**NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES**

Format and Data Requirements For Digital Drawings Submitted to DMS

The DMS utilizes ArcGIS as it's primary mapping and geospatial analysis tool. DMS recognizes that the wetland and stream design community typically utilizes digital drawing programs such as AutoCAD (.dwg) and MicroStation (.dgn) as their primary design tools. This document is designed to provide specifications regarding the formatting of a subset of feature objects typically rendered in digital drawings that will make the digital submissions more useful to DMS in various asset verification and analysis applications in ArcGIS. This document is <u>not</u> intended to dictate how to render these feature/objects in the printed deliverables nor does it introduce new or unfamiliar features outside the typical experience of DMSs consultant pool.

1.0   Any digital drawing or mapping files submitted must comply with the following:

1.1   Digital drawings must be submitted in its digital drawing format (e.g. DXF/DWG AutoCad1, DGN - Microstation), <u>and</u> ArcGIS shapefiles or an ArcGIS geodatabase format for certain features (see Table II below).

1.2   All providers of digital drawing files are to read the ESRI guidance document entitled "Creating Compatible CAD Data for ArcGIS ® Software An ESRI ® Technical Paper October, 2003" found on the DMS website in the same section as this document or at the URL below. This document details how best to manage digital drawing files for eventual conversion and use in ArcGIS.

Creating Compatible CAD Data for ArcGIS®

1.3   Drawings must be geo-referenced using NAD State Plane North Carolina (US Feet).

1.4   All files submitted directly in GIS will be submitted with complete metadata (.txt or .xml) and projection files (*.prj). DMS uses ESRI ArcGIS software, and requires that metadata be compatible with importation into ArcCatalog. Consultants will use ArcCatalog to create metadata or must create a FGDC compliant metadata text file. (DO NOT use MSWORD to create metadata.) For those consultants who do not wish to use ArcCatalog to create metadata,

Information on creating FGDC compliant metadata can be found at:
http://www.fgdc.gov/metadata/documents/workbook_0501_bmk.pdf

Free metadata editors and validation tools can be downloaded from:
http://www.fgdc.gov/metadata/geospatial-metadata-tools#availabletools

At a minimum the metadata must contain the following information:

1.4.1.   Citation
1.4.2.   Description
1.4.3.   Time Period of Content
1.4.4.   Spatial Domain
1.4.5.   Point of Contact
1.4.6.   Process steps and source citations
1.4.7.   Entity and Attribute Information

1.5   For submittals of the digital drawings files (e.g. CAD, Microstation), the consultant is to use the checklist/form found in the appendix. The form will include the following:

1.5.1   Company Name, designer, contact information.
1.5.2   Surveyor name and contact info (The surveyor can be different than the designer).
1.5.3   Coordinate system
1.5.4   For field data, the date of data collection.
1.5.5   Description of file layers

1.6   Features need to be provided in the shape types as listed in Table II. They can be formatted in any way that is necessary for hard copy rendering, but a feature depicting a polygon must be a closed polygon and the actual underlying lines must not be segmented, but be solid and contiguous.

1.7   Geoferenced layers and their contents must be defined, described and easily distinguished such that features can be readily selected individually or extracted per logical feature categories/groups in ArcGIS. Files will not be submitted with large, undistinguished layers or feature classes/types that cross all sorts of logical groupings without clear differentiation in the underlying data/attribute tables. Table II provides a listing of some features that DMS needs to be able to easily differentiate and extract. It provides a coding structure and required shape type(s). This obviously does not represent the full extent of features produced in digital drawings produced for DMS projects.   Features not in Table II can use existing NCDOT/NCDENR feature labeling/coding conventions, but the overarching requirement of submitting digital files with discernable underlying data tables that permit ready selection and differentiation in an ArcGIS environment, still applies.

2.0   File Naming Conventions

File naming convention – The following provides an example of the desired file naming format for digital drawing files.   ProjName_ProjNum_Phase_Firm_FinalStatus confirmation

Table I. Digital Drawing File Naming Conventions		
Name Component	**Phase**	**Description**

	Coding	
ProjName	NA	Provide project name without spacing
ProjNum	NA	Project number provided by DMS
Firm	NA	Firm Abbreviation
Phase	CE	Conservation Easement
	C*	Conceptual drawing
	MP*	Mitigation Plan drawing
	CD	Construction (Final Design) drawing
	AB	As-built drawing
	MY1	Monitoring Year1 – Current Condition Plan View
	MY2	Monitoring Year2 – Current Condition Plan View
	MYX	Etc.
	RD	Repair design drawing
	RAB	Repair As-built
* Full Digital drawing files are not routinely required until the Final design (construction drawings), however certain features such as easement shapefiles or existing wetland features are sought at earlier phases (See Table II below). Typically, digital drawings are not sought at some of the above phases, but the coding was included in the event they are specifically requested in certain cases. There will be no need for digital submissions of draft versions of drawings, but just for confirmation of the status of the submission please include "Final" at the end of the file name.		

Examples:

JumpingRun(UT)_137_AB_10/1/2014_Final

Project: UT Jumping Run
Project Number: 137
Phase: As-built
Date: Sealing date
Status: Final

A digital drawing file might only require the single file. A full ArcGIS submission would minimally include 3 shapefiles with the above naming convention for each of the 3 shape types (point, polyline, polygon).

3.0   Other Guidance/Notes

3.1 The items listed in Table II are not designed to supplant any detail in digital submissions that the designer/provider typically includes for proper interpretation of the printed deliverable. For example, it is very useful to have the engineered stream structures rendered on plan drawings in forms that are recognizable such as rootwads and vanes, but DMS also requires a point feature (attributed as indicated below) associated with those feature objects.

<div align="center">

Table II

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Use of the Tag Coding below represents an example system. The full name of the Distinct Feature/Layer type or another coding system would be acceptable as well, but the basic requirement is that the objects of the same type are grouped and can be selected in ArcGIS as a group through some organized labeling/coding system whether the feature type is supplied in CAD, Microstation, or ArcGIS.
Note some features are required in ArcGIS - see below

Feature Category	Category[1] Text Tag/Coding	Distinct Feature[2] or Layer Type	Text Tag[2] /Coding	Unique ID ?[3]	Shape Type	GIS Shapefile	FD Task Milestone	DDB Milestone	Description/Note
Site Point	Site	Site Location	SL	N	Point	Required	Proposal	1st site visit	Approximate centroid of project area
Property Boundary And Crossing Features (Asset Impactors)	Boundary	Easement	CE	N	Polygon	Required	Task 2	PO1 Form	Conservation easement as a closed polygon (GIS and CAD formats) GIS at milestone indicated
	Boundary	Fencing	F	N	Polygon	Required			Fencing boundary as polygons (assuming continuity) otherwise polyline
	Boundary	Utility Easement	UE	N	Polygon	Required	6	AB	Label by type using pre-existing NCDOT and NCDENR coding/annotation
	Boundary	Structure	S	N	Polygon	Required			Any pre-existing structure within the easement, which might impact asset/buffer acreage calculations; use DOT symbology and labeling conventions
	Boundary	Access Corridor	AC	N	Polygon	Required			Not a construction access, but a corridor, which will likely be included in the easement language that will permit future access
	Crossings	Ford Crossing	FC	N	Polygon	Required			
	Crossings	Culvert Crossing	CC	N	Polygon	Required	6	AB	
	Crossings	Bridge	B	N	Polygon	Required			
	Crossings	Other	O	N	Polygon	Required			
Contours	Contour	X-contours	X-C	N	Polyline	Useful	6	AB	Only necessary for contours developed by provider/consultant survey as part of As-built X = interval (1,2, foot etc) for contour
Channel Features	Channel	Centerline[7]	CL	Y	Polyline	Required	6	AB	Centerlines broken out using reach breaks and reach ID's (in attribute table) to match the drawing and breakdown in document asset table
	Channel	Thalweg[7]	TL	N	Polyline	Required	6	AB	
	Channel	Bank toe[7]	BT	N	Polyline	Useful	6	AB	Channel features in general and Centerline and Top of Bank in particular are sought for the pre-existing condition as well as the As-built. The pre-existing alignment is a feature that is required in the As-built – See Monitoring Baseline/As-built template. Please distinguish pre-existing features from AB in coding.
	Channel	Bankfull	BKF	N	Polyline	Useful	6	AB	
	Channel	Top of Bank	TOB	Y	Polyline&Polygon	Required	6	AB	
	Channel	Terrace toe	TT	N	Polyline	Useful	6	AB	
	Channel	Top of terrace	TOT	N	Polyline	Useful	6	AB	
Engineered Stream Structures	ESS	Cross Vane	CV	N	Single	Useful	6	AB	
	ESS	Double Drop Vane	DDV	N	Polygon or Point	Useful	6	AB	
	ESS	W-Weir	W	N	Polygon or Point	Useful	6	AB	
	ESS	Single Arm Vane	SAV	N	Polygon or Point	Useful	6	AB	
	ESS	SingleArmVane w/Sill	SAVS	N	Polygon or Point	Useful	6	AB	
	ESS	J-Hook	J	N	Polygon or Point	Useful	6	AB	
	ESS	Sill	S	N	Polygon or Point	Useful	6	AB	
	ESS	Elevated Sill	ES	N	Polygon or Point	Useful	6	AB	
	ESS	Rootwad	RW	N	Polygon or Point	Useful	6	AB	The adjacent are examples among possible types. As indicated above, the basic requirement is that the objects of the same type are grouped and can be selected in ArcGIS as a group through some organized labeling/coding system whether the feature type is supplied in CAD, Microstation, or ArcGIS.
	ESS	Root Wrap	RWP	N	Polygon or Point	Useful	6	AB	
	ESS	Boulder	B	N	Polygon or Point	Useful	6	AB	
	ESS	Toe Log	TL	N	Polygon or Point	Useful	6	AB	
	ESS	Cover Log	CL	N	Polygon or Point	Useful	6	AB	
	ESS	Wing Deflector	D	N	Polygon or Point	Useful	6	AB	
	ESS	Double Wing Deflectr	DWD	N	Polygon or Point	Useful	6	AB	
	ESS	Step Pool	SP	N	Polygon or Point	Useful	6	AB	
	ESS	Constructed Riffle	CR	N	Polygon or Point	Useful	6	AB	
	ESS	Channel Plug	CP	N	Polygon or Point	Useful	6	AB	
	ESS	Brush Mattress	BM	N	Polygon or Point	Useful	6	AB	
	ESS	AOP Structure	AOP	N	Polygon or Point	Useful	6	AB	
	ESS	Other	O	N	Polygon or Point	Useful	6	AB	
Wetland Features					As with stream channel features the pre-existing wetland features from the mitigation plan figures are sought as well as wetland features in the the as-built				
	WET	Surface Water	SW	N	Polygons	Required	3,6	MP, AB	Existing surface water feature (e.g. pond) within the project extent or one of hydrologic influence on the project
	WET	Pool Feature	P	N	Polygons	Required	3,6	MP, AB	Constructed Vernal Pool
	WET	Wetland Tract	WT	Y	Polygons	Required	3,6	MP, AB	Boundary of a wetland feature that is some form of wetland asset – Unique Identifier for each feature or each type (e.g. Non-riparian restoration)
	WET	Wetland Feature	WF	N	Polygons	Required	3,6	MP, AB	Boundary of a wetland feature that is not a mitigation feature.
Vegetation Features	VEG	Vegetated Buffer	VB	N	Polygons	Required	6	AB	Sections of easement with existing vegetation not requiring any planting or vegetative augmentation (including invasives removal/control)
	VEG	Planted buffer	PB	N	Polygons	Required	6	AB	Extent of buffer that was planted = planted acreage
	VEG	Planting zones	PZ	Y	Polygons	Required	6	AB	Planting and vegetative augmentation (e.g. invasive removal) zones as per planting plan
Best Management Practice Stormwater & Ag.	BMP	Bioretention Cell	BR	N	Polygon	Useful	6	AB	The adjacent are examples among many possible types. As indicated above the basic requirement is that the objects of the same type are grouped and can be selected in ArcGIS as a group through some organized labeling/coding system whether the feature type is supplied in CAD, Microstation, or ArcGIS.
	BMP	Stormwater Wetland	SW	N	Polygon	Useful	6	AB	
	BMP	Dry Detention Pond	DDP	N	Polygon	Useful	6	AB	
	BMP	Wet Detention Pond	WDP	N	Polygon	Useful	6	AB	
	BMP	Swale	S	N	Polygon	Useful	6	AB	
	BMP	Watering Systems	NI	N	Polygon	Useful	6	AB	

Feature Category	Category[1] Text Tag/Coding	Distinct Feature[2] or Layer Type	Text Tag[2] Coding	Unique ID ?[3]	Shape Type	GIS Shapefile	FD Task Milestone	DDB Milestone	Description
Monitoring and Survey	MS	Benchmark/Control	BM	Y	Point	Useful	3,6	MP, AB	Label as property, design, permanent, temporary etc.
	MS	Cross-Section	XS	Y	Polyline	Required	3,6	MP, AB	
	MS	Groundwater Gauge	GG	Y	Point	Required	3,6	MP, AB	
	MS	Crest Gauge	CG	Y	Point	Required	3,6	MP, AB	
	MS	Stream Gauge	SG	Y	Point	Required	3,6	MP, AB	
	MS	Precipitation Gauge	PG	Y	Point	Required	3,6	MP, AB	Unique ID field (see footnote 3) These features may be monitored during the design phase as well
	MS	Vegetation Plot[4]	VP	Y	Polygon	Required	3,6	MP, AB	
	MS	Photo Points	PP	Y	Point	Required	3,6	MP, AB	
	MS	Water Quality Samp	WQ	Y	Point	Required	3,6	MP, AB	
	MS	Biological Samp Point	B	Y	Point	Required	3,6	MP, AB	
	MS	Other	O	Y	Point	Required	3,6	MP, AB	
Annual CCPV Features		Bank Erosion Areas	BE	N	Polyline	Required	7-13	MYX	
		Beaver Dams	B	N	Polyline	Required	7-13	MYX	
		Impounded Areas	I	N	Polygon	Required	7-13	MYX	See monitoring template. These features are provided as part of standard digital submission for monitoring
		Encroachments	E	N	Polygon	Required	7-13	MYX	
		Invasives Areas	IV	N	Polygon	Required	7-13	MYX	
		Areas of veg deficiency	V	N	Polygon	Required	7-13	MYX	

1 = Expected name for major feature groupings of interest. This will be the first level of organization and will be housed in a field in the underlying table regardless of digital format.

2 = Next layer of feature organization. Use of the Tag Coding above represents an example system. The full name of the object category is acceptable as well. The basic requirement is that the objects of the same type are grouped and can be selected as a group in ArcGIS

3 = A final layer of differentiation that may be useful for any feature type that has more than one occurrence, it could be reach names, or veg plots (VP1, VP2 etc.) A "Y" indicates that feature type requires unique identifiers.

Appendix

Electronic Drawing Data Submittal Form				
Project Name:			Project ID:	
County:				
CU:			HUC:	
Design Firm:				
Contact Name:				
Contact Phone:				
Contact E-mail:				
Survey Company:				
Surveyor Name:				
Surveyor Phone:				
Surveyor E-mail:				
Is File Georeferenced?	Y	N		
Coordinate System:	State Plane Feet NAD 83		Other?	
Comments:				