# ORD Survey Files – Office QA/QC Checklist

As outlined in TDOT’s ***Requirements for Model-Centric Design*** document, there are up to five (5) expected deliverables from the Survey phase to Design found in Appendix A. Survey Deliverables Workflow. (Also detailed in the Survey (ORD) Manual Appendix A):

1. **Aerial Survey Data** file (**Aerial Model.dgn** from the **3D seed**) contains the existing graphics imported from the aerial survey. This is only required as a survey deliverable on projects with an aerial survey included in the scope.
2. **Field Survey Data** file (**Model.dgn** from the **3D seed**) contains the existing graphics imported from the original Field Book(s) (e.g. utilities (plan), pavement edges, buildings, vegetation, etc.).
3. **Terrain Model** file (**Terrain.dgn** from the **3D seed**) contains the existing DTM features (e.g. contours, triangles, etc.). If a project requires a Field Survey Data file and an Aerial Survey Data file, the Terrain Model file should combine both the field survey TIN file and the aerial survey TIN file.
4. **Preliminary Geometry** file (**Alignment.dgn** from the **2D seed**) contains the survey preliminary centerline horizontal alignment with profile, existing right-of-way lines, property lines, parcel lines, property owners, tract numbers, and projected existing drainage and utilities (profile only).
5. **Utility Model** file (**Utility.dgn** from the **2D seed**) contains the existing drainage and utility models (plan only), delineated drainage areas, and drainage/hydraulic data blocks.

The following **ORD Survey Files – Office QA/QC Checklist** has been developed to assure the completeness and consistency of survey deliverables as they relate to office procedures and is one (1) of four (4) ORD Survey checklists for NEW ORD projects that must be completed by the surveyor/survey team and submitted as part of the formal, overall survey deliverable package. This checklist has been broken down by survey file type (i.e. Model.dgn, Terrain.dgn, Alignment.dgn, and Utility.dgn).

When a project’s limits have a railroad in its vicinity, refer to the ORD **Railroad Survey Files – Office QA/QC Checklist** found within the **ORD Railroad Survey Files – QAQC Checklist** file.

Additional Requirements

* ROW Acquisition Table: Fill in and place in the project workset folder.
* ROW and Property Line Justification Template: Fill in and place in the project workset folder, detailing the methodology used to determine the ROW and property line locations and orientations for each tract. (Use the **ORD Survey –** **ROW and Property Line Justification Template** file)

(**Note:** For any unusual or complex drainage, stream, or structure situation, contact the TDOT Hydraulics Office, [TDOT.Structures@tn.gov](mailto:TDOT.Structures@tn.gov))

# Project Information

|  |  |
| --- | --- |
| **County:** | Choose an item. |
| **Federal Project No.:** | Click or tap here to enter text. |
| **PIN:** | Click or tap here to enter text. |
| **Description:** | Click or tap here to enter text. |
| **Submitted by Surveyor:**  **(TDOT or Consultant)**  **Date:** | Click or tap here to enter text.  Click or tap here to enter text.  Click or tap here to enter text. |
| **Survey Reviewed By:** | Click or tap here to enter text. |
| **Submitted by TDOT Regional Survey Manager:** | Click or tap here to enter text. |
| **Submission Date:** | Click or tap here to enter text. |
| **Comments**:  Click or tap here to enter text. | |

# ORD Survey Data (Model.dgn) Checklist

In the ***Verified*** column, select either **Yes**, **No**, or **N/A** for the verification status of each documentation/task.

**Note:** In conjunction with completing the checklist below, the reviewer should also create a copy of the project’s **Model.dgn** file. This will be used by the reviewer as a check file along with the **ORD Survey – Office Checklist – Comments Template** file. The copied **Model.dgn** will be used by the reviewer to verify checklist items below and place numbers (e.g. M-1) as flags locating an area that needs to be edited. These numbers will refer to respective comments detailed in the **ORD Survey – Office Checklist – Comments Template** file. The **SUR - MISC - Office** level should be used when placing the number flags within the copied **Model.dgn**. After corrections are made, the deliverable should be placed in the project workset folder.

The surveyor/survey team may provide additional information in the space provided at the end of the Model.dgn checklist.

| Category  Subcategory | Documentation/Task | Verified |
| --- | --- | --- |
| Settings |  |  |
|  | TDOTSeed3D.dgn seed file was used to create the Model.dgn file | Choose an item. |
|  | Current TDOT ORD workspace utilized | Choose an item. |
|  | Current TDOT feature codes, feature definitions, annotation groups and element templates utilized | Choose an item. |
|  | File name aligns with the TDOT ORD File Naming Convention Standards | Choose an item. |
|  | Used State Plane NAD83 (2011) coordinate system, i.e. *TN83/2011F – NSRS11 (NAD83/ 2011) Tennessee State Plane Zone, US Foot* | Choose an item. |
|  | Applicable DGN drawing scale | Choose an item. |
| Planimetric |  |  |
| General | All survey points, lines, and curves have an “S” prefix | Choose an item. |
|  | Check for text overlap and rotations | Choose an item. |
|  | Correct Mainline survey length, including starting and ending points, compare limits in man-day estimate and scope drawing | Choose an item. |
|  | Correct Sideroad(s) survey length, including starting and ending points, compare limits in man-day estimate and scope drawing | Choose an item. |
|  | Ties to prior surveys | Choose an item. |
|  | All field data shown | Choose an item. |
|  | Check North Arrow is within 500’ of the centerline and placed every 1400’ along centerline | Choose an item. |
|  | Drawing Scale Information Block Completed – from TDOTSeed3D.dgn seed file | Choose an item. |
|  | Datum Adjustment Factor Information Block Completed – from TDOTSeed3D.dgn seed file | Choose an item. |
|  | Control Point Information Block Completed – from TDOTSeed3D.dgn seed file | Choose an item. |
|  | Project Description Information Block Completed – from TDOTSeed3D.dgn seed file | Choose an item. |
|  | Petroleum Storage Tank Owner Information Block Completed, if applicable – from TDOTSeed3D.dgn seed file | Choose an item. |
|  | TDOT Disclaimer Information Block Shown – from TDOTSeed3D.dgn seed file | Choose an item. |
|  | Drainage/Hydraulic Data for Bridge Information Block Completed – from TDOTSeed3D.dgn seed file  (Ensure drainage info boxes include information from all upstream areas contributing to applicable drainage structure) | Choose an item. |
|  | Drainage Data Information Block Completed– from TDOTSeed3D.dgn seed file  (Ensure drainage info boxes include information from all upstream areas contributing to applicable drainage structure) | Choose an item. |
|  | Utility Owner’s Information Block Completed – from TDOTSeed3D.dgn seed file  (Underground utility location notes and 811 response tickets) | Choose an item. |
| Control | Reference datum and datum adjustment factor noted (horizontal and vertical) | Choose an item. |
|  | Control points (compare these points values to those on the GNSS Point Report description) (to the 4th decimal) | Choose an item. |
|  | Control points table, including point number, elevation, coordinate (Northing and Easting), station, and offset (to the 3rd decimal for elevations and to the 4th decimal for coordinates) **Note:** Point number format should be:  County# - 3DigitSR# - point number. Example: 82-001-01. | Choose an item. |
|  | Survey tied at the beginning to existing log mile marker, if applicable | Choose an item. |
| Topo | Vegetation features | Choose an item. |
|  | Transportation features shown, with roadways, driveways, and parking lots surface type labeled. (other features shown - edge of pavement, edge of road, curb (if applicable), edge of shoulder, driveway, etc.) | Choose an item. |
|  | Traffic control features | Choose an item. |
|  | Septic tanks and field lines shown (or location notes on tracts not served by a sanitary sewer) | Choose an item. |
|  | Underground fuel tanks, including size, owner ID number, and facility number | Choose an item. |
|  | Historical features | Choose an item. |
|  | Natural features\* shown in accordance with Environmental Boundary Report | Choose an item. |
|  | Buildings shown and labeled, including identification (residential, business, etc.) (label business name, if applicable) | Choose an item. |
|  | Ground cover labeled | Choose an item. |
|  | Wells shown (or water source noted on tracts not served by a public water utility company - list name, address of driller, date drilled, depth, property owner at time of drilling) | Choose an item. |
|  | Bottom flowline of the stream and stream limits shown | Choose an item. |
|  | Any additional topographic features shown and labeled | Choose an item. |
| Drainage | Pipes and box culverts located, include size, type, and invert elevations | Choose an item. |
|  | Storm sewer lines and catch basins/manholes, include top, bottom, and invert elevations (ensure catch basin inverts are correct as they run downhill) | Choose an item. |
|  | Floor elevations of building subject to flooding noted | Choose an item. |
| Bridge (if applicable) |  |  |
|  | Show existing bridge and wingwalls, include description and drainage information – include bridge ID in description | Choose an item. |
|  | Show existing bridge abutments, aprons, etc. (include description) | Choose an item. |
|  | Streambed, top-of-water, and top-of-bank shown and labeled | Choose an item. |
|  | Stream name labeled | Choose an item. |

\*Notify office if wetlands are possible. Locate them after they are flagged.

### ORD Field Survey Data (Model.dgn) Checklist – Additional Information:

Click or tap here to enter text.

# ORD Terrain Model (Terrain.dgn) Checklist

In the ***Verified*** column, select either **Yes**, **No**, or **N/A** for the verification status of each documentation/task.

**Note:** In conjunction with completing the checklist below, the reviewer should also create a copy of the project’s **Terrain.dgn** file. This will be used by the reviewer as a check file along with the **ORD Survey – Office Checklist – Comments Template** file. The copied **Terrain.dgn** will be used by the reviewer to verify checklist items below and place numbers (e.g. T-1) as flags locating an area that needs to be edited. These numbers will refer to respective comments detailed in the **ORD Survey – Office Checklist – Comments Template** file. The **SUR - MISC - Office** level should be used when placing the number flags within the copied **Terrain.dgn**. After corrections are made, the deliverable should be placed in the project workset folder.

The surveyor/survey team may provide additional information in the space provided at the end of the Terrain.dgn checklist.

| Category  Subcategory | Documentation/Task | Verified |
| --- | --- | --- |
| Settings |  |  |
|  | TDOTSeed3D.dgn seed file was used to create the Terrain.dgn file | Choose an item. |
|  | Current TDOT ORD workspace utilized | Choose an item. |
|  | Current TDOT feature codes, feature definitions, and element templates utilized | Choose an item. |
|  | File name aligns with the TDOT ORD File Naming Convention Standards | Choose an item. |
|  | Used State Plane NAD83 (2011) coordinate system, i.e. *TN83/2011F – NSRS11 (NAD83/ 2011) Tennessee State Plane Zone, US Foot* | Choose an item. |
|  | Applicable DGN drawing scale | Choose an item. |
| General |  |  |
|  | Do not exceed maximum triangle length  **Note:** TDOT recommends not to exceed 75ft. If site conditions require a longer length make note of distanced used and reasoning below in *ORD Terrain Model (Terrain.dgn) Checklist – Additional Information* | Choose an item. |
|  | Only terrain boundary shown | Choose an item. |
| Planimetric |  |  |
| DTM | Correct Mainline digital terrain model length and width, including starting and ending points, compare limits in man-day estimate and scope drawing | Choose an item. |
|  | Correct Sideroad(s) digital terrain model length and width, including starting and ending points, compare limits in man-day estimate and scope drawing | Choose an item. |
|  | Non-ground-surface points and points off project limits are removed from DTM | Choose an item. |
|  | Check if roadway surface is properly modeled (review crown, superelevation rates, etc.) | Choose an item. |
|  | Check curbs, abutments, and pipe endwalls are properly modeled | Choose an item. |
|  | Check if bridges are properly modeled (terrain model should follow terrain below the bridges) | Choose an item. |
|  | Breakline crossings resolved | Choose an item. |
|  | Obscure areas within project limits are filled in | Choose an item. |
|  | Elevation errors resolved (by contouring or rendering) | Choose an item. |
|  | **With Aerial:** Densify around drainage structures and in ditches where needed | Choose an item. |
|  | **With Aerial:** Locate all pavement ties on mainline and sideroads, including edge of pavement, shoulders, and ditches | Choose an item. |
|  | Check for gaps in DTMs at catch basins and manholes, ensure proper density around structures and holes filled in | Choose an item. |
|  | Check bridge and pipe end walls are properly modeled | Choose an item. |
| Bridge (if applicable) |  |  |

### ORD Terrain Model (Terrain.dgn) Checklist – Additional Information:

Click or tap here to enter text.

# ORD Preliminary Geometry (Alignment.dgn) Checklist

In the ***Verified*** column, select either **Yes**, **No**, or **N/A** for the verification status of each documentation/task.

**Note:** In conjunction with completing the checklist below, the reviewer should also create a copy of the project’s **Alignment.dgn** file. This will be used by the reviewer as a check file along with the **ORD Survey – Office Checklist – Comments Template** file.The copied **Alignment.dgn** will be used by the reviewer to verify checklist items below and place numbers (e.g. A-1) as flags locating an area that needs to be edited. These numbers will refer to respective comments detailed in the **ORD Survey – Office Checklist – Comments Template** file. The **SUR - MISC - Office** level should be used when placing the number flags within the copied **Alignment.dgn**. After corrections are made, the deliverable should be placed in the project workset folder.

The surveyor/survey team may provide additional information in the space provided at the end of the Alignment.dgn checklist.

| Category  Subcategory | Documentation/Task | Verified |
| --- | --- | --- |
| Settings |  |  |
|  | TDOTSeed2D.dgn seed file was used to create the Alignment.dgn file | Choose an item. |
|  | Current TDOT ORD workspace utilized | Choose an item. |
|  | Current TDOT feature definitions, annotation groups and element templates utilized | Choose an item. |
|  | File name aligns with the TDOT ORD File Naming Convention Standards | Choose an item. |
|  | Used State Plane NAD83 (2011) coordinate system, i.e. *TN83/2011F – NSRS11 (NAD83/ 2011) Tennessee State Plane Zone, US Foot* | Choose an item. |
|  | Applicable DGN drawing scale | Choose an item. |
| General |  |  |
|  | Check for text overlap and rotations | Choose an item. |
|  | Beginning and end of mainline project limits labeled, including station and coordinates (Northing and Easting) | Choose an item. |
|  | Beginning and end of sideroad(s) project limits shown labeled, including station and coordinates (Northing and Easting) | Choose an item. |
|  | Intersection of mainline and sideroad(s) labeled, including station and coordinates (Northing and Easting) | Choose an item. |
|  | North arrow | Choose an item. |
| Planimetric |  |  |
| Plan Centerlines | Alignment and base chains named descriptively, such as a road or stream name | Choose an item. |
|  | Stationing on mainline (if log mile, in the direction of increasing log mile; if no log mile, stationing is south-to-north and west-to-east) | Choose an item. |
|  | Bearings on tangents labeled | Choose an item. |
|  | Check stationing convention for Sideroads, Intersecting highways, ramps, and stream baselines | Choose an item. |
|  | Bearings on curve tangents agree with bearings on adjoining centerline tangent sections | Choose an item. |
|  | Mainline centerline shown | Choose an item. |
|  | Sideroad(s) shown | Choose an item. |
|  | Ensure PI Symbols are shown, and Point Circles for PC, PT, PCC, PRC, ST, SC, CS, and ST points are shown | Choose an item. |
|  | Completed curve data (for both circular and spiral curves) | Choose an item. |
|  | Full station tics shown every 500’ | Choose an item. |
|  | Half station tics shown every 100’ | Choose an item. |
|  | Show stationing label every 500’ | Choose an item. |
|  | Sideroad(s) centerline intersection station equations | Choose an item. |
|  | Coordinates for all centerline PIs | Choose an item. |
|  | Coordinates for all centerlines begin and end points | Choose an item. |
| Property | Property lines and parcels | Choose an item. |
|  | Each tract shown in its entirety (where scale will allow) | Choose an item. |
|  | Property lines’ metes and bounds | Choose an item. |
|  | If a centerline crosses a property line or curve, show station of intersection, and divide the property line or curve, and metes and bounds, in two | Choose an item. |
|  | Property owner names (Owner's name on Present Layout should match name as written on the current legal description and in the ROW acquisition table exactly) | Choose an item. |
|  | Property tract shown in its entirety (where scale will allow) and numbered properly. If property tract is disconnected use separate property tract number | Choose an item. |
|  | Property tract numbers are consecutive from beginning of the project (crisscrossing the centerline as necessary) | Choose an item. |
|  | Property overlaps and unclaimed properties noted | Choose an item. |
|  | City, county, and/or state boundary lines (check city maps, or TN Property Maps, for city limit lines) | Choose an item. |
|  | All accesses to properties | Choose an item. |
| Present ROW and Easements |  |  |
|  | Present ROW shown and labeled | Choose an item. |
|  | Present ROW metes and bounds | Choose an item. |
|  | If a centerline crosses a present ROW line or curve, show station of intersection, and divide the property line or curve, and metes and bounds, in two | Choose an item. |
|  | Present easements shown and labeled, including book and page of source record | Choose an item. |
|  | Station/offset flags on present ROW, including beginning, end, and bend points, curve points, and property intersections, all breaks are flagged | Choose an item. |
|  | Bearings/distances on present ROW, all segments are labeled | Choose an item. |
|  | Check that all labels and flags off sideroads reference sideroad chain, not mainline | Choose an item. |
| Profile | Show separate profile model for each centerline, labeled with the road name. Model names should also correlate to the road names. | Choose an item. |
|  | Stations and elevations are properly scaled based on selected sheet seed | Choose an item. |
|  | All centerline groundlines shown and labeled | Choose an item. |
|  | Centerline intersection station equations | Choose an item. |
|  | Control Points – check they are correctly numbered, and the coordinates and elevations match the information shown on the GNSS control point datasheets control point table exactly with the elevation to the 3rd decimal places and the coordinates to the 4th decimal places.  **Note:** Label with same format as XCP's on Control Point Table and Present Layout, County-3digit SR-PT#.  Ex. 82-001-01 | Choose an item. |
|  | Underground utilities shown, including those running parallel to the centerline (projected) and those crossing the centerline (3D cut) | Choose an item. |
|  | Low wires shown (3D cut), including station, elevation, type (add temperature for high-tension lines) | Choose an item. |
|  | Bridge deck shown | Choose an item. |
|  | Existing drainage structures that cross centerline, (ex. pipes and box culverts) including size, type, station, invert elevation, and direction of flow (3D cut) | Choose an item. |
|  | Storm and sanitary sewers shown, including those running parallel to the centerline (projected) and those crossing the centerline (3D cut) | Choose an item. |
| Bridge (if applicable) |  |  |
|  | Beginning (upstream) and end (downstream) \*thalweg and floodplain section line(s) shown, including station, coordinates (Northing and Easting) | Choose an item. |
|  | Intersection of stream \*thalweg and floodplain section line(s) shown, including station, coordinates (Northing and Easting) | Choose an item. |
|  | Label point of intersection between the stream centerline and the floodplain sections and point of intersection between stream centerline and the proposed roadway centerlines. | Choose an item. |
|  | Show stationing tick marks from beginning to end of stream survey, labeled from upstream to downstream | Choose an item. |
|  | Profile flood plain section looking downstream, show type of vegetation and high-water elevation | Choose an item. |
|  | Profile centerlines of existing roads completely through floodplains, show high water elevation and stream name | Choose an item. |
|  | Profile of stream bed, top-of-water, and top-of-bank | Choose an item. |
|  | Existing bridge sketch model, include low beam elevation | Choose an item. |
|  | Stream data fields completed | Choose an item. |
|  | Normal and high-water elevations at stream crossings | Choose an item. |

\* Thalweg – A line drawn to join the lowest points along the entire length of a stream/channel bed valley in its downward slope.

### ORD Preliminary Geometry (Alignment.dgn) Checklist – Additional Information:

Click or tap here to enter text.

### 

# ORD Utility Model (Utility.dgn) Checklist

In the ***Verified*** column, select either **Yes**, **No**, or **N/A** for the verification status of each documentation/task.

**Note:** In conjunction with completing the checklist below, the reviewer should also create a copy of the project’s **Utility.dgn** file. This will be used by the reviewer as a check file along with the **ORD Survey – Office Checklist – Comments Template** file. The copied **Utility.dgn** will be used by the reviewer to verify checklist items below and place numbers (e.g. U-1) as flags locating an area that needs to be edited. These numbers will refer to respective comments detailed in the **ORD Survey – Office Checklist – Comments Template** file. The **SUR - MISC - Office** level should be used when placing the number flags within the copied **Utility.dgn**. After corrections are made, the deliverable should be placed in the project workset folder.

The surveyor/survey team may provide additional information in the space provided at the end of the Utility.dgn checklist.

| Category  Subcategory | Documentation/Task | Verified |
| --- | --- | --- |
| Settings |  |  |
|  | TDOTSeed2D.dgn seed file was used to create the Utility.dgn file | Choose an item. |
|  | Current TDOT ORD workspace utilized | Choose an item. |
|  | Current TDOT feature definitions, annotation groups and element templates utilized | Choose an item. |
|  | File name aligns with the TDOT ORD File Naming Convention Standards | Choose an item. |
|  | Used State Plane NAD83 (2011) coordinate system, i.e. *TN83/2011F – NSRS11 (NAD83/ 2011) Tennessee State Plane Zone, US Foot* | Choose an item. |
|  | Applicable DGN drawing scale | Choose an item. |
| General |  |  |
|  | Check for text overlap and rotations | Choose an item. |
|  | North arrow | Choose an item. |
| Planimetric |  |  |
| Utility Model | All existing utility models created (needed for any utility where a profile depth is required to be shown). The correct type and size should be in the Properties and shown. | Choose an item. |
|  | Limits of service shown when two utility owners supply the same service | Choose an item. |
|  | Utility easements, including easements for utilities outside the present ROW | Choose an item. |
|  | Manholes and top elevation shown | Choose an item. |
|  | TVA towers and tower numbers shown | Choose an item. |
|  | Signal heads shown | Choose an item. |
|  | All poles shown and labeled | Choose an item. |
|  | Check flow of gravity sewers | Choose an item. |
| Drainage Model | Pipes and box culverts located, include size and type | Choose an item. |
|  | Storm sewer lines, gravity sewer lines, and catch basins/manholes, include top, bottom, and invert elevations (ensure catch basin inverts are correct as they run downhill) | Choose an item. |
|  | Floor elevations of building subject to flooding | Choose an item. |
|  | Drainage area shown and info box is filled in | Choose an item. |
|  | Ensure catch basins and manholes are below ground data | Choose an item. |
| Bridge (if applicable) |  |  |

### ORD Utility Model (Utility.dgn) Checklist – Additional Information:

Click or tap here to enter text.

# ORD LiDAR Checklist (if applicable)

The checklist below lists items intended to help ensure accuracy of LiDAR submittals. For more detailed standards and guidelines, follow the **ASPRS** Standards (<https://www.asprs.org/committees/standards-committee>) for LiDAR verification.

In the ***Verified*** column, select either **Yes**, **No**, or **N/A** for the verification status of each documentation/task.

The surveyor/survey team may provide additional information in the space provided below.

| Category  Subcategory | Documentation/Task | Verified |
| --- | --- | --- |
| General |  |  |
|  | Verified control point accuracy | Choose an item. |
|  | Randomized field checks against the point cloud surface | Choose an item. |
|  | Check for tilt and warp errors | Choose an item. |
|  | Point cloud classified | Choose an item. |
|  | Provide an independent validation survey consisting of multiple horizontal vertical check points that correspond to the project’s size, access, and unique features. Make note in ORD LiDAR Checklist – Additional Information below amount of points, how it was determined, and approval | Choose an item. |
|  | Use the validation survey to statistically evaluate the point cloud against the desired accuracy level for areas of interest in the project. | Choose an item. |
| Photo-grammetry |  |  |
|  | Consistent ground sampling distance | Choose an item. |

### ORD LiDAR Checklist – Additional Information:

Click or tap here to enter text.

# Appendix A. Survey Deliverables Workflow

