x17** block, right-click, then select **Block Editor**.
3. In the Block Editor, double click the **DSC-1** attribute. Click the ellipsis icon […] for the tag's Default text to open the multiline text editor.

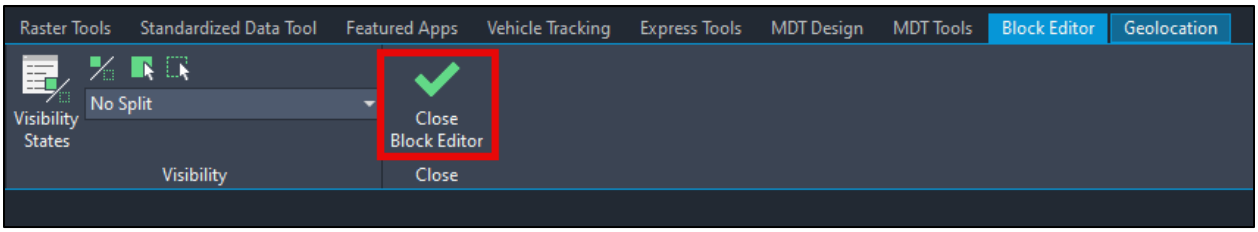


4. In the text editor, select the field, delete it, then overwrite with the appropriate terminology, like "**MAINLINE CROSS SECTIONS**" or "**DETOUR CROSS SECTIONS**."



5. Click **OK** in the Text Formatting box or click outside of the text box to close it.
6. Select **OK** to close the Edit Attribute Definition dialog.

7. **Ribbon > Block Editor contextual tab > Close panel > Close Block Editor**



8. A popup will appear after selecting Close Block Editor. Select **Save the changes**. Alternatively, the block can be saved prior to closing out of the editor by selecting the **Save Block** icon in the Block Editor contextual tab.

9. If block edits are not showing after saving, use the command **ATTSYNC** to sync the block's attributes. When prompted for an option, choose **Select**. Select the **B-BorderRoad_11x17** block, then select **Yes**. This will update the block in all the layouts.

   NOTE: Any further edits to the sheet description can be made using the **FIND** command and replacing all instances in the entire drawing.

Section IV. Add Additional Section Views

Additional section views may need to be added after the initial section view group has been created. Follow the steps below to update the section view group with the new section views.

Procedure – Add Section View to Section View Group

1. **Ribbon > Home tab > Profile & Section Views panel > Sample Lines**.

2. Select the alignment containing the sample line group from model space or press the **<enter>** key to select the alignment from a list.

3. Create individual sample lines as previously created in the Create Sample Lines section of this document. Ensure the naming template is still set to **<Sample Line Raw Station>**.

4. Create a single section view via **Ribbon > Home Tab > Profile & Section View panel > Section Views dropdown > Create Section View** for each new sample line with the same settings as in the Create Multiple Section Views section of this document, except select the newly added sample line station number.

5. Insert the section view below the existing section view group section views.

6. **Toolspace > Prospector > Alignments > Centerline Alignments > *[alignment containing section views]* > Sample Line Groups > SLG-[alignment name] > Section View Groups**.

7. Select a Section View Group in the Prospector tab. The individual section views will appear in a list at the bottom of the Toolspace.

8. Right-click the individual section views that were just created and select **Move to Section View Group…**.

9. Select the Section View Group containing all section views, then select **OK**.

10. The section view group will update, and the section views will shift to add the section view by station value.

11. Adjust the new section views as necessary via the *Section View Properties*.

12. Projections will need to be redone with the addition of each new section view.

Section V. Project Objects to Multiple Section Views

Procedure – Project Objects Setup

ROMAP

1. Open **Section View Group Properties** by right-clicking on a section view and selecting **Section View Group Properties…**.

2. In the **Section Views** tab, select the ellipsis […] icon under the **Profile Grade** column.

3. In the Alignment dropdown, change the alignment to a R/W alignment and select **Add >>**.

4. Change the marker style to **MDT XSVL-EX RW**.

5. Repeat for all other R/W alignments/profiles.

ENWSU (if wetlands present)

1. Select the XREF in model space, right-click and select **Isolate Objects > Isolate Selected objects**.

2. Open the **Layer Properties Manager** by typing **LAYER** in the command line and pressing **<enter>**.

3. Expand the XREF layer filter on the left side and select the ENWSU drawing name.

4. With the ENWSU drawing layer filter selected, turn off all the XREF layers except **V-WETL-BNDY-E** and **V-WWAY-OHWM-E**.

5. Type **NCOPY** at the command line and press **<enter>**.

6. Select all wetland boundaries and OHWM lines. Press **<enter>** through the remaining prompts until the linework is copied into the file.

7. Select one of the wetland boundaries and right-click.

8. Choose **Select Similar** to select all the wetland boundaries. Repeat this procedure for the OHWM lines.

9. Convert the 2D polylines to 3D polylines. **Ribbon > Modify tab > Design panel dropdown > Convert 2D to 3D Polylines**.

10. End object isolation. At the command line, type **UNISOLATE**, or in model space, **Right-click > Isolate Objects > End Object Isolation.**

DIMAP/CSMAP

There are two methods for inserting DIMAP/CSMAP data. The method is dependent on when the file was created. If the file was created prior to survey databases being saved to BIM 360/ACC, follow Method 1. If the survey database has been saved to BIM 360/ACC, then follow Method 2.

To verify a survey database has been saved to BIM 360/ACC, navigate to the project's CS and/or DI folder and search for a survey database folder (likely named **Survey Database** or **UPN#** or **[UPN#]CSNEZ001**) containing files such as **Survey.sqlite** and **Survey.SDXX**.

Method 1 – Insert DIMAP/CSMAP Into Drawing

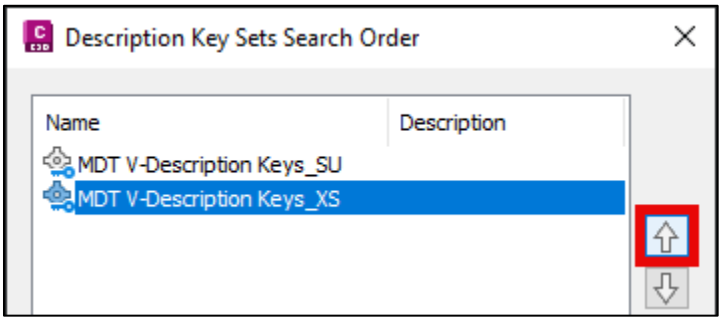
1. Insert the CSMAP/DIMAP. Use the **CLASSICINSERT** command (not the XREF > Bind method).

2. Type **EXPLODE** at the command line, select the CSMAP/DIMAP, and press **<enter>**.

3. Erase/Delete any unnecessary inserted items from the CSMAP/DIMAP for efficiency. **Right-click > Select Similar** to select multiple items of the same type to batch delete items.

Method 2 – Use Survey Database and Survey Queries to Insert Filtered Survey Data

1. **Toolspace > Settings tab > Point > Right-click Description Key Sets > Properties…**.
2. Select **MDT V-Description Keys_XS** and select the **up** arrow to move it to the top of the list. Click **Apply** then **OK**. This automatically applies the correct projection styles to the COGO points.



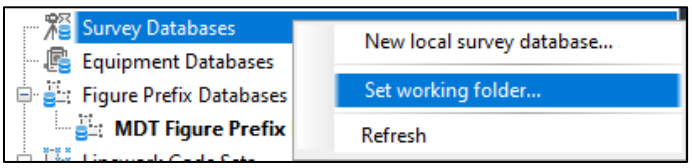
NOTE: If the file does not contain the MDT V-Description Keys_XS description key set, use the MDT tools to import it into the file:

Ribbon > MDT Tools > MDT Components > Component Tools > Add XS Description Key Set.

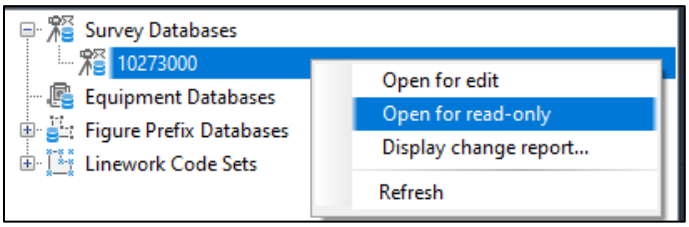
If the MDT V-Description Keys_XS description key set does not show in the list after adding it, perform the following:

Toolspace > Settings tab > Point > Right-click Description Key Sets > Refresh

3. **Toolspace > Survey Tab > Right-click Survey Databases > Set working folder…**.



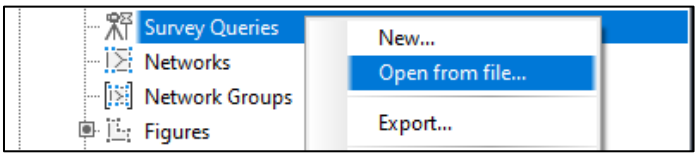
4. **Select** the project's **CS** or **DI** directory folder, whichever one has the survey database folder within it.
5. Right-click the survey database's name and select **Open for read-only**.



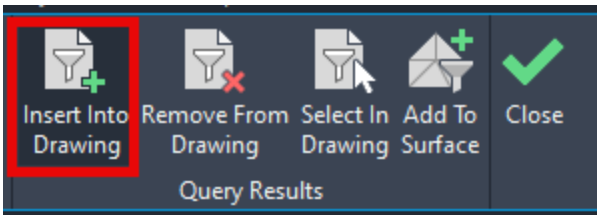
6. Ensure there is a **[UPN#]DINEZ01.csv** file within the Import Events. The csv file contains the survey points and figures.

7. Right-click **Survey Queries**, select **Open from file…**, then navigate to **C:\mdoh\StateKit\Civil 3D\2024\Tools\Survey Queries**.

   Select **MDT-XSFigures.qml**, then select **Open**.



8. **Ribbon > Survey Query tab > Query Results panel > Insert Into Drawing**.



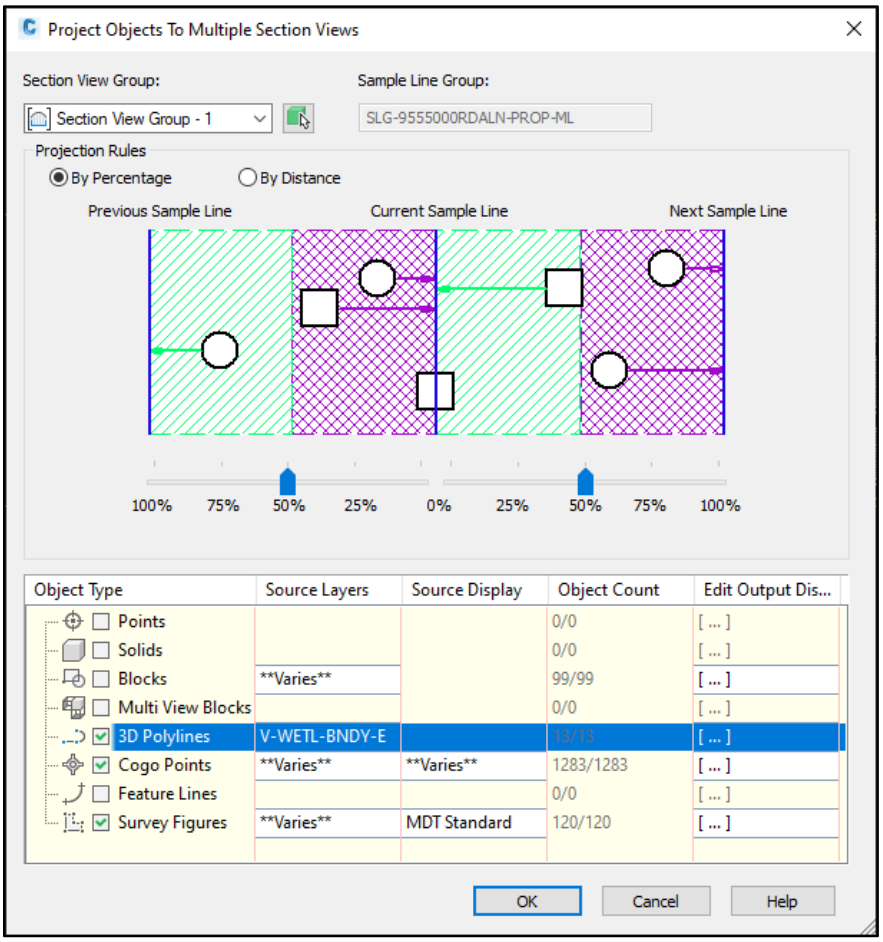
9. Repeat step 7. Select **MDT-XSPoints.qml**, then select **Open**.
10. Repeat step 8.
11. **Ribbon > Survey Query tab > Query Results panel > Close**.
12. Because the survey database was opened for read-only, there may be an error regarding folder permissions in the Desktop Connector. If an error occurs, select the ellipsis […] icon and select **Undo** to clear the process.

Procedure – Project Objects to Multiple Section Views

1. **Ribbon > Home tab > Profile & Section View panel > Section Views dropdown > Project Objects To Multiple Section Views**.

2. Select a sample line or a section view.

3. Place a checkmark for **Survey Figures**, **3D Polylines** (for wetlands and OHWM), and **Cogo Points** (for elements like telephone pedestals, water valves, etc.). Uncheck unneeded items.



4. Filter out unnecessary layers via the *Source Layers* column.

    a. Select the **Source Layers** for each object type.
    b. In the **Select Entities by Layer** dialog box, uncheck any layers not needed.

5. Select the **Edit Output Display** for each object type.

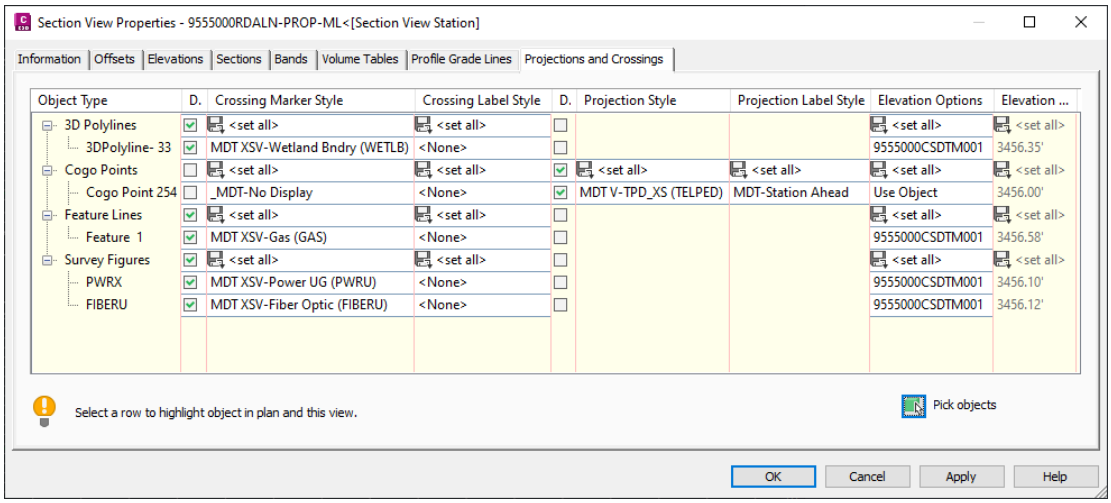
    a. Select a matching Crossing Marker Style for each object in the list. Repeat the process for each object type. Left and right Crossing Marker Styles (appended with _LT/_RT) for survey figures and feature lines may be selected to achieve labels offset left or right to reduce marker conflicts. Updates may also be made later for individual section view conflicts.

    3D polylines do not have names, so it is necessary to know what the object is in order to match the marker style to the object type, like wetlands or OHWM. Right-click the polyline name and select **Zoom to**, to view the object.

    COGO Points will not have crossing markers nor crossing labels - only Projection Styles and Projection Label Styles (use **MDT-Station Ahead**). Set the Crossing Marker style for all COGO points to **_MDT-No Display** and Crossing Labels to **<None>**.

    b. In the **Elevation Options** column, select the existing ground surface as the target for all objects except COGO points.

    For COGO points, select the **Use Object** elevation option.



6. Select **Apply** then **OK.**

7. Projections can also be edited in individual section views by right-clicking a section view and selecting **Section View Properties…** and selecting the **Projections and Crossings** tab.

Procedure – Draw Perpendicular Utility Crossings

Utilities that perpendicularly intersect the alignment will need to be drawn in the cross sections, as projections only work for features crossing sample lines or for COGO points surrounding or intersecting the sample lines.

1. Set the active layer to the appropriate feature layer:

Feature	Layer
Cable Television: Underground	V-CATV-UGND-E
Fiber Optic: Underground	V-FIBR-UGND-E
Gas	V-GAS-E
Missile	V-MSSL-E
Phone: Underground	V-PHON-UGND-E
Power: Overhead	V-POWR-OVHD-E
Power: Underground	V-POWR-UGND-E
Riprap: Boundary	V-RPRP-BNDY-E
Utility: Guy Wire Anchor	V-UTIL-GWRA-E
Water: Pipe	V-WATR-PIPE-E

2. Use either the **LINE (L)** or **POLYLINE (PL)** command to draw each line as a graphical representation of the feature on the appropriate section view nearest where the feature crosses the alignment.