User's Manual for DLG2SHP Version 3

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1. Installation

DLG2SHP version 3 is installed by running the setup program, setupdlg.exe. To install the program, simply start the setup program. Follow the screen instructions to install the program.

2. What the Program Does

DLG2SHP is a Windows application for converting USGS Digital Line Graphs-3 (DLG3) in Optional Format or SDTS Format to ArcView shape files. Descriptions of these files can be found at http://www-nmd.usgs.gov/www/html/2nmpgds.html. DLG files are supplied by the US Geological Survey in one of two formats: either optional format (often called DLG-O) or Spatial Data Transfer Standard format. These programs will work with either format. You can download data from http://edcwww.cr.usgs.gov/doc/edchome/ndcdb/ndcdb.html.

DLG2SHP has many features that make converting DLG-O and DLG-SDTS files a simple matter of point-and-click. Here are some of their major features:

- **Automatic Decompression of Files**. No more fooling around with WinZip Options! DLG2SHP will automatically un-gzip and un-tar SDTS and Optional format dlgs.
- **Batch Processing**. You can set up the program to convert several DLG files in one session. It is a simple and easy process.
- **Output Directory Options**. You can specify a directory under which you want the program to write each DLG's shape (each DLG gets its own subdirectory under a parent directory you set). You can set the parent directory for each DLG individually, or specify a default parent directory for all DLGs you wish to process.
- **Descriptive Directory Names for SDTS DLGs**. Output directories are given the same name as the SDTS DLG plus a time stamp (to ensure unique directory names.) For example, the output directory "ARLINGTON__TN___HYDROGRAPHY1_11_20_09" would contain Hydrography for Arlington, TN. The shape files were created on January 11 at 8:09 PM.
- **Automatic Assignment of Elevations for SDTS Hypsography**. SDTS Hypsography shape features are automatically assigned elevations (lines and points). There is no need for joining an elevation table to the shapes—DLG2SHP does this for you. (Please see the note on Carrying Contours, below).
- **Conversion of Degenerate Line Cases in Optional Format**. DLGs, particularly at the 1:2000000 scale, can contain degenerate lines (lines of zero length). DLG2SHP converts degenerate lines to node features, making them easier to display in your GIS.
- **Complete SDTS Format Attribute Coding**. SDTS format DLGs contain many tables. DLG2SHP converts these tables to dbf files with key fields for easy joining and linking to the geographic entities to which they refer. The

shapes and attribute tables have descriptive names for ease in linking. The additional tables are discussed in section 4.4, below.

- **Optional Format Attribute Coding**. One problem in working with DLGs is that features (points, lines, or areas) can have a varying number of attributes. Because of this, it is impossible to know how many columns an attribute file will have. DLG2SHP seeds the attribute files of features with basic information. They also produce up to four extra dbf files (one for nodes, one for lines, one for degenerate lines, and one for areas) that can be linked to map features with a one-to-many relationship. These new dbf files include all attributes in a DLG that are not included in the basic feature attribute tables.
- **Feature From/To Topology and Line Lengths**. In DLGs all features have complete topology, similar to the whole polygon model used in ArcInfo. DLG2SHP reports this topology and calculate line lengths during the conversion.

2.1 Layers That Are Extracted

A DLG3 file contains point, line, and polygon layers for a particular feature type. The major feature types that DLG3 files cover are:

- Hypsography
- Hydrography
- Vegetative Surface Cover
- Non-vegetative Features
- Boundaries
- Survey Control and Markers
- Transportation: In SDTS format, all transport features are in one DLG. In Optional format, they are broken into 3 groups: Roads and Trails, Railroads and Pipelines, Transmission Lines, Miscellaneous Transportation Features
- Manmade Features
- US Public Land Survey System

For each type of feature in a DLG, the program will generate shapes for points, lines, and areas. Each of these topological structures contains certain basic attributes.

- Nodes. The basic attribute is the node ID.
- Lines. The basic attributes are the line ID, the from node ID, the to node ID, the polygon on the left of the line, the polygon on the right of the line, and the length of the line.
- Areas. The basic attribute is the area id. For Optional Format DLGs, the X coordinate of the polygon centroid, and the Y coordinate of the polygon centroid also are included. For SDTS format DLGs, the centroids are stored as a separate point shape.

More attributes are stored in tables that can be joined or linked to each map layer.

3. Using the Program

To use DLG2SHP, simply click on its entry in the program folder.

3.1 Specifying the Files to Process

When the program starts, the following figure will appear on the screen.

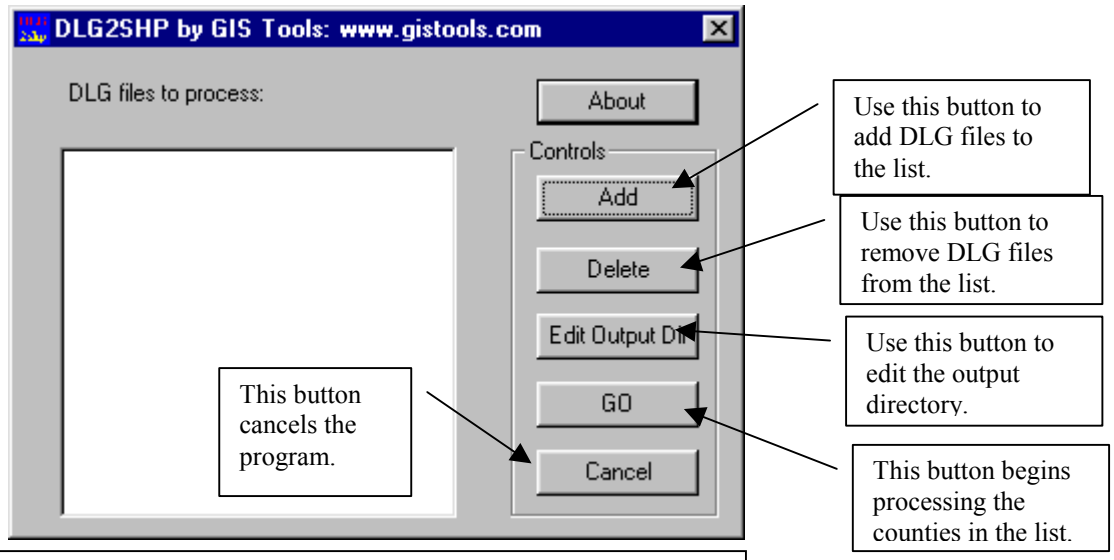

Figure 1. The Program's Main Screen

You use DLG2SHP by building a list of DLG files you wish to process, setting their output directory, and then pressing GO. To add DLG files, press the Add button. A standard Windows Explorer Open-File dialog will appear. Navigate to where the DLG files are located. The Open-File dialog has options for four types of files (Figure 2):

Compressed files (*.gz or *.tar files)
SDTS format DLGs
Optional format DLGs
All files

The Open-File dialog supports multiple selection of files—very handy when you want to process a large number of DLGs. To select several files at one time, you can hold down the shift key to select all files between the first one and the last one you click on, or hold down the control key to select several DLGs individually.

3.2 The Output Parent Directory

Once the input files are selected by clicking the Open button in the file dialog, you will be prompted to set the "Output Parent Directory". This is the directory under which the program will write the shape files. For example, if the Output Parent Directory

were C:\mydlg, then a new subdirectory would be created under it for each DLG file that uses this as its Output Parent Directory. The directory where the files are written depends on the type DLG being processed.

Optional Format: If file Az2milhy (Arizona, 1:2000000, hydrography) used this as the parent directory, then a directory called Az2milhyshp (if extracting shapes) would be created under C:\mydlg. All the shape files created by the program for this DLG file will be in directory C:\mydlg\Az2milhyshp\. In addition, a LOG file, called Az2milhy.LOG will be created under C:\mydlg\Az2milhyshp.

SDTS Format: The output will be written to a directory named for the DLG area and layer type concatenated with the month, day, hour and minute that the shapes were created. An example directory would be CHATTANOOGA_TN__HYDROGRAPHY1_23_14_05. This would be the hydrography layer for Chattnooga, TN and it would have been created on January 23 at 2:05 PM.

The Output Parent Directory must already exist on your hard drive. To select the Output Parent Directory, click the Browse button (Figure 3). Note that you can set a parent directory to be used for all cases (you only have to set it once). However, you can set different directories for each DLG if you wish. When you click the Browse button, a directory select dialog will appear (Figure 4).

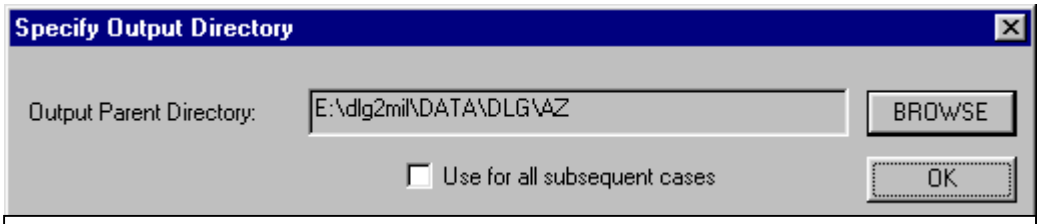

Figure 3. The Output Directory Prompt

The default output parent directory is the source directory for the DLG files, unless that directory is on a CD-ROM. If you are reading DLG files from a CD, the default output parent directory is C:\. Obviously, the program cannot write to a read only CD!

3.3 Deleting a DLG From the List

If you wish to delete a DLG from the list of cases to be processed, highlight that DLG in the list box on the main program screen (Figure 1), and click on the Delete button.

3.4 Editing the Output Parent Directory

If you wish to change the output parent directory for a dlg, highlight that DLG and click the Edit Output Dir button. You will be returned to the output directory prompt.

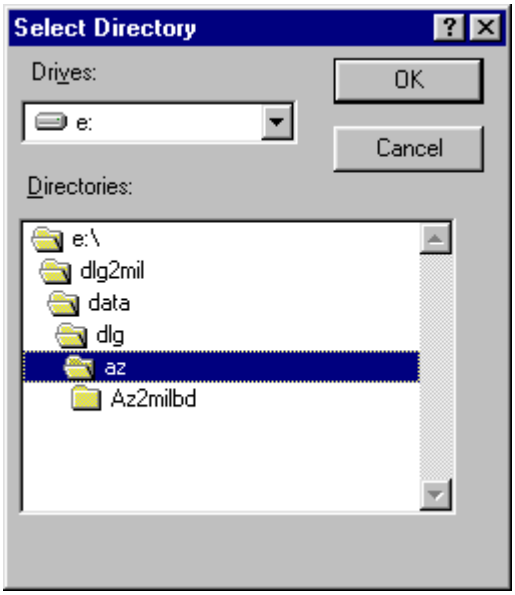

Figure 4. Choosing an Output Parent Directory

4. SDTS Format Processing

This section describes how SDTS format files are processed.

4.1 Using Compressed SDTS Files

If you downloaded your SDTS files from USGS, chances are they are compressed. A new feature of DLG2SHP Version 3 is automatic un-gzip and un-tar operations. There is no need to pre-process the compressed files.

4.2 Running the Program

Once you have built a list of DLGs you wish to process, press the GO button to begin creating shape files. When “Go” is pressed, the DLG currently being processed is highlighted in the list box, a second dialog appears which will keep you posted on the program’s progress (Figure 5).

After the DLG is processed, control returns to the main program. If there are more DLGs in the list, the next one is processed. This continues until all DLGs in the list are processed.

4.3 The LOG File and Metadata Document

The SDTS option generates 2 files that contain information about the DLG and how it was processed. The first of these is a log file. It is named after the catalog file

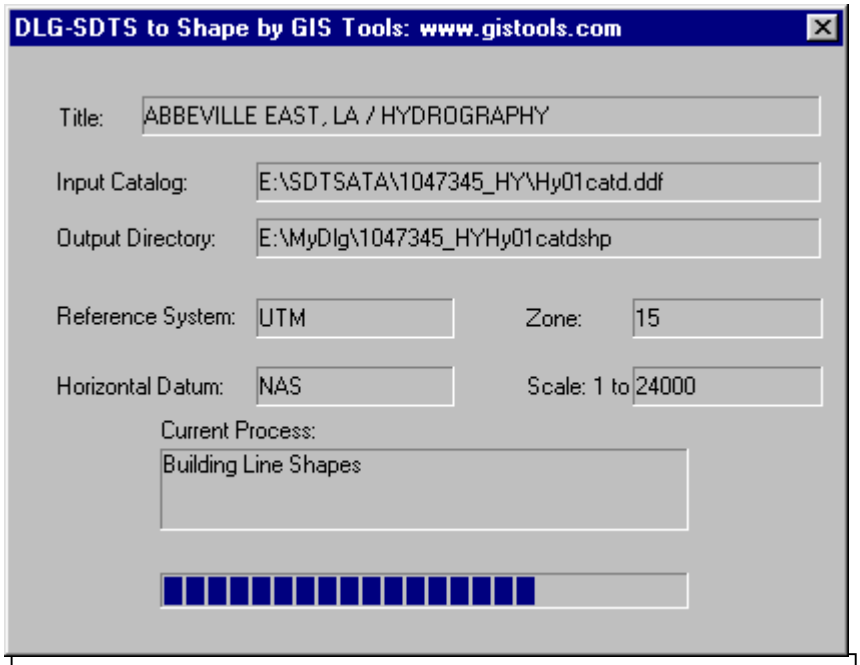

Figure 5. Processing the SDTS format DLGs

chosen. For example, if the catalog file chosen was Hy01catd.ddf, the log file would be named Hy01catd.log. Here is a typical SDTS format log file:

```
********* DLG Log File  *****************

input catalog: E:\SDTS\DATA\1047345_HY\Hy01catd.ddf
output directory E:\SDTS\DATA\1047345_HY\1047345_HYHy01catdshp
New Process started on 5/31 at 11:43
Map Title: ABBEVILLE EAST, LA / HYDROGRAPHY
Map Scale: 1 to    24000
Reference System: UTM
Horizontal Datum: NAS
Zone: 15

Wrote 1228 attribute records to file
E:\SDTS\DATA\1047345_HY\1047345_HYHy01catdshp\HY01AHYF.dbf

Wrote full names for fields in file
E:\SDTS\DATA\1047345_HY\1047345_HYHy01catdshp\HY01AHYF to dbf file
E:\SDTS\DATA\1047345_HY\1047345_HYHy01catdshp\HY01AHYF(Name).dbf

Wrote 54 attribute records to file
E:\SDTS\DATA\1047345_HY\1047345_HYHy01catdshp\HY01ACOI.dbf

Wrote full names for fields in file
E:\SDTS\DATA\1047345_HY\1047345_HYHy01catdshp\HY01ACOI to dbf file
E:\SDTS\DATA\1047345_HY\1047345_HYHy01catdshp\HY01ACOI(Name).dbf

Wrote 1 attribute records to file
E:\SDTS\DATA\1047345_HY\1047345_HYHy01catdshp\HY01AHDR.dbf
```

```
Wrote full names for fields in file
E:\SDTS\DATA\1047345_HY\1047345_HYHy01catdshp\HY01AHDR to dbf file
E:\SDTS\DATA\1047345_HY\1047345_HYHy01catdshp\HY01AHDR(Name).dbf

Writing attribute records to table NO01-Hy01AHYF.dbf
Writing attribute records to table LE01-Hy01AHYF.dbf
Writing attribute records to table LE01-Hy01ACOI.dbf
Wrote 913 line records to shape HYDROGRAPHY(LE01)
Wrote 311 polygon records to shape HYDROGRAPHY(PC01)
Writing attribute records to table PC01-Hy01AHYF.dbf
Writing attribute records to table PC01-Hy01ACOI.dbf
```

The meaning of these items is explained below.

The program also generates a file with “doc” extension. As with the log file, the name of the file is the same as the catalog. In the current example, this would be Hy01catd.doc. This file contains metadata information extracted from the SDTS files. An example “doc” file is listed in Appendix A.

4.4 The Layers and Attribute Tables

SDTS files can contain many map layers in one SDTS file set. These layers can be of three types: polygons, lines, or points. Points are further subdivided into four types: polygon centroids (called Area Points in SDTS), point features (called Entity Points in SDTS), end points of lines (called Planar Nodes in SDTS), and map registration points (called nodes in SDTS). Each of the layer types has a two letter code associated with it. Here are the definitions:

PC = polygon layer
LE = line layer
NA = area points
NE = entity points
NO = planar nodes
NP = nodes

If there is more than one layer for a given type, the layers are numbered. For example, suppose there were several line types. These would be named LE01, LE02, LE03 and so on. There would have to be NO01, NO02, NO03 and so on for the corresponding planar nodes.

DLG2SHP names each layer by concatenating the layer name, its two letter code and its number. For example, a single transportation DLG might give rise to the following line layer names:

ROADS AND TRAILS(LE01)
RAILROADS(LE02)
PIPE & TRANS LINES(LE03)

Similar layers for nodes would be generated. In general, the name of a shape layer has the form *descriptive name(code)*. These layers will contain the basic attributes of each layer. More information is stored in separate attribute tables.

The SDTS option in DLG2SHP generates several additional dbf files that can be linked to corresponding map layers. The files that are generated depend on the map type being extracted. Here are the possible tables generated from SDTS versions of DLG.

Table Type	Description
AHDR	A header containing information on the current DLG.
ACOI	A table of features which are coincident with features in other DLGs. For example, a road may be coincident with a political boundary.
AHPF	Hypsography primary attributes
AHYF	Hydrography primary attributes
ASCF	Vegetative Surface Cover primary attributes
ANVF	Non-Vegetative Features primary attributes
ABDF	Boundaries primary attributes
ASMF	Survey Control and Markers primary attributes
ARDF	Roads and Trails primary attributes
ARRF	Railroads primary attributes
AMTF	Pipelines, Transmission Lines, and Miscellaneous Transportation Features primary attributes
AMSF	Manmade Features primary attributes
APLF	US Public Land Survey System primary attributes
ABDM	Agencies for Boundaries
ARDM	Route Numbers for Roads and Trails
AHPT	Elevation in Feet for Hypsography
AHPR	Elevation in Meters for Hypsography

For 1:2000000 DLGs, there can be secondary attribute tables. These are the file types:

BFPC	County Names by FIPS Code
BFPS	State Names by FIPS Code
BMSP	Populated Place Names with Populations
BMTA	Airport Names
BGRL	Land Grant Names

All of the tables listed above contain information about a given DLG. DLG2SHP separates the attributes according to the map layer to which they apply. It also dumps out the full table for those interested in it. However, we feel most users will want the tables separated out by layer type. Here is an example.

The ABBEVILLE EAST, LA / HYDROGRAPHY DLG generated the following map layers:

Shape Name	Description
Hydrography(NP01)	Registration Points
Hydrography(NA01)	Polygon Centroids
Hydrography(NO01)	Planar Nodes
Hydrography(LE01)	Lines
Hydrography(PC01)	Polygons

In addition, the following dbf files were generated:

HY01AHDR.dbf	Header Information (not tied to a layer)
NO01-HY01AHYF.dbf	Hydrography attributes of planar nodes
LE01-HY01AHYF.dbf	Hydrography attributes of lines
LE01-HY01ACOI.dbf	Line coincident feature attributes
PC01-HY01AHYF.dbf	Hydrography attributes of polygons
HY01AHYF.dbf	The full hydrography attributes for all types of features (a combined version of the NO01-HY01AHYF, LE01-AHYF, and PC01-AHYF dbf files.)
HY01ACOI.dbf	The full coincident list for all types of features

These last two files are for completeness. It is unlikely that most users will need them.

The key to joining or linking layers to their attributes is to match up their 4 character codes, eg, PC01.

4.5 The Entity Lookup Table

The dbf files generated from the primary attribute modules all have the same structure. An important field in these files is the entity label (called entity_lab). These consist of numeric codes that correspond to a type of feature. GIS Tools has prepared a lookup table, entity.dbf, which can be used to interpret these codes. You can download a copy of the entity.dbf file from our web site: www.gistools.com/ftp.

4.6 The Name File

The various attribute fields contained in an SDTS format DLG often have names in excess of 10 characters. When writing dbf files, we must shorten those names to 10 spaces. Some of the shorter names are easy to comprehend. For example, entity_lab is the shortened name for entity label. For every primary and secondary attribute file encountered, DLG2SHP generates a table that consists of the shortened name and the original name. For example, for the file AHDR for a catalog named HP01catd.ddf, the program will generate a dbf file named: HP01AHDR(NAME).dbf. That file will contain the shortened name and the long name.

4.7 Hypsography Layers

Most DLG features can have several attributes. That is, there is a one-to-many relationship between features and attributes. In many cases, it is not possible to know which attributes a user wishes to assign to features. However, for hypsography, this is almost always elevation. Version 3 of DLG2SHP **automatically joins the elevation data** to the corresponding points and lines. This removes the burden of doing such joins from the user.

You should note, however, that it is possible for a line feature to have more than one elevation value. Contours of this type are called “Carrying Contours” by USGS and they correspond to very steep areas. DLG2SHP assigns the first corresponding contour it finds in the AHPR or AHPT file. However, it also keeps the original AHPR or AHPT dbf file, so it is possible for you to determine those contour lines which are carrying contours.

5. Optional Format Processing

Optional format DLGs processing is very similar to that of SDTS format DLGs. Howver, there are some slight differences.

5.1 Program Execution

Once you have built a list of DLGs you wish to process, press the GO button to begin creating shape files. When “Go” is pressed, the DLG currently being processed is highlighted in the list box, a second dialog appears which will keep you posted on the program’s progress (Figure 6).

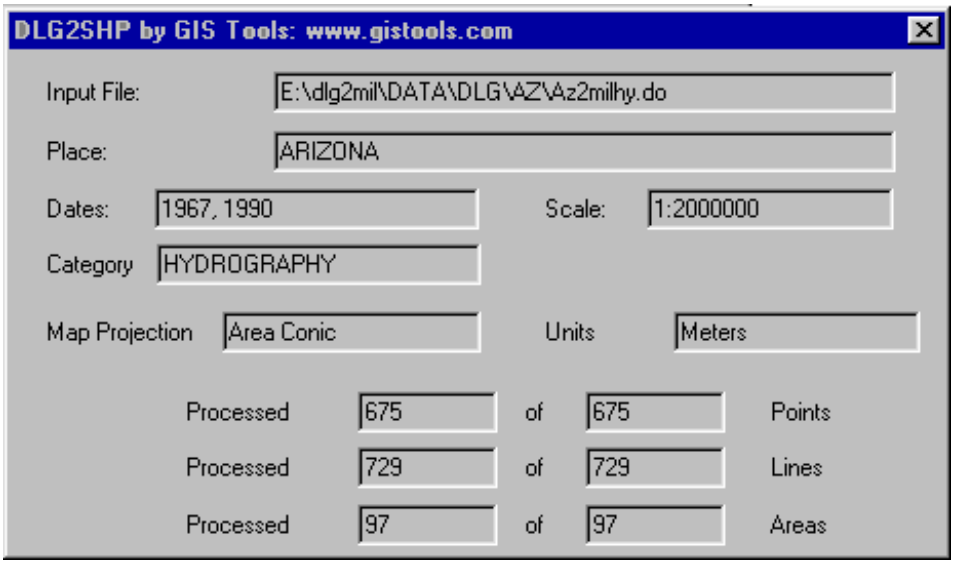

Figure 6. Running the optional format translator

As the program progresses, the number of points, lines, and polygons processed will change until all the features are translated.

After the DLG is processed, control returns to the main program. If there are more DLGs in the list, the next one is processed.

5.2 The LOG file

In addition to what is written on the screen, a LOG file is generated in the Output Parent Directory. This file is named after the DLG file being processed. For example, if the DLG file is Az2milhy.do, then the LOG file is Az2milhy.LOG. This file lists all the information that is displayed in Figure 5. It also will contain any error messages or warnings the program might generate. The file is opened for appending. That is, if a LOG file with this name already exists, the current operations messages will be appended to the bottom of that file. Listed below is a typical LOG file:

```
New Process started on 6/22 at 20:20
Directory E:\Az2milhyshp created
Processing DLG for ARIZONA
Dates of source material: 1967, 1990
Scale is 1:2000000
DLG reference system is Area Conic
DLG units are meters
DLG horizontal datum NAD 27
DLG vertical datum NGVD 29
Category is HYDROGRAPHY
Read 675 node records
Wrote 675 node shapes
Wrote 336 node attribute records
Read 97 area records
Read 729 line records
Wrote 729 line shapes
Wrote 1056 line attribute records
No degenerate line (node) attributes were generated
Wrote 97 area shapes
Wrote 74 area attribute records
```

Note that the number of attributes generated need not match the number of features generated. In some cases there will be more attributes than features (features will have multiple attributes). In other cases the number of attributes may be less than the number of features.

5.3 Program Outputs for Optional Format DLGs

DLG2SHP generates 3 shape files for each DLG file selected (one for points, one for lines, and one for areas.) The files are found in the directory <OutputParentDirectory>\<DLG filename>\. The default names for the output files start with the DLG name (with no extension) plus a name suffix.
The suffixes used are as follows:

*nodes for node shapes (eg, Az2milhynodes.shp)
*links for link shapes (eg, Az2milhylinks.shp)
*areas for area shapes

In addition to the geographic files, the following dbf files are generated. These files contain attributes for the map features.

The attribute files (up to four dbf files) are named
*nodeatts for node attributes (eg, Az2milhynodeatts.dbf)
*linkatts for link attributes (eg, Az2milhylinkatts.dbf)
*dglnatts for degenerate line attributes. This file should be linked with the node features (eg, Az2mildglnatts.dbf)
*areaatts for area attributes (eg, Az2milhyareaatts.dbf)

5.4. Special Files of the 1:2000000 DLGs

1:2000000 scale DLGs can have two other dbf files generated: one for airports, the other for populated places. These files will have the following names and attributes:

For airports:
File name: *air (eg, Az2milmtair.dbf)
Attributes: Airport Code, Airport Name, Node ID

For places:
File name: *place.(eg, Az2milmsplace.dbf)
Attributes: Place ID, Place Name, County FIPs, Population, Node_ID. A population value less than zero means no population data was available.

6. Some Aspects of DLG Files to Remember

DLG files use a whole polygon model. If you have never worked with these files before, you should review this section. There will be polygons in the translated DLG files that you may wish to delete after loading the files into your GIS. You also may want to delete degenerate lines from your line layers (optional format case). DLG2SHP translates all features that are in DLGs, but not all features are particularly useful.

6.1 Void Areas and File Boundaries

DLGs can contain two polygons that you may wish to delete. The first is the study area polygon, usually called Outside Area. This is the first polygon generated. Figure 7 shows the shape file for Tennessee, 1:2000000, Manmade Structures.

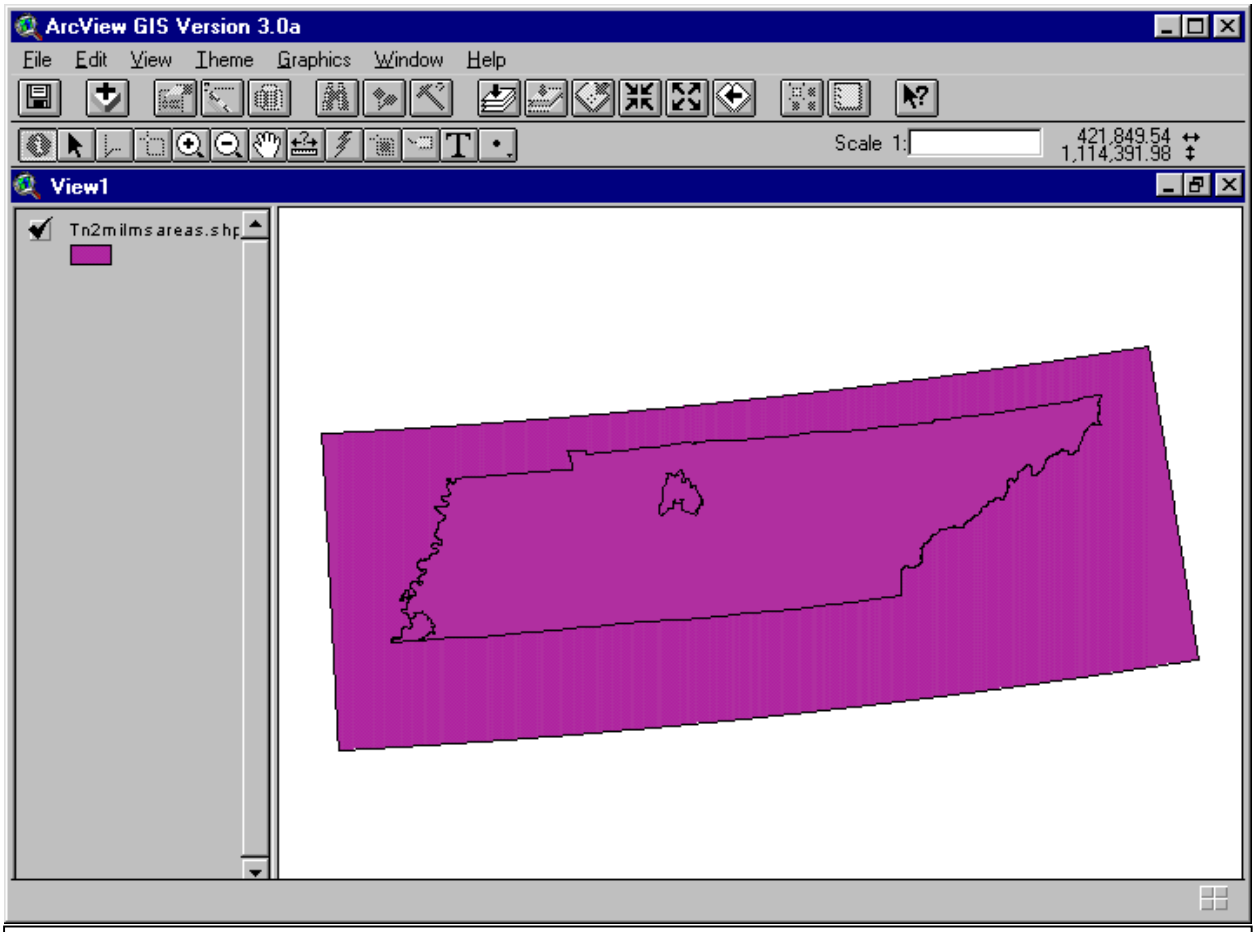

Figure 7. The polygons for the Tn2milms DLG

The first polygon consists of the entire rectangle encompassing this study area (Figure 8).

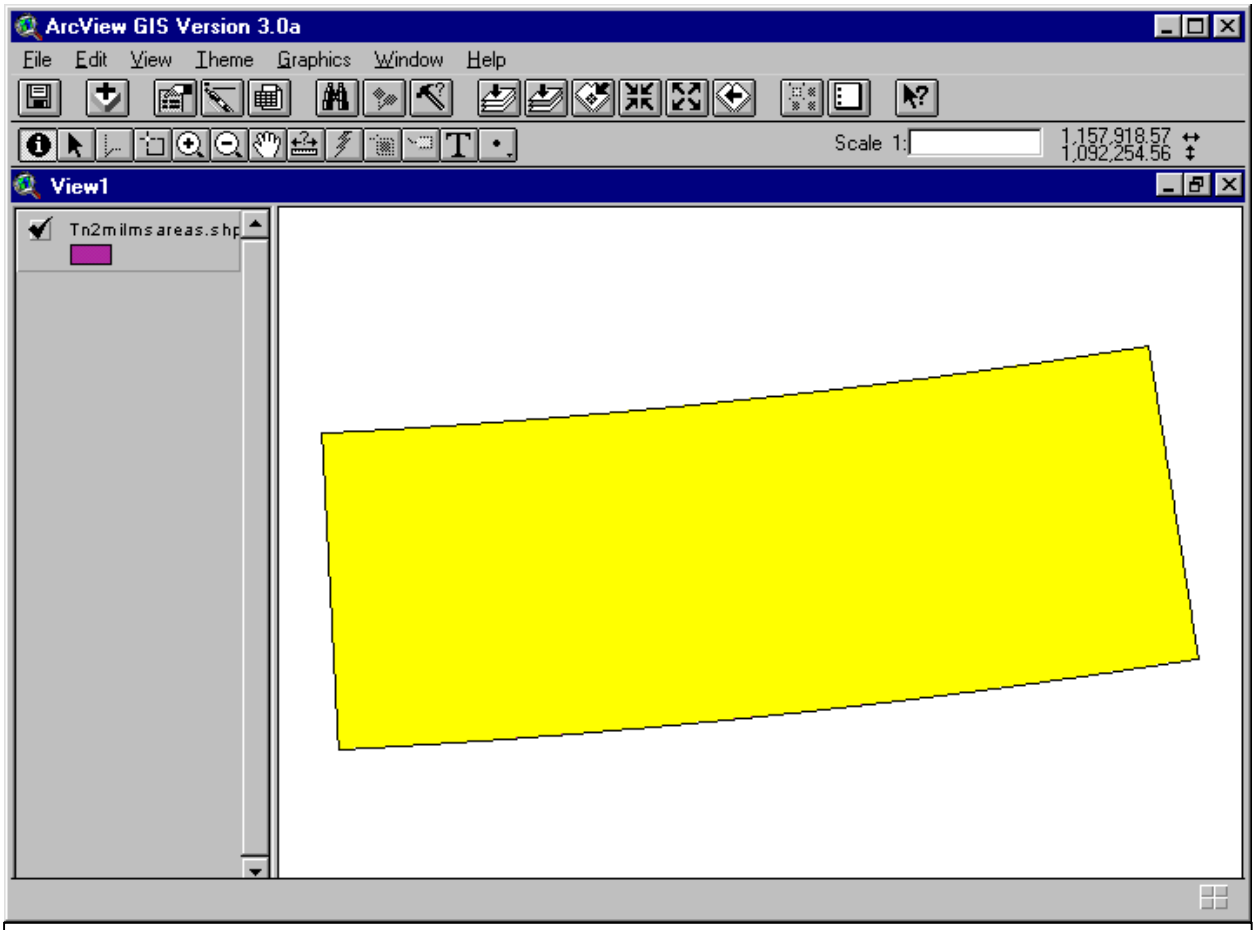

Figure 8. Polygon 1 for the DLG Tn2milms. It encompasses the entire study area.

A second polygon you may wish to delete is the area outside the state. It is shown as the yellow area in Figure 9.

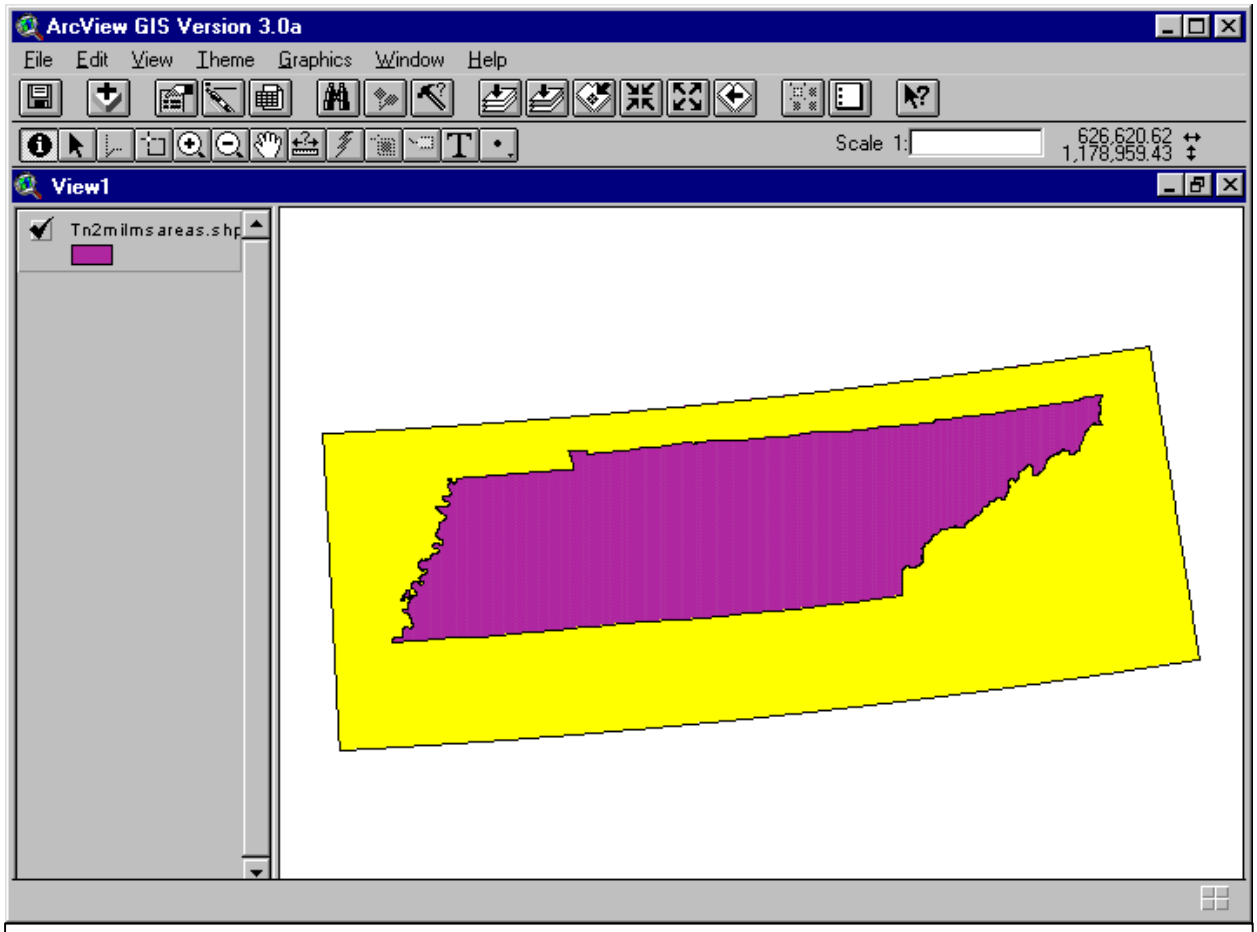

Figure 9. The area outside the state

6.2 Degenerate Lines in Optional Format

DLGs at the 1:2000000 scale also may contain degenerate lines. DLG2SHP extracts these lines as part of the line shapes. However, the programs also create a dbf file which associate the attributes of these degenerate lines with their corresponding nodes. It is easy to draw nodes. It is much more difficult to draw lines of 0 length.

Appendix A. The Metafile Document

Listed below is a typical “doc” file generated from SDTS optional format DLGs.

```
********* SDTS Document File  *****************

TITLE:           ABBEVILLE EAST, LA / HYDROGRAPHY
SCALE:           24000
STID:            SPATIAL DATA TRANSFER STANDARD
VERSION:         1994 JUNE 10
PROFILE:         SDTS TOPOLOGICAL VECTOR PROFILE
PROFILE VERSION: VERSION 1.0 JUNE 10, 1994
DOCUMENT:        FIPS PUB 173-1
COMMENT:         This transfer requires an external data dictionary from the
U.S. Geological Survey, National Mapping Division, with a 4-character code of
DLG3, version number  3.00
Reference System:           UTM
Horizontal Datum:           NAS
ZONE:                            15
COMMENT:            This Digital Line Graph, (if not digitally revised), was
digitized from a standard U.S. Geological Survey (USGS) quadrangle (name,
date and scale of quadrangle indicated in SDTS Identification Module), and
was archived in the National Digital Cartographic Data Base (NDCDB).
Quadrangles were referenced to one of the following horizontal datums:  the
North American Datum of 1927 (NAD 27), NAD 83, Puerto Rico Datum 1940
adjustment, Old Hawaiian Datum, 1963 Guam Datum, or various local datums.
Quadrangles were referenced to one of the following vertical datums:
National Geodetic Vertical Datum of 1929, the International Great Lakes Datum
of 1955, or mean sea level.  Datum information is contained in the SDTS
External Spatial Reference Module.  The digital data were produced by either
scanning or manually digitizing a stable-based copy of the graphic materials.
The scanning process captured the digital data at a scanning resolution of at
least 0.001 inches;  the resulting raster data were vectorized and then
attributed on an interactive editing station.  Manual digitizing used a
digitizing table to capture the digital data at a resolution of at least
0.001 inches;  attribution was performed either as the data was digitized, or
on an interactive edit station after the digitizing was completed.  The
determination of the DLG production method was based on various criteria,
including feature density, feature symbology, and availability of production
systems.  Four control points corresponding to the four corners of the
quadrangle were used for registration during data collection.  An eight
parameter projective transformation was performed on the coordinates used in
the data collection and editing systems to register the digital data to the
internal coordinates used in the USGS Production System (PROSYS) and a four
parameter linear transformation performed from the PROSYS internal
coordinates to Universal Transverse Mercator (UTM) grid coordinates.  These
four control points are stored as point objects in the "NP" Point-Node Module
and their latitude and longitude are stored in the SDTS AHDR Attribute
Primary Module.  The DLG data were checked for position by comparing plots of
the digital data to the graphic source.  DLG data classification was checked
by comparing plots of the digital data to the graphic source and/or using
PROSYS verification software.  The revision status, and category of revision
of this digital file (limited update or standard update), is indicated in the
SDTS AHDR Attribute Primary Module.  Limited update revision uses monoscopic
imagery and limited ancillary source, with no field verification;  standard
update revision uses stereoscopic imagery as needed, in addition to
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monoscopic imagery, and field verification. Certain attributes and/or entities, e.g. PHOTOREVISED, convey data quality information; for details refer to the SDTS Data Dictionary Modules. The DLG outside area is converted to the SDTS Universe Polygon object. The Universe Polygon can be identified by the object representation code "PW"; the Universe Polygon does not reference any attributes. DLG areas coded with void area are converted to the SDTS Void Polygon object. Void Polygons can be identified by the object representation code of "PX"; Void Polygons do not reference any attributes. Information on the PROSYS program, the attribute standard, and the NDCDB is available from USGS.

COMMENT: Accuracy of this digital data (if not digitally revised), is based upon the use of source graphics which are compiled to meet National Map Accuracy Standards. NMAS horizontal accuracy requires that at least 90 percent of points tested are within 0.02 inches of the true position. The digital data are estimated to contain a horizontal positional error of less than or equal to 0.003 inches standard error in the two component directions relative to the source graphic. NMAS vertical accuracy requires that at least 90% of well defined points tested be within one half contour interval of the correct value. Comparison to the graphic source is used as control to assess digital positional accuracy. Cartographic offsets may be present on the graphic source, due to scale and legibility constraints. Digital map elements require edge alignment between data sets. Data along each quadrangle edge are tested against the data set for the adjacent quadrangle; tests check for positional accuracy between data sets within a 0.02 inches tolerance. Features with like dimensionality, and with or without like attribution, that are within the tolerance are adjusted by moving the feature equally in both data sets. Features outside the tolerance are not moved. All disconnects are identified by edge matching flags that document the mismatch. These edge matching flags are located in the SDTS AHDR Attribute Primary Module in subfields EDGEWS, EDGEWR, EDGENS, EDGENR, EDGEES, EDGEER, EDGESS, and EDGESR. If the digital data underwent limited update revision, then the data meets at least the class 2 positional accuracy specification in the draft "United States National Cartographic Standards for Spatial Accuracy". If the digital data underwent standard update revision, then the data meets the class 1 positional accuracy specifications. Certain attributes and/or entities, e.g. BEST_ESTIMATE, convey data accuracy information; for details refer to the SDTS Data Dictionary Modules.

COMMENT: Attribute accuracy is tested by manual comparison of the source with hard copy plots and/or symbolized display of the digital line graph on an interactive computer graphic system; selected attributes that cannot be visually verified on plots or on screen, are interactively queried and verified on screen. In addition, PROSYS software (USGS) tests the attributes against a master set of valid attributes for the hydrography category; it also checks for selected valid attribute combinations, and for valid attributes relative to topology and dimensionality. All attribute data conform to the attribute codes current as of the date of digitizing as described in Part 3: Attribute Codes in "Standards for Digital Line Graphs", National Mapping Program Technical Instructions, USGS. Accuracy is estimated to be 98.5 percent. Certain attributes and/or entities, e.g. BEST_ESTIMATE, convey data quality information; for details refer to the SDTS Data Dictionary Modules.

COMMENT: Certain node/geometry and topology (GT)-polygon/chain relationships are collected or generated to satisfy topological requirements. (The GT-polygon corresponds to the DLG area). Some of these requirements include: chains must begin and end at nodes, chains must connect to each other at nodes, chains do not extend through nodes, left and right GT-polygons are defined for each chain element and are consistent throughout the

transfer, and the chains representing the limits of the file (neatline) are free of gaps. The tests of logical consistency are performed by PROSYS (USGS) program. The neatline is generated by connecting the four corners of the digital file, as established during initialization of the digital file. All data outside the enclosed region are ignored and all data crossing these geographically straight lines are clipped at the neatline. (Exception: Early files may have area pointings outside of the neatline, for those areas which were too small to place the area pointing within, given software constraints at the time of collection.) Data within a specified tolerance of the neatline are snapped to the neatline. Neatline straightening aligns the digitized edges of the digital data with the generated neatline, that is, with the longitude/latitude lines in geographic coordinates. All internal polygons are tested for closure; early files were checked using plots, later files were checked using PROSYS. Certain attributes and/or entities, e.g. closure line, convey data quality information; for details refer to the SDTS Data Dictionary Modules. Throughout the transfer, null values are denoted by adjacent delimiters. When a subfield, either user-defined in Attribute Primary and Attribute Secondary Module records, or in other SDTS Module records, is implemented as fixed-length, the following null scheme is used: (a) when information to be encoded in the subfield is known to be not applicable (undefined, not relevant), then the subfield is valued by a string of spaces; and (b) when the information to be encoded is relevant but unknown (or missing), then the subfield is valued by a string of question marks "?".