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.

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 FL RP12.410
DW65200,543878.078,173202.861,1441.801,CEND-0 1 MNDT
DW65201,543878.078,173202.861,1441.801,CCMP9-12 0 MNDT FL RP12.410
DW65210,543949.290,173159.265,1442.551,CEND-0 1 MNDT
DW65211,543949.290,173159.265,1442.551,CCMP10-12 0 MNDT FL RP12.388
DW65220,543972.787,173145.432,1441.998,CEND-0 1 MNDT
DW65221,543972.787,173145.432,1441.998,CCMP10-12 0 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 FL RP12.353
DW65260,544135.009,173042.367,1440.524,CEND-0 1 MNDT
DW65261,544135.009,173042.367,1440.524,CCMP12-12 0 MNDT FL RP12.353
DW65270,544260.081,172981.869,1439.595,CEND-0 1 MNDT
DW65271,544260.081,172981.869,1439.595,CRCP3-24 0 MNDT 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
```

A output file from a Geodimeter Faceplate

50=B042303B	5=64441	4=BL* RCP8-12 0 FILLED
2=514	6=8.25	WITH SILT
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=5.250
11=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:
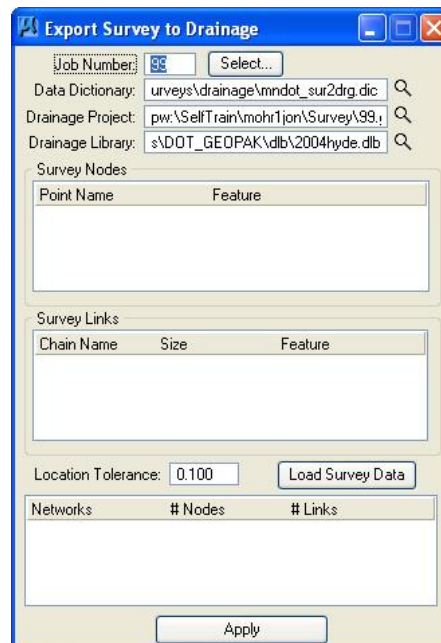
pw:\\PW8i.ad.dot.state.mn.us:cadp\Documents\CADDStandards\MnDOTStandards\DOT_GEOPAK\surveys\drainage\esurvey04.gdf

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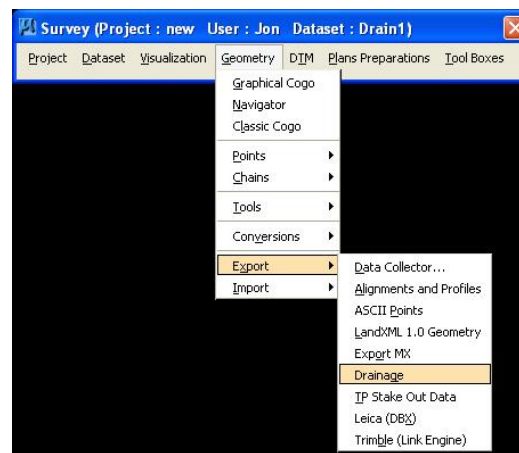
When selecting **Drainage** from pull down, the dialog below opens.

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.

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\surveys\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\2004hyde.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.
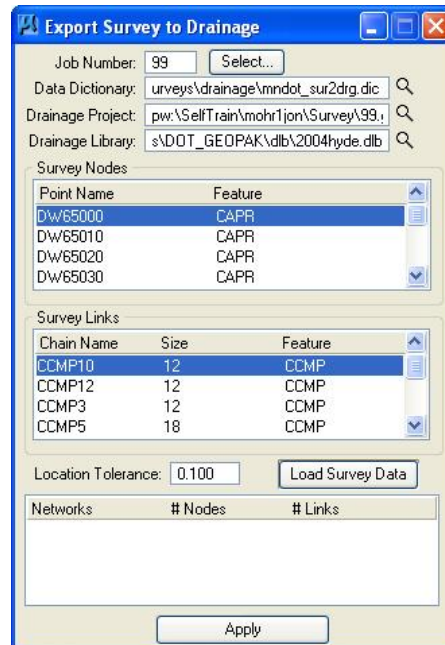
6. To verify results, compare the COGO Navigator Survey Chains to the Survey Links in the Export dialog. Then compare COGO Navigator Points to the Survey Nodes in the Export dialog.
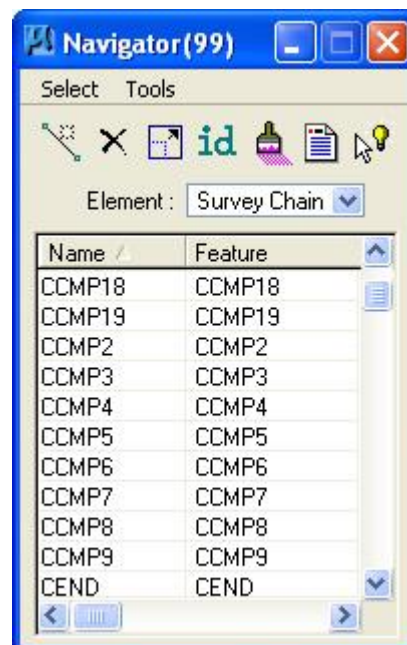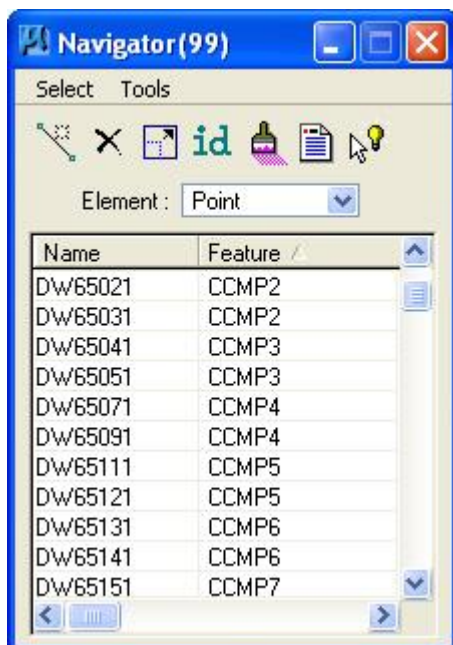
7. Highlight the Survey Nodes and Survey Links to be utilized in the exporting process, (which is normally all items). To highlight all entries, highlight one, then press the <control> A on the keyboard. Repeat the process for the Survey Links. One sample dialog is depicted below.

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.

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** http://www3.dot.state.mn.us/help/help.html

11.   The following deliverables should be included for the Hydraulics / Design personnel:

- GPK file
- Survey Design file
- Drainage project (gdf) file