Standard Operating Procedure (SOP) for Delivering Models and Digital Data For Information Only on NDOT Projects

June 13, 2025

Overview

This document provides guidance for delivering models and data files for NDOT projects to ensure consistency and accessibility. Projects are categorized into two types, projects with Basic Digital Package For Information Only (Basic Digital Package FIO) and those with Detailed Digital Package For Information Only (Detailed Digital Package FIO).

All areas of Full Depth Pavement Replacement, and/or Wetland Mitigation Sites, will have a Detailed Digital Package FIO's. The Detailed Digital Package FIO's will contain all of the information provided in the Basic Digital Package FIOs, plus additional model information for the areas of full depth pavement. Please see the description below for more details.

Exceptions may be allowed if approved by the Roadway Design Engineer or their Designee.

Either package will be developed prior to turn-in to PS&E and updated after blue line corrections have been accomplished, but no later than 30 days prior to the letting date.

Process for Delivering Digital Package FIOs:

Designer

The roadway designer shall be responsible for the following activities:

- Ensure all project data files are accurately compiled and formatted before submission.
- Create XML files for the required project deliverables based on the package type (See the FIO deliverables and file index template listed below for direction.)
- Generate a KMZ file of the final design (see Appendix D for instructions).

- Create a file index for a Basic Digital Package or Detailed Digital Package, ensuring all necessary files are correctly categorized and referenced for ease of use. (See the For Information Only deliverables and file index template listed below for direction.)
- Create and upload the zipped file package for PSE (see Appendix E for zipping instructions).
    - All zipped files will be uploaded to **NDOT RD Construction Model** document type in OnBase and will require the following keywords:
        - Control Number
        - Package Type
            - Basic or Detailed
        - Category
            - For Information Only or Model as Legal Document

Roadway Design Unit Head

In addition to the P.S.& E. turn-in package review provided by the Roadway Design Unit Head, the Unit Head will be responsible for checking to make sure that all XML files will load correctly in Trimble Business Center (TBC), (See Appendix C for instructions). TBC will only be provided to Design Unit Heads, and this task should not be delegated unless approved by the Roadway Design Engineer. TBC is a shared license and should be closed immediately after the Unit Head has completed their testing of the XML.

Additionally, each project that meets the criteria for a Digital Package FIO should have at least a Basic or Detailed package. If a Digital Package is not going to be delivered for an eligible project , the Unit Head will request approval from the Roadway Design Engineer or their designee. If approved, the Unit Head will send an email to the Roadway Design Engineer, the District Project Delivery Engineer, and the Construction Engineer to determine what digital information, if any, can be provided post-letting.

PS&E

For all eligible projects, PS&E will export the Digital Data Package FIO from OnBase and ensure that it has the following naming convention: Control Number – Package Type – Category (example: Control Number 12345 – Basic Digital Package – For Information Only). The data will be uploaded to BidX and properly identified as FIO and add the approved affidavit (see Appendix F) to project proposals .

Digital Package FIOs

The digital information package was developed to provide the Districts and the contractors access to the most current digital information that was used to develop the plans. As this data will be labeled “For Information Only”, the plans and contract shall govern in matters of contractual dispute. However, the Designer should do their best to ensure the data is representative of the information shown in the plans. Designers should follow the guidance below on each project that requires this level of package.

Deliverables for Basic Digital Package FIO

1. Digital Package FIO File Index (See Appendix A)
2. Viewer File
    a. KMZ of Roadway Design Feature File
3. CAD Files (*.DGN format)
    a. Alignment File(s)
    b. Roadway Design Feature File(s)
    c. ROW Feature File (as applicable)
    d. Wetlands Feature File (as applicable)
    e. Original Topography
    f. Cross Sections (as applicable)
4. Alignment Data
    a. LandXML Format (See Appendix B for instructions.)

Detailed Digital Package FIO

The Detailed Digital Package FIOs will contain all the information provided in the Basic Digital Package FIOs, plus additional model information for areas of full depth pavement or for Wetland projects. The sections of project that require the Detailed Package will require a higher quality model with more in-depth review. As such the design requirements below should be followed

Design Model Guidelines - Template Drop Interval

The intention of this guidance is to identify template drop intervals that will create accurate models that can be used by contractors using automated machine control equipment. Generally, preliminary cross-section intervals may be at greater intervals if the design unit head determines that model development is not as critical for that phase.

Intervals must be a multiple of the desired cross-section spacing, such that a template drop occurs at every cross-section.

Initial Template Drop Interval

Design Speed, V (mph)	Maximum (ft.)	Recommended (ft.)
V < 30	10	5
30 < V < 55	25	5
V > 55	25	5

Additional Template Drops

Description	**Recommended Interval**
Auxiliary Lanes	Key Stations
Borrow/Waste Sites	25' Interval Plus Key Stations
Crossovers	Key Stations
Culverts	Culvert location, Large openings may need template drops at each end of opening
Curbed Intersections	1' through radii
Curves	PC, PT, VPC, VPT (These can be done automatically in the Roadway Designer Options to Include Critical Sections, checking both Horizontal Cardinal Points and Vertical Cardinal Points.)
Cut-to-Fill and Fill-to-Cut Transitions	5' (a distance of 100' ahead and beyond anticipated location of transition point)
Driveways with Major Grading*	5'
Earth Dikes	Key Stations
Erosion Control Curb	Key Stations
Frontage Roads	Per Initial Template Drop Interval Table
Gore locations	1'
Grading under Bridges	Key Stations per bridge plan
Guardrail Surfacing/Grading	Locations as per Design Guide 1700, 1710, 1711, 1712
Intercepting Dikes	Key Stations

Intersections w Major Grading*	5', 1' through the radii returns.
Mailbox Turnouts	Key Stations
Ramp Terminals	1' through radii
Retaining Walls	25' plus Key Stations per wall plan
Roundabouts	1' around circulating roadway
Sidewalks	Key Stations
Special Ditches	Key Stations, begin and end ditches, points of grade or width change
Streams	Key Stations to identify stream meander accurately
Superelevated Curves	Points of change
Temporary Roadway	Per Initial Template Drop Interval Table
Wetland Mitigation Sites	Key Stations

*Driveways requiring minor grading will not be modeled. Intersections on 3R projects generally will not be modeled.

Definitions:

- Template Drop: The user "drops" templates onto the corridor via the template drop dialog box. Setting the interval causes Roadway Designer to drop the template at each interval. So, dropping a template at the beginning of a 200' long corridor at a 50' interval would create 5 template drops.
- Key Stations: These are "keyed" in by the user at stations where additional template drops are desired such as culvert locations or transition points.

Deliverables for Detailed Digital Package FIO

1. Digital Package FIO File Index (See Appendix A)
2. Viewer File
    a. KMZ of Roadway Design Feature File
3. CAD Files (*.DGN format)
    a. Alignment File(s)
    b. Roadway Design Feature File(s)
    c. ROW Feature File (as applicable)
    d. Wetlands Feature File (as applicable)
    e. Original Topography
    f. Cross Sections (as applicable)
    g. 3D Design Breakline file (See Appendix G)
4. Alignment Data
    a. LandXML Format (see Appendix B and C)
5. Machine Control Surface Model files (LandXML format) (See Appendix G)
    a. Existing Ground
    b. Proposed Finish Ground
    c. Proposed Grading Surface
6. Superelevation Transition Diagrams
    a. Shown in plans, typically on the G Sheets, General Information Sheets
    b. Word Document (unless a superelevation diagram is shown on the plans)

Appendix A: Digital Package FIO File Index

Digital Package For Information Only File Index					
Project Name:					
Project Number:					
Control Number:					
	File Type	**File Name**	**Description**	**Date**	**File Size**
Basic Digital Package FIO Deliverables	Viewer Files (KMZ):				
	CAD Files (*.dgn)				
	Alignment(s):	*Control#* **Alignment.dgn** (Example: 12345 Alignment.dgn)			
	Roadway Design Feature(s):	*Control#* **Features.dgn** (Example: 12345 Features.dgn)			
	Right-of-Way Design:	*Control#* **ROW_Design.dgn** (Example: 12345 ROW_Design.dgn)			
	Wetlands Delineation:	*Control#* **Enviro.dgn** (Example: 12345 Enviro.dgn)			
	Topography:	*Control#* **SP.dgn** (Example: 12345SP.dgn)			
	Cross Sections:				
	Alignment Data file(s) in LandXML format:	LandXML file Control#Highway#.XML (Example: 12345US6.XML)			
Detailed Digital Package FIO Deliverables	CAD Files (*.dgn)				
	3D Design Breakline(s):	TBD			
	Surface Model Files in LandXML format				
	Existing Ground:				
	Proposed Finished Grade:				
	Proposed Grading Surface:				
	Superelevation Transition Information				
	Superelevation Diagram in plans or provide Word Document containing Superelevation information.				
Disclaimer: These files are provided For Information Only and are not incorporated into the contract. The Department does not guarantee or warranty that the Digital Files provided herein accurately represent the contract plans. The letting plans, and any subsequent revisions, are the contract plans and will be used to decide any and all disputes.					

Appendix B: Creating and Exporting an XML from an Existing Alignment in OpenRoads Designer (ORD)

Video Instructions Link

1. **Open the Design File**
   Launch OpenRoads Designer and open the DGN file containing the alignment.
2. **Open the OpenRoads Model Tab**
   Navigate to the **OpenRoads Model** tab (typically found in the Explorer panel) to view available alignments.
3. **Select the Alignment**
   Expand the "Geometry" section to find your alignment. Right-click on the desired alignment name.
4. **Choose 'Export to LandXML'**
   From the right-click menu, select **Export to LandXML**.
5. **Configure Export Settings**
   In the LandXML Export dialog:
   1. Check the box for the alignment you wish to export.
   2. Ensure the proper coordinate system is set if needed.
   3. Set units and version (usually defaults are acceptable or 2.0).
6. **Choose a Save Location**
   Click **Browse** to select the destination and filename for your XML file.

   (Note: Naming Convention for this file should be the control number then the highway number. (Example: 12345US6.dgn)

7. **Export the File**
   Click **OK** or **Export** to generate the LandXML file.
8. **Verify Output (Optional)**
   Locate and open the exported XML file in a text editor or Civil software to confirm the alignment data.

   (Note: If the process works correctly the file size should generally be greater than 10 KB.)

Appendix C: Checking an XML Alignment in TBC

Follow these steps to import an XML alignment and survey data into Trimble Business Center (TBC) and verify that the alignment is in the correct location.

Video Instructions Link

Step 1: Start a New Project or Open an Existing One

1. Open Trimble Business Center.
2. Start a new project or open an existing one.
3. Set or confirm your project coordinate system under:
   Project Settings > Coordinate System.

Step 2: Import the XML Alignment

You can find the LandXML file, Control#Highway#.XML (Example: 12345US6.XML), and Drag and Drop it into TBC.

Or

1. Click the “Home” tab, then select “Import”.
2. Browse to your LandXML file Control#Highway#.XML (Example: 12345US6.XML)
3. Select the file and click “Open”.
4. In the Import window:
   - Confirm the file type is LandXML.
   - Ensure the alignment is recognized and listed.
5. Click “Import”.

Step 3: Import the Survey Data

You can find the survey file Control# SP.dgn (Example: 12345SP.dgn) and Drag and Drop it into TBC.

Or

1. From the “Home” tab, click “Import” again.
2. Select your survey file Control# SP.dgn (Example: 12345SP.dgn)
3. In the Import options:
4. Confirm or configure the coordinate system to match your project.
5. Click “Import”. Or Drag and Drop the file in TBC.

Step 4: Verify the Alignment Location

1. Check that the alignment overlays correctly on survey shots or control points.

Step 5: Close TBC as soon as you finish!

Appendix D: Creating and Exporting a KMZ File of the Final Design

Description

To generate a Google Earth (.KMZ) file that provides a clear visual summary of the project design for stakeholder review, field coordination, or public outreach.

Design Files to be Included

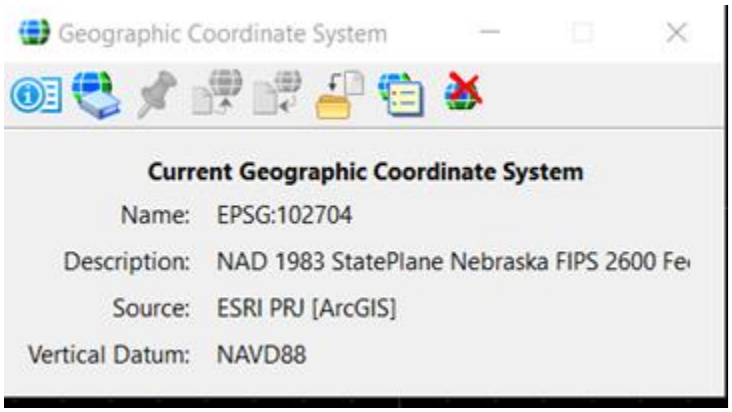
Turn the following attachments on in the Feature File:

- Alignment(s): Control# Alignment.dgn (Example: 12345 Alignment.dgn)
- Right-of-Way Design: Control# ROW_Design.dgn (Example: 12345 ROW_Design.dgn)
- Wetlands Delineation: Control# Enviro.dgn (Example: 12345 Enviro.dgn)
- Topography: Control# SP.dgn (Example: 12345SP.dgn)

When creating a KMZ export, include the following features to ensure the file communicates the design intent clearly:

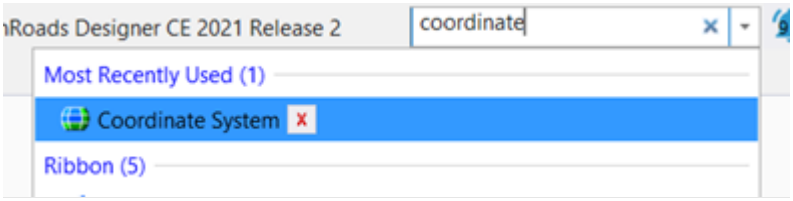
- Centerline alignment – Clearly labeled
- Proposed constructed linear features, including:
    - Pavement
    - Shoulders
    - Sidewalks
    - Curbs
- Right-of-way (ROW) lines – Existing and proposed
- Construction limits or grading boundaries
- Wetlands – Clearly defined boundaries
- Utilities – Major utility lines
- Item features – All applicable items of work shown in the plans, such as:
    - Bridges
    - Culverts
    - Flumes
    - Inlets
    - Guardrail
    - Erosion control
    - Lighting or signal poles
    - ADA features

Written Instructions

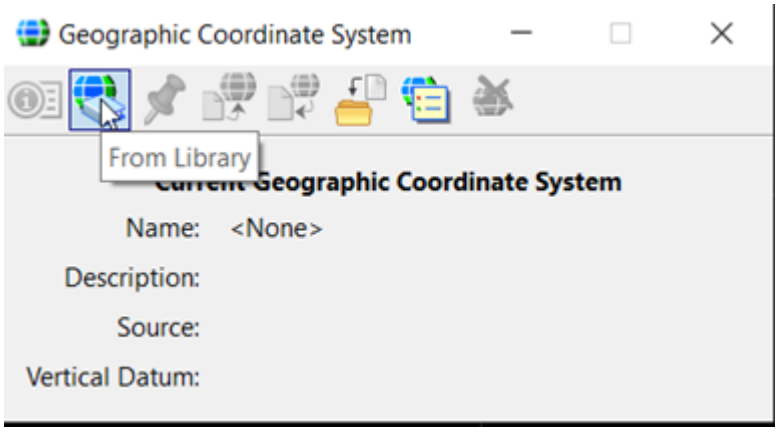


Access the Geographic Coordinate System Tool through:

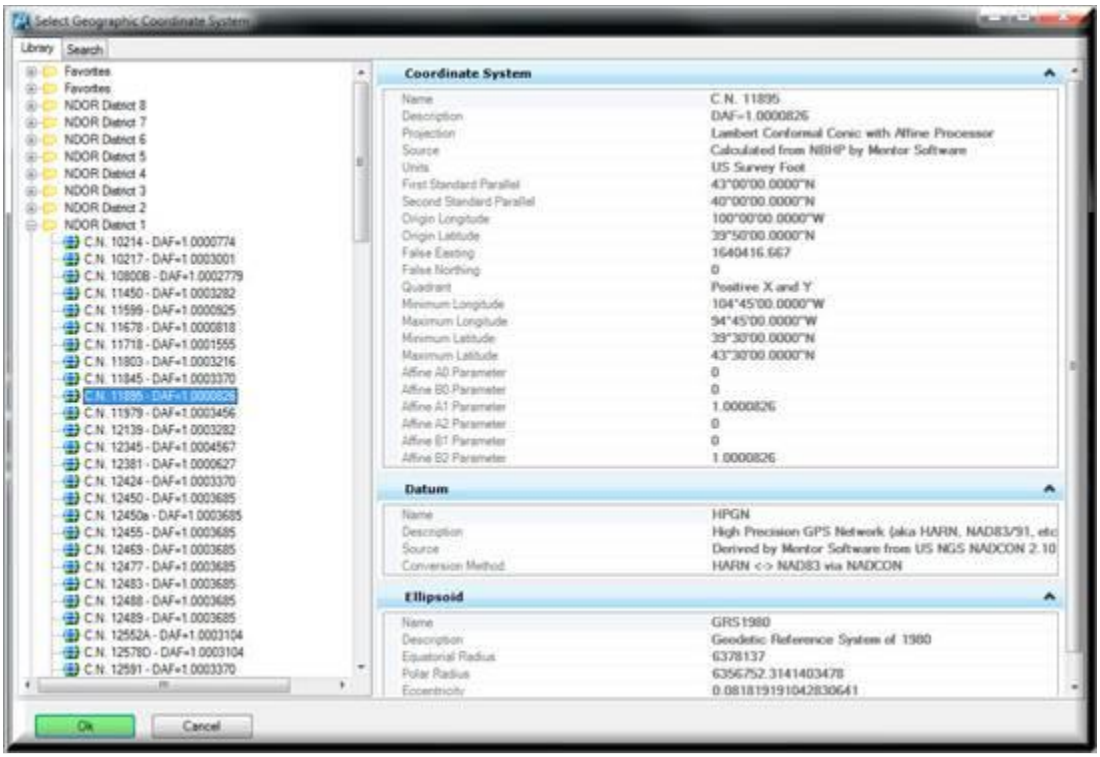
Survey>Utilities>Geographic Select Coordinate System. You can also type Coordinate in the Search window.



Select the “From Library” Icon.

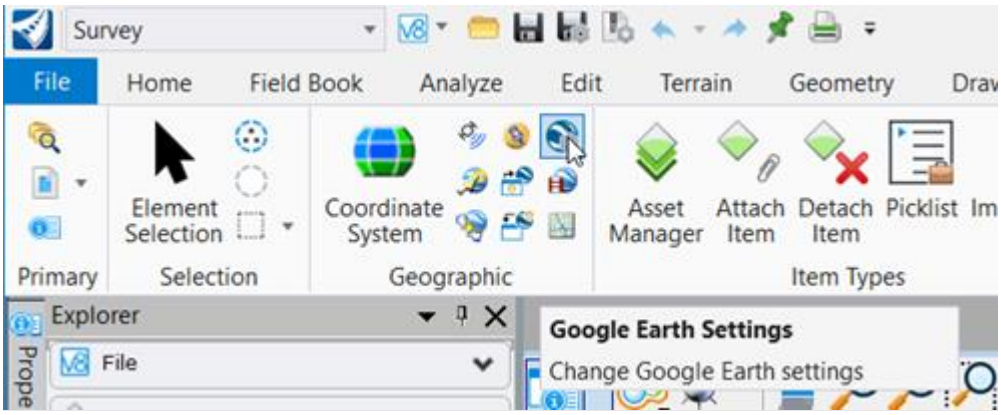


Select the control number of the current project to be displayed in Google Earth.

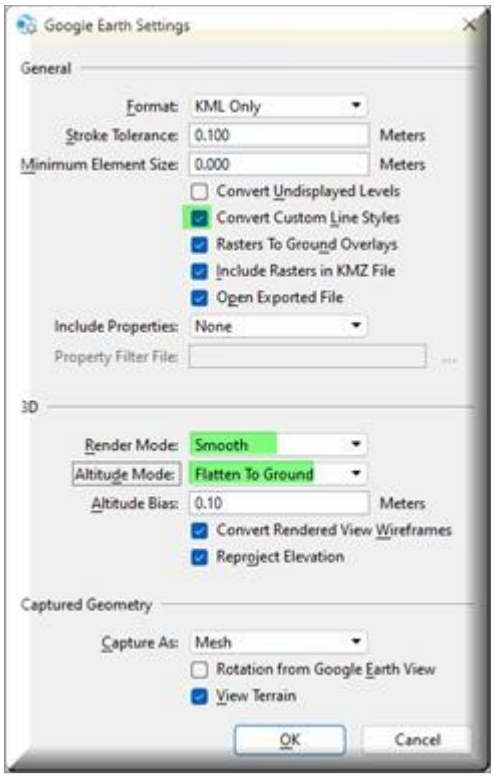


If the control number for a specific project does not exist, please contact the Geodetic Survey Department for further instructions.

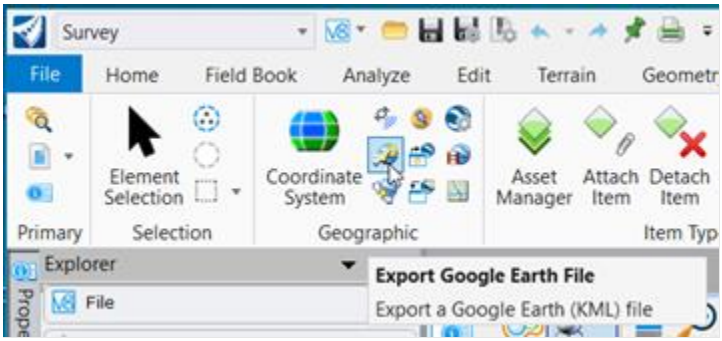
Check the Google Earth Settings.



Be sure the Render Mode is ‘Smooth’ and the Altitude Mode is ‘Flatten To Ground’.



Select Export Google Earth (KML) File. This will create a KMZ file that will attach itself to Google Earth automatically.



Do NOT have more than 1 view window open for this process to work correctly. Name the KMZ file and save the file. Upon saving the KMZ file Google Earth will launch in the background and display the current project.

Appendix E: Zipping a File Package for PS&E

1. Gather all required files, including:
    - XML file of final alignments
    - KMZ file of final design
    - Design files as specified in the project index
2. Select all files and right-click.
3. Choose **Send to > Compressed (zipped) folder**.
4. Name the zip file.
    - The zipped file shall be named Control#BasicDigitalPackageFIO for a basic package and Control#DetailedDigitalPackageFIO for a detailed package. Example: 71127BasicDigitalPackageFIO
5. Verify the zip package contents before uploading.
6. The zipped file package should then be uploaded to OnBase under **NDOT RD Construction Model FIO**.

By following these steps, NDOT ensures that all project models and data files are properly formatted, stored, and accessible for future use.

Appendix F: Approved Affidavit

INFORMATION PROVIDED "FOR INFORMATION ONLY"

By signing this bid, Bidder agrees that information provided by Nebraska Department of Transportation indicated as "For Information Only" will not be incorporated or otherwise become a part of the contract and acknowledges further that no guarantees or assurances of trustworthiness of the data have been made. Bidder acknowledges that use of the information is voluntary and accepts and assumes the risk of any inaccuracies in the information.

Appendix G: Creating 3D Linestrings and Surface Models

There are numerous methods to create this data, any of which may be required depending on the design characteristics of the project. The methods outlined in this appendix are generally less complex than other available options; however, a Designer may need to use alternative methods either in place of or in conjunction with the guidance provided here, based on the project's specific needs. If the Designer encounters difficulties in developing the necessary deliverables, they should coordinate with their Unit Head and Design Support for assistance.

Because CAD software and related technologies continually evolve, the instructions provided here reflect the processes and tools in place at the time this SOP was prepared.

Surface Models

Existing Ground

1. Open any file that has the existing ground terrain referenced to it
2. Select the terrain in the file
3. From the popup menu, select "Export Terrain Model – LandXML"
4. Give the file a suitable name
5. Under "Export Options" select "Export Triangles Only".
6. Save the file to the folder that will eventually be compressed and uploaded to OnBase
7. Test the file to ensure it imports into TBC and represents design intent.

Proposed Finished Grade

1. Set the file to "OpenRoads Modeling"
2. On the "Terrain" Ribbon, in the "Create" tools, choose the tool "Create Terrain Model from Design Meshes"
3. Set the side to "Top"
4. Create the terrain
5. Check the terrain by reviewing the terrain in 3D and by reviewing the dynamic cross-sections to ensure that the terrain matches the design intent.
6. Once satisfied, export the terrain to XML by selecting the terrain in the file.
7. From the popup menu, select "Export Terrain Model – LandXML"
8. Give the file a suitable name
9. Under "Export Options" select "Export Triangles Only"
10. Save the file to the folder that will eventually be compressed and uploaded to OnBase
11. Test the file to ensure it imports into TBC and represents design intent.

Proposed Grading Surface

1. Set the file to “OpenRoads Modeling”.
2. On the “Terrain” Ribbon, in the “Create” tools, choose the tool “Create Terrain Model from Design Meshes”.
3. Set the side to “Bottom”
4. Create the terrain
5. Check the terrain by reviewing the terrain in 3D and by reviewing the dynamic cross-sections to ensure that the terrain matches the design intent.
6. Once satisfied, export the terrain to XML by selecting the terrain in the file.
7. From the popup menu, select “Export Terrain Model – LandXML"
8. Give the file a suitable name.
9. Under “Export Options” select “Export Triangles Only”.
10. Save the file to the folder that will eventually be compressed and uploaded to OnBase
11. Test the file to ensure it imports into TBC and represents design intent.

3D Design Breaklines

1. Create a new Microstation ORD file using a 3D seed file.
2. Reference the corridor(s) to the file, referencing the Default-3D-Model
3. Turn off everything that is not a linestring level (Generally, “RD” levels will be the only levels that need to be on)
4. In the “Reference File” dialog box, do a “Merge into Master” of that referenced file.
5. Multiple corridors can be referenced into one file, or they can be kept separate, and is dependent on what the designer believes to be the best way to convey the information to the contractor.
6. Save the file to the folder that will eventually be compressed and uploaded to OnBase.
7. Test the file to ensure it imports into TBC and represents design intent.