

**KANSAS GEOLOGICAL SURVEY  
OPEN-FILE REPORT 2002-28**

ARCVIEW INTERFACE FOR PREPARING ANNAGNPS SOIL  
INPUT DATASET FROM SSURGO VERSION 2.0 SOIL DATABASE

by

Girmay Misgna  
Ming-shu Tsou  
Xiaoyong Zhan

*Disclaimer*

The Kansas Geological Survey does not guarantee this document to be free from errors or inaccuracies and disclaims any responsibility or liability for interpretations based on data used in the production of this document or decisions based thereon. This report is intended to make results of research available at the earliest possible date, but is not intended to constitute final or formal publications.

Kansas Geological Survey  
1930 Constant Avenue  
University of Kansas  
Lawrence, KS 66047-3726

**ARCVIEW INTERFACE FOR PREPARING  
ANNAGNPS SOIL INPUT DATASET FROM  
SSURGO VERSION 2.0 SOIL DATABASE**

*Girmay Misgna, Ming-Shu Tsou, and Xiaoyong Zhan  
Kansas Geological Survey*

**KGS Open-File Report 2002-28**

## **I. Introduction**

Soil characterization data are a key piece of information for any watershed model. The Annualized Agricultural Non Point Source (AnnAGNPS) model requires about 30 soil properties for each soil map unit identified in a watershed.

Most of these required soil parameters are available in the Soil Survey Geographic (SSURGO) version2.0 soil database exported from the National Soil Information System (NASIS). In order to use SSURGO in AnnAGNPS, it is necessary to calculate some unavailable parameters from the available ones, to do conversion of soil parameter units, and to process data for the AnnAGNPS required format. Due to the large amount of data involved, manual processing and entry of these required soil data for AnnAGNPS is very difficult, if not impossible, and prone to errors. The Arcview SSURGO to AnnAGNPS tool that we have developed completely automates this process of soil data creation for AnnAGNPS in its required format saving the user considerable time and mistakes in soil data handling.

## **II. Sources of digital soil data**

NASIS is a generic software tool for managing data in a relational database system. NRCS is currently using NASIS to manage the soil survey database for the whole country. “The data NASIS manages are defined in a data dictionary that includes information about a particular business area its policies and procedures” (NASIS documentation). The current NASIS data dictionary contains information about the soil survey database.

The SSURGO is the most detailed level of soil mapping done by NRCS. It is typically published at scales between 1:15 840 and 1:24 000. The map extent for a SSURGO data set is a soil survey area, which may consist of a county, multiple counties, or parts of multiple counties.

SSURGO spatial data are available in Arc Interchange format or as Digital Line Graph (DLG-3) optional file format. Some state or regional NRCS offices may distribute the data in additional formats. The latest version of SSURGO is available for download at [http://www.ftw.nrcs.usda.gov/ssurgo\\_ftp3.html](http://www.ftw.nrcs.usda.gov/ssurgo_ftp3.html). Data for Kansas can also be downloaded from DASC website <http://mapster.kgs.ukans.edu/dasc/catalog/coredata.html> at Kansas Geological Survey.

The SSURGO database contains two data sets. Spatial data depicting the soil boundaries (map units), and ancillary data on soil map unit composition, soil properties, and interpretations (USDA-NRCS, 1995). SSURGO file includes several soil data tables related to each other through various table relationships and relationship cardinalities. The physical data model of SSURGO version2.0 soil data tables is shown in Figure-1.

## SSURGO 2.0 Physical Data Model Soil Data Tables

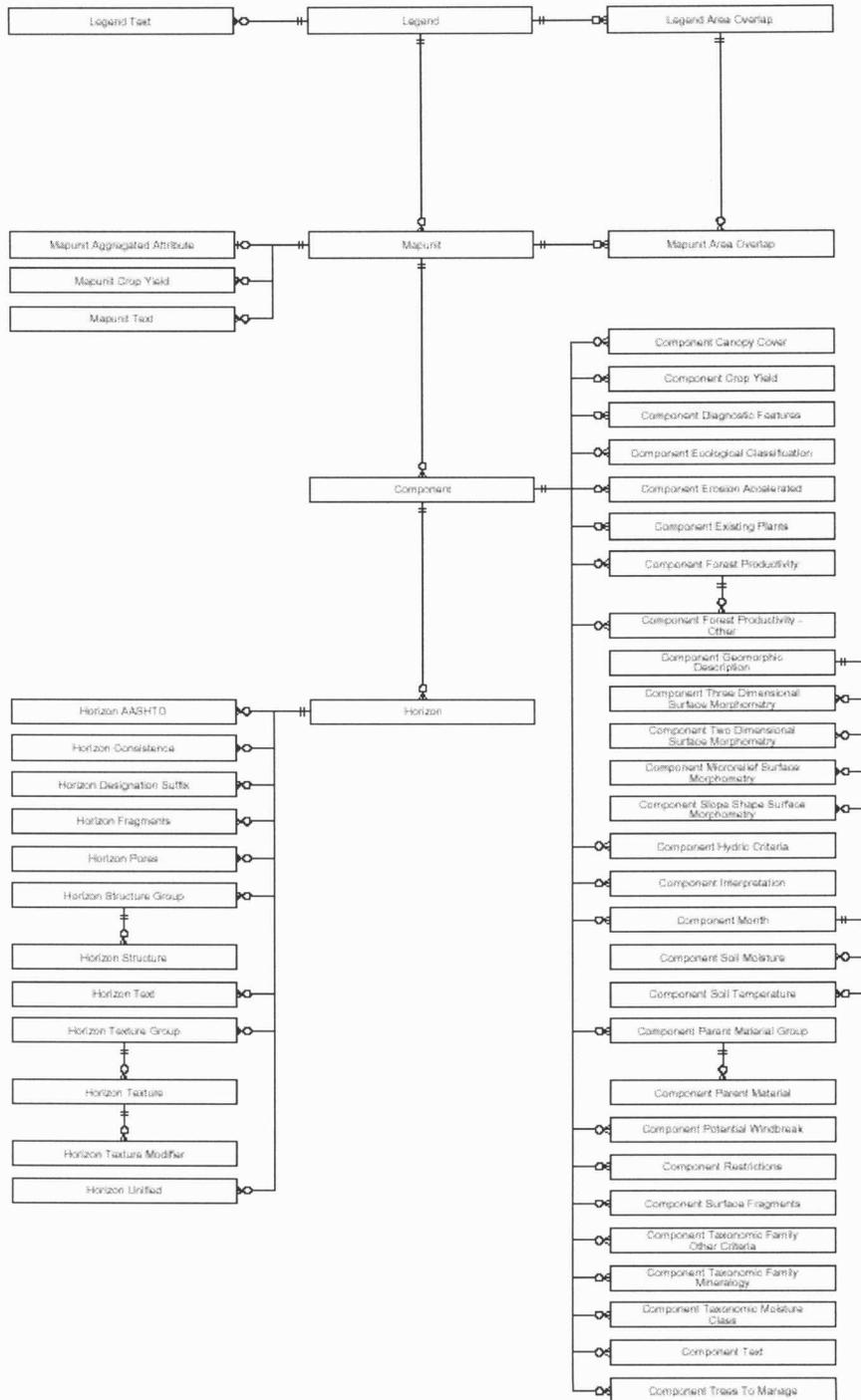


Figure-1. Table relationships diagram (NASIS: SSURGO Version 2.0 documentation)

Detailed documentation for the SSURGO version 2.0 structure, is available from NASIS web site at <http://nasis.nrcs.usda.gov/documents/metadata>. From this page, select the link "Index to SSURGO Version 2 Tabular Metadata". This will take you to a page where a variety of reports and diagrams are available. The report titled "Static Tabular Metadata - Tables" shows which ASCII delimited export file is associated with each table in the database. A database template for converting the export file in to a Microsoft Access database is available at <http://www.nasis.nrcs.usda.gov/downloads>. The template also contains some standard queries and reports.

NASIS provides the capability of exporting NASIS data in the SSURGO version 2.0 format. The individual files produced by the NASIS Export process are ASCII delimited files. In each file, the field delimiter is the pipe or vertical bar character, and the text delimiter is the double quote character. For each database table that is part of the SSURGO version 2.0 standard, there is a corresponding ASCII delimited file.

Among these several files (there are more than 50), which are in pipe delimited ascii text file format, the 5 important files we need to work with in the AnnAGNPS soil parameters and data conversion process are the "chorizon.txt", "comp.txt", "mapunit.txt", "chtexgrp.txt", "cpmatgrp.txt". The next section presents description of these files, extracted from the complete metadata of the tables and column contents of the SSURGO version2.0 documentation available at NASIS website.

### **III. Description of AnnAGNPS related SSURGO version2.0 datasets**

#### **File Name: chorizon.txt**

Table Physical Name: chorizon; Table Logical Name: chorizon.

The Horizon table lists the horizon(s) and related data for the referenced map unit component. If the horizon thickness is greater than zero (low=5, RV=8, high=12), the horizon exists everywhere this component occurs. If the horizon thickness includes zero (low=0, RV=1, high=3), the horizon may exist in some places, but not in other places.

Horizons that have two distinct parts, such as E/B or E&Bt horizons, are recorded twice: the first time for the characteristics of the first part, and then on another row, using the same depths and thickness, for the characteristics of the other part for the second time.

Column Physical Name: **hzname** Column Label: Designation

The concatenated string of four kinds of symbols (five data elements) used to distinguish different kinds of layers in the soil. (SSM)

Column Physical Name: **desgnvert** Column Label: Sub

One of the four kinds of symbols, when concatenated, are used to distinguish different kinds of layers in soils. Vertical subdivisions are used to subdivide a horizon or layer designated by a single letter or combination of letters.

Column Physical Name: **hzdept\_l** Column Label: Top Depth - Low Value  
Column Physical Name: **hzdept\_r** Column Label: Top Depth - Representative Value  
Column Physical Name: **hzdept\_h** Column Label: Top Depth - High Value  
The distance from the top of the soil to the upper boundary of the soil horizon.

Column Physical Name: **hzdepb\_l** Column Label: Bottom Depth - Low Value  
Column Physical Name: **hzdepb\_r** Column Label: Bottom Depth - Representative Value  
Column Physical Name: **hzdepb\_h** Column Label: Bottom Depth - High Value  
The distance from the top of the soil to the base of the soil horizon.

Column Physical Name: **frag3to10\_l** Column Label: Rock 3-10 - Low Value  
Column Physical Name: **frag3to10\_r** Column Label: Rock 3-10 - Representative Value  
Column Physical Name: **frag3to10\_h** Column Label: Rock 3-10 - High Value  
The percent by weight of the horizon occupied by rock fragments 3 to 10 inches in size.

Column Physical Name: **sieveno4\_l** Column Label: #4 - Low Value  
Column Physical Name: **sieveno4\_r** Column Label: #4 - Representative Value  
Column Physical Name: **sieveno4\_h** Column Label: #4 - High Value  
Soil fraction passing a number 4 sieve (4.70mm square opening) as a weight percentage of the less than 3 inch (76.4mm) fraction.

Column Physical Name: **sieveno10\_l** Column Label: #10 - Low Value  
Column Physical Name: **sieveno10\_r** Column Label: #10 - Representative Value  
Column Physical Name: **sieveno10\_h** Column Label: #10 - High Value  
Soil fraction passing a number 10 sieve (2.00mm square opening) as a weight percentage of the less than 3 inch (76.4mm) fraction.

Column Physical Name: **sieveno40\_l** Column Label: #40 - Low Value  
Column Physical Name: **sieveno40\_r** Column Label: #40 - Representative Value  
Column Physical Name: **sieveno40\_h** Column Label: #40 - High Value  
Soil fraction passing a number 40 sieve (0.42mm square opening) as a weight percentage of the less than 3 inch (76.4mm) fraction.

Column Physical Name: **sieveno200\_l** Column Label: #200 - Low Value  
Column Physical Name: **sieveno200\_r** Column Label: #200 - Representative Value  
Column Physical Name: **sieveno200\_h** Column Label: #200 - High Value  
Soil fraction passing a number 200 sieve (0.074mm square opening) as a weight percentage of the less than 3 inch (76.4mm) fraction.

Column Physical Name: **sandtotal\_l** Column Label: Total Sand - Low Value  
Column Physical Name: **sandtotal\_r** Column Label: Total Sand - Representative Value  
Column Physical Name: **sandtotal\_h** Column Label: Total Sand - High Value  
Mineral particles 0.05mm to 2.0mm in equivalent diameter as a weight percentage of the less than 2 mm fraction.

Column Physical Name: **sandvf\_l** Column Label: vfs - Low Value  
Column Physical Name: **sandvf\_r** Column Label: vfs - Representative Value  
Column Physical Name: **sandvf\_h** Column Label: vfs - High Value  
Mineral particles 0.05 to 0.10mm in equivalent diameter as a weight percentage of the less than 2 mm fraction.

Column Physical Name: **silttotal\_l** Column Label: Total Silt - Low Value  
Column Physical Name: **silttotal\_r** Column Label: Total Silt - Representative Value  
Column Physical Name: **silttotal\_h** Column Label: Total Silt - High Value  
Mineral particles 0.002 to 0.05mm in equivalent diameter as a weight percentage of the less than 2.0mm fraction.

Column Physical Name: **claytotal\_l** Column Label: Total Clay - Low Value  
Column Physical Name: **claytotal\_r** Column Label: Total Clay - Representative Value  
Column Physical Name: **claytotal\_h** Column Label: Total Clay - High Value  
Mineral particles less than 0.002mm in equivalent diameter as a weight percentage of the less than 2.0mm fraction.

Column Physical Name: **om\_l** Column Label: OM - Low Value  
Column Physical Name: **om\_r** Column Label: OM - Representative Value  
Column Physical Name: **om\_h** Column Label: OM - High Value  
The amount by weight of decomposed plant and animal residue expressed as a weight percentage of the less than 2 mm soil material.

Column Physical Name: **dbthirdbar\_l** Column Label: Db 0.33 bar H2O - Low Value  
Column Physical Name: **dbthirdbar\_r** Column Label: Db 0.33 bar H2O- Rep Value  
Column Physical Name: **dbthirdbar\_h** Column Label: Db 0.33 bar H2O - High Value  
The oven dry weight of the less than 2 mm soil material per unit volume of soil at a water tension of 1/3 bar.

Column Physical Name: **partdensity** Column Label: Dp  
Mass per unit of volume (not including pore space) of the solid soil particle either mineral or organic. Also known as specific gravity.

Column Physical Name: **ksat\_l** Column Label: Ksat - Low Value  
Column Physical Name: **ksat\_r** Column Label: Ksat - Representative Value  
Column Physical Name: **ksat\_h** Column Label: Ksat - High Value  
The amount of water that would move vertically through a unit area of saturated soil in unit time under unit hydraulic gradient.

Column Physical Name: **wthirdbar\_l** Column Label: 0.33 bar H2O - Low Value  
Column Physical Name: **wthirdbar\_r** Column Label: 0.33 bar H2O - Rep Value  
Column Physical Name: **wthirdbar\_h** Column Label: 0.33 bar H2O - High Value  
The volumetric content of soil water retained at a tension of 1/3 bar (33 kPa), expressed as a percentage of the whole soil.

Column Physical Name: **wfifteenbar\_l** Column Label: 15 bar H2O - Low Value  
Column Physical Name: **wfifteenbar\_r** Column Label: 15 bar H2O - Rep Value  
Column Physical Name: **wfifteenbar\_h** Column Label: 15 bar H2O - High Value  
The volumetric content of soil water retained at a tension of 15 bar (1500 kPa), expressed as a percentage of the whole soil.

Column Physical Name: **kwfact** Column Label: Kw  
An erodibility factor which quantifies the susceptibility of soil particles to detachment and movement by water. This factor is adjusted for the effect of rock fragments.

Column Physical Name: **caco3\_l** Column Label: CaCO3 - Low Value  
Column Physical Name: **caco3\_r** Column Label: CaCO3 - Representative Value  
Column Physical Name: **caco3\_h** Column Label: CaCO3 - High Value  
The quantity of Carbonate (CO3) in the soil expressed as CaCO3 and as a weight percentage of the less than 2 mm size fraction.

Column Physical Name: **sumbases\_l** Column Label: Sum of Bases - Low Value  
Column Physical Name: **sumbases\_r** Column Label: Sum of Bases - Rep Value  
Column Physical Name: **sumbases\_h** Column Label: Sum of Bases - High Value  
The sum of NH4OAc extractable bases (pH 7.0), reported on less than 2mm base.

Column Physical Name: **ph1to1h2o\_l** Column Label: pH H2O - Low Value  
Column Physical Name: **ph1to1h2o\_r** Column Label: pH H2O - Representative Value  
Column Physical Name: **ph1to1h2o\_h** Column Label: pH H2O - High Value  
The negative logarithm to the base 10, of the hydrogen ion activity in the soil using the 1:1 soil-water ratio method. A numerical expression of the relative acidity or alkalinity of a soil sample. (SSM)

Column Physical Name: **cokey** Column Label: Component Key  
The unique identifier of a record in the Component table. Use this column to join the Horizon table to the Component table.

Column Physical Name: **chkey** Column Label: Chorizon Key  
A non-connotative string of characters used to uniquely identify a record in the Horizon table.

**File Name: comp.txt**

Table Physical Name: component; Table Logical Name: component.

The Component table lists the map unit components identified in the referenced map unit, and selected properties of each component. If the Component % is greater than zero (low=65, RV=75, high=90) for a component, that component exists in every delineation of that mapunit. If the Component % includes zero (low=0, RV=50, high=90), the component may exist in some delineations, but not in others.

Column Physical Name: **compct\_l** Column Label: Comp % - Low Value  
Column Physical Name: **compct\_r** Column Label: Comp % - Representative Value  
Column Physical Name: **compct\_h** Column Label: Comp % - High Value  
The percentage of the component of the mapunit.

Column Physical Name: **compname** Column Label: Component Name  
Name assigned to a component based on its range of properties.

Column Physical Name: **majcompflag** Column Label: Major Component  
Indicates whether or not a component is a major component in the mapunit.

Column Physical Name: **albedodry\_l** Column Label: Albedo Dry - Low Value  
Column Physical Name: **albedodry\_r** Column Label: Albedo Dry - Representative Value  
Column Physical Name: **albedodry\_h** Column Label: Albedo Dry - High Value  
The estimated ratio of the incident short-wave (solar) radiation that is reflected by the air dry, less than 2 mm fraction of the soil surface.

Column Physical Name: **hydgrp** Column Label: Hydrologic Group  
A group of soils having similar runoff potential under similar storm and cover conditions.  
Examples are A and A/D. (NSSH)

Column Physical Name: **taxclname** Column Label: Taxonomic Class  
A concatenation of the Soil Taxonomy subgroup and family for a soil (long name).

Column Physical Name: **mukey** Column Label: Mapunit Key  
The unique identifier of a record in the Mapunit table. Use this column to join the Component table to the Mapunit table.

Column Physical Name: **cokey** Column Label: Component Key  
A non-connotative string of characters used to uniquely identify a record in the Component table.

**File Name: mapunit.txt**

Table Physical Name: mapunit; Table Logical Name: mapunit.

The Mapunit table identifies the map units included in the referenced legend. Data related to the map unit as a whole are also given.

Column Physical Name: **musym** Column Label: Mapunit Symbol  
The symbol used to uniquely identify the soil mapunit in the soil survey.

Column Physical Name: **muname** Column Label: Mapunit Name  
Correlated name of the mapunit (recommended name or field name for surveys in progress).

Column Physical Name: **lkey** Column Label: Legend Key

The unique identifier of a record in the Legend table. Use this column to join the Mapunit table to the Legend table.

Column Physical Name: **mukey** Column Label: Mapunit Key

A non-connotative string of characters used to uniquely identify a record in the Mapunit table.

**File Name: chtexgrp.txt**

Table Physical Name: chtexturegrp; Table Logical Name: chorizon\_texture\_group.

The Horizon Texture Group table lists the range of textures for the referenced horizon as a concatenation of horizon texture and texture modifier(s). For example, a horizon that is gravelly loamy sand in some places and gravelly loamy coarse sand in other places is shown as GR-LS on one row and GR-LCOS on another row in this table. The row with the typically occurring texture is identified as the RV row. Stratified textures are shown in one row. For example, a horizon that is stratified gravelly loamy fine sand and cobbly coarse sand is shown as SR- GR-LFS CB-COS on one row and the Stratified? column for that row is marked "yes". If two or more textures always occur together but are not stratified, all of the textures are listed on one row and the Stratified? column for that row is marked "no".

Column Physical Name: **texture** Column Label: Tex Mod & Class

Name for the concatenation of TEXTURE\_MODIFIER and TEXTURE\_CLASS.

Column Physical Name: **rvindicator** Column Label: RV?

A yes/no field that indicates if a soil texture is representative for the horizon.

Column Physical Name: **texdesc** Column Label: Texture Description

The full texture description for a horizon, using full texture class and in lieu of names rather than abbreviations.

Column Physical Name: **chkey** Column Label: Chorizon Key

The unique identifier of a record in the Horizon table. Use this column to join the Horizon Texture Group table to the Horizon table.

**File Name: cpmatgrp.txt**

Table Physical Name: copmgrp; Table Logical Name: component\_parent\_material\_grp.

The Component Parent Material Group table lists the concatenated string of parent material(s) in which the referenced map unit component formed based on entries in the Component Parent Material table. For example, a component formed in one parent material, such as loess, or one vertical sequence of parent materials, such as loamy glacial drift over silty residuum weathered from shale, has one row in this table. A component formed in one parent material in some locations, but another parent material (or sequence of parent materials) in other locations has two rows in this table, one for each parent

material (or sequence of parent materials). One row is identified as the representative parent material.

Column Physical Name: **pmgroupname** Column Label: Group Name  
Name for the concatenation of PARENT\_MATERIAL\_MODIFIER, PARENT\_MATERIAL\_KIND, and PARENT\_MATERIAL\_ORIGIN for each of the parent materials that may occur in a vertical cross section of a soil.

Column Physical Name: **rvindicator** Column Label: RV?  
A yes/no field that indicates if a listed parent material is representative for the component.

Column Physical Name: **cokey** Column Label: Component Key  
The unique identifier of a record in the Component table. Use this column to join the Component Parent Material Group table to the Component table.

#### IV. Table relationships

A map unit is the soil type identifiable on the map. Each map unit may consist more than one soil component. The percentage by area of each soil component within a single map unit is given by “compct” field. The “mukey” field in the map unit and component tables is the key that represents the one to many relationship between these two tables.

Each soil component can consist more than one soil horizon (layer). The component and the horizon tables are related by a one to many relationship represented by the key field “cokey” in both tables. The “cokey” in component also relates the component table with the component parent material group table with a one to many cardinality. The primary key “chkey” in the horizon table is used to relate this table to the horizon texture group table in a one to many relationship. See Figure-2 for the relationship diagram between the tables that are relevant to AnnAGNPS soil data.

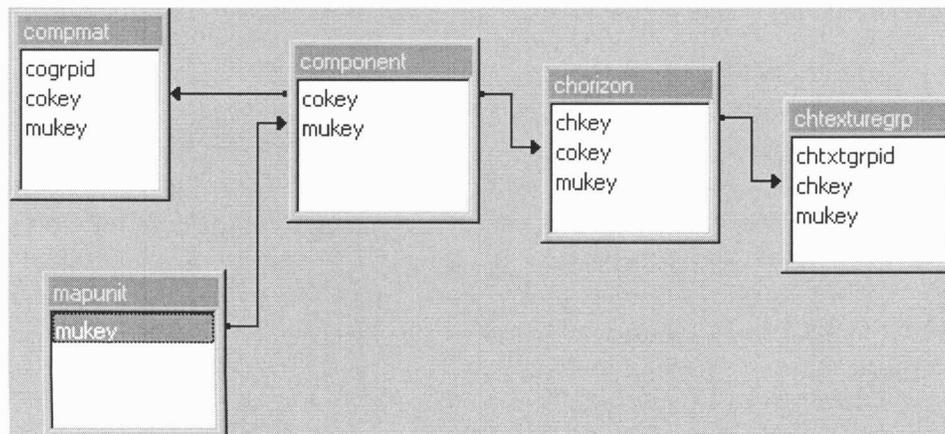


Figure-2. Table relationship diagram of source tables relevant to AnnAGNPS soil data

## V. AnnAGNPS Soil data preparation and implementation

In AnnAGNPS, each watershed cell subdivision is assigned the spatially dominant soil map unit within the cell. About 30 soil input parameters from the major soil component, and its soil horizons are required for each soil map unit. Figure-3 shows the required soil parameters and soil data matrix in AnnAGNPS format. The corresponding columns and tables of soil parameters from SSURGO version 2.0 dataset used to extract and derive each AnnAGNPS soil parameter are given below. The derivation and conversion process of the soil parameters from the SSURGO to AnnAGNPS is implemented using the Avenue script in Arcview.

Soil Data							
Data Field 1	Data Field 2	Data Field 3	Data Field 4	Data Field 5	Data Field 6	Data Field 7	Data Field 8
<b>Soil Data:</b>				Number Soils	Number Soils Layers		
REP	Soil Identifier	Hydrologic Soil Group	K-factor	Albedo	Time to Consolidation	Impervious Depth	Specific Gravity
EAT	Soil Name			Soil Texture			
R	Layer Depth	Bulk Density	Clay Ratio	Sand Ratio	Silt Ratio	Rock Ratio	Fine Sand Ratio
E		CaCO <sub>3</sub>	Saturated Conductivity	Field Capacity	Wilting Point	Volcanic code	Base Saturation
P							Unstable Aggregate Ratio
E		pH	Organic Matter Ratio	Organic N Ratio	Inorganic N Ratio	Organic P Ratio	Inorganic P Ratio
A							Soil Structure code
T							

Figure-3. AnnAGNPS soil data format (Source: Bingner et al., 2002)

### Soil Identifier:

Map unit symbol (Musym) from mapunit table plus user entered less than 4 character length string

### Hydrologic Soil Group:

Hydrologic soil group (Hydgrp ) from component table

### K-factor:

Soil erodibility factor (Kw) from horizon table for english report. Soil erodibility factor (Kw) x 0.1317 from horizon table for metric report

### Albedo:

Albedo dry from component table

### Time to Consolidation:

Default value of 1 year for all soils

### Impervious depth:

Depth representative value from horizon table to top of any layer with a Ksat (low) of  $0 \div 2.54$  for english report (inches). **Ksat(0) / 2.54**. Depth representative value from horizon table to top of any layer with a Ksat (low) of  $0 \times 10$  for metric report (millimeters). **Ksat(0) \* 10**

### Specific Gravity:

Default value of 2.65 for all soils

### Soil Name:

Soil name from component table

### Soil Texture:

Soil texture from component table

**Layer Depth:**

Bottom depth representative value from horizon table for each layer ÷ 2.54 for English report (inches). Bottom depth representative value from horizon table for each layer x 10 for metric report (millimeters)

**Bulk Density:**

Bulk density (Db) 1/3 bar representative value from horizon table for each layer for metric report. Bulk density (Db) 1/3 bar representative value from horizon table for each layer x 62.37 for english report (lb/ft<sup>3</sup>)

**Clay Ratio:**

Total clay percent - representative value from horizon table for each layer ÷ 100

**Silt Ratio:**

1.00 – (clay ratio + sand ratio)

**Sand Ratio:**

Total sand percent - representative value from horizon table for each layer ÷ 100

**Rock Ratio:**

$((100 - [\% \text{ passing } \#10 \text{ representative value}] / ([\% \text{ passing } \#10 \text{ representative value}] + [\text{rock fragment 3 to 10 representative value}] \text{ from horizon table}))$

**Very Fine Sand Ratio:**

Very fine sand percent representative value from horizon table for each layer ÷ 100

**CaCO3:**

CaCO3 equivalent representative value from horizon table for each layer ÷ 100

**Saturated Conductivity:**

Ksat representative value from horizon table for each layer ÷ 7.055 for English report (inches/hour). (Ksat representative value from horizon table for each layer ÷ 7.055) \* 25.4 for metric report (cm/hour)

**Field capacity:**

Water 1/3 representative value from horizon table for each layer ÷ 100

**Wilting Point:**

Water 15 bar representative value from horizon table for each layer ÷ 100

**Volcanic Code:**

Default value of 0. User, if so desires, may enter values using the provided component parent material group as a look up reference

**Base Saturation:**

Sum of bases representative value from horizon table for each layer

**Unstable Aggregate Ratio:**

Default value of 0

**PH:**

PH representative value from horizon table for each layer

**Organic Matter Ratio:**

Organic matter representative value from horizon table for each layer run through the following equation:

$$OM_{vol} = \frac{OM_{wt} \div OM_{density}}{100 \div (((OM_{wt} \div OM_{density}) + ((100 - OM_{wt}) \div Mineral\ Soil_{density})) \div 100)}$$

where:  $OM_{wt}$  is the percent Organic matter by weight rv from NASIS  
 $OM_{density}$  is assumed to be 0.9 g/cc  
Mineral Soil<sub>density</sub> is assumed to be 1.5 g/cc  
 $OM_{vol}$  is the calculated volume percentage of Organic matter

Since this formula assumes an average bulk density of 1.5 g/cc for the mineral fraction, there may be slight differences for layers that have significantly higher or lower bulk density in the mineral fraction (eg. soils with high volume of rock fragments or very low density mineral materials) (Source NRCS)

**Organic Nitrogen Ratio:**

Default 500 ppm for first layer and 50 ppm for each subsequent layer

**Inorganic Nitrogen Ratio:**

Default 5 ppm for first layer and 0.5 ppm for each subsequent layer

**Organic Phosphorous Ratio:**

Default 500 ppm for first layer and 250 ppm for each subsequent layer

**Inorganic Phosphorous Ratio:**

Default 500 ppm for first layer and 250 ppm for each subsequent layer

**Structure Code:**

Derived from soil texture group table (values 1 to 4)

## VI. Running the Arcview SSURGO AnnAGNPS Interface.

The GIS interface developed in the Arcview GIS allows the user to automatically extract, calculate and export the required soil parameter dataset in the AnnAGNPS format. GIS interface dialogues and processing procedure used for the extraction and assignment of the dominant soil types to each sub watershed cells for AnnAGNPS are shown in Figures 4 through 10 and described next.

### **Start Arcview and load extension**

- 1) Choose “SSURGO process” from the menu bar
- 2) Click “Create\_AnnAGNPS\_table”. A dialog box looking like Figure-5 will pop up in the Arcview window.
- 3) Navigate to the directory containing the SSURGO Version 2 text files by clicking on the left “Directory list” box. List of text files in current folder is displayed on the right “Files list directory” box. Choose the appropriate radio button option indicating the soil parameter units, English or Metric, of your choice.
- 4) Click “Ok”
- 5) A dialog box will appear prompting you to enter a unique not more than 3 character string to uniquely identify each soil map unit symbol. This id could be a soil survey area id number, county name abbreviation or any thing else. Enter a value and click “Ok”

6) The following 5 tables are generated and saved in the directory you navigated to in step 3. They are also added to the current arcview project in table view.

**Ann\_unit\_id:** AnnAGNPS soil parameters table contains the complete soil parameter data set for AnnAGNPS

**comp\_id:** table consisting soil parameters from the component table.

**layer\_id:** table consisting soil parameters from the horizon table.

**mapu\_id:** table consisting soil parameters from the mapunit table.

**texgrp\_id:** table consisting soil parameters from the texture group table.Used to calculate soil structure codes parameter for AnnAGNPS.

**compmat\_id:** table consisting soil parameters from the component parent material group table. This table is included to help as look up reference to assign values for the volcanic code parameter for AnnAGNPS if so desired.

7) Choose “SSURGO process” from the menu bar

8) Click “Export\_to\_infile”. A dialog box looking like Figure-9 will pop up in the Arcview window.

9) Select the AnnAGNPS table generated in the previous steps of 1 to 6 from the list of tables in the list box of the dialog. Select also the appropriate radio button option indicating your desire of whether to insert the exported AnnAGNPS soil parameters in to existing .inp file, or to write it out to a new separate text file.

10) In the save dialog window navigate to the desired location and select the .inp file you want the result to be inserted to, or if your option above was to export the result to a new text file the save directory and provide a name for the file.

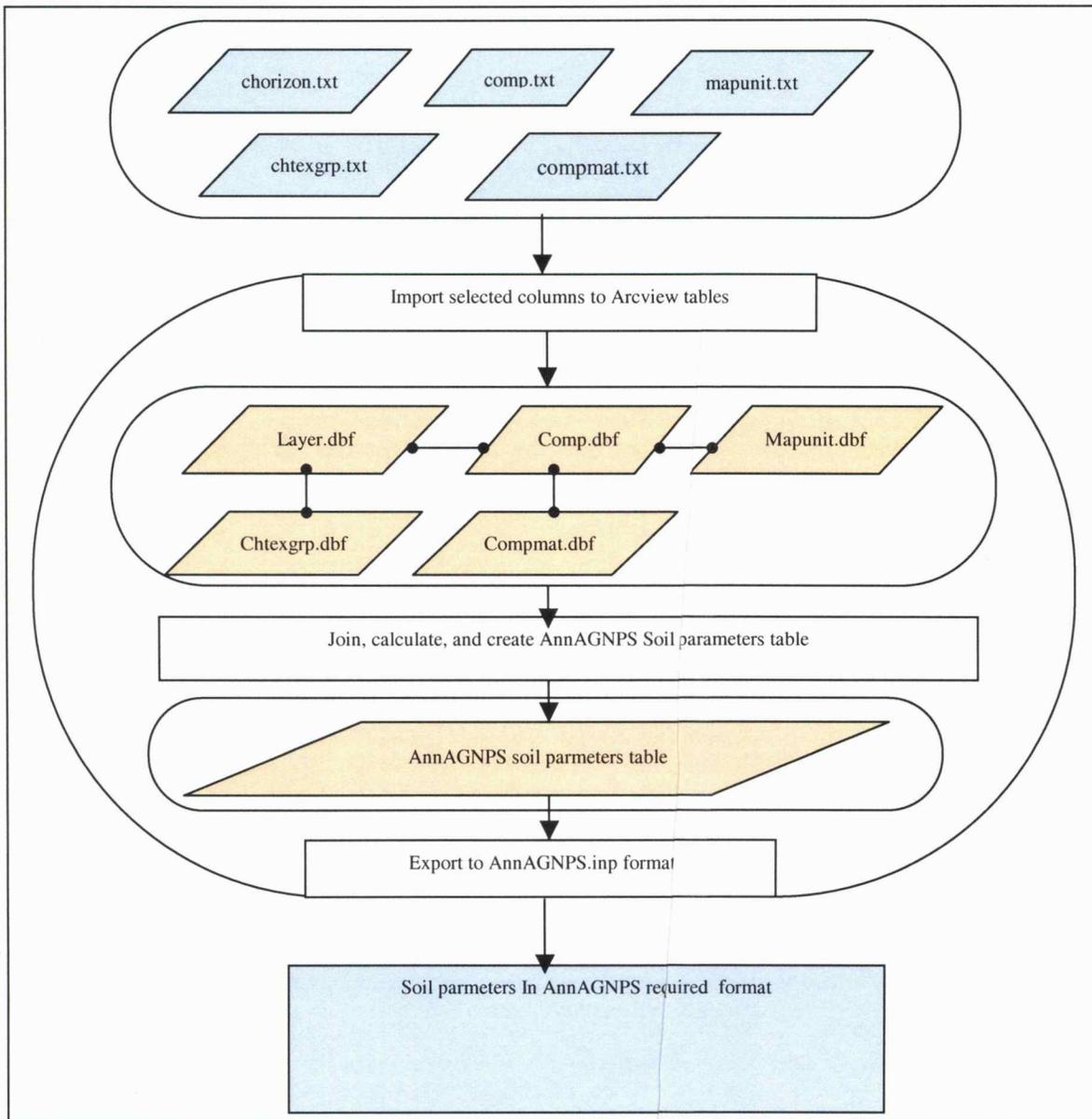


Figure-4. Process flow diagram of the Arcview SSURGO-AnnAGNPS soil data creator.

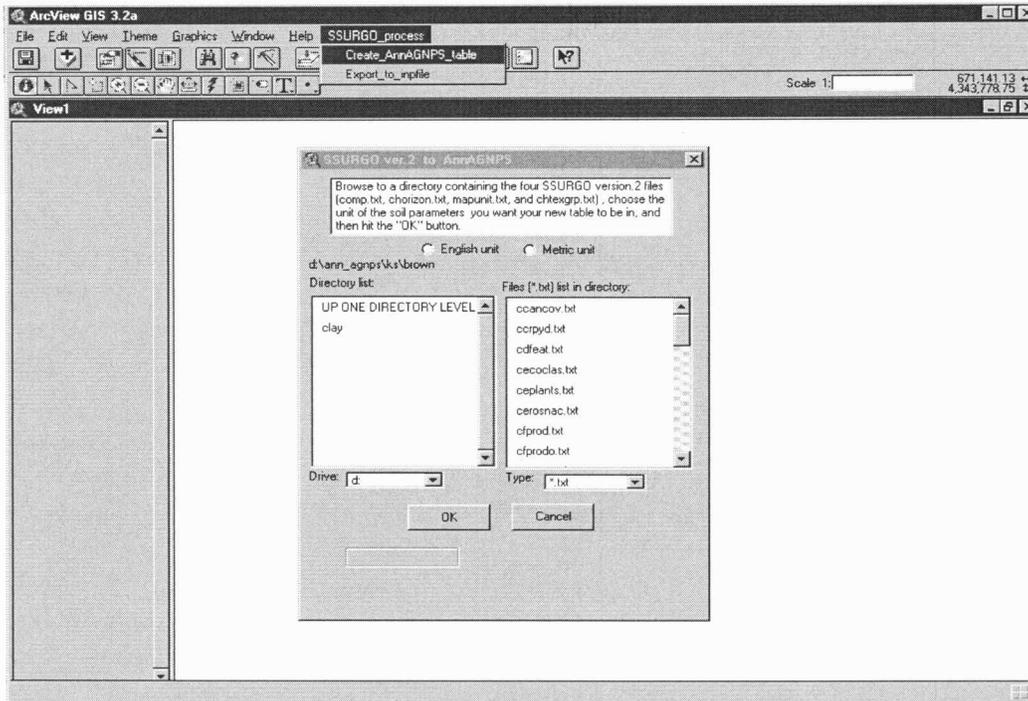


Figure-5. Dialog window to navigate to directory holding the SSURGO Version 2 files.

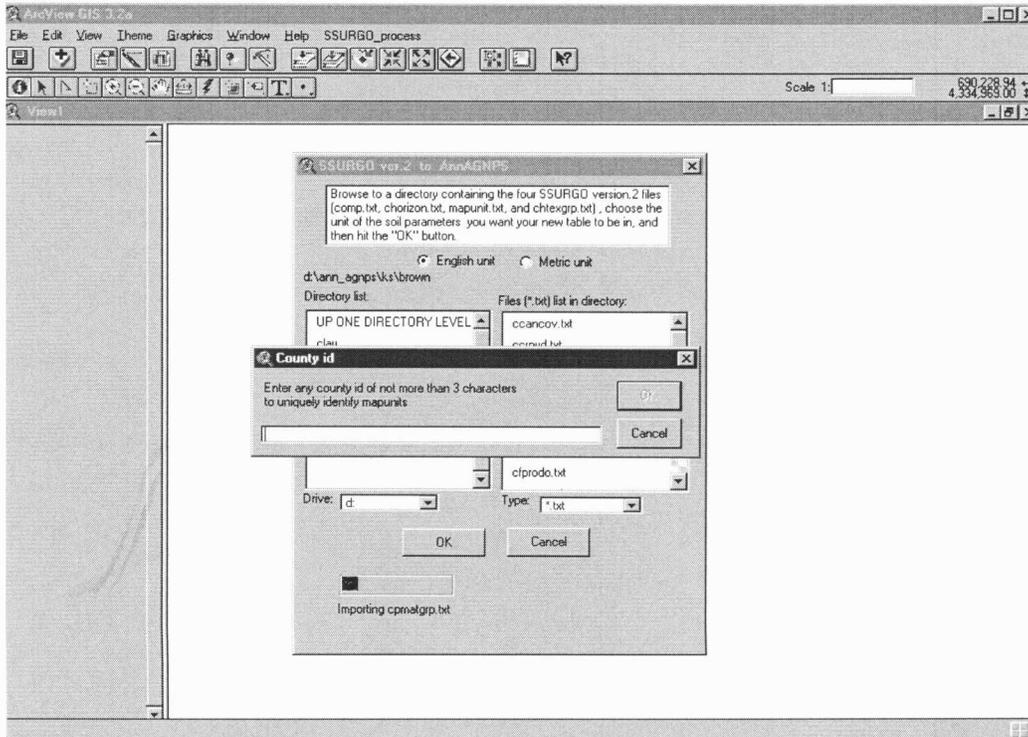


Figure-6. A dialog box prompts for a unique not more than 3 character symbol.

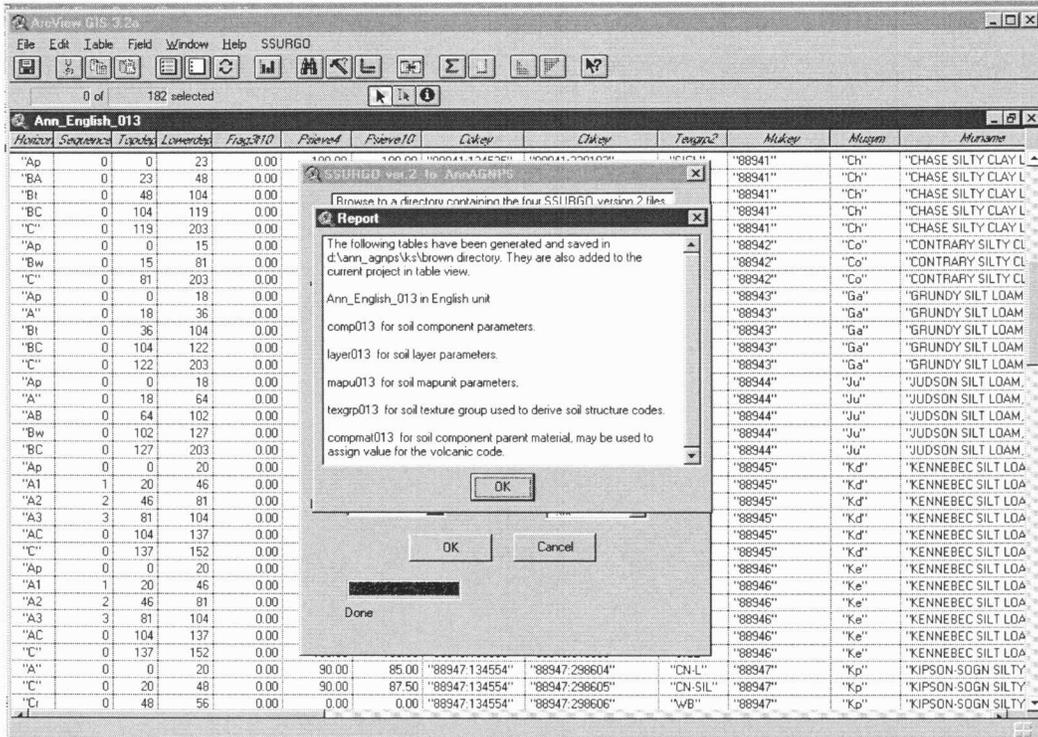


Figure-7. Dialog shows end of process generating soil parameters table and result report.

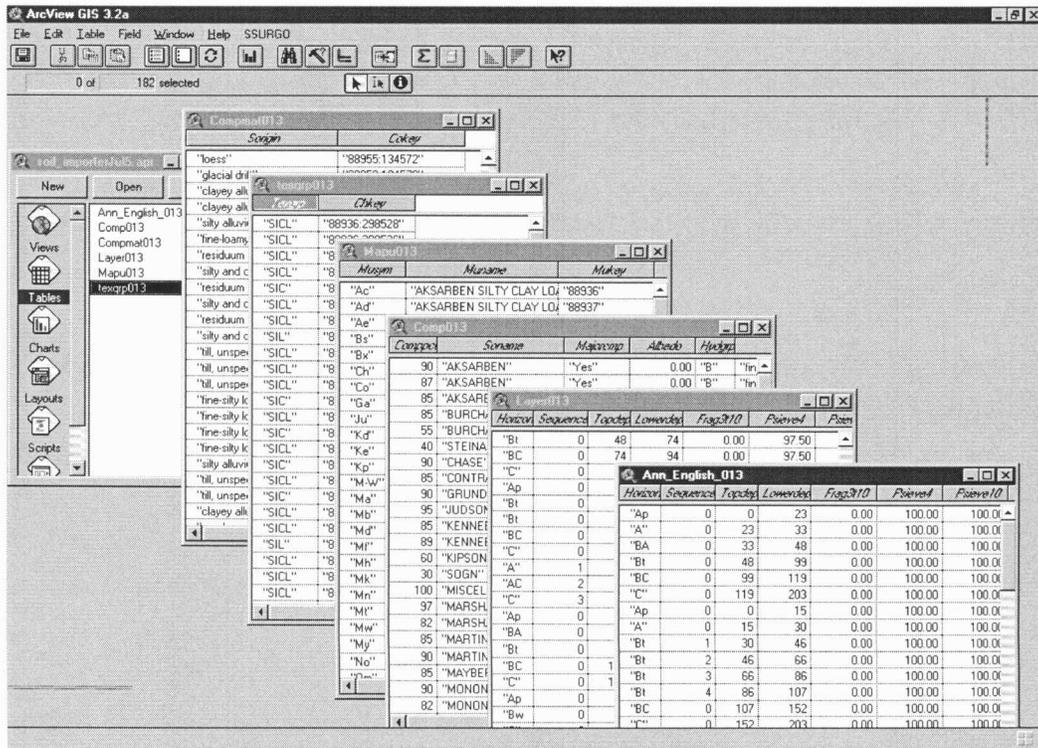


Figure-8. Five tables are generated and saved in the current project

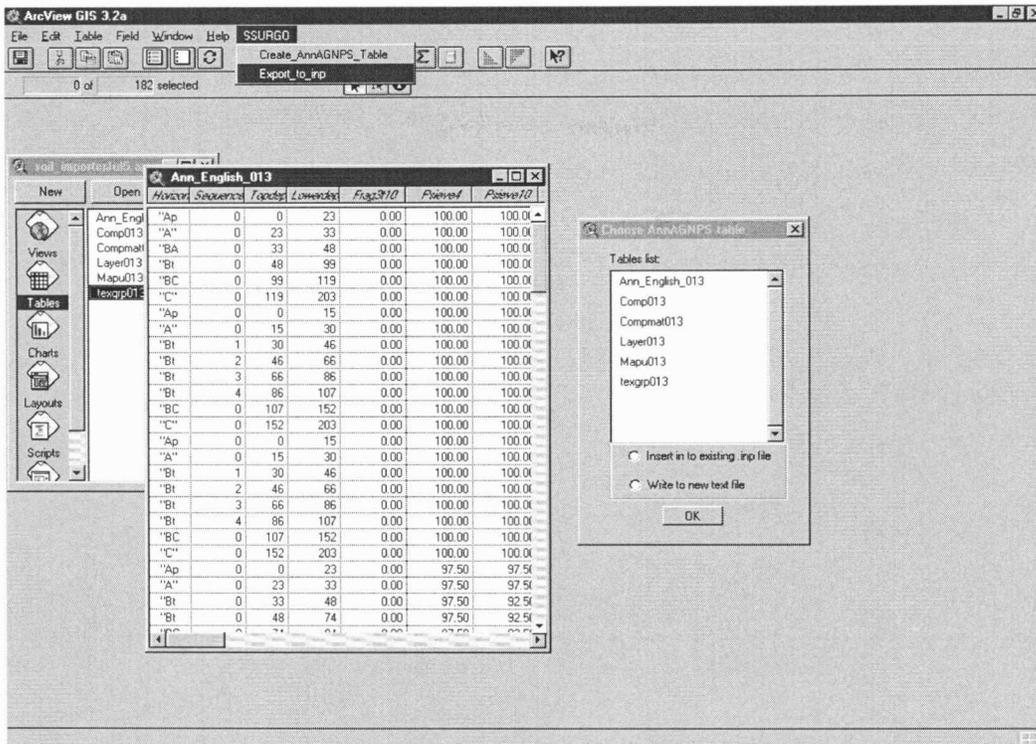


Figure-9. Dialog box for the “Export\_to\_inp” function. Choose the AnnAGNPS table generated in previous stage.

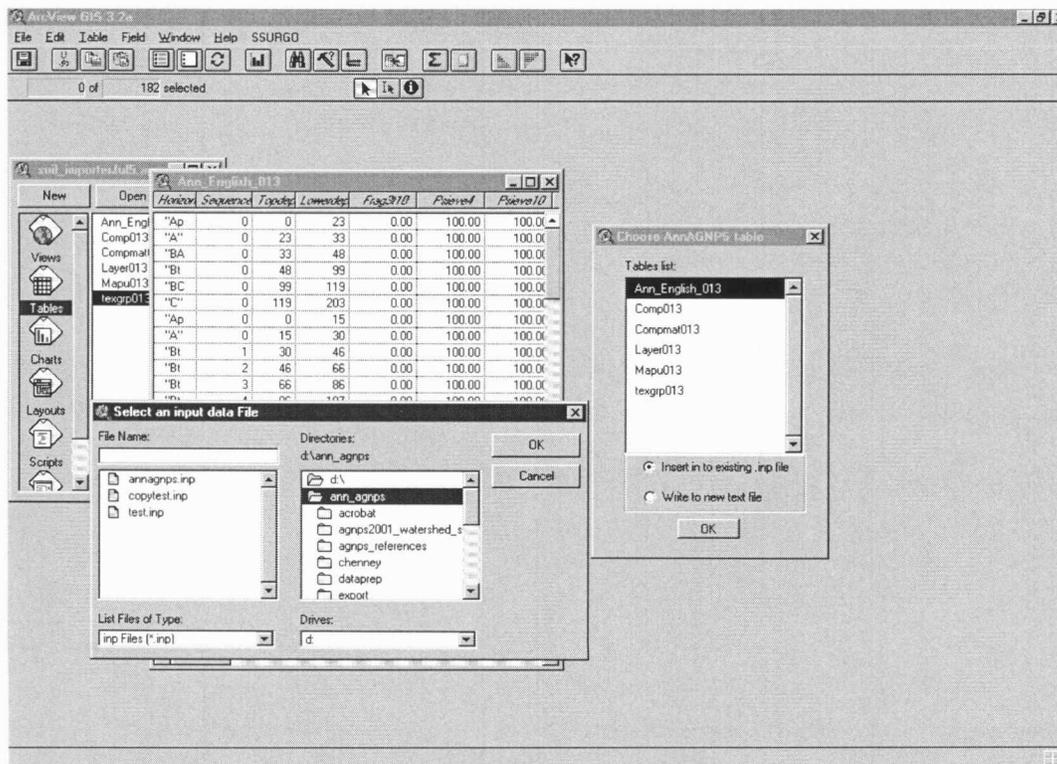


Figure-10. Dialog window to location of format export or the .inp file.

## **VI. Conclusion**

AnnAGNPS is a very effective tool for watershed management. However, the complex modeling procedures and data preparation keep it from being an efficient modeling tool. Our main thrust in building the GIS tool and the interface has been to minimize the user interaction in model simulations and preparing the soil input data for the model. Soil input data preparation is one of the most time consuming tasks in AnnAGNPS. This Arcview GIS tool we have created automatically extracts and derives needed soil parameters in the AnnAGNPS format from the nationally available SSURGO version2.0 soil data base. In the tests we have done, for Brown county of Kansas, the tool has been proven to be very valuable in helping reduce the time and complexity inherent in the running of the model. It also reduces the human errors that may inevitably be introduced due to manual entries of soil data parameters in the absence of such automation tools.

## **References**

1. National Soil Information System (NASIS) documentation for the SSURGO Version 2.0 structure. NASIS Web Site. <http://nasis.nrcs.usda.gov/documents/metadata>
2. United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). National Soil Survey Center Miscellaneous Publication Number 1527, Soil Survey Geographic (SSURGO) Data base Data Use Information, January 1995.
3. Bingner, R.L., F.D. Theurer, R.G. Cronshev, R.W. Darden. 2002. AnnAGNPS documentation. AGNPS 2002 Web Site. <http://www.sedlab.olemiss.edu/AGNPS.html>