Three different utility models are needed for utility conflict plans;
1. Topog_Drape.dgn – Topographical linear features
2. Xsec_Utility_Crossings – Manually drawn linear elements drawn in plan view. Begin and ending crossing elements are drawn at approximate locations that will intersect known cross sections locations.
3. Xsec_Utility_Cells_as_Lines - Utility cell will be converted to 3D linear elements so that they can be displayed in cross sections.

All three of these models use OpenRoads technology where the 3D linear element can be represented by a MicroStation cell in the cross sections. Completed models can be referenced into any model used for cross sections and the utility cells will automatically be referenced into the cross sections.

This guide will discuss how to prepare each of these 3 models, but before this is discussed, 3 task common to preparing all 3 models should be understood.
1. Create OpenRoads Features from plain MicroStation graphics
2. Set Active Terrain
3. Drape Features on Surface (Terrain).

Create OpenRoads Features from plain MicroStation graphics
The “General Geometry > Feature Definition Toggle Bar” and “Set Feature Definition” tools can be used to assign a feature definition to plain MicroStation graphics. This process may be automated for many features that are referenced in cross sections by using a macro.
1. Features are typically created from a 2D model. This will allow for both a 2D and separate but linked 3D features. This facilitates easier feature editing. Having utility graphics in a 2D model with the correct level color style and weight attributes is a prerequisite.
2. Use the Macro to set the applicable feature definitions. This macro can take over a minute to process. The macro can be activated from the main menu: NDDOT > Tools > Utilities > Set Utility Features.
3. Use the Element Information tool to confirm that the feature definitions have been set.
CADD Standards

Set the Active Terrain
Setting the active terrain provides a reference surface for draping features (assigning elevation based on surface). Setting the active terrain can also create a “Default-3D” model that is associated to the “Default” 2D model. These steps are needed for assigning elevations to different types of features and will be cross referenced in preparing the different utility reference drawings.

1. From a 2D model reference the 3D terrain from a terrain drawing. Utilities will usually be using a voidless terrain named Terrain_Exst_Drape.dgn.
2. Right click and press on the terrain boundary. A popup tool tray should appear. The second icon in the tray is used for setting the active terrain.

Drape Features on Surface (Terrain)
The “Vertical Geometry > Profile from Surface” tool can be used to assign elevation information to a feature. “3D Linear” features in a 3D model will be created from 2D features in a 2D model.

1. Set the Active Terrain (see previous guidance).
2. Create OpenRoads features (see previous guidance). The features should be in a 2D model.
3. Features are typically draped one of three different depths; 0’, -3’ or -7.5’. Load the Utility Level Filters to assist with level selection. This can be done from the main menu: NDDOT > Levels > Level Filters > Utilities.
4. All the features at a specific depth can be draped at one time. After the utilities of a specific depth are selected with the applicable filter, use the “Profile from Surface” tool to assign a profile based of the active terrain.
5. Repeat step 4 for each group of utilities at other depths.
6. After the utilities have been draped, “3D linear” elements should have automatically been created in the 3D Model. Review the 3D model for these elements.
7. Set the “Drawing Scale” of the 3D model to the Display scale for the cross sections. This “Drawing Scale” setting will determine the size of the MicroStation utility cells displayed in the cross sections. “Save Settings” so that this Drawing Scale is kept.

General Utility Model Preparation
The following information is required – as a starting point:
- Topog.dgn with utilities
- Terrain_Exst_Drape.dgn with voidless terrain.
CADD Standards

Preparing Topog_Drape.dgn
1. Create a 2D drawing named Topog_Drape.dgn.
2. Attach the Utility Filters. This can be done from the main menu: NDDOT > Levels > Level Filters > Utilities.
3. Reference the drawing Topog.dgn and display only utility lines by using the filter “Utility_Lines”.
4. Copy these utility lines into this Topog_Drape.dgn.
5. “Create OpenRoads Features from plain MicroStation graphics” (see previous instructions).
6. “Set the Active Terrain” (see previous instructions).
7. “Drape Features on Surface” (see previous instructions).

Preparing Xsec_Utility_Crossing Drawing
In most cases crossing elements are not perfectly perpendicular to the alignment and would be difficult to reference into a true cross section. This process creates an embellished model that represents utility crossings on the nearest cross section.

1. Create a 2D model named Xsec_Utility_Crossings.dgn.
2. Identify your cross section range, interval and key stations. You can use the following options to display OpenRoads Pattern Line for the cross sections to help sketch in crossings to pattern lines. Drawing Open Roads Pattern Lines is optional.
   a. This part of the guide doesn’t address how to create cross sections sheets. Only certain cross section settings and files pertaining to pattern lines are discussed.
   b. Try to get a *.xsc file from the designer. The cross section range, interval, and key station can be saved to this file. Using the same *.xsc file as the designer will help you draw crossing lines that will match the final plans.
   c. Before you draw the crossings lines, create some draft cross section sheets with the following option changed. We are not really concerned about the draft cross section with this step. At this step we mostly after the pattern Lines.
CADD Standards

3. Use the Drawing Task Tools locate at “Design>Xsec>Linear>Utilities>Mark as Crossing” to draw a line from the start of the crossing utility to an approximate point that crosses a cross section location which generally creates a line roughly parallel to the alignment. Repeat this process for the end of the crossing element. Each crossing element should be represented with 2 new lines.

4. After all of the crossing elements have been drawn.
   a. “Create OpenRoads Features from plain MicroStation graphics” (see previous instructions).
   b. “Set the Active Terrain” (see previous instructions). This step may have been completed in step 2 above.
   c. “Drape Features on Surface” (see previous instructions).
CADD Standards

Preparing Xsec_Utility_Cells_as_Lines_(Alignment_Name) Drawing.
1. Create a 2D drawing named Xsec_Utility_Cells_as_Lines_(Alignment_Name).dgn. Appending the alignment name to the end of the Drawing name is recommend when multiple cross section alignments are planned. This should help user associate the correct drawing with each cross section model.
2. Attach the Utility Filters. This can be done from the main menu: NDDOT > Levels > Level Filters > Utilities.
3. Reference the drawing Topog.dgn and display only utility cells by using the filter “Utility Cells”.
4. Copy these utility Cells into this Xsec_Utility_Cells_as_Lines.dgn. Use the level filter “Utility Cells” to pick the cells.
5. Detach the Topog.dgn.
6. Manually attach the cell library: S:\STANDARD\V8i\cell\SpecialAttachment\cells_to_lines.cel.
7. Use the Replace Cells tool to replace the cells. Be sure to use “Method > Update” and “Mode > Global”.

8. The Replacement cells will look like lines, but at this point they are still cells. Detach the “cells_to_lines.cell” library. If you don’t detach this library the correct cell will not appear in the cross sections.
9. Reference the alignment file, usually DS_Align.dgn.
10. Rotate the all the cells so that they are relatively parallel to the cross section alignment.
   a. Reference in your cross section alignment model.
   b. Select the utility cells.
   c. Activate the “Rotate Point Symbol” tool from Geopak or main menu: NDDOT > Tools > Utilities > Rotate Point Symbol. Use the OpenRoads alignment as a MS Element, Rotation > Tangent. Then click Start.
11. If the project uses multiple cross section alignments, make a backup drawing at this point. You will need to have separate versions of the “Xsec_Utility_Cells_as_Lines.dgn” in order to address the different cell rotation orientations.
12. Once the cells are rotated, use the MicroStation > Drop Element command with the Complex option to drop the cells to single line elements.
CADD Standards

13. After all of the cell have be replaced with rotate line elements;
   a. “Create OpenRoads Features from plain MicroStation graphics” (see previous instructions).
   b. “Set the Active Terrain” (see previous instructions).
   c. “Drape Features on Surface” (see previous instructions).

Test and Review Utility Models
The 3D utility models needs to exist or be referenced into your 3D cross section model. The utility features should display in both dynamic cross sections and sheet cross sections. If the size of the cell doesn’t appear correctly, the Drawing scale of the 3D Utility model is probably off (see previous instructions on “Drape Features on Surface”).

Cross Sections Key Index
The Cross Section Key Index is locate in the Sheets.cell library. The cell “XS Legend” should be placed without annotation scale.