

Export Field Data to GEOPAK Drainage

1.1 Overview

The Export to GEOPAK Drainage tool can be utilized to leverage data collected by field surveys (i.e., pipes and structures) into a GEOPAK Drainage project. This can be extremely useful when the current system is changed or augmented with new structures, which is often the case in today's transportation and site projects.

Note: GEOPAK Drainage is not required to export to Drainage, but is needed to open the drainage project for subsequent review.

The key to leveraging survey data into drainage is GEOPAK's ability to determine the feature code within Surveys and its relationship to items within the GEOPAK Drainage Library. This association between the Survey Manager Database and the Drainage Library is a Data Dictionary file. This file (not to be confused with the data dictionary files on many data collectors and GPS equipment) is an ASCII file which associates each Feature code which could be used for drainage applications and the Item within the Drainage Library. This file can be set up based on the organization's SMD and DLB; therefore, one file can be utilized throughout the organization.

Survey points are utilized for the structures (referred to as nodes within GEOPAK Drainage), while survey chains define the pipes (referred to links within GEOPAK Drainage.)

GEOPAK scans the specified Coordinate Geometry (GPK) file which contains the field data, compares each feature name (and size for pipes) to the Data Dictionary file, and then displays any item for which a match is found. In this way, nodes and pipes are displayed, while non-drainage items (such as trees and fences) are not utilized. Once the items are displayed, the user has the option to use only those items for a particular processing. In this way, any items which are outside the area on interest may be removed from consideration.

When processed, GEOPAK finds the node with the lowest invert and assumes this is an outlet. Then it finds all connected pipes and that becomes a network. Then the process is repeated until all nodes and links are part of a network. A network is a series of links and nodes, interconnected flowing to a single outlet.

The pipes, links, and networks are stored in the specified Drainage Project File. Using GEOPAK Drainage, the user can then review, modify or utilize the information within the design or upgrade of the drainage project.

Note: The project must be created prior to commencing the export process.

1.2 Data Collection

In order to export drainage data, two items must be noted during the field collection.

Each pipe must be one survey chain. While COGO supports more than two vertices per survey chain, exporting to GEOPAK Drainage does not. Each end of the chain must have one of the link (pipe) features. See Excel spreadsheet (Drainage Features.xls) for supported link features. A pipe also has to have a node feature associated with it. For example, a pipe with no apron would be both an RCP and END.

Each pipe must have a Size and Condition. These must be placed as the first characters in the description field (separated by a space), as illustrated in the sample OBS editor dialog below.

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	S DW65220	DTM:+	GeomrP	Zn;1	CEND X:	543972,787 Ti	173145.432 Zi	1441.950		-
	5 DW65221	DTM:+	Geom:P	Znt 1	CCMP10 In	543972.707 Y	170145,403 7:	1441,990		1
	S DW65230	DTH:+	Geom: P	In:1	CAPR Z:	544022.783 Y:	173106.660 2:	1441.548		
	- 6 D¥65231	DTN:+	Geom: P	Zn:1	CCMP11 X:	544024.682 Y	: 173105.126 2:	1441.524		
-	5 DV6524D	DTN:+	Geom: P	Zn:1	CAPR X:	544058.036 T:	173083.494 2:	1441.748		
	DW65241	DTN:+	Geom: P	Zn:1	CCMP11 X:	544055.813 Y	: 173085.023 Z:	1441.587		
	-6 DW65250	DTH:+	Geom: P	In:1	CEND X:	544111.896 Y:	173055.784 2:	1441.351		
	- DW65251	DTM:+	Geom:P	Zn:1	CCMP12 I:	544111,896 Y	: 173055.784 2:	1441.351		
	S DW65260	DTH:+	GeomrP	Zn:1	CEND I:	544135.009 T:	173042.367 Zi	1440.524		- 7
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	D¥65280	DTN:+	GeomsP	Zn:1	STMM X:	594291.124 1:	173034,461 2:	1444.679		
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-	DW65283	DTH:+	Geom:P	Zn:1	CRCP4 X:	544291.124 Yr	173034.461 %:	1439.189		
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DW65290	CEND		01MM	7	544111.896	173055.784	1641.351 P	+	1	1
DW65251	OCMP12	BL*	12.0 M	£7	544111.896	173055.784	1441.351	+	1	
DW65260	CEND		O 1 MM	T	544135.000	173042.367	1440,524 P	+	1	
D4465261	COMP12	F1.*	32 D M	ØT	544135.009	173042.367	1440.524 P	+	1	
0465270	CEND		DIMM	T	544260-083	172981.869	1439.595 P	+	1	
04405271	CRCP3		24014	OT-u	\$44260-091	172981 869	1439.595 P	+	1	
DW65290	STMH	CL*	DIMN	T	544291.124	173034.461	1444.679.P	+	1	-6
DW65281	COMP13	BL*	18019	DT R.	544291.124	173034.461	1439,189 P	+	1	6
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1.2.1 Field Numbering Scheme

Each structure should be given a unique number. (i.e. 1234) which should be included in all the point numbers for that horizontal location.

Example: Structure 1234

The surface point number should be **12340**, the first inlet/outlet down would be **12341**, and the second down would be **12342**.

For additional identification of points a prefix can be utilized. (SUR12340).

1.2.2 Pipe Size and Condition

The highlighted line shows a pipe size of 12 inches and a condition of 0. The other endpoint of the pipe is the fourth line, where the size is also 12 inches and condition of 0. If two different sizes are given for a single pipe, the first size is utilized, while the second is ignored. If no condition is collected, simply set to 0.

If the pipe size is unknown, set the size to 0. The pipe is exported to drainage as a default (unknown) size. If each end of the pipe is a different size, the first collected point is the governing size.

The Size must match with an entry in the data dictionary file, while the Condition can be 0-4. See Lisa's condition chart.

The size is utilized as the size in the Drainage link, while the beginning and ending condition are placed in the Drainage Link description field. See Excel spreadsheet (Drainage Features.xls) for supported link features.

1.2.3 Sample of Field Output Files and Processing Settings

A comma separated file from Trimble output.

DW65171,543747.235,173278.202,1442.255,CCMP8-12 0 MNDT FL RP12.432
DW65180,543779.784,173258.431,1442.106,CEND-0 1 MNDT
DW65181.543779.784.173258.431.1442.106.CCMP8-12 0 MNDT FL RP12.432
DW65190 543854 405 173217 049 1441 807 CEND-0 1 MNDT
DW65191 543854 405 173217 049 1441 807 CCMP9-12 0 MNDT FT RP12 410
DW65200 543878 078 173202 861 1441 801 CEND-0 1 MNDT
DUGE201 E43979 079 173202 861 1441 901 COMP9-12 0 MNDT FT DD12 410
DUG2210 E42040 200 172120 2001,1442 E1 (CON D-12 0 MDT PL M12.410
DW05210,545545.250,173155.205,1442.551,CCMD-0 1 MMD1
DW65211,543949.290,173159.265,1442.551,CCMPI0-12 0 MMDI FL KPI2.388
DW65220,543972.787,173145.432,1441.998,CEND-0 1 MNDI
DW65221,543972.787,173145.432,1441.998,CCMP10-12 U MNDT FL RP12.88
DW65230,544022.783,173106.688,1441.548,CAPR-0 1 MNDT
DW65231,544024.682,173105.128,1441.524,CCMP11-24 0 MNDT FL RP12.370
DW65240,544058.036,173083.494,1441.748,CAPR-0 1 MNDT
DW65241.544055.813.173085.023.1441.587.CCMP11-24 0 MNDT FL RP12.370
DW65250 544111 896 173055 784 1441 351 CEND-0 1 MNDT
DW65251 544111 896 173055 784 1441 351 CCMP12-12 0 MNDT FT RP12 353
DW65260 544135 009 173042 367 1440 524 CEND-0 1 MNDT
DW62261 C44125 009 173042 267 1440 524 CCWD12 12 0 WNDT FT DD12 252
DW05230 54433.007,173042.307,1440.324,CCH12=12.0 HMD1 FL R12.333
DW65270,544260.081,172781.869,1439.575,CEND=0 1 MNDT FT DP 12.021
DW652/1,544260.081,1/2981.869,1439.595,CRCP3-24 0 MND1 FL RP 12.324
DW65280,544291.124,173034.461,1444.679,STMH-0 1 MNDT
DW65281,544291.124,173034.461,1439.189,CCMP13-18 0 MNDT FL
DW65282,544291.124,173034.461,1439.189,CRCP3-24 0 MNDT FL

XYZ to Coordinates User : Jon Dataset : Drain	8
File \CAES\TEST\Survey\DrainProcessing\drain.txt Q	
Delimiter . Comment Delimiter Dash	
DW65000,540507.149,174567.298,1463.136,CAPR-0 1 MNDT	*
DW65001,540507.026,174565.648,1463.282,CCMP1-18 0 MNDT FL RP13.025	
DW65010,540498.371,174492.332,1463.830,CAPR-0 1 MNDT	
DW65011,540498.565,174493.858,1463.953,CCMP1-18 0 MNDT FL	Ŧ
DW65001 540507.026 174565.648 1463.282 CCMP1	
PNum V V V PCode PCode	•
Reset Next >> Link w/ No Gap (LF) ▼ Chain	•
Load ASCII Dialog On Dataset Open Process Import After Process	
Open Editor After Processing	
Process LcodePcode same as Raw Data	

A output file from a Geodimeter Faceplate

4=BL* RCP8-12 0 FILLED 50=B042303B 5=64441 WITH SILT 2=514 6=8.25 37=189418.140 7=29.5021 5=64452 38=587827.925 8=89.2504 6=9.75 39=894.960 9=499.48 7=31.2644 62=174 4=CB 8=89.2214 37=190476.800 5=64450 9=499.24 38=588570.070 6=4.920 4=UPT-VOLVO 39=907.095 7=31.2644 5=C172 21=35.0153 8=89.2214 6 = 5.25011=0.000 9=499.24 7=194.5726 3=0.000 4=EL* RCP7-12 0 FILLED 8=90.1730 4=CB WITH SILT 9=943.42 5=64440 5=64451 4=UPT-GUL 6=4.920 6=8.920 5=C171 7=29.5021 7=31.2644 6=4.940 8=89.2504 8=89.2214 7=198.3822 9=499.48 9=499.24 8=90.0319 4=BL* RCP7-12 0 FILLED 9=1671.13

Note: The **Apply Best Match Feature** is supported in the Exporting to GEOPAK Drainage procedure.

1.3 Exporting to GEOPAK Drainage Dialog

The general workflow is detailed below:

- 1. Process data with GEOPAK Survey through the Import to GPK step.
- **2.** GEOPAK Drainage utilizes a drainage project file (.gdf). Seed files have been created, so Surveys can copy the seed file from:

pw:\\pw8i.ad.dot.state.mn.us:cadp\Documents\CADDStandards\MnDOTStandards\DOT_GEOPAK\dlb\eseed. gdf

- Copy this file into the working directory and rename to project specific name. Do not change the gdf extension.
 - **3.** Invoke the Export to GEOPAK Drainage by selecting **Geometry>Export>Drainage** from the Survey Project dialog.



When selecting **Drainage** from pull down, the dialog below opens.

🐂 Export Survey	to Drainage	
Job Number: Data Dictionary: Drainage Project: Drainage Library: Survey Nodes	001 Select urveys\drainage urvey\DrainProc rds\DOT_GEOP	t vmndot_sur2drg.dic Q essing\s691699.gdf Q AK\dlb\MnDOT.dlb Q
Point Name	Feature	•
Survey Links Chain Name	Size	Feature
Location Tolerand	ce: 0.000	Load Survey Data
Networks	# Nodes	# Links
	Apply	/

The dialog is divided into four main sections:

- Project Information defines the location of the various files needed for exporting
- Survey Nodes displays the survey points in the current coordinate geometry database which have feature names in the Data Dictionary file.
- Survey Links displays the survey chains in the current coordinate geometry database which have feature names in the Data Dictionary file.
- Networks After exporting data, the created networks and number of Links and Nodes are displayed.
- **4.** Populate the Project Information data at the top of the dialog. One sample dialog fragment is depicted below.

🐂 Export Survey	to Drainage 🗖 🗖 🖾
Job Number:	001 Select
Data Dictionary:	urveys\drainage\mndot_sur2drg.dic
Drainage Project:	urvey\DrainProcessing\s691699.gdf
Drainage Library:	rds\DOT_GEOPAK\dlb\MnDOT.dlb

The four fields in the Project Information section are detailed in the table below.

Job Number (GPK): GEOPAK coordinate geometry database which contains all field information for the project. Note the application will sort export only drainage information, leaving non-drainage information intact.

Data Dictionary (DIC): ASCII file (comma separated) which contains the Survey Feature Names and associated Drainage Library Items. Note this file contains all possible links (pipes) and nodes (structures). GEOPAK determines which are utilized on each project and ignores the rest. This file can be found at:

pw:\\PW8i.ad.dot.state.mn.us:cadp\Documents\CADDStandards\MnDOTStandards\DOT_GEOPAK\surv eys\drainage\mndot_sur2drg.dic

Drainage Project (GDF): Name of the drainage project created in the previous step. This is project specific, not the seed drainage project on the server.

Drainage Library File (DLB): Reference to the Drainage Library file containing the Node Library and Link Library items. This file can be located at:

pw:\\pw8i.ad.dot.state.mn.us:cadp\Documents\CADDStandards\MnDOTStandards\DOT_GEOPAK\dlb\ MnDOT.dlb 5. Press the Load Survey Data button, which reads the GPK file, determines which points and survey chains have features matching the Data Dictionary, and populates the Survey Nodes and Survey Links list boxes. One sample dialog is depicted below.

🐂 Export Survey	to Drainage		×				
Job Number: 001 Select							
Data Dictionary: urveys\drainage\mndot_sur2drg.dic 🔍							
Drainage Project: urvey\DrainProcessing\s691699.gdf Q							
Survey Nodes -			· .				
Point Name	Feat	ure					
DW65000	CAP	R	Tel I				
DW65010	CAP	R					
DW65020	CAF	R					
DW65030	CAP	R	-				
Survey Links Chain Name	Size	Feature					
CCMP10	12	CCMP					
CCMP12	12	CCMP					
CCMP3	12	CCMP					
CCMP5	18	CCMP	Ŧ				
Location Toleran	nce: 0.000	Load Survey Da	ta				
Networks	# Nodes	# Links					
	Ap	ply					

6. To verify results, compare the COGO Navigator Survey Chains to the Survey Links in the Export dialog. Then compare COGO Navigator Points to the Survey Nodes in the Export dialog.

🛛 Navigator ((99) 📃 🗖 🔀
Select Tools	
🏹 🗙 📝	id 👌 🗎 🖓
Element :	Point 💌
Name	Feature 🖉 🔬
DW65021	CCMP2
DW65031	CCMP2
DW65041	CCMP3
DW65051	CCMP3
DW65071	CCMP4
DW65091	CCMP4
DW65111	CCMP5
DW65121	CCMP5
DW65131	CCMP6
DW65141	CCMP6
DW65151	CCMP7
	2

🛛 Navigato	r (99) 📃 🗖	×
Select Tools	i	
% × ₽] id 👌 🗎 🛛	8
Element :	Survey Chain 😒	
Name /	Feature	^
CCMP18	CCMP18	
CCMP19	CCMP19	-
CCMP2	CCMP2	
CCMP3	CCMP3	
CCMP4	CCMP4	
CCMP5	CCMP5	
CCMP6	CCMP6	
CCMP7	CCMP7	
CCMP8	CCMP8	
CCMP9	CCMP9	
CEND	CEND	~
<	2	

7. Highlight the Survey Nodes and Survey Links to be utilized in the exporting process, (which is normally all items). To highlight all entries, highlight one, then press the <control> A on the keyboard. Repeat the process for the Survey Links. One sample dialog is depicted below.

🐂 Export Survey	to Drainage		
Job Number:	001 Selec	ct	
Data Dictionary:	urveys\drainage	mndot_sur2drg.dic	; Q
Drainage Project:	urvey\DrainProc	cessing\s691699.gd	# Q
Drainage Library:	rds\DOT_GEOF	AK\dlb\MnDOT.dlt	5 Q
Survey Nodes			
Point Name	Featur	e	
DW65000	CAPR	}	=
DW65010	CAPR	}	
DW65020	CAPR	}	
DW65030	CAPR	1	T
Converse Limbra			
Survey Links	_	_	
Chain Name	Size	Feature	
CCMP10	12	CCMP	
CCMP12	12	CCMP	
CCMP3	12	CCMP	
CCMP5	18	CCMP	T
Location Toleran	ce: 0.000	Load Survey	Data
Networks	# Nodes	# Links	
	Appl	y	

- 8. The Location Tolerance must be defined prior to processing. When collecting pipe and link data, the shot at the end of the pipe should be at the center of the structure, which is generally where the structure shot is taken. Therefore the X, Y coordinate of the pipe and link may not be exact. If the end of a link is within the Location Tolerance of the structure, the link will be included in the building of networks. If the end of the link is outside the Location Tolerance, it will not be included. Therefore, if you set the Location Tolerance to 1.0, this should be acceptable for the majority of projects.
- 9. After setting the **Location Tolerance**, press the **Apply** button to commence processing.

GEOPAK finds the node with the lowest invert and assumes this is an outlet. Then it finds all connected pipes and that becomes a network. It repeats the process until all nodes and links are part of a network. At this time you will see the bottom of the box populate with the data.

🐂 Export Survey	to Drainage		×				
Job Number:	001 Se	lect					
Data Dictionary: urveys\drainage\mndot_sur2drg.dic $\$							
Drainage Project: urvey\DrainProcessing\s691699.gdf							
Drainage Library: rds\DOT GEOPAK\dlb\MnDOT.dlb							
Survey Nodes							
Point Name	Fea	ture					
DW65000	CA	PR					
DW65010	CAI	PR					
DW65020	CA	PR					
DW65030	CA	PR	-				
Survey Links Chain Name CCMP10 CCMP12 CCMP3	Size 12 12 12	Feature CCMP CCMP CCMP	•				
CCMP5	18	CCMP	-				
Location Tolerance: 0.000 Load Survey Data							
Networks	# Nodes	# Links	•				
DW65300	3	2					
DW65260	2	1					
DW65200	2	1					
DW65220	2	1	Ψ.				
	A	oply					

- **10.** In the working directory, open the OrphanNodesLinks.log file to determine drainage field data that was not exported. Links without a node or a node without links are listed here. Resolve any problems and re-run if necessary. This may entail additional field data and a additional survey run to be processed, or editing of current data in the appropriate areas.
- 12. Use" Validation of Exported Field Data in GEOPAK Drainage" Document located at <u>http://www3.dot.state.mn.us/help/help.html</u>
- **11.** The following deliverables should be included for the Hydraulics / Design personnel:
 - GPK file
 - Survey Design file
 - Drainage project (gdf) file