MODEL BASED DIGITAL DELIVERY REFERENCE GUIDE

The Model Based Digital Delivery method takes advantage of electronic data that can be readily utilized in construction. This is primarily in the form of 3D solids that can be utilized to illustrate design intent, assist with fabrication, easily obtain quantity information and for utility clash detection to name a few. In addition, MBDD also provides various forms of digital data such LandXML's that can be easily consumed by survey equipment for Automated Machine Guidance and Global Positioning System technologies. Providing this information digitally also eliminates the need for presenting this information within the 2D plan set, reducing effort spent on plan sheet production. The following steps are necessary to deliver a PSE in this format:

1) Digital Data - Identify the digital data that will be provided as a contractual document in addition to the 2D plans. Refer to the MBDD project application for a list of design elements that require approval.

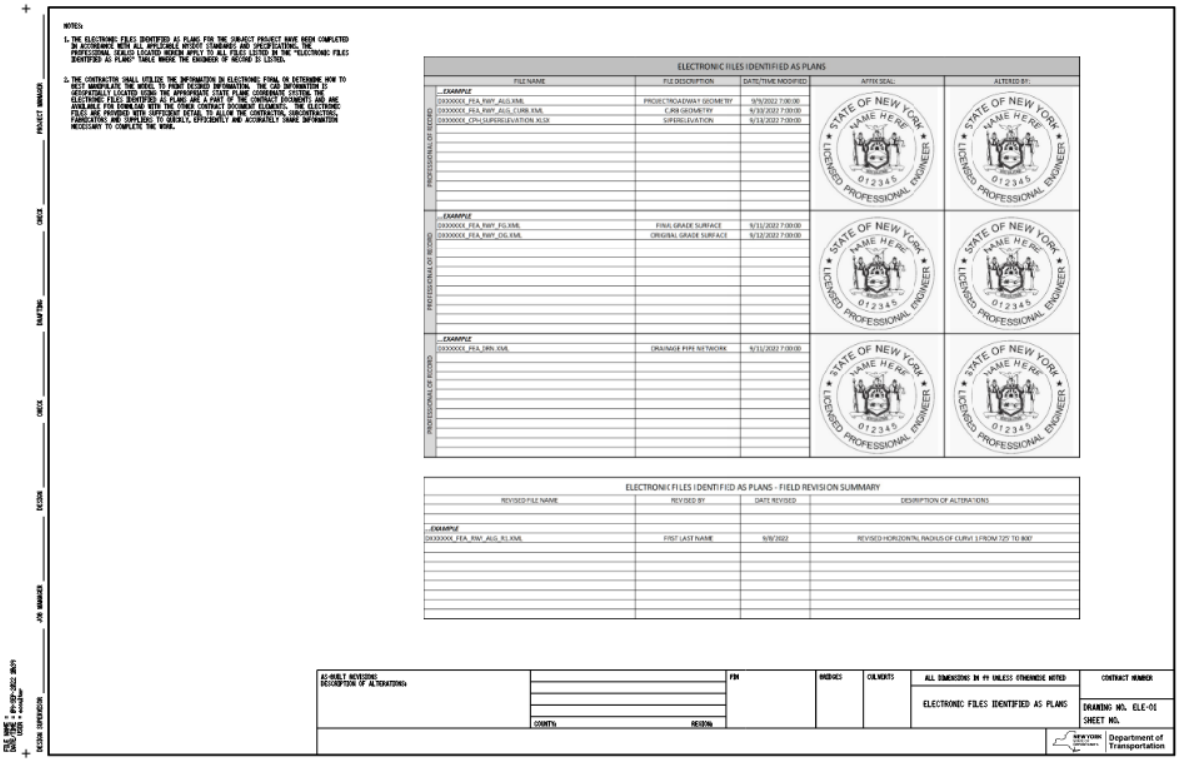
Design Element (Select all that apply "X")			Drawings or Elements Removed from the 2D Plans	Contractual Files (Sealed by P.E.)		Supplemental Files Provided for Design Reviews and PS&E for Bidding (list format)
				3D Solid Model (DGN)	Digital Data (list format)	
Highway		Original Ground Surface	N/A	No	DTM/XML	Mapping Information - type, coordinate system (PDF)
		Sub-grade Surface	N/A	No	DTM/XML	None
		Final Grade Surface	Grading Plan	No	DTM/XML	None
		Baseline Alignment	Baseline Ties	No	ALG/XML	Survey control report (PDF)
		Horizontal Alignment	Horizontal Control Plan/Table	No	ALG/XML	OpenRoads horizontal alignment report (PDF)
		Vertical Alignment	Vertical Profile	No	ALG/XML	Vertical profile roll plot (PDF)
		Superelevation	N/A	No	Excel	Vertical profile roll plot with banking diagram (PDF)
		Highway Corridor Features (All)	General Plan	Yes	DGN	3D PDF (Optional)
		Closed Drainage Network	Drainage Plan/Profile/Table	Yes	DGN	OpenRoads SUDA drainage table export (PDF)
		Large Culvert	Culvert Plan/Details	Yes	DGN	3D PDF (Optional)
		Existing/Proposed Utilities	Utility Plan/Profile/Table	Yes	DGN	3D PDF (Optional)
		Right of way Acquisitions	Right of Way Plan/Table	No	No	Acquisition Maps (PDF)
		Work Zone Horizontal Alignment	WZTC Horizontal Control	No	ALG/XML	OpenRoads horizontal alignment report (PDF)
		Work Zone Vertical Alignment	WZTC Vertical Profile	No	ALG/XML	Vertical profile roll plot (PDF)
		Work Zone Superelevation	N/A	No	Excel	Vertical profile roll plot with banking diagram (PDF)
		Work Zone Corridor Features (On-	WZTC Plan/Detail	Yes	DGN	3D PDF (Optional)
Structures		Existing substructures	N/A	No	No	3D solids of existing features (DGN)
		Existing superstructure	N/A	No	No	2D plan or 3D solids of existing features (DGN)
		Boring Location	Boring location plan	Yes	DGN	None
		Boring Logs	Subsurface profile	No	PDF	None
		Earthwork (excavation, fill)	Plan/Sections	Yes	DGN	None
		Temporary excavation support	Plan/Sections	Yes	DGN	None
		Foundations	Pile layout/details/table	Yes	DGN	Actual Pile Length Table (Excel)
		Proposed substructures	Plan/elevation/sections	Yes	DGN	None
		Bridge bearings	Bearing table	No	Excel	None
		Superstructure (steel or concrete)	Elevation/section/details	No	Excel	3D solids of proposed features (DGN)
		Design load tables	Design load tables	No	Excel	None
		Moment and shear tables	Moment and shear tables	No	Excel	None
		Camber table	Camber table	No	Excel	None
		Haunch table	Haunch table	No	Excel	None
		Superstructure and Approach slabs	Plan/elevation/sections	Yes	DGN	None
		Sidewalks, Median	Plan/elevation/sections	Yes	DGN	None
		Overhead sign structures	Plan/elevation/sections/details	Yes	DGN	None
		Bridge mounted sign structures	Plan/elevation/sections/details	Yes	DGN	None
		Architectural treatment	Locations and details	Yes	DGN	None
		Reinforcement	Sections and details	Yes	DGN	Reinforcement Bar list (Excel)

It is important to note that by removing plan sheets it is still crucial to provide reviewable information for both design and bidding reviews. The right most column identifies the mitigation that must be provided as supplemental information which require minimal effort to produce.

2) Special Notes – There is a specific special note that needs to be provided on all digital delivery projects. The MBDD deliverable special note is embedded within the Digital Delivery Guidance Document and is summarized as follows:

I. Definition of Terms
II. Electronic Files
III. Level of Development
IV. Electronic File Content
V. Software Required & Training Videos
VI. Field Revisions to Electronic Files

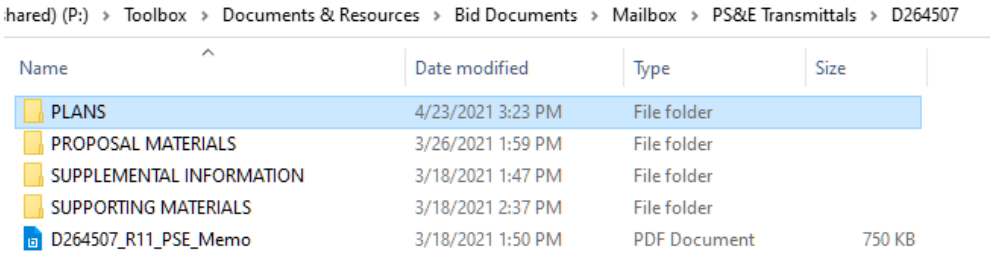
3) Professionally Sealing Digital Data – Sealing digital files and maintaining a "single source of truth" is accomplished by listing the files on a plan drawing titled Electronic Files Identified as Plans. This drawing identifies the name of the digital file, format, date and time and provides a location for professional seal. Both the Microstation drawing and Excel file used to create this sheet are embedded within the Digital Delivery Guidance Document. The number of professionals can be increased or decreased as necessary for your project.



4) Index of Drawings – A revised index of drawings is necessary to provide clarity for downstream users. The index identifies the standard drawings that have been replaced by digital data, provides the file name including format and supporting information to assist with review of the digital data. Refer to the embedded documents within the Digital Delivery Guidance Document for an example index of drawings to utilize as a starting point.

			TOTAL NUMBER OF SHEETS	XXX
INDEX OF DRAWINGS				
SHEET NO.	DESCRIPTION	DRAWING NUMBER	DIGITAL DELIVERY COMPONENT	
			DIGITAL DATA	SUPPORTING INFORMATION (NOTE 1)
	TITLE SHEET	COV-01		
	INDEX AND ABBREVIATIONS	IND-01		
	LEGEND SHEETS	LEG-01 TO LEG-02		
	TYPICAL SECTIONS	TYP-01 TO TYP-00		
	GENERAL NOTES	GNN-01 TO GNN-00		
	WORK ZONE TRAFFIC CONTROL SECTIONS	TCS-01 TO TCS-00		
	WORK ZONE TRAFFIC CONTROL NOTES	TCN-01 TO TCN-00		
	WORK ZONE TRAFFIC CONTROL DETAILS	TCD-01 TO TCD-00		
	WORK ZONE TRAFFIC CONTROL PLANS	TCP-01 TO TCP-00		
	BASELINE TIES	NO DRAWINGS	DXXXXXX_FEA_RWY_BSL.XML	PDF - SURVEY REPORT
	HORIZONTAL CONTROL TABLE	NO DRAWINGS	DXXXXXX_FEA_RWY_ALG.XML	PDF - ALIGNMENT REPORT
	ALIGNMENT PLANS	NO DRAWINGS	DXXXXXX_FEA_RWY_ALG.XML	PDF - ALIGNMENT REPORT
	MAINTENANCE JURISDICTION PLAN	MJP-01 TO MJP-00		
	MAINTENANCE JURISDICTION TABLE	MJT-01 TO MJT-00		
	MISCELLANEOUS TABLES	MST-01 TO MST-00		

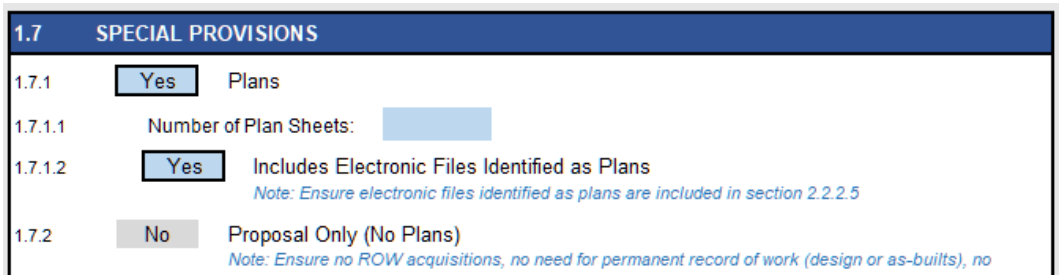
5) DQAB Submittal – Add the traditional plan set and all electronic files identified as plans to the "PLANS" folder

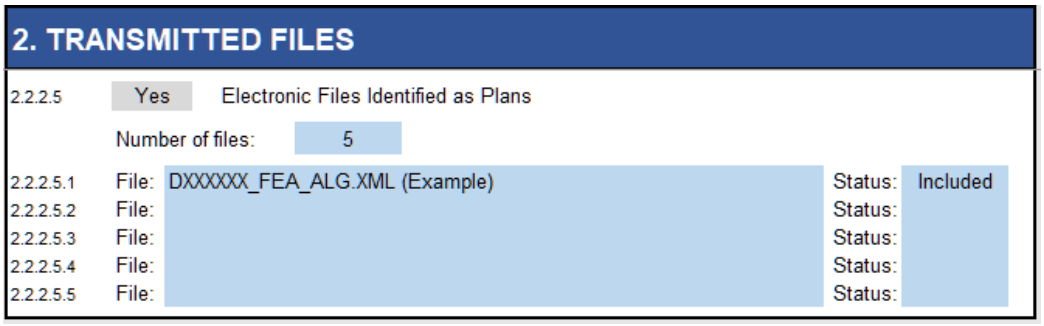


6) CONR9 Information – Provide the mitigating materials to support bid review as supplemental information under section 11. A federated file is prepared for MBDD projects to pull all the contractual and supplemental information into one location to provide a comprehensive model. The federated file will also be provided within this section 11. For example:

FILE NAME *(Including File Format)*	DESCRIPTION	DETAILS
1. CADD DRAWINGS [1]		**CHOOSE...**
2. CADD SURFACES [1]		**CHOOSE...**
3. CADD ALIGNMENTS [1]		**CHOOSE...**
4. QUANTITY WORKUPS [2]		**CHOOSE...**
5. UNSEALED LAYERED PDF or 3D PDF		**CHOOSE...**
6. CROSS SECTIONS		**CHOOSE...**
7. RECORD PLANS		**CHOOSE...**
8. SIGN FACE LAYOUTS		**CHOOSE...**
9. SUBSURFACE INFORMATION		**CHOOSE...**
10. ANTICIPATED CONSTRUCTION SCHEDULE		**CHOOSE...**
11. SPECIAL REPORTS OR OTHER INFORMATION		**Provided**
PIN#_	Federated File (Zip Folder)	Digital
PIN#_	Federated File - Reference Files (Zip Folder)	Digital
PIN#_	Federated File - Embedded Links (Zip Folder)	Digital
PIN#_	Design Approval Document	Digital
PIN#_	Project Labor Agreement	Digital
PIN#_	Stormwater Pollution Prevention Plan	Digital
PIN#_	Permits	Digital

7) PSE Transmittal Memo – The contractual digital files that were identified in step one and submitted to DQAB in step five need to be listed in the transmittal memo as well. Under section 1.7.1.2 select "YES" for Digital Delivery. This will enable section 2.2.2.5 and allow you to list the additional contractual files.





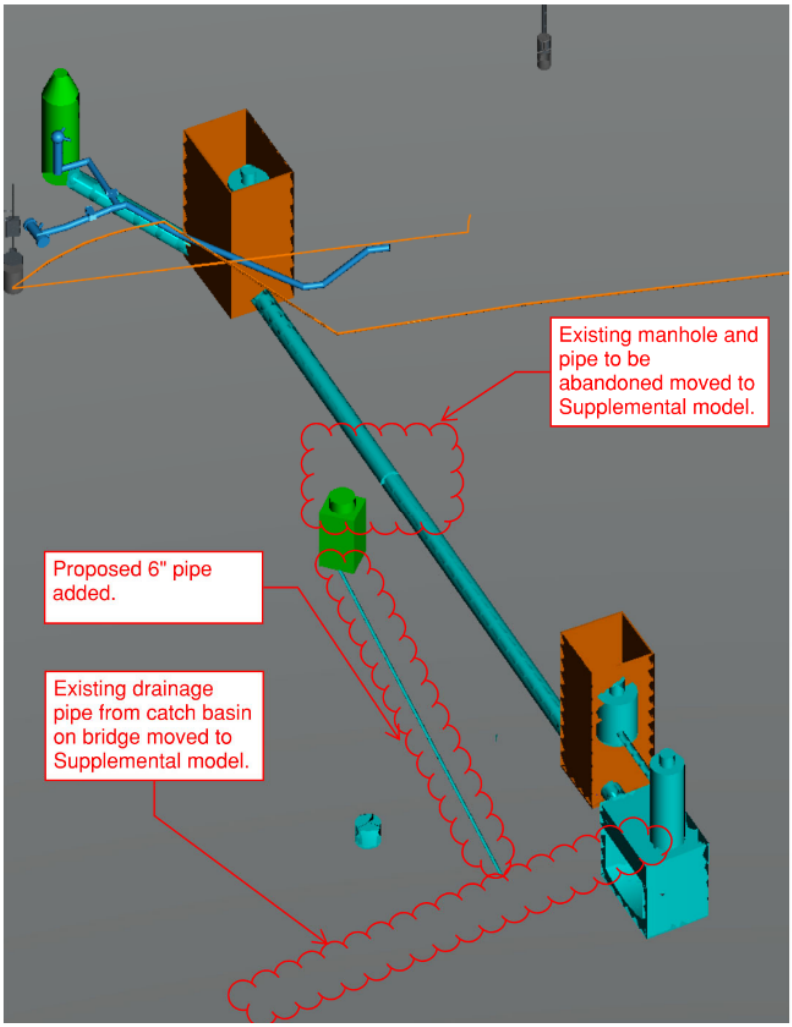
8) Amendments – The electronic files should be treated the same as a plan sheet. If a file is revised it should receive the A1 suffix in the file name. The plan sheet drawing no. ELE-01 also needs to be revised with the new file name, date and time stamp and seal. Within the body of the amendment document, this information needs to be summarized as follows:

1. Electronic Files Identified as Plans deletions/additions/replacements are summarized in the following table:

Old File Name	New File Name	Description of Changes
Dxxxxxx_fea_rwy_alg.xml	Dxxxxxx_fea_rwy_alg_A1.xml	Revised curve 1 horizontal radius from 700' to 800'
Dxxxxxx_fea_rwy_fg.xml	Dxxxxxx_fea_rwy_fg_A1.xml	Updated final grade surface based on changes to curve 1.

It is recommended to provide an illustration with the amendment to illustrate the changes to the model.

UTILITY CHANGES TO MODEL: D264507_fea_utl_proposed_A1.dgn



9) Field Revisions – Again, revisions to the electronic files should be treated in the same manner as a plan sheet. The R1 suffix should be added to the file name. Drawing no. ELE-01 should be updated to provide users with the current version including revised date and time information. If the file was revised by a new professional, there is a box for an altered by seal. There is also a table located at the bottom to summarize all field revisions made to the file during construction.

ELECTRONIC FILES IDENTIFIED AS PLANS - FIELD REVISION SUMMARY			
REVISED FILE NAME	REVISED BY	DATE REVISED	DESCRIPTION OF ALTERATIONS
…EXAMPLE			
DXXXXXX_FEA_RWY_ALG_R1.XML	FIRST LAST NAME	9/8/2022	REVISED HORIZONTAL RADIUS OF CURVE 1 FROM 725' TO 800'

10) As-Builts – All of the electronic files listed on drawing no. ELE-01 at the end of the project need to be provided along with the traditional plan set for as-built records. At this time, it is preferred to also provide the federated CAD model as part of the As-Built information. The best way to do this is provide a zip folder with all of the reference files and embedded links included to retain the data relationships in the future.

