

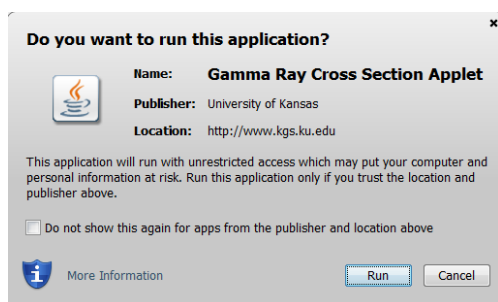
Gamma Ray Cross Section Java Applet

by John R. Victorine

Introduction

The Gamma Ray Cross Section web app has 2 sources for importing well data, 1) the user's PC or 2) the Kansas Geological Survey (KGS) Server & ORACLE Database. This program allows the user to import Log and Tops Data.

There will be occasions when the user would like to inspect the contents of a LAS file. So, for example, the user may wish to find the identity of the well, the types of logs, depth range, well or log parameters. Alternatively, the user can suspect that the file is not coded correctly in LAS format if the Import LAS function fails, and wishes to examine the file to troubleshoot the problem. The LAS file is an ASCII file and can be read by any text editor, i.e. Notepad, WordPad, TextPad, etc. The CSV (Comma Separated Values) files are also ASCII and can be edited in the same way or with Microsoft Excel.



To access Gamma Ray Cross Section go to http://www.kgs.ku.edu/stratigraphic/GR_CROSS_SECTION/. At the top of the web page there is a menu "Main Page|Description|Applet|Help|Copyright & Disclaimer|". Select the "Applet" menu option a "Warning - Security" Dialog will appear. The program has to be able to read and write to the user's PC and access the Kansas Geological Survey (KGS) Database and File Server, ORACLE requires this dialog. The program does not save your files to KGS, but allows you to access the KGS for well information that may be missing in your Kansas logs. The program does not use Cookies or any hidden software it only reads the LAS and CSV files for the Gamma Ray Cross Section Session. The blue shield on the warning dialog is a symbol that the Java web app is created by a trusted source, which is the University of Kansas. Select the "Run" Button, which will show the Cross Section Panel,

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Cross Section Panel

The Cross Section Panel manages the basic well data for the cross section plot. The user can import multiple well data (log, tops and core/cuttings descriptions) or measured sections to plot in a multiple well profile plot. This program does not necessarily need the X-Y-Z position of the well to plot, but the “Map” button does if the user wishes to plot the location of the well in 2 dimensions and the “Cross Section” button does if the user wishes to plot the wells by elevation.

File Menu Button

- Open an Existing Gamma Ray Cross Section
- Save Gamma Ray Cross Section Information

Memory usage progress bars displays the available memory as you load well data into the web app.

Load XML Status progress bar shows the user the status in loading the well data into the gamma ray colorlith cross section dialog

Down Button changes the well/location order by moving it down one row in the table list.

Up Button changes the well/location order by moving it up one row in the table list.

Cross Section Well List

Table displays the wells that are part of the cross section and the order they will be plotted.

Map Button plots the well position

Cross Section Button plots the well data.

Modify Button allows the user to modify the well information data.

New Well Button allows the user to add a well to cross section. The button is enabled until a maximum of 100 wells are reached.

Remove All Button to remove all data from list.

Remove Button to remove well from list.

LTG	Well Name	API-Number	Status	Latitude	Longitude	Elevation	Tc	Order
LT	Schneider 1	15-071-20094	D&A	38.629	-101.813	3,725.16S		1
LT	Brunswick 'A' 1	15-071-20168	GAS	38.614	-101.7	3,613.16S		2
LT	Helen M. Green et al. 1	15-071-20159	D&A	38.616	-101.689	3,596.16S		3
LT	Wilken 1	15-071-20334	D&A	38.67	-101.668	3,584.16S		4
LT	Hert Land and Cattle 'E' 1	15-071-20275	D&A	38.688	-101.593	3,508.16S		5
LT	Eugene 1-22	15-203-20076	D&A	38.647	-101.393	3,353.16S		6

Figure: Description of the Cross Section Panel, the main entry point for entering multiple well data.

The cross section requires the user to manage the memory in building the cross section plot, which is displayed on the main panel; the panel has the Memory Usage as well as the Total Available Memory Usage Status Bar Fields. For each cross section the user must decide how many wells and their respective depth ranges will fit in one plot. The memory size is dependent on the user's own PC. This applet will allow from 1 to 100 wells on one cross section plot. This web app can support 100 wells because it requires only one log curve, Gamma Ray, unlike the Cross Section web app that plots all available log curves which requires a lot of extra memory to hold the data.

Quick Cross Section Work Flow

- Select the “**New Well**” button to load data for each well into the cross section panel.
 - Maximum of 100 wells allowed for plotting a cross section.
 - Minimum of 1 well can be plotted in the cross section plot.
 - For each well loaded,
 - Verify that the well has a latitude, longitude and elevation.
 - If any latitude, longitude and elevation is missing then,
 - Highlight the well/measured section in the list.
 - Select the “**Modify**” button to enter the missing data, either manually or by using the “Search KGS Database for Well Information” button to search the Kansas Geological Survey (KGS) database for existing well header information.
- For more 2 wells select the “**Map**” button to plot the wells on latitude versus longitude map plot to verify the order is correct.
 - If a well is out of order then,
 - Highlight the well in question.
 - Select the “Up” or “Down” buttons to change the order of the well, verify with the latitude versus longitude map plot.
- Select the “**Cross Section**” Button to create a Cross Section Plot.

Loading Well Data

Click the "New Well" Button, which will show the "Load Data" Dialog. The dialog below displays an example of the Wellington KGS 1-32 well data loaded from the PC Data icon buttons with the data in the tables above. The icon buttons in the Data Source Panel assists the user in loading well data into the Gamma Ray Cross Section Applet.

Data Source Panel

Load existing well data. User can load from multiple sources.

Data Loaded Panel

Positive feedback to user to verify what source data was loaded and location of the source.

Dialog Buttons:

Add Well Data – Load well data into Cross Section Data Structure for plotting.

Clear – Clear loaded data from this dialog.

Data Source

KGS Data KGS (Database & Server) Well Data

PC Data PC (ASCII Data Files) Ver 2.0 & 3.0 Tops CSV

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: Wellington-KGS-1-32.las

2:

3:

PC ASCII Files:

Tops CSV: Wellington-KGS-1-32_Tops.csv

Data Type	3.0	LAS	CSV	KGS
Log Data	.....	YES	.....	.....
Perforations	NO	.....	.....	.....

Data Type	3.0	LAS	CSV	KGS
Tops Data	YES	.....

Add Well Data Clear Exit

Load data from Kansas Geological Survey (KGS) Database and Server.

Load ASCII Delimited Data Files from PC.

Displays the filename of files loaded.

Show the source of the data and type.

Data Source Panel

The Data Source Panel provides two methods of importing data into the Gamma Ray Cross Section Web App. The Kansas Geological Survey (KGS) Database & File Server and the user's PC. A number of icon buttons are provided to assist the user in importing the specific data type of interest. When the user selects the icon button a search dialog is provided specific to the data type. The CSV (Comma Separated Values) icon buttons under the "PC ASCII Delimited Data Files" Panel are expecting a general type of data presentation. Although the order of the specific data columns is not important, the "Mnemonics" of the data column is. Each data type in GEMINI Tools web apps have a data mnemonic list that will be presented later as each icon search dialog is presented. The CSV Search Dialog will use the first two lines of the CSV file to automatically match the file column data mnemonics with the web app curve mnemonics, but if

the program does not recognize the file data mnemonic then it will leave it blank and expect the user to match the file data mnemonic to the web app curve mnemonics, this will be explained later.



Kansas Geological Survey (KGS) Database & Server Data



Kansas Well Data

This button allows the user to access well data stored in the Kansas database & Server. LAS ASCII Standard (LAS) version 2.0 Files & Core Images JPEG Files (Boxes, Core Slab, Thin Sections) Database Data: Perforations Depth Data, Formation Tops (Stratigraphic Units), Measured Core Data.



PC ASCII Delimited Data Files



Log ASCII Standard (LAS) File Read

This version will read up to 3 Log ASCII Standard (LAS) Files, versions 2.0 & 3.0. This read process does not necessarily distinguish between the two versions. The LAS Java Read classes follow the rules set up by the Canadian Well Logging Society for both versions.



Tops CSV (comma separated values) ASCII File Read

This version will allow the user to map a comma delimited ASCII file data columns to the tops data variables in the Profile Web Application.

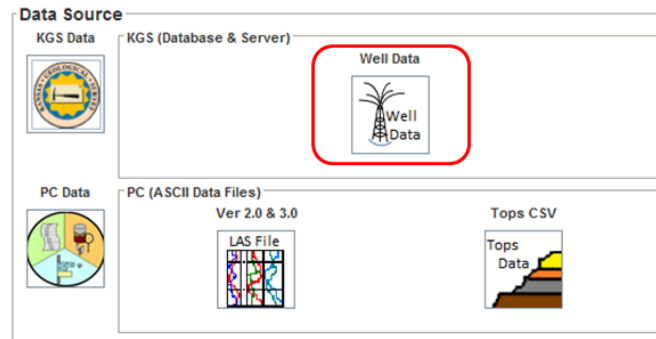
Data Loaded Panel

The Data Loaded Panel provides a visual feedback that the data type was loaded, by the file names of the files that were accessed to load the data and by the data type that is loaded. The data type is important in that it shows where the data came from. The KGS data has the ORACLE Database from which the Tops Data, and Core Data, etc. are retrieved from a XML (Extensible Markup Language) data stream that is constructed using the ORACLE PL/SQL for each data type. The user's PC will load the data from CSV (Comma Delimited Values) file. The LAS File can be downloaded automatically from the KGS Server in the program or from the user's PC. This program allows the user to import up to 3 Log ASCII Standard (LAS) version 2.0 or 3.0 files. The LAS version 3.0 file can hold all the well data, but if the user wishes to add log curves from a LAS version 2.0 file it is advised that the LAS version 3.0 file be loaded last. In most cases the user is importing multiple LAS version 2.0 files, which can be saved into a single LAS version 3.0 file.

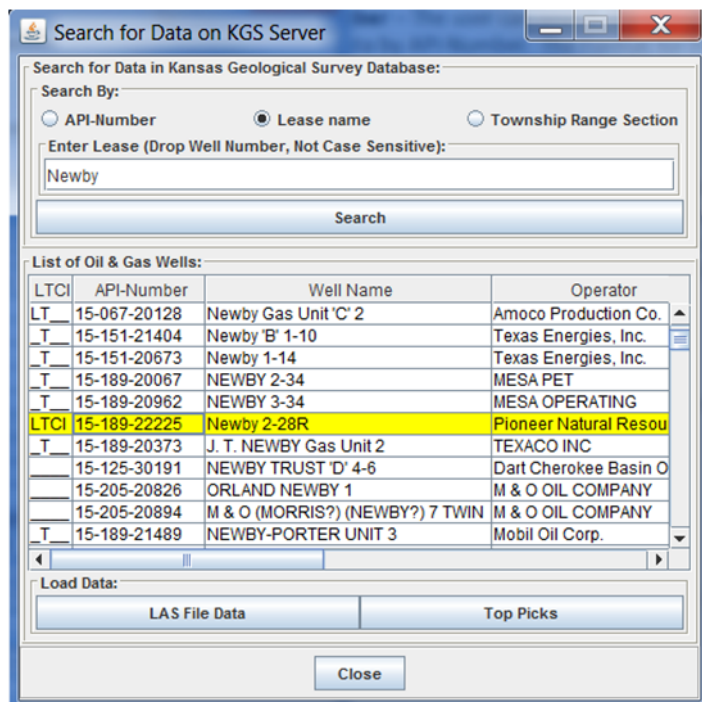
Importing KGS (Database & Server) Data

KGS (Database & Server) - Importing Well Data

The Kansas Geological Survey (KGS) has a good collection of well data stored in the ORACLE Database and File Server as Files Log ASCII Standard (LAS) version 3.0 Files. In this example the user will download the well data available from the KGS, Log data (LAS version 2.0 File), Tops Data, Measured Core Data, and Perforation Data. The ORACLE Database is accessed by making Stored Procedure PL/SQL calls to the ORACLE Database from which an Extensible Markup Language (XML) data stream is created containing the well data that is passed back to the web app making the request.



Left Click on the “Well Data” Icon Button in the Data Source Panel of the Load Data Dialog.



Search for Well Data in KGS Database Search By:

- **API-Number** – The user can search the KGS Database for well data by API-Number. The Format for the API is SS-CCC-99999 where
 - SS – Two Digit State Code
 - CCC – Three Digit County Code
 - 99999 – 5 Digit Well Number
- **Lease Name** – The user can search for well data by lease partial phrase, i.e. “Newby”, which will look for all wells with the phrase “Newby” in the lease name.
- **Township-Range-Section** – Search for a list of Wells by a specific area.

List of Kansas wells that match the search criteria

Load Well Data Buttons

- **LAS File Data** – Load Log ASCII Standard (LAS) Files
- **Top Picks** – Load Formation Tops Picks

NOTE: LTCI Column in Table: L-LAS Files; T-Formation Tops; C-Measured Core Data; I-Core Images

This will display the “Search for Data on KGS Server” Dialog, see above image. This dialog allows the user to search the KGS database for well data. In this example, the well of interest will be the Newby 2-28R, this well contains all the well data that can be retrieved from the KGS Database, i.e. Log Data (LAS version 3.0 File), Tops Data, Core Data, and Perforations.

As the Summary image suggests there are 3 methods for searching for the well data within this dialog,

- By API-Number – KGS has a specific format for the API-Number, i.e. SS-CCC-99999 where SS is the state code for Kansas 15, CCC is the county code for Newby 2-28R it is 189 for Stevens County and the 5-Digit Well Number for Newby 2-28R it is 22225.

Search By:

☒ API-Number ☐ Lease name ☐ Township Range Section

Enter API-Number : _____

15-189-22225

Search

- By Partial Lease Name – The stored procedure used to retrieve the well header information allows the user to enter a partial phrase, in this example Newby. The program places a ‘%’ in front and back of the phrase and sends the request to the Database, i.e. “%Newby%”.

Search By:

☐ API-Number ☒ Lease name ☐ Township Range Section

Enter Lease (Drop Well Number, Not Case Sensitive): _____

Newby

Search

- By Township Range Section – This search is by location in Kansas, this search also allows the user to enter just the Township and Range to search for wells, e.g. to look for the Newby 2-28R, enter Township as 31 set the S (South) Radio button and Range as 37 set the W (West) Radio button.

Search By:

☐ API-Number ☐ Lease name ☒ Township Range Section

Section: _____ Township: _____ Range: _____

0 31 ☐ N ☒ S 37 ☒ W ☐ E

Search

The user only needs to enter the above data and select the “Search” Button to display the list of Wells in the Kansas Database that match the search criteria. In the image below the Lease Name “Newby” was entered to search for all wells in Kansas with the Phrase Newby in it. The user searches through the list until they find the well of interest. In this example it is the Newby 2-28R, which is highlighted.

Search for Data on KGS Server

Search for Data in Kansas Geological Survey Database:

Search By:

☐ API-Number ☒ Lease name ☐ Township Range Section

Enter Lease (Drop Well Number, Not Case Sensitive):

Newby

Search

List of Oil & Gas Wells:

LTCI	API-Number	Well Name	Operator
LT_	15-067-20128	Newby Gas Unit 'C' 2	Amoco Production Co.
T_	15-151-21404	Newby 'B' 1-10	Texas Energies, Inc.
T_	15-151-20673	Newby 1-14	Texas Energies, Inc.
T_	15-189-20067	NEWBY 2-34	MESA PET
T_	15-189-20962	NEWBY 3-34	MESA OPERATING
LTCI	15-189-22225	Newby 2-28R	Pioneer Natural Resou
T_	15-189-20373	J. T. NEWBY Gas Unit 2	TEXACO INC
	15-125-30191	NEWBY TRUST 'D' 4-6	Dart Cherokee Basin O
	15-205-20826	ORLAND NEWBY 1	M & O OIL COMPANY
	15-205-20894	M & O (MORRIS?) (NEWBY?) 7 TWIN	M & O OIL COMPANY
T_	15-189-21489	NEWBY-PORTER UNIT 3	Mobil Oil Corp.

Load Data:

LAS File Data Top Picks

Close

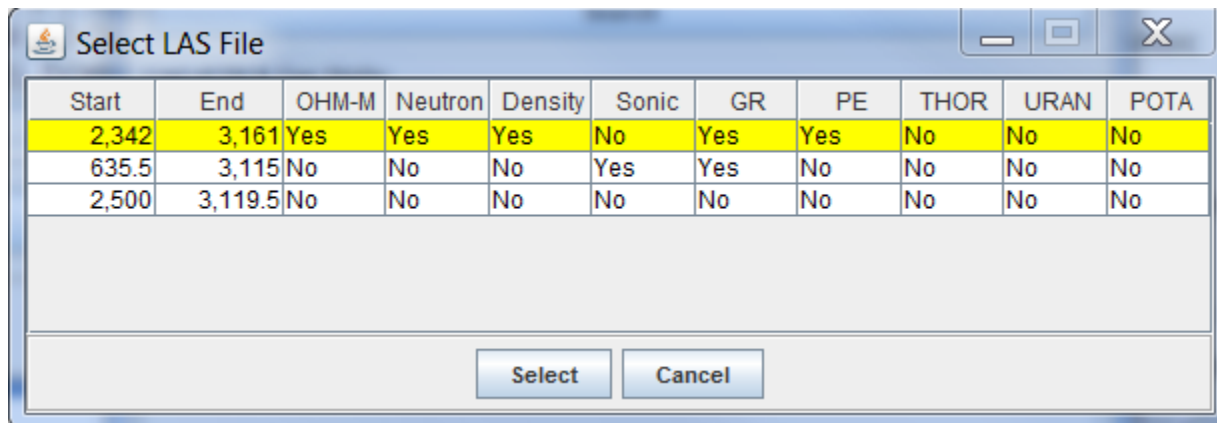
Notice that the LTCI represents the type of data that the well contains. It is a visual aid that lets the user see what is available before trying to download the data. If you require a LAS file you would want to see an L in that column. The LTCI labels stand for the following,

- L – Log ASCII Standard (LAS) version 2.0 Files
- T – Tops Data (Stratigraphic Unit Horizons)
- C – Measured Core Data
- I – Core Joint Photographic Experts Group (JPEG) Image Files

This dialog allows the user to now download each of the data types that are available.

Load KGS Well Data – LAS File Data

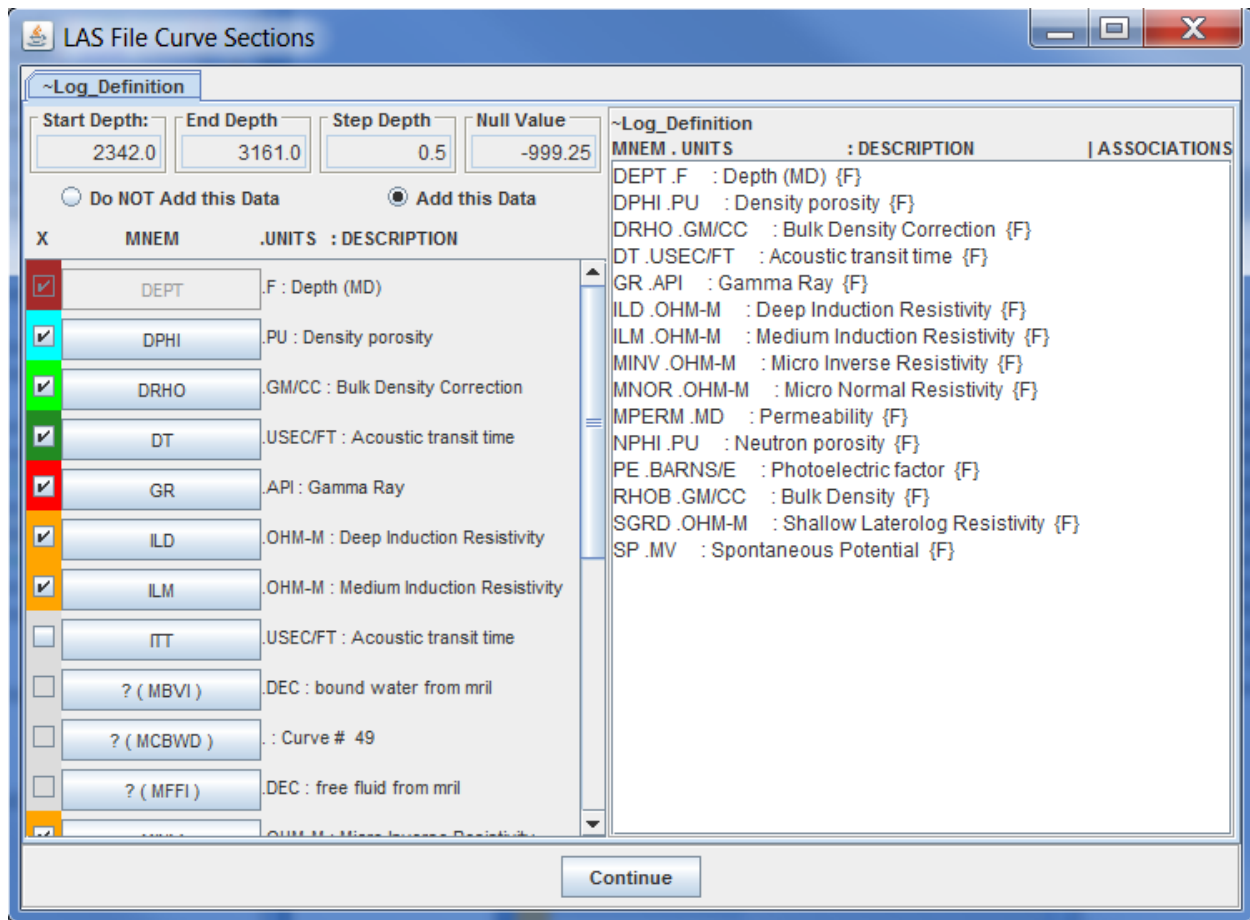
The “Search for Data on KGS Server” Dialog allows the user to download data from the KGS Database & Server to the web app. The “LAS File Data” Button will display the “Select LAS File” Dialog with a list of LAS version 2.0 Files that are available.



In this example there are three LAS files available, with a table suggesting the log data type in the file. In the beginning of the GEMINI Project (2000-2003) a precursor to the GEMINI Tools the KGS populated the Tool Types from every log that was in the KGS Server at that time. Unfortunately KGS has not maintain that table for wells uploaded after 2003 so the LAS File may have “No” for all the log types, which is not accurate. The user will need to open or download the file or search for the Well on the KGS Master List of Oil and Gas Wells in Kansas Web Page (<http://www.kgs.ku.edu/Magellan/Qualified/index.html>) to see what is in the File Header before deciding to download data from this program. For this example the first log has most of the data necessary except the Spectral Gamma Ray Logs. The Table above identifies the following log types,

- OHM-M – Resistivity Logs
- Neutron – Neutron Porosity Log
- Density – Bulk Density and/or Density Porosity Log
- Sonic – Acoustic Transit Time and/or Sonic Porosity Log
- GR – Gamma Ray (API units) Log
- PE – Photoelectric Factor Log
- THOR – Thorium Concentration
- URAN – Uranium Concentration
- POTA – Potassium Concentration)

In this example the first log contains the data needed, highlight the first log and click on the “Select” Button to display the “LAS File Curve Sections” Dialog. The “LAS File Curve Sections” Dialog allows the user to map unknown LAS Curve Mnemonics to the KGS “Standard” Curve Mnemonics so they will be plotted in the 3D Cross Plot. This program reads the “LAS Tool Curve Mnemonics map to KGS Standard Mnemonics” XML File (http://www.kgs.ku.edu/software/gemini/data/las_standard_tools.xml), which will automatically maps the Curve Mnemonics from the LAS file to one of 31 KGS “Standard” Curve Mnemonics.



As you can see this log has all the log types of interest, Gamma Ray API, Resistivity, Neutron/Density, Photoelectric Factor, Sonic and Permeability. If a curve Mnemonic is not recognized the program will place a “?” in front of the Mnemonic, e.g. “?(MPERM16)” for the “: Curve # 51” Log Curve. If the user is satisfied with the automatic curve selections, which are checked and color coded, they only need to select the “Continue” Button at the bottom of the Dialog to import the file. The next section will take the user through a series of examples in changing the curve selections and mapping unknown curve mnemonics.

Notice that some of the check boxes are colored with different colors, which shows that the curves were automatically selected, but also to represent the curve type by color. The Curves are colored by type (data units) as follows,

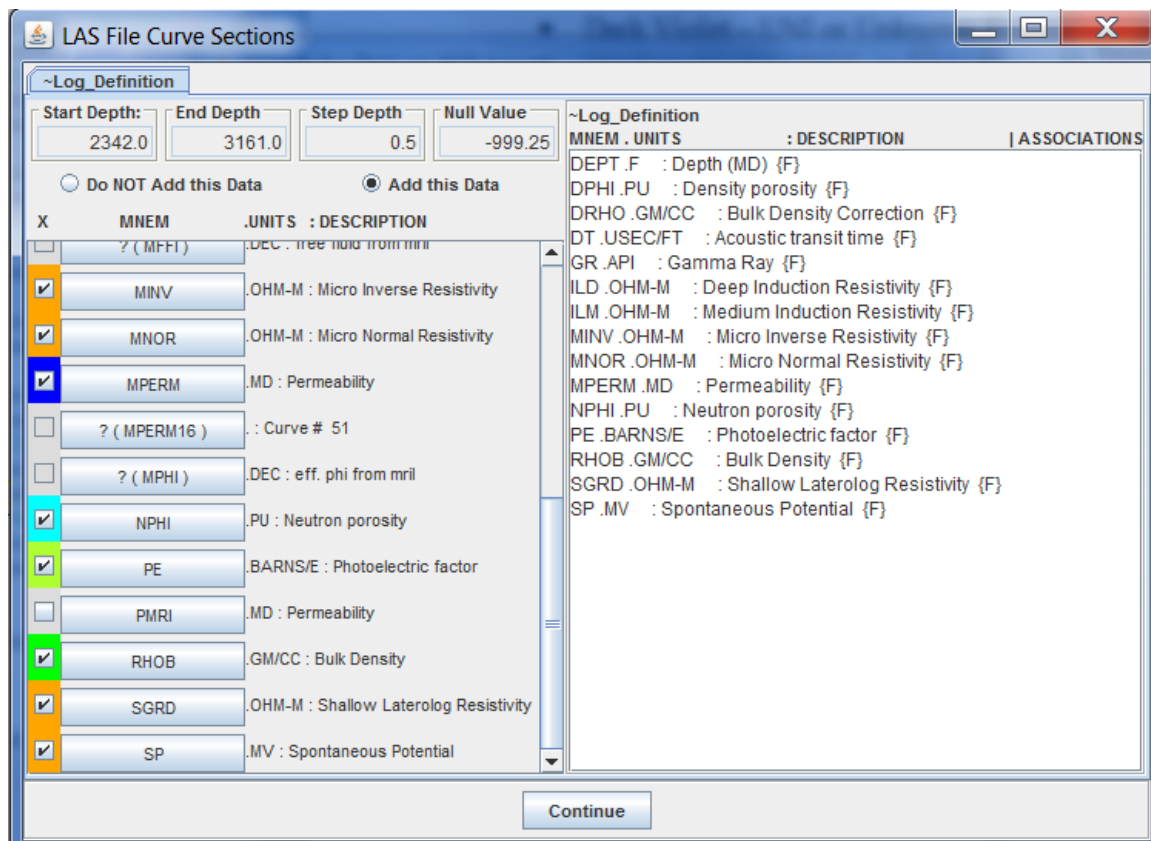
- Orange - OHM-M or Resistivity Logs
- Cyan – PU or porosity Logs, Neutron Porosity, Density Porosity, etc.
- Greenish yellow – BARNS/E or Photoelectric Factor Logs
- Green – GM/CC or Bulk Density Log
- Forest Green – USEC/FT or the Acoustic Transit Time Log
- Red – API, PPM or “%” as Radioactive logs, Gamma Ray, Spectral Gamma Ray, etc.
- Blue – MD or Permeability Logs
- Brown – F, FT or IN or Depth

- Middle yellow – FRAC, or other log curve types.
- Dark Violet – UNI or Unknown Linear Curves
- Medium Violet – UNL or Unknown Logrithum Curves

The color coding of the selected curves were added to also help the user visually recognize that a curve was selected or not.

Map Curves & Change Curve Selections

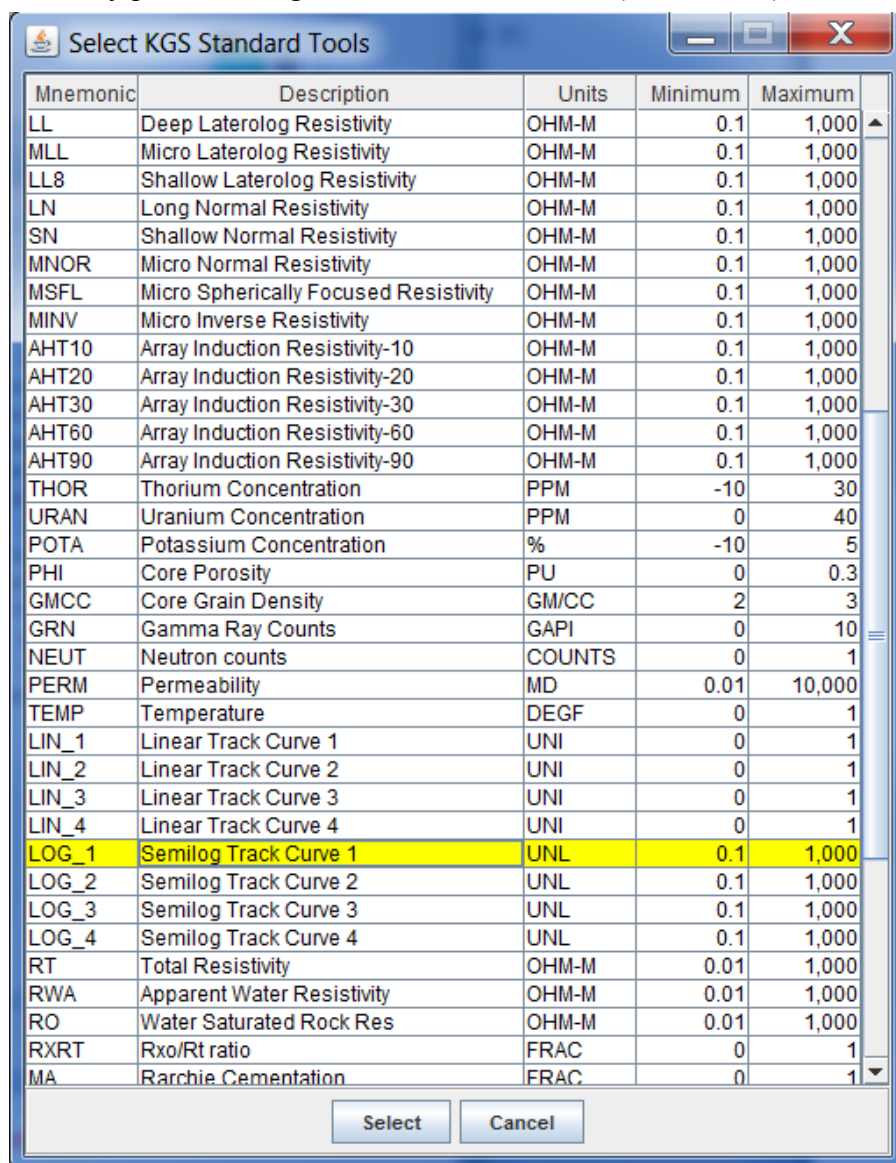
Some logs will have curve mnemonics that are not recognized as one of the KGS “Standard” Curve Mnemonics. The user will need to map the log curve to one of the KGS standard curves if they want to display the curve. Slide the scroll bar down to the Permeability Curves MPERM and ?(MPERM16).



Click on the “?(MPERM16)” Button to display the “Select KGS Standard Tools” Dialog. This dialog provides a list of the KGS “Standard” Curve Mnemonics, from which the user can map an unrecognized log curve to one of the KGS standard curve mnemonics. The KGS “Standard” Curve Mnemonics List was created as a way to standardize the alpha bit soup of Log Mnemonics. Each logging company has their own curve mnemonics to represent similar tools. The Gamma Ray Cross Section program is a later version of code from the GEMINI Project Cross Section Module, which needed to standardize the log curves so the curves could be automatically read and assigned a plot track. The “LAS Tool Curve Mnemonics map to KGS

Standard Mnemonics” XML File was created to map the log curves from logs that were part of the KGS LAS File Collection which is not a complete list of possible curve mnemonics.

To map the unknown curve mnemonic “?(MPERM16)” you first notice that it similar to the MPERM curve above, which is a permeability curve. In this example both curves will be plotted together, but the Permeability Plot Track can only plot one curve. The web app has the ability to allow the user to plot up to 4 unknown logarithm curves and 4 unknown linear curves. The permeability is usually plotted as logarithmic. Click on the “?(MPERM16)” Button to display the



“Select KGS Standard Tools” Dialog. Slide the scroll bar down to the “LOG_1” Mnemonic – Semilog Track Curve 1 and highlight that curve. Click on the “Select” Button to map the “?(MPERM16) to the Semilog Track Curve 1.

LAS File Curve Sections

~Log_Definition

Start Depth: 2342.0 End Depth: 3161.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

X	MNEM	.UNITS : DESCRIPTION
<input type="checkbox"/>	? (MFFI)	.DEC : free fluid from mrii
<input checked="" type="checkbox"/>	MINV	.OHM-M : Micro Inverse Resistivity
<input checked="" type="checkbox"/>	MNOR	.OHM-M : Micro Normal Resistivity
<input checked="" type="checkbox"/>	MPERM	.MD : Permeability
<input type="checkbox"/>	MPERM16	.UNL : () Curve # 51
<input type="checkbox"/>	? (MPHI)	.DEC : eff. phi from mrii
<input checked="" type="checkbox"/>	NPHI	.PU : Neutron porosity
<input checked="" type="checkbox"/>	PE	.BARNS/E : Photoelectric factor
<input type="checkbox"/>	PMRI	.MD : Permeability
<input checked="" type="checkbox"/>	RHOB	.GM/CC : Bulk Density
<input checked="" type="checkbox"/>	SGRD	.OHM-M : Shallow Laterolog Resistivity
<input checked="" type="checkbox"/>	SP	.MV : Spontaneous Potential

Continue

~Log_Definition

MNEM . UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT .F	: Depth (MD) {F}	
DPHI .PU	: Density porosity {F}	
DRHO .GM/CC	: Bulk Density Correction {F}	
DT .USEC/FT	: Acoustic transit time {F}	
GR .API	: Gamma Ray {F}	
ILD .OHM-M	: Deep Induction Resistivity {F}	
ILM .OHM-M	: Medium Induction Resistivity {F}	
MINV .OHM-M	: Micro Inverse Resistivity {F}	
MNOR .OHM-M	: Micro Normal Resistivity {F}	
MPERM .MD	: Permeability {F}	
NPHI .PU	: Neutron porosity {F}	
PE .BARNS/E	: Photoelectric factor {F}	
RHOB .GM/CC	: Bulk Density {F}	
SGRD .OHM-M	: Shallow Laterolog Resistivity {F}	
SP .MV	: Spontaneous Potential {F}	

The ?(MPERM16) Curve has been changed to MPERM16 removing the ?() around the Curve Mnemonic. Also select the check box next to it, which changes to a dark violet.

LAS File Curve Sections

~Log_Definition

Start Depth: 2342.0 End Depth: 3161.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

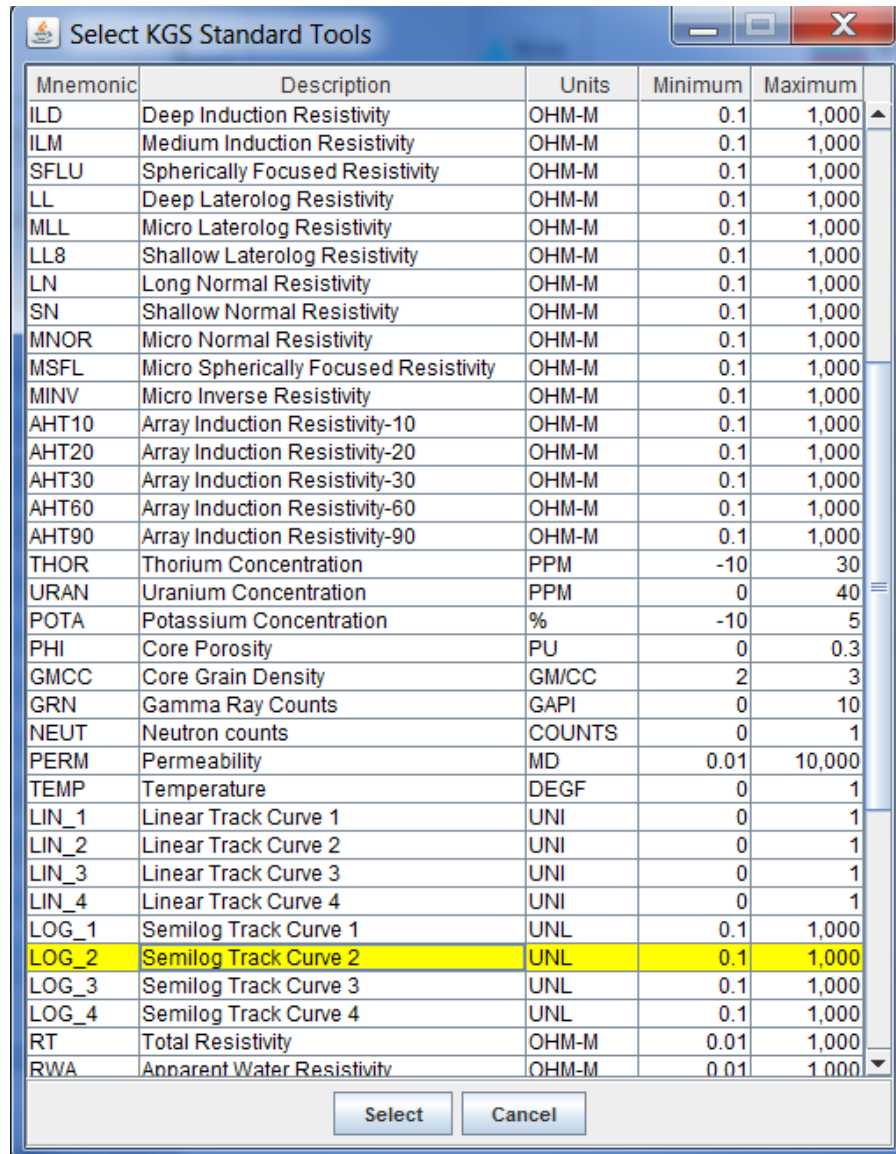
X	MNEM	.UNITS : DESCRIPTION
<input type="checkbox"/>	? (MBVI)	.DEC : bound water from mrii
<input type="checkbox"/>	? (MCBWD)	. : Curve # 49
<input type="checkbox"/>	? (MFFI)	.DEC : free fluid from mrii
<input checked="" type="checkbox"/>	MINV	.OHM-M : Micro Inverse Resistivity
<input checked="" type="checkbox"/>	MNOR	.OHM-M : Micro Normal Resistivity
<input checked="" type="checkbox"/>	MPERM	.MD : Permeability
<input checked="" type="checkbox"/>	MPERM16	.UNL : () Curve # 51
<input type="checkbox"/>	? (MPHI)	.DEC : eff. phi from mrii
<input checked="" type="checkbox"/>	NPHI	.PU : Neutron porosity
<input checked="" type="checkbox"/>	PE	.BARNS/E : Photoelectric factor
<input type="checkbox"/>	PMRI	.MD : Permeability
<input checked="" type="checkbox"/>	RHOB	.GM/CC : Bulk Density

Continue

~Log_Definition

MNEM . UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT .F	: Depth (MD) {F}	
DPHI .PU	: Density porosity {F}	
DRHO .GM/CC	: Bulk Density Correction {F}	
DT .USEC/FT	: Acoustic transit time {F}	
GR .API	: Gamma Ray {F}	
ILD .OHM-M	: Deep Induction Resistivity {F}	
ILM .OHM-M	: Medium Induction Resistivity {F}	
MINV .OHM-M	: Micro Inverse Resistivity {F}	
MNOR .OHM-M	: Micro Normal Resistivity {F}	
MPERM .MD	: Permeability {F}	
MPERM16 .UNL	: Curve # 51 {F}	
NPHI .PU	: Neutron porosity {F}	
PE .BARNS/E	: Photoelectric factor {F}	
RHOB .GM/CC	: Bulk Density {F}	
SGRD .OHM-M	: Shallow Laterolog Resistivity {F}	
SP .MV	: Spontaneous Potential {F}	

In order to plot both Permeability Curves on the same track, the MPERM must be assigned to the unknown Log Curves with MPERM16. Click on the MPERM Mnemonic Button to display the



“Select KGS Standard Tools” Dialog. Slide the scroll bar down to the “LOG_2” Mnemonic – Semilog Track Curve 2 and highlight that curve. Click on the “Select” Button to map the “MPERM to the Semilog Track Curve 2.

LAS File Curve Sections

~Log_Definition

Start Depth: 2342.0 End Depth: 3161.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

X	MNEM	.UNITS	DESCRIPTION
<input type="checkbox"/>	? (MBVI)	.DEC	: bound water from mrii
<input type="checkbox"/>	? (MCBWD)	.	: Curve # 49
<input type="checkbox"/>	? (MFFI)	.DEC	: free fluid from mrii
<input checked="" type="checkbox"/>	MINV	.OHM-M	: Micro Inverse Resistivity
<input checked="" type="checkbox"/>	MNOR	.OHM-M	: Micro Normal Resistivity
<input checked="" type="checkbox"/>	MPERM	.UNL : (UNL) (MD)	Permeability
<input checked="" type="checkbox"/>	MPERM16	.UNL : ()	Curve # 51
<input type="checkbox"/>	? (MPHI)	.DEC	: eff. phi from mrii
<input checked="" type="checkbox"/>	NPHI	.PU	: Neutron porosity
<input checked="" type="checkbox"/>	PE	.BARNS/E	: Photoelectric factor
<input type="checkbox"/>	PMRI	.MD	: Permeability

~Log_Definition

MNEM	.UNITS	DESCRIPTION	ASSOCIATIONS
DEPT	.F	: Depth (MD) {F}	
DPHI	.PU	: Density porosity {F}	
DRHO	.GM/CC	: Bulk Density Correction {F}	
DT	.USEC/FT	: Acoustic transit time {F}	
GR	.API	: Gamma Ray {F}	
ILD	.OHM-M	: Deep Induction Resistivity {F}	
ILM	.OHM-M	: Medium Induction Resistivity {F}	
MINV	.OHM-M	: Micro Inverse Resistivity {F}	
MNOR	.OHM-M	: Micro Normal Resistivity {F}	
MPERM	.UNL	: Permeability {F}	
MPERM16	.UNL	: Curve # 51 {F}	
NPHI	.PU	: Neutron porosity {F}	
PE	.BARNS/E	: Photoelectric factor {F}	
RHOB	.GM/CC	: Bulk Density {F}	
SGRD	.OHM-M	: Shallow Laterolog Resistivity {F}	
SP	.MV	: Spontaneous Potential {F}	

Continue

Click the check box next to the MPERM Mnemonic Button you will notice that it has the same color as MPERM16, which now groups the two curves together. Select the “Continue” Button to load the LAS File into the web app.

Load KGS Well Data – Top Picks

The “Search for Data on KGS Server” Dialog allows the user to download data from the KGS Database & Server to the web app. The “Top Picks” Button will display the “Move/Merge KGS Data” Dialog with available top picks grouped by the sources creating the tops.

Move/Merge KGS Data.

KGS Stratigraphic Units:

- ☒ HUG ELOG-EM
- ☐ MKD
- ☐ MKD-07/2006

List of Sources for the tops, e.g. Newby 2-28R has 3 sources of tops data. The user can search through and add some or all to the web app.

Add to User's Stratigraphic Units List:

☐ Remove & Replace ☒ Add to List ☐ Add New Units Only

Source	Top	Base	Name	R
HUG ELOG-EM	0	0	Council Grove	GROL
HUG ELOG-EM	728	0	Day Creek Dolomite	FORM
HUG ELOG-EM	1,090	1,170	Blaine	FORM
HUG ELOG-EM	1,250	1,412	Cedar Hills Sandstone	FORM
HUG ELOG-EM	1,690	1,759	Stone Corral	FORM
HUG ELOG-EM	2,182	2,516	Wellington	FORM
HUG ELOG-EM	2,291	0	Hutchinson Salt	MEMB
HUG ELOG-EM	2,496	0	Hollenberg Limestone	MEMB
HUG ELOG-EM	2,516	2,832	Chase	GROL
HUG ELOG-EM	2,516	2,536	Herington Limestone	MEMB

User's Stratigraphic Units:

Source	Top	Base	Name	Rank	P
HUG ELOG-EM	728	0	Day Creek Dolomite	FORMATION	P
HUG ELOG-EM	1,090	1,170	Blaine	FORMATION	P
HUG ELOG-EM	1,250	1,412	Cedar Hills Sandstone	FORMATION	P
HUG ELOG-EM	1,690	1,759	Stone Corral	FORMATION	P
HUG ELOG-EM	2,182	2,516	Wellington	FORMATION	P
HUG ELOG-EM	2,291	0	Hutchinson Salt	MEMBER	P
HUG ELOG-EM	2,496	0	Hollenberg Limestone	MEMBER	P
HUG ELOG-EM	2,516	2,832	Chase	GROUP	P
HUG ELOG-EM	2,516	2,536	Herington Limestone	MEMBER	P
HUG ELOG-EM	2,536	2,538	Paddock Shale	MEMBER	P
HUG ELOG-EM	2,544	2,580	Krider Limestone	MEMBER	P
HUG ELOG-EM	2,580	2,594	Odell Shale	FORMATION	P
HUG ELOG-EM	2,594	2,629	Winfield Limestone	FORMATION	P
HUG ELOG-EM	2,632	0	Gage Shale	MEMBER	P
HUG ELOG-EM	2,655	2,704	Towanda Limestone	MEMBER	P
HUG ELOG-EM	2,742	2,756	East Diley Limestone	MEMBER	P

Buttons: Add, Add All, Clear Selection, Remove, Remove All, Load Data, Close

“Add to User's Stratigraphic Units List” Table shows the tops selected by the source, e.g. “HUG ELOG-EM” Source Tops List.

Radio Buttons

Remove & Replace – move the selected tops and replace any duplicate names

Add to List – move the selected tops to the “User's Stratigraphic Units” Table

Add New Units Only – move on the selected tops that are not already in the “User's Stratigraphic Units” Table

Table Buttons

Add – add the highlighted top(s) to the “User's Stratigraphic Units” Table. Note: this table will allow the user to select multiple wells by using the “Ctrl” Key and the left click of mouse.

Add All – copy the list of tops to the “User's Stratigraphic Units” Table.

Clear Selection – remove the highlight on tops selected.

“Add to User's Stratigraphic Units List” Table.

“User's Stratigraphic Units” Table shows the list of tops that will appear in the web app when the user selects the “Load Data” Button.

Table Buttons

Clear Selection – remove the highlight on tops selected.

Remove – remove the highlighted top(s) from the table. Note: this table will allow the user to select multiple wells by using the “Ctrl” Key and the left click of mouse.

Remove All – remove all tops from the table.

Load Data – transfer the tops list to the web app calling.

Close – Close this dialog

This dialog allows the user to add all or some the tops from each of the sources. Both tables are set up so the user can use the “Ctrl” Key with the left click of mouse to select multiple tops, i.e.

Notice that the only some of the tops are selected. You can then select the Add Button to move only the selected tops to the “User’s Stratigraphic Units” Table.

MKD Source Example:

KGS Stratigraphic Units:

☐ HUG ELOG-EM

☒ MKD

☐ MKD-07/2006

Add to User's Stratigraphic Units List:

☒ Remove & Replace ☐ Add to List ☐ Add New Units Only

Source	Top	Base	Name	R
MKD	0	2,773	Fort Riley Limestone	MEMB
MKD	0	2,693	Towanda Limestone	MEMB
MKD	2,538	2,580	Krider Limestone	MEMB
MKD	2,629	0	Gage Shale	MEMB
MKD	2,712	0	Fort Riley Limestone	MEMB
MKD	2,777	2,789	Florence Limestone	MEMB
MKD	2,807	0	Wreford Limestone	FORM
MKD	2,832	0	Council Grove	GROL
MKD	2,832	0	Council Grove	GROL
MKD	2,832	2,853.5	Speiser Shale	FORM

(1) Select the MKD Source, which will be displayed in the “Add to User’s Stratigraphic Units List” Table.

Add Add All Clear Selection

KGS Stratigraphic Units:

☐ HUG ELOG-EM

☒ MKD

☐ MKD-07/2006

Add to User's Stratigraphic Units List:

☐ Remove & Replace ☒ Add to List ☐ Add New Units Only

Source	Top	Base	Name	R
MKD	0	2,773	Fort Riley Limestone	MEMB
MKD	0	2,693	Towanda Limestone	MEMB
MKD	2,538	2,580	Krider Limestone	MEMB
MKD	2,629	0	Gage Shale	MEMB
MKD	2,712	0	Fort Riley Limestone	MEMB
MKD	2,777	2,789	Florence Limestone	MEMB
MKD	2,807	0	Wreford Limestone	FORM
MKD	2,832	0	Council Grove	GROL
MKD	2,832	0	Council Grove	GROL
MKD	2,832	2,853.5	Speiser Shale	FORM

(2) Select the “Add to List” Radio button.

Add Add All Clear Selection

KGS Stratigraphic Units:

☐ HUG ELOG-EM
☒ MKD
☐ MKD-07/2006

Add to User's Stratigraphic Units List:

☐ Remove & Replace ☒ Add to List ☐ Add New Units Only

Source	Top	Base	Name	R
MKD	0	2,773	Fort Riley Limestone	MEMB
MKD	0	2,693	Towanda Limestone	MEMB
MKD	2,538	2,580	Krider Limestone	MEMB
MKD	2,629	0	Gage Shale	MEMB
MKD	2,712	0	Fort Riley Limestone	MEMB
MKD	2,777	2,789	Florence Limestone	MEMB
MKD	2,807	0	Wreford Limestone	FORM
MKD	2,832	0	Council Grove	GROU
MKD	2,832	0	Council Grove	GROU
MKD	2,832	2,853.5	Speiser Shale	FORM

User's Stratigraphic Units:

Source	Top	Base	Name	Rank	
MKD	2,538	2,580	Krider Limestone	MEMBER	P
MKD	2,629	0	Gage Shale	MEMBER	P
MKD	2,712	0	Fort Riley Limestone	MEMBER	P
MKD	2,777	2,789	Florence Limestone	MEMBER	P
MKD	2,807	0	Wreford Limestone	FORMATION	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	2,853.5	Speiser Shale	FORMATION	P
MKD	2,853.5	2,894.5	Funston Limestone	FORMATION	P
MKD	2,894.5	2,910.5	Blue Rapids Shale	FORMATION	P
MKD	2,910.5	2,929	Crouse Limestone	FORMATION	P
MKD	2,929	2,933.5	Easley Creek Shale	FORMATION	P
MKD	2,933.5	2,947	Middleburg Limestone	MEMBER	P
MKD	2,947	2,957.5	Hooser Shale	MEMBER	P
MKD	2,957.5	2,962.5	Eiss Limestone	MEMBER	P
MKD	2,962.5	2,973.5	Stages Shale	FORMATION	P

Once the list of tops are in the "User's Stratigraphic Units" Table the user can edit the list by removing any duplicate or invalid tops. Notice that the "Council Grove" Top occurs 2 times in the list. Highlight the one of the "Council Grove" tops.

User's Stratigraphic Units:

Source	Top	Base	Name	Rank	
MKD	2,538	2,580	Krider Limestone	MEMBER	P ▲
MKD	2,629	0	Gage Shale	MEMBER	P
MKD	2,712	0	Fort Riley Limestone	MEMBER	P
MKD	2,777	2,789	Florence Limestone	MEMBER	P
MKD	2,807	0	Wreford Limestone	FORMATION	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	2,853.5	Speiser Shale	FORMATION	P
MKD	2,853.5	2,894.5	Funston Limestone	FORMATION	P
MKD	2,894.5	2,910.5	Blue Rapids Shale	FORMATION	P
MKD	2,910.5	2,929	Crouse Limestone	FORMATION	P
MKD	2,929	2,933.5	Easley Creek Shale	FORMATION	P
MKD	2,933.5	2,947	Middleburg Limestone	MEMBER	P
MKD	2,947	2,957.5	Hooser Shale	MEMBER	P
MKD	2,957.5	2,962.5	Eiss Limestone	MEMBER	P
MKD	2,962.5	2,972.5	Stearns Shale	FORMATION	P ▼

Buttons: Clear Selection, Remove, Remove All, Load Data, Close

Now select the “Remove” Button.

User's Stratigraphic Units:

Source	Top	Base	Name	Rank	
MKD	2,538	2,580	Krider Limestone	MEMBER	P ▲
MKD	2,629	0	Gage Shale	MEMBER	P
MKD	2,712	0	Fort Riley Limestone	MEMBER	P
MKD	2,777	2,789	Florence Limestone	MEMBER	P
MKD	2,807	0	Wreford Limestone	FORMATION	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	2,853.5	Speiser Shale	FORMATION	P
MKD	2,853.5	2,894.5	Funston Limestone	FORMATION	P
MKD	2,894.5	2,910.5	Blue Rapids Shale	FORMATION	P
MKD	2,910.5	2,929	Crouse Limestone	FORMATION	P
MKD	2,929	2,933.5	Easley Creek Shale	FORMATION	P
MKD	2,933.5	2,947	Middleburg Limestone	MEMBER	P
MKD	2,947	2,957.5	Hooser Shale	MEMBER	P
MKD	2,957.5	2,962.5	Eiss Limestone	MEMBER	P
MKD	2,962.5	2,972.5	Stearns Shale	FORMATION	P ▼
MKD	2,972.5	2,972.5	Merrill Limestone	MEMBER	P

Buttons: Clear Selection, Remove, Remove All, Load Data, Close

The MKD-07/2006 has only one top, so this dialog allows the user to add that top to the “User’s Stratigraphic Units” Table. The MKD does not have this top and this is an extra top missing from the MKD data set.

KGS Stratigraphic Units:

☐ HUG ELOG-EM
☐ MKD
☒ MKD-07/2006

Add to User's Stratigraphic Units List:

☐ Remove & Replace ☒ Add to List ☐ Add New Units Only

Source	Top	Base	Name	Rank
MKD-07/2006	2,789	2,807	Matfield Shale	FORMATION

(1) Select the MKD-07/2006 Source, which will be displayed in the "Add to User's Stratigraphic Units List" Table.

(2) Select the "Add All" Button to move the contents from the "Add to User's Stratigraphic Units List" Table to the "User's Stratigraphic Units" table.

User's Stratigraphic Units:

Source	Top	Base	Name	Rank	
MKD	2,538	2,580	Krider Limestone	MEMBER	P
MKD	2,629	0	Gage Shale	MEMBER	P
MKD	2,712	0	Fort Riley Limestone	MEMBER	P
MKD	2,777	2,789	Florence Limestone	MEMBER	P
MKD-07/2006	2,789	2,807	Matfield Shale	FORMATION	P
MKD	2,807	0	Wreford Limestone	FORMATION	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	2,853.5	Speiser Shale	FORMATION	P
MKD	2,853.5	2,894.5	Funston Limestone	FORMATION	P
MKD	2,894.5	2,910.5	Blue Rapids Shale	FORMATION	P
MKD	2,910.5	2,929	Crouse Limestone	FORMATION	P
MKD	2,929	2,933.5	Easley Creek Shale	FORMATION	P
MKD	2,933.5	2,947	Middleburg Limestone	MEMBER	P
MKD	2,947	2,957.5	Hooser Shale	MEMBER	P
MKD	2,957.5	2,962.5	Eiss Limestone	MEMBER	P
MKD	2,962.5	2,972.5	Steele Shale	FORMATION	P

Now with the data set complete select the "Load Data" Button to import the Tops data into the web app.

As the user accepted each data type the “Data Source Filenames:” Panel in the Load Data Dialog changes. The LAS File that was downloaded from the KGS Server to the Gamma Ray Cross Section Web App is added to the “Log ASCII Standard (LAS) Files” panel will show the filename downloaded. The Log Data, Perforations and Tops Data, have been downloaded from KGS.

Load Data

Data Source

KGS Data KGS (Database & Server)

Well Data

PC Data PC (ASCII Data Files)

Ver 2.0 & 3.0

LAS File

Tops CSV

Tops Data

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: 1022012442.las

2:

3:

PC ASCII Files:

Tops CSV:

Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data			YES	Tops Data	.....			YES
Perforations			YES					

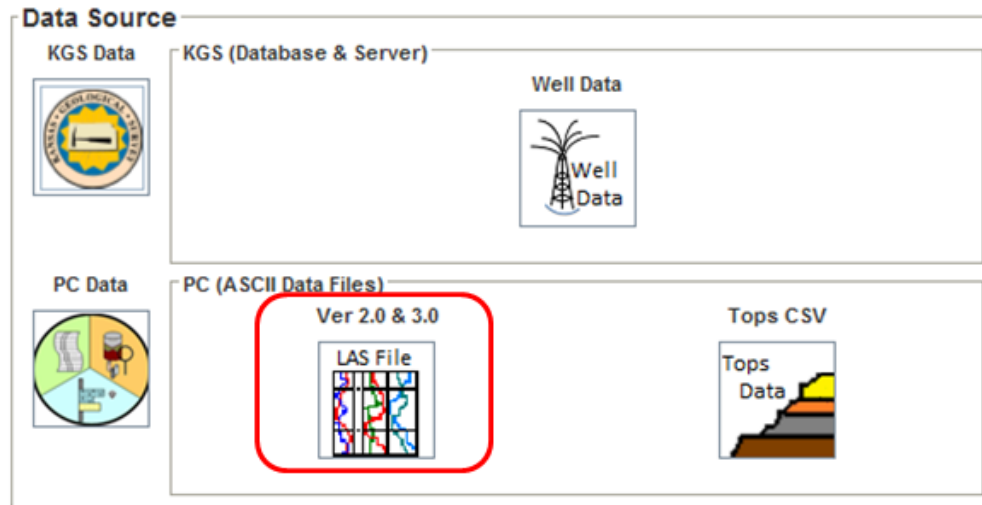
Add Well Data Clear Exit

Select the “Add Well Data” Button to transfer the Newby 2-28R Well Data to the Cross Section Data Structure.

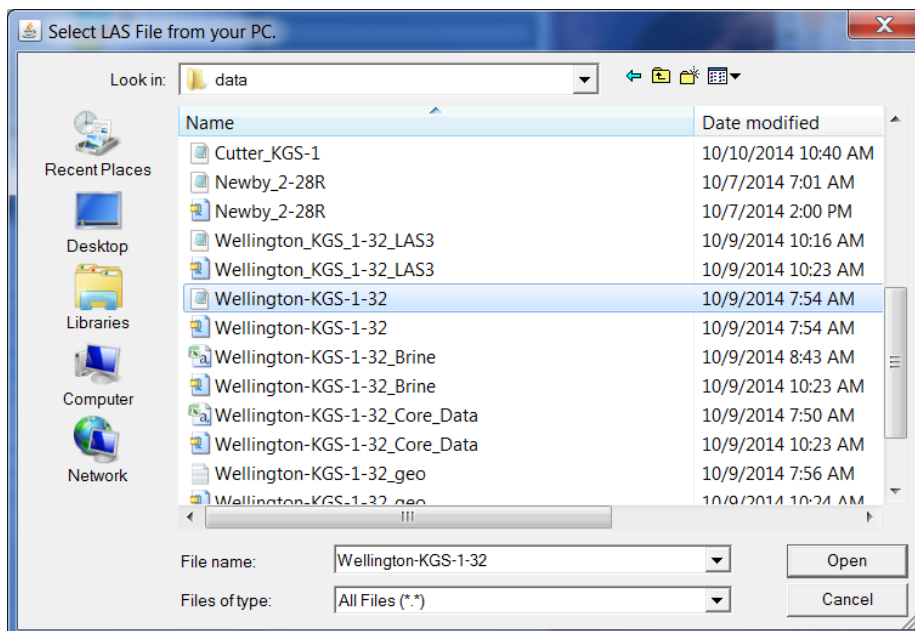
Importing PC Data - Download Well Data to PC

Importing PC Data – Log ASCII Standard (LAS) version 2.0 File

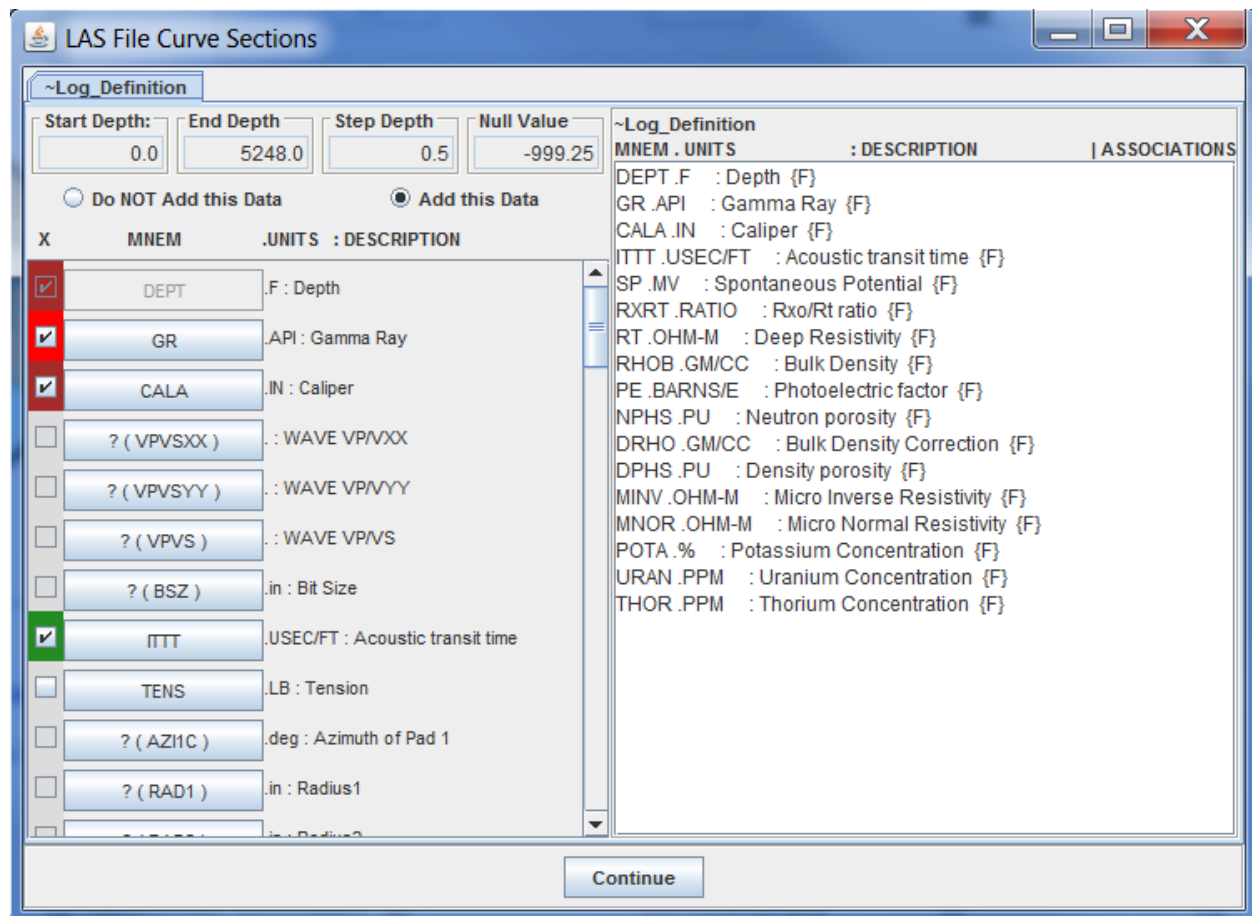
Most of the web apps will use the same input dialogs to import Log ASCII Standard (LAS) version 2.0 or 3.0 files. The Load Data Dialog is basically the same for most of the Web Apps, except they only load a subset of the total data types. In this example a LAS version 2.0 file is being imported into the web app.



Left Click on the “LAS File” Icon Button in the Data Source Panel of the Load Data Dialog. This will display the “Select LAS File from your PC” Dialog. This dialog allows the user to search their PC for the file of interest. In this example it is the LAS version 2.0 file Wellington-KGS-1-32.las, highlighted below. Select the Open button to display the “LAS File Curve Sections” Dialog.



The “LAS File Curve Sections” Dialog allows the user to map unknown LAS Curve Mnemonics to the KGS “Standard” Curve Mnemonics so they will be plotted in the 3D Cross Plot. This program reads the “LAS Tool Curve Mnemonics map to KGS Standard Mnemonics” XML File (http://www.kgs.ku.edu/software/gemini/data/las_standard_tools.xml), which will automatically maps the Curve Mnemonics from the LAS file to one of 31 KGS “Standard” Curve Mnemonics. If a curve Mnemonic is not recognized the program will place a “?” in front of the Mnemonic, e.g. “?(BSZ)” for the “.in : Bit Size” Log Curve. If the user is satisfied with the automatic curve selections, which are checked and color coded, they only need to select the “Continue” Button at the bottom of the Dialog to import the file. The next section will take the user through a series of examples in changing the curve selections and mapping unknown curve mnemonics.



Notice that some of the check boxes are colored with different colors, which shows that the curves were automatically selected, but also to represent the curve type by color. The Curves are colored by type (data units) as follows,

- Orange - OHM-M or Resistivity Logs
- Cyan – PU or porosity Logs, Neutron Porosity, Density Porosity, etc.
- Greenish yellow – BARNS/E or Photoelectric Factor Logs
- Green – GM/CC or Bulk Density Log
- Forest Green – USEC/FT or the Acoustic Transit Time Log

- Red – API, PPM or “%” as Radioactive logs, Gamma Ray, Spectral Gamma Ray, etc.
- Blue – MD or Permeability Logs
- Brown – F, FT or IN or Depth
- Middle yellow – FRAC, or other log curve types.
- Dark Violet – UNI or Unknown Linear Curves
- Medium Violet – UNL or Unknown Logrithum Curves

The color coding of the selected curves were added to also help the user visually recognize that a curve was selected or not.

Map Curves & Change Curve Selections

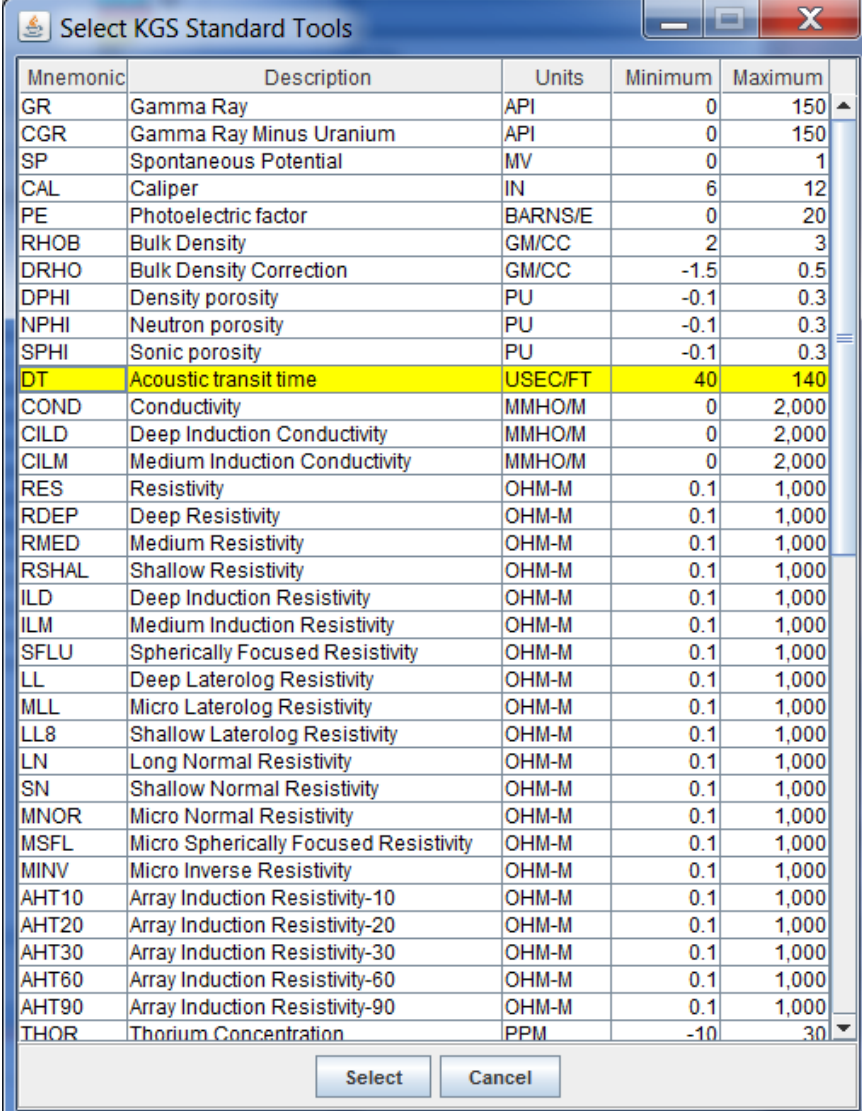
Some logs will have curve mnemonics that are not recognized as one of the KGS “Standard” Curve Mnemonics. The user will need to map the log curve to one of the KGS standard curves if they want to display the curve. The first example is to map the Acoustic Transit Time (DT), which is labeled as “.uspf : WAVE DTC” log curve in the LAS File. Also notice that the button label “?(DTC)” is not recognized by the Gamma Ray Cross Section web app.

The screenshot shows the 'LAS File Curve Sections' dialog box. It has a 'Log Definition' tab. At the top, there are input fields for 'Start Depth' (0.0), 'End Depth' (5248.0), 'Step Depth' (0.5), and 'Null Value' (-999.25). Below these are two radio buttons: 'Do NOT Add this Data' and 'Add this Data' (selected). The main area is a table with columns 'X', 'MNEM', and '.UNITS : DESCRIPTION'. The table lists several curves, with 'ITTT' selected (checked). A red arrow points to the curve '?(DTC)' which is labeled '.uspf : WAVE DTC'. To the right of the table is a list of standard curve mnemonics and their descriptions, including DEPT.F, GR.API, CALA.IN, ITTT.USEC/FT, SP.MV, RXRT.RATIO, RT.OHM-M, RHOB.GM/CC, PE.BARNS/E, NPHS.PU, DRHO.GM/CC, DPHS.PU, MINV.OHM-M, MNOR.OHM-M, POTA.%, URAN.PPM, and THOR.PPM. At the bottom is a 'Continue' button.

X	MNEM	.UNITS : DESCRIPTION
<input checked="" type="checkbox"/>	ITTT	USEC/FT : Acoustic transit time
<input type="checkbox"/>	TENS	LB : Tension
<input type="checkbox"/>	? (AZ1C)	deg : Azimuth of Pad 1
<input type="checkbox"/>	? (RAD1)	in : Radius1
<input type="checkbox"/>	? (RAD2)	in : Radius2
<input type="checkbox"/>	? (RAD3)	in : Radius3
<input type="checkbox"/>	? (RAD4)	in : Radius4
<input type="checkbox"/>	? (RAD5)	in : Radius5
<input type="checkbox"/>	? (RAD6)	in : Radius6
<input type="checkbox"/>	? (TPUL)	: Tension Pull
<input type="checkbox"/>	? (DTXX)	.uspf : WAVE XX Flexural
<input type="checkbox"/>	? (DTC)	.uspf : WAVE DTC

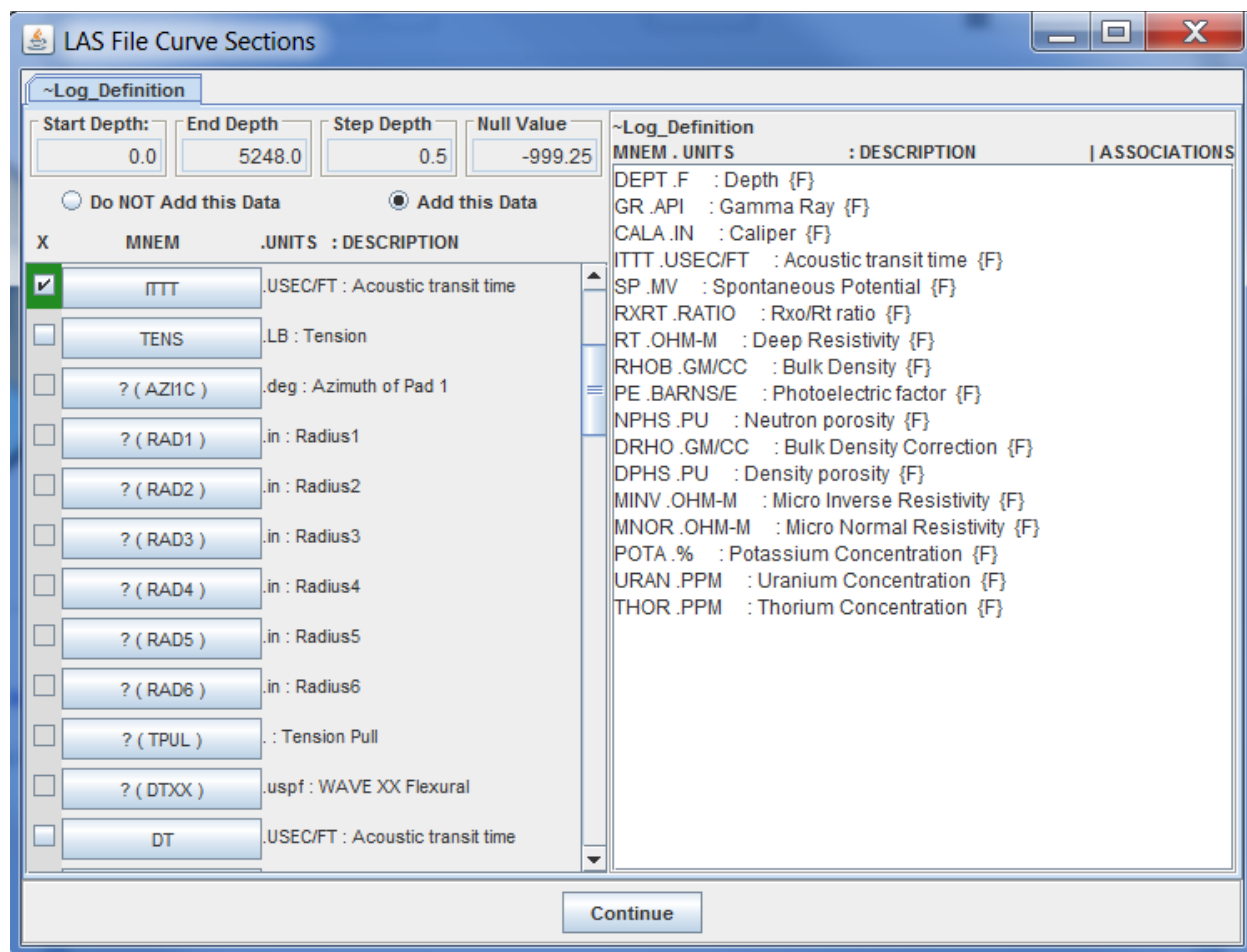
Click on the “?(DTC)” Button to display the “Select KGS Standard Tools” Dialog. This dialog provides a list of the KGS “Standard” Curve Mnemonics, from which the user can map an unrecognized log curve to one of the KGS standard curve mnemonics. The KGS “Standard” Curve Mnemonics List was created as a way to standardize the alpha bit soup of Log Mnemonics. Each logging company has their own curve mnemonics to represent similar tools. The Gamma Ray Cross Section program is a later version of code from the GEMINI Project Cross Section Module, which needed to standardize the log curves so the curves could be automatically read and assigned a plot track. The “LAS Tool Curve Mnemonics map to KGS Standard Mnemonics” XML File was created to map the log curves from logs that were part of the KGS LAS File Collection which is not a complete list of possible curve mnemonics.

To map the unknown curve mnemonic “?(DTC)” you first notice that the unit is “uspf” (micro seconds per foot) a unit of time. Also the Acoustic Transit Time Curve Mnemonic is similar to the KGS “Standard” Curve Mnemonic “DT”. By selecting the “?(DTC)” Button you will display the “Select KGS Standard Tools” Dialog.

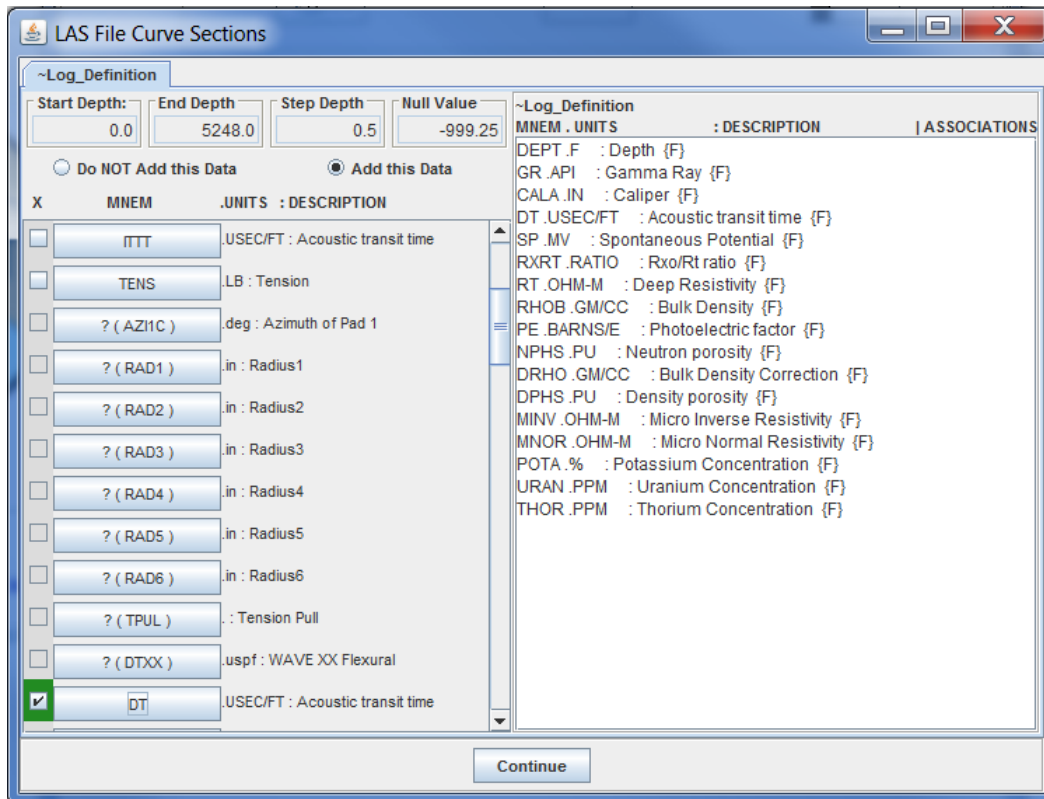


Mnemonic	Description	Units	Minimum	Maximum
GR	Gamma Ray	API	0	150
CGR	Gamma Ray Minus Uranium	API	0	150
SP	Spontaneous Potential	MV	0	1
CAL	Caliper	IN	6	12
PE	Photoelectric factor	BARNSE	0	20
RHOB	Bulk Density	GM/CC	2	3
DRHO	Bulk Density Correction	GM/CC	-1.5	0.5
DPHI	Density porosity	PU	-0.1	0.3
NPHI	Neutron porosity	PU	-0.1	0.3
SPHI	Sonic porosity	PU	-0.1	0.3
DT	Acoustic transit time	USEC/FT	40	140
COND	Conductivity	MMHO/M	0	2,000
CILD	Deep Induction Conductivity	MMHO/M	0	2,000
CILM	Medium Induction Conductivity	MMHO/M	0	2,000
RES	Resistivity	OHM-M	0.1	1,000
RDEP	Deep Resistivity	OHM-M	0.1	1,000
RMED	Medium Resistivity	OHM-M	0.1	1,000
RSHAL	Shallow Resistivity	OHM-M	0.1	1,000
ILD	Deep Induction Resistivity	OHM-M	0.1	1,000
ILM	Medium Induction Resistivity	OHM-M	0.1	1,000
SFLU	Spherically Focused Resistivity	OHM-M	0.1	1,000
LL	Deep Laterolog Resistivity	OHM-M	0.1	1,000
MLL	Micro Laterolog Resistivity	OHM-M	0.1	1,000
LL8	Shallow Laterolog Resistivity	OHM-M	0.1	1,000
LN	Long Normal Resistivity	OHM-M	0.1	1,000
SN	Shallow Normal Resistivity	OHM-M	0.1	1,000
MNOR	Micro Normal Resistivity	OHM-M	0.1	1,000
MSFL	Micro Spherically Focused Resistivity	OHM-M	0.1	1,000
MINV	Micro Inverse Resistivity	OHM-M	0.1	1,000
AHT10	Array Induction Resistivity-10	OHM-M	0.1	1,000
AHT20	Array Induction Resistivity-20	OHM-M	0.1	1,000
AHT30	Array Induction Resistivity-30	OHM-M	0.1	1,000
AHT60	Array Induction Resistivity-60	OHM-M	0.1	1,000
AHT90	Array Induction Resistivity-90	OHM-M	0.1	1,000
THOR	Thorium Concentration	PPM	-10	30

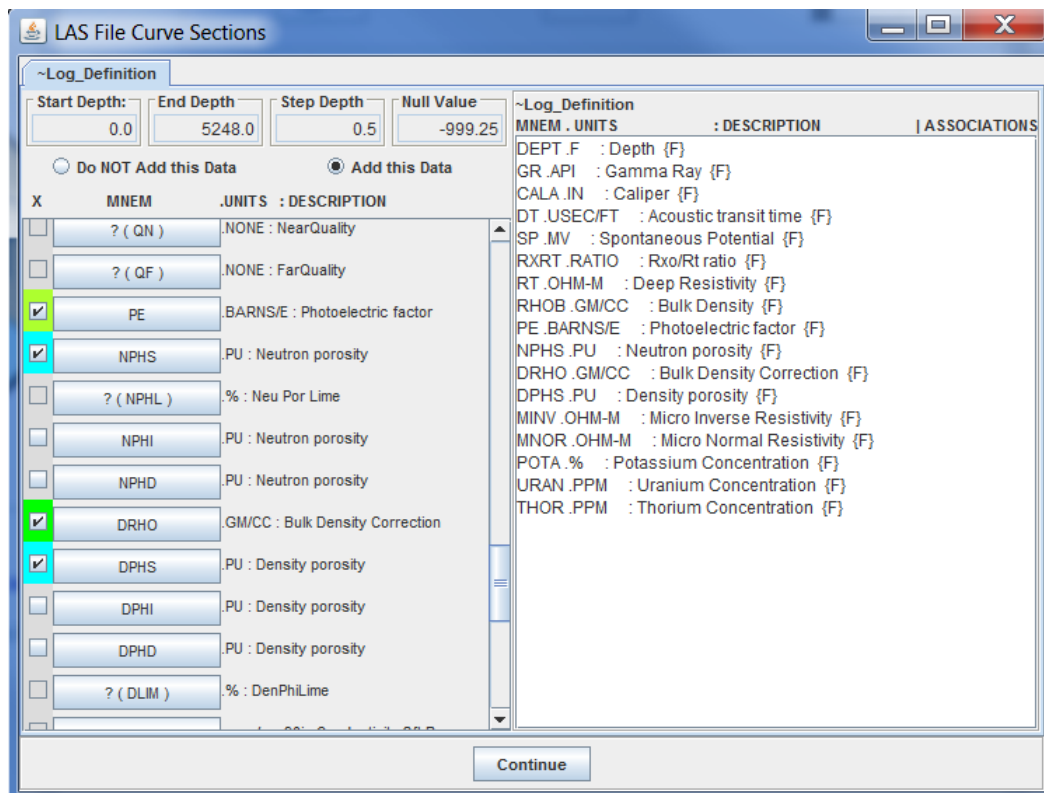
Highlight the “DT” Mnemonic Row and click on the “Select” Button to map the “?(DTC)” Curve Mnemonic to “DT” KGS Standard Curve Mnemonic.



The “?(DTC). .uspf : WAVE DTC” has changed to “DT.ussec/ft : Acoustic transit time”. We want to change the selected “ITTT” Log Curve to “DT” Log Curve. The reason is that “ITTT” is the wrong curve type for the Acoustic Transit Time. The program found the curve mnemonic as similar to the “DT” Standard Curve Mnemonic, but this curve will not plot correctly in the 3D Cross Plot. Just click on the green check box in front of the “ITTT” Mnemonic Button to deselect the curve and then click on the check box in front of the “DT” Mnemonic Button to select it. Also notice that the ~Log_Definition Text Area was modified to show the change.



Moving the scroll bar down to the porosity curves, Neutron Porosity, and Density Porosity.



The LAS File Read will select the first curve that it recognizes and selects and color codes the curve. In this case the Neutron porosity mnemonic selected is “NPHS”, which is a valid curve, but the “NPHI” curve is desired so like the Acoustic Transit Time, you can deselect the “NPHS” and then select the “NPHI” Curve. Also the “DPHS” Density Porosity Curve can be deselected since the “RHOB” Bulk Density Curve has been selected. The reason for deselecting the Density Porosity Curve, if the Bulk Density Curve is present, is to force the Gamma Ray Cross Section program to recompute the Density Porosity using a Limestone Matrix. If the Neutron Porosity, Bulk Density, Gamma Ray with/without a Photoelectric Factor Logs are present then the program will automatically compute a Lithology Composition Plot, but the Density Porosity has to be computed with a Limestone Matrix or the Lithology Composition Plot will not be computed correctly.

LAS File Curve Sections

~Log_Definition

Start Depth: 0.0 End Depth: 5248.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

X	MNEM	.UNITS : DESCRIPTION
<input type="checkbox"/>	? (QN)	NONE : NearQuality
<input type="checkbox"/>	? (QF)	NONE : FarQuality
<input checked="" type="checkbox"/>	PE	.BARNS/E : Photoelectric factor
<input type="checkbox"/>	NPHS	.PU : Neutron porosity
<input type="checkbox"/>	? (NPHL)	% : Neu Por Lime
<input checked="" type="checkbox"/>	NPHI	.PU : Neutron porosity
<input type="checkbox"/>	NPHD	.PU : Neutron porosity
<input checked="" type="checkbox"/>	DRHO	.GM/CC : Bulk Density Correction
<input type="checkbox"/>	DPHS	.PU : Density porosity
<input type="checkbox"/>	DPHI	.PU : Density porosity
<input type="checkbox"/>	DPHD	.PU : Density porosity
<input type="checkbox"/>	? (DLIM)	% : DenPhiLime

~Log_Definition

MNEM . UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT .F	: Depth {F}	
GR .API	: Gamma Ray {F}	
CALA .IN	: Caliper {F}	
DT .USEC/FT	: Acoustic transit time {F}	
SP .MV	: Spontaneous Potential {F}	
RXRT .RATIO	: Rxo/Rt ratio {F}	
RT .OHM-M	: Deep Resistivity {F}	
RHOB .GM/CC	: Bulk Density {F}	
PE .BARNS/E	: Photoelectric factor {F}	
NPHI .PU	: Neutron porosity {F}	
DRHO .GM/CC	: Bulk Density Correction {F}	
MINV .OHM-M	: Micro Inverse Resistivity {F}	
MNOR .OHM-M	: Micro Normal Resistivity {F}	
POTA .%	: Potassium Concentration {F}	
URAN .PPM	: Uranium Concentration {F}	
THOR .PPM	: Thorium Concentration {F}	

Continue

The above dialog represents the changes made for the neutron/density porosity logs. The last curves to be modified are the Array Induction Logs. Haliburton uses a different curve mnemonic for these logs. Move the scroll bar up to find the Array Induction Logs, RT90, RT60, etc.

LAS File Curve Sections

~Log_Definition

Start Depth: 0.0 End Depth: 5248.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

X	MNEM	.UNITS : DESCRIPTION
<input checked="" type="checkbox"/>	SP	.MV : Spontaneous Potential
<input checked="" type="checkbox"/>	RXRT	.RATIO : Rxo/Rt ratio
<input type="checkbox"/>	RXO	.RATIO : Rxo/Rt ratio
<input type="checkbox"/>	? (RT90)	.ohmm : 90in Resistivity 2ft Res
<input type="checkbox"/>	? (RT60)	.ohmm : 60in Resistivity 2ft Res
<input type="checkbox"/>	? (RT30)	.ohmm : 30in Resistivity 2ft Res
<input type="checkbox"/>	? (RT20)	.ohmm : 20in Resistivity 2ft Res
<input type="checkbox"/>	? (RT10)	.ohmm : 10in Resistivity 2ft Res
<input checked="" type="checkbox"/>	RT	.OHM-M : Deep Resistivity
<input type="checkbox"/>	? (RMUD)	.ohmm : RMUD
<input checked="" type="checkbox"/>	RHOB	.GM/CC : Bulk Density
<input type="checkbox"/>	? (QN)	.NONE : NearQuality

~Log_Definition

MNEM . UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT .F	: Depth {F}	
GR .API	: Gamma Ray {F}	
CALA .IN	: Caliper {F}	
DT .USEC/FT	: Acoustic transit time {F}	
SP .MV	: Spontaneous Potential {F}	
RXRT .RATIO	: Rxo/Rt ratio {F}	
RT .OHM-M	: Deep Resistivity {F}	
RHOB .GM/CC	: Bulk Density {F}	
PE .BARNS/E	: Photoelectric factor {F}	
NPHI .PU	: Neutron porosity {F}	
DRHO .GM/CC	: Bulk Density Correction {F}	
MINV .OHM-M	: Micro Inverse Resistivity {F}	
MNOR .OHM-M	: Micro Normal Resistivity {F}	
POTA .%	: Potassium Concentration {F}	
URAN .PPM	: Uranium Concentration {F}	
THOR .PPM	: Thorium Concentration {F}	

Continue

Like the Acoustic Transit Time the “?(RT90).ohmm: 90in Resistivity 2ft Res” through “?(RT10).ohmm : 10in Resistivity 2ft Res” are not recognized. These curves can be map to the “AHT90 Array Induction Resistivity-90” to “AHT10 Array Induction Resistivity-10” KGS Curves Respectively. Click on the “?(RT90)” Mnemonic Button to display the “Select KGS Standard Tools” Dialog.

Select KGS Standard Tools

Mnemonic	Description	Units	Minimum	Maximum
GR	Gamma Ray	API	0	150
CGR	Gamma Ray Minus Uranium	API	0	150
SP	Spontaneous Potential	MV	0	1
CAL	Caliper	IN	6	12
PE	Photoelectric factor	BARNs/E	0	20
RHOB	Bulk Density	GM/CC	2	3
DRHO	Bulk Density Correction	GM/CC	-1.5	0.5
DPHI	Density porosity	PU	-0.1	0.3
NPHI	Neutron porosity	PU	-0.1	0.3
SPHI	Sonic porosity	PU	-0.1	0.3
DT	Acoustic transit time	USEC/FT	40	140
COND	Conductivity	MMHO/M	0	2,000
CILD	Deep Induction Conductivity	MMHO/M	0	2,000
CILM	Medium Induction Conductivity	MMHO/M	0	2,000
RES	Resistivity	OHM-M	0.1	1,000
RDEP	Deep Resistivity	OHM-M	0.1	1,000
RMED	Medium Resistivity	OHM-M	0.1	1,000
RSHAL	Shallow Resistivity	OHM-M	0.1	1,000
ILD	Deep Induction Resistivity	OHM-M	0.1	1,000
ILM	Medium Induction Resistivity	OHM-M	0.1	1,000
SFLU	Spherically Focused Resistivity	OHM-M	0.1	1,000
LL	Deep Laterolog Resistivity	OHM-M	0.1	1,000
MLL	Micro Laterolog Resistivity	OHM-M	0.1	1,000
LL8	Shallow Laterolog Resistivity	OHM-M	0.1	1,000
LN	Long Normal Resistivity	OHM-M	0.1	1,000
SN	Shallow Normal Resistivity	OHM-M	0.1	1,000
MNOR	Micro Normal Resistivity	OHM-M	0.1	1,000
MSFL	Micro Spherically Focused Resistivity	OHM-M	0.1	1,000
MINV	Micro Inverse Resistivity	OHM-M	0.1	1,000
AHT10	Array Induction Resistivity-10	OHM-M	0.1	1,000
AHT20	Array Induction Resistivity-20	OHM-M	0.1	1,000
AHT30	Array Induction Resistivity-30	OHM-M	0.1	1,000
AHT60	Array Induction Resistivity-60	OHM-M	0.1	1,000
AHT90	Array Induction Resistivity-90	OHM-M	0.1	1,000
THOR	Thorium Concentration	PPM	-10	30

Select Cancel

Highlight the AHT90 and click on the “Select” Button.

LAS File Curve Sections

~Log_Definition

Start Depth: 0.0 End Depth: 5248.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

X	MNEM	.UNITS : DESCRIPTION
<input checked="" type="checkbox"/>	SP	.MV : Spontaneous Potential
<input checked="" type="checkbox"/>	RXRT	.RATIO : Rxo/Rt ratio
<input type="checkbox"/>	RXO	.RATIO : Rxo/Rt ratio
<input checked="" type="checkbox"/>	AHT90	.OHM-M : Array Induction Resistivity-90
<input type="checkbox"/>	? (RT60)	.ohmm : 60in Resistivity 2ft Res
<input type="checkbox"/>	? (RT30)	.ohmm : 30in Resistivity 2ft Res
<input type="checkbox"/>	? (RT20)	.ohmm : 20in Resistivity 2ft Res
<input type="checkbox"/>	? (RT10)	.ohmm : 10in Resistivity 2ft Res
<input checked="" type="checkbox"/>	RT	.OHM-M : Deep Resistivity
<input type="checkbox"/>	? (RMUD)	.ohmm : RMUD
<input checked="" type="checkbox"/>	RHOB	.GM/CC : Bulk Density
<input type="checkbox"/>	? (QN)	.NONE : NearQuality

~Log_Definition

MNEM	.UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT	.F	: Depth {F}	
GR	.API	: Gamma Ray {F}	
CALA	.IN	: Caliper {F}	
DT	.USEC/FT	: Acoustic transit time {F}	
SP	.MV	: Spontaneous Potential {F}	
RXRT	.RATIO	: Rxo/Rt ratio {F}	
AHT90	.OHM-M	: Array Induction Resistivity-90 {F}	
RT	.OHM-M	: Deep Resistivity {F}	
RHOB	.GM/CC	: Bulk Density {F}	
PE	.BARNS/E	: Photoelectric factor {F}	
NPHI	.PU	: Neutron porosity {F}	
DRHO	.GM/CC	: Bulk Density Correction {F}	
MINV	.OHM-M	: Micro Inverse Resistivity {F}	
MNOR	.OHM-M	: Micro Normal Resistivity {F}	
POTA	.%	: Potassium Concentration {F}	
URAN	.PPM	: Uranium Concentration {F}	
THOR	.PPM	: Thorium Concentration {F}	

Continue

The “(?AHT90).ohmm : 90in Resistivity 2ft Res” has changed to “AHT90.OHM-M : Array Induction Resistivity-90” and the orange check box is selected. The rest of the Array Induction Log Curves each are mapped to the respective KGS Mnemonic Curve as follows,

(?RT90).ohmm : 90in Resistivity 2ft Res to AHT90.OHM-M : Array Induction Resistivity-90
 (?RT60).ohmm : 60in Resistivity 2ft Res to AHT60.OHM-M : Array Induction Resistivity-60
 (?RT30).ohmm : 30in Resistivity 2ft Res to AHT30.OHM-M : Array Induction Resistivity-30
 (?RT20).ohmm : 20in Resistivity 2ft Res to AHT20.OHM-M : Array Induction Resistivity-20
 (?RT10).ohmm : 10in Resistivity 2ft Res to AHT10.OHM-M : Array Induction Resistivity-10

LAS File Curve Sections

~Log_Definition

Start Depth:

0.0

End Depth:

5248.0

Step Depth:

0.5

Null Value:

-999.25

☐ Do NOT Add this Data
 ☒ Add this Data

X	MNEM	.UNITS : DESCRIPTION
<input checked="" type="checkbox"/>	SP	.MV : Spontaneous Potential
<input checked="" type="checkbox"/>	RXRT	.RATIO : Rxo/Rt ratio
<input type="checkbox"/>	RXO	.RATIO : Rxo/Rt ratio
<input checked="" type="checkbox"/>	AHT90	.OHM-M : Array Induction Resistivity-90
<input checked="" type="checkbox"/>	AHT60	.OHM-M : Array Induction Resistivity-60
<input checked="" type="checkbox"/>	AHT30	.OHM-M : Array Induction Resistivity-30
<input checked="" type="checkbox"/>	AHT20	.OHM-M : Array Induction Resistivity-20
<input checked="" type="checkbox"/>	AHT10	.OHM-M : Array Induction Resistivity-10
<input checked="" type="checkbox"/>	RT	.OHM-M : Deep Resistivity
<input type="checkbox"/>	? (RMUD)	.ohmm : RMUD
<input checked="" type="checkbox"/>	RHOB	.GM/CC : Bulk Density
<input type="checkbox"/>	? (QN)	.NONE : NearQuality

~Log_Definition

MNEM . UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT .F	: Depth {F}	
GR .API	: Gamma Ray {F}	
CALA .IN	: Caliper {F}	
DT .USEC/FT	: Acoustic transit time {F}	
SP .MV	: Spontaneous Potential {F}	
RXRT .RATIO	: Rxo/Rt ratio {F}	
AHT90 .OHM-M	: Array Induction Resistivity-90 {F}	
AHT60 .OHM-M	: Array Induction Resistivity-60 {F}	
AHT30 .OHM-M	: Array Induction Resistivity-30 {F}	
AHT20 .OHM-M	: Array Induction Resistivity-20 {F}	
AHT10 .OHM-M	: Array Induction Resistivity-10 {F}	
RT .OHM-M	: Deep Resistivity {F}	
RHOB .GM/CC	: Bulk Density {F}	
PE .BARNSE	: Photoelectric factor {F}	
NPHI .PU	: Neutron porosity {F}	
DRHO .GM/CC	: Bulk Density Correction {F}	
MINV .OHM-M	: Micro Inverse Resistivity {F}	
MNOR .OHM-M	: Micro Normal Resistivity {F}	
POTA .%	: Potassium Concentration {F}	
URAN .PPM	: Uranium Concentration {F}	
THOR .PPM	: Thorium Concentration {F}	

Continue

34

Select the Continue Button to read and parse the LAS log curves selected into the Gamma Ray Cross Section Web App. Notice that the “Data Source Filenames:” Panel lists the LAS version 2.0 File that was just read in as well as the type of data, i.e. Log Data from LAS Data Type.

Load Data

Data Source

KGS Data KGS (Database & Server) Well Data

PC Data PC (ASCII Data Files) Ver 2.0 & 3.0 LAS File Tops CSV

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: Wellington-KGS-1-32.las

2:

3:

PC ASCII Files:

Tops CSV:

Data Type 3.0 LAS CSV KGS Data Type 3.0 LAS CSV KGS

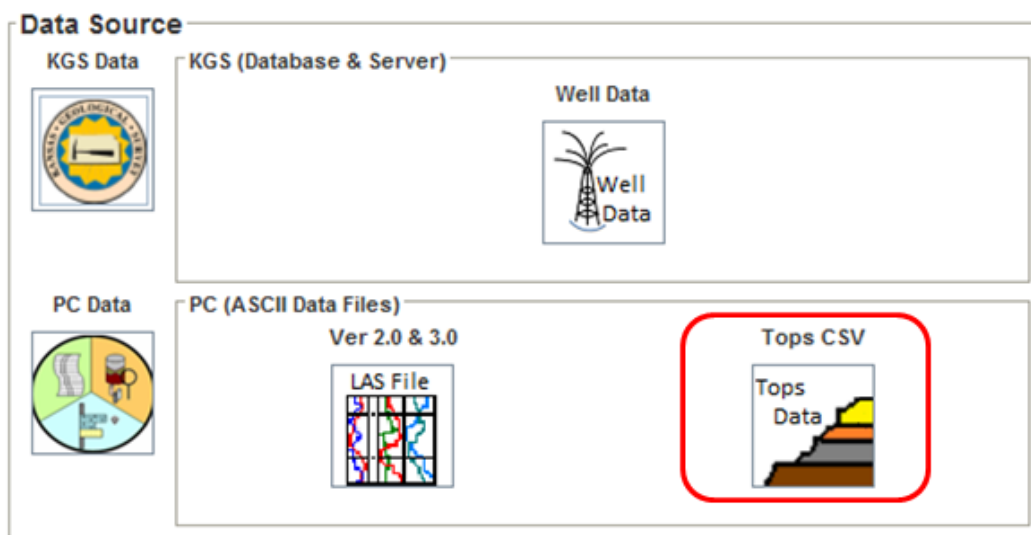
Log Data YES Tops Data NO

Perforations NO

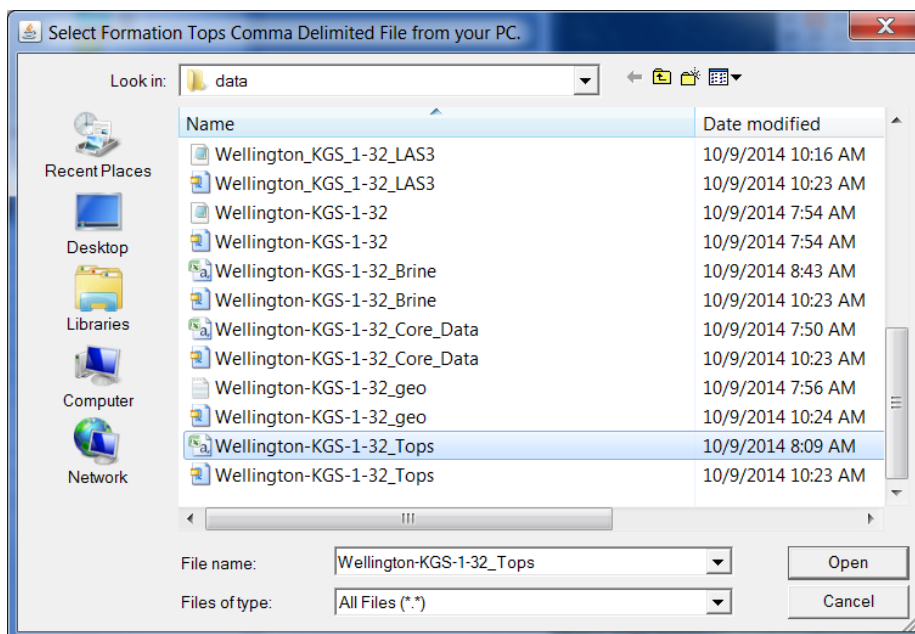
Add Well Data Clear Exit

Importing PC Data – Tops CSV (Comma Separated Values) File.

Most of the web apps will use the same input dialogs to import tops CSV (Comma Separated Values) file. The Load Data Dialog is basically the same for most of the Web Apps except they only load a subset of the total data types. In this example a Tops CSV file is being imported into the web app.



Left Click on the “Tops Data” Icon Button in the Data Source Panel of the Load Data Dialog. This will display the “Select Formation Tops Comma Delimited File from your PC” Dialog. This dialog allows the user to search their PC for the file of interest. In this example it is the Tops CSV file Wellington-KGS-1-32_Tops.csv, highlighted below. Select the Open button to display the “Map File Column Number to Region Column” Dialog.



The “Map File Column Number to Region Column” Dialog allows the user to map the file columns number to the web app tops data structure. In this example the file has the well information in line one of the Tops CSV File and line two of the Tops CSV File has the file data columns. In this case the chosen file columns match the Tops Mnemonics for the tops data structure. The File Column Number is automatically assigned to the Region Column Names. The user only needs to select the “Load Data” Button to parse the Tops Data into the web app.

Map File Column Number to Region Column

1st Line of Comma Delimited File:
Wellington KGS 1-32, 15-191-22591, T31S R1W sec. 32, GL:1259, KB:1272

2nd Line of Comma Delimited File:
Top, Name, Rank, System, Subsystem, Series, source

Formation Tops Columns:

Start Reading Data at Row Assume Row & Column Count is 1,2,3 ...

Region Column Name	File Column Number
Depth Top	<input type="text" value="1"/>
Depth Base	<input type="text" value="0"/>
Stratigraphic Unit Rank [SYSTEM, GROUP, etc.]	<input type="text" value="3"/>
Stratigraphic Name	<input type="text" value="2"/>
Alternate Name	<input type="text" value="0"/>
Era	<input type="text" value="0"/>
System	<input type="text" value="4"/>
Subsystem	<input type="text" value="5"/>
Series	<input type="text" value="6"/>
Subseries { Pennsylvanian & Mississippian Series }	<input type="text" value="0"/>
Stage	<input type="text" value="0"/>
Group	<input type="text" value="0"/>
Subgroup	<input type="text" value="0"/>
Formation	<input type="text" value="0"/>
Start Age (Ma)	<input type="text" value="0"/>
End Age (Ma)	<input type="text" value="0"/>

Tops CSV (Comma Separated Values) File Structure.

The Wellington KGS 1-32 Tops CSV example has two introduction lines, the first line is the well header information and the second line is the actual column labels for the tops data, illustrated below,

```

Line 1 Well Header Info Wellington KGS 1-32, 15-191-22591, T31S R1W sec. 32, GL:1259, KB:1272
Line 2 Data Column Labels Top, Name, Rank, System, Subsystem, Series, source
Line 3 Data Start 620, Chase, GROUP, Permian, , Wolfcampian, PG
748, Towanda Limestone, MEMBER, Permian, , Wolfcampian, PG
1595, Wabaunsee, GROUP, Carboniferous, Pennsylvanian, Upper, PG
1622, Root Shale, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
1662, Stotler Limestone, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
1920, Severy Shale, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
1980, Topeka Limestone, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
2312, Lecompton Limestone, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
2402, Heebner Shale, MEMBER, Carboniferous, Pennsylvanian, Upper, PG
2703, Stalnaker Sandstone, BED, Carboniferous, Pennsylvanian, Upper, PG
3039, Kansas City, GROUP, Carboniferous, Pennsylvanian, Upper, PG
3169, Stark Shale, MEMBER, Carboniferous, Pennsylvanian, Upper, PG

```

Figure: Partial Contents of the Wellington-KGS-1-32_Tops.csv File.

The “Map File Column Number to Region Column” Dialog allows the user to map the data in the Tops CSV File to the web app data structure variables. The program first reads the first and second line of the CSV File looking for the data column headers. The lines are each parsed to single out the data column headers and to match those headers to the tops data structure. The program then assigns the column number to the Region Column Name starting at column 1,2,3, ... if the file column name used matches the expected region column name. The Column Names matrix used to parse the file column variables are listed below,

Depth Top	Top	Start
Depth Base	Base	End
Stratigraphic Unit Rank [SYSTEM, GROUP, etc.]	Rank	
Stratigraphic Name	Name	
Alternate Name	Alt Name	
Era		
System	Sys	
Subsystem	subsys	
Series	Ser	
Subseries { Pennsylvanian & Mississippian Series }	Subseries	Subser
Stage	Stg	
Group	Grp	
Subgroup	subgrp	
Formation	Form	
Start Age (Ma)	Start Age	
End Age (Ma)	End Age	

The Wellington KGS 1-32 Tops CSV File example above line 2 has only the Top, Tops Name, Rank, System, Subsystem, Series and Source as the column name variables. The program was able to map each of the column headers to the tops data structure, except Source, i.e.

Column	File Column Label	Tops Data Name
1	Top	Depth Top
2	Name	Stratigraphic Name
3	Rank	Stratigraphic Unit Rank
4	System	System
5	Subsystem	Subsystem
6	Series	Series
7	Source	

When the user selects the “Load Data” Button on the “Map File Column Number to Region Column” Dialog the data is parsed into the Gamma Ray Cross Section Program, where the Tops CSV file name is entered into the “PC ASCII Files:” Panel as well as the data type source.

Load Data

Data Source

KGS Data KGS (Database & Server)

Well Data

PC Data PC (ASCII Data Files)

Ver 2.0 & 3.0

LAS File

Tops CSV

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: Wellington-KGS-1-32.las

2:

3:

PC ASCII Files:

Tops CSV: Wellington-KGS-1-32_Tops.csv

Data Type 3.0 LAS CSV KGS Data Type 3.0 LAS CSV KGS

Log Data YES Tops Data YES

Perforations NO

Add Well Data Clear Exit

Examples: Importing Well Data into Cross Section

The cross section was created to allow the user to plot multiple wells and plot versus depth. The user can datum the logs by tops, elevation or log depth (default). Like other GEMINI Tools web apps this program can load from two sources the user's PC and the Kansas Geological Survey (KGS) database and file server. This section will give 2 examples that will cover each of the import processes,

1. Import well data from Kansas Geological Survey Database and File Server, which will search for 3 wells that are part of the same Township, Range and Section.
2. Import well data from the user's PC, this example will allow the user to import 3 wells from the user's PC to load Log ASCII Standard (LAS) version 2.0 and 3.0 files as well as Comma Separated Values (CSV) tops and Geologist Cuttings/Core Description ASCII delimited file.
3. Import the XML (Extensible Markup Language) file with a list of 56 wells with the location of Log ASCII Standard (LAS) version 2.0 file and tops for each well. This file contains the location of LAS files on the KGS Server, the Gamma Ray Cross Section web app will automatically retrieve the LAS from the KGS Server and load the Gamma Ray log data.

The “**New Well**” button on the Cross Section Panel allows the user to import well/measured section data into the cross section web app. The user can import from data from each of the well sources or

Import Well Data from the Kansas Geological Survey's Database and File Server

This example will focus on wells that are part of the same Township, Range and Section, i.e. Township 31 South, Range 37 West and Section 28. The three wells for this example are as follows,

1. Newby 2-28R (15-189-22225)
2. Lightcap 1-28 (15-189-22306)
3. Newby 3-28 (15-189-21240)

The user must load the well data for each well separately by clicking the “**New Well**” button for each well loading the Log & Tops Data with the “Load Data” dialog. Clicking the “Add Well Data” button at the bottom of the “Load Data” dialog will transfer the well data to the Cross Section Panel. The user can search for well data in the KGS Database and File Server using the “Search for Data on KGS Server” by API-Number, Partial Lease Name or by Township-Range Section. To create this cross section, the Township, Range and Section (TRS) of Newby 2-28R was used to find other wells that appear within the same TRS location. The details of loading well data from the KGS Database and File Server can be found by going to the [KGS \(Database & Server\) - Importing Well Data](#) Section (page 7) of this document for loading the Newby 2-28R well data example.

➤ **Newby 2-28R (15-189-22225)**

Click on the “**New Well**” button on the Cross Section Panel to open the “Load Data” dialog. The user then clicks on the “Well Data” icon button to open the “Search for Data on KGS Server” dialog.

To find all wells with the same Township, Range Section of interest, e.g. Township 31 South (S), Range 37 West (W) and Section 28.

Select the “Search” Button to retrieve all wells in the KGS database that match this search criteria.

Highlight the Newby 2-28R well and notice that under the LTCI column this well has L=Log Data (LAS 2.0 Files), T=Tops Data, C=Core Data and I=Core Image Data.

Also notice that there are two other wells that have the same TRS location with L=Log Data and T=Tops Data, Lightcap 1-28 and NEWBY 3-28.

Click on the “LAS File Data” button to load the “Select LAS File” dialog.

Start	End	OHM-M	Neutron	Density	Sonic	GR	PE	THOR	URAN	POTA
2,342	3,161	Yes	Yes	Yes	No	Yes	Yes	No	No	No
635.5	3,115	No	No	No	Yes	Yes	No	No	No	No
2,500	3,119.5	No	No	No	No	No	No	No	No	No

Highlight the first LAS File, notice that with this well the KGS Database has defined the log curve types that are part of the LAS version 2.0 files, i.e. it has Resistivity Logs (OHM-M), Neutron Porosity (Neutron), Bulk Density (Density), Acoustic Transit Time (Sonic), Gamma Ray (GR), and Photoelectric Factor (PE) Logs. Now click on the “Select” Button to display the “LAS File Curve Sections” dialog, which lists all the data sections in the LAS File. This example only has Log Data so only one panel will be displayed with a “~Log_Definition” tab.

LAS File Curve Sections

~Log_Definition

Start Depth: 2342.0 End Depth: 3161.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

X	MNEM	.UNITS : DESCRIPTION
<input checked="" type="checkbox"/>	DEPT	F : Depth (MD)
<input checked="" type="checkbox"/>	DPHI	PU : Density porosity
<input checked="" type="checkbox"/>	DRHO	GM/CC : Bulk Density Correction
<input checked="" type="checkbox"/>	DT	USEC/FT : Acoustic transit time
<input checked="" type="checkbox"/>	GR	API : Gamma Ray
<input checked="" type="checkbox"/>	ILD	OHM-M : Deep Induction Resistivity
<input checked="" type="checkbox"/>	ILM	OHM-M : Medium Induction Resistivity
<input type="checkbox"/>	ITT	USEC/FT : Acoustic transit time
<input type="checkbox"/>	? (MBVI)	DEC : bound water from mrii
<input type="checkbox"/>	? (MCBWD)	: Curve # 49
<input type="checkbox"/>	? (MFFI)	DEC : free fluid from mrii
<input checked="" type="checkbox"/>		OHM-M : Micro Inverse Resistivity

~Log_Definition

MNEM . UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT .F	: Depth (MD) {F}	
DPHI .PU	: Density porosity {F}	
DRHO .GM/CC	: Bulk Density Correction {F}	
DT .USEC/FT	: Acoustic transit time {F}	
GR .API	: Gamma Ray {F}	
ILD .OHM-M	: Deep Induction Resistivity {F}	
ILM .OHM-M	: Medium Induction Resistivity {F}	
MINV .OHM-M	: Micro Inverse Resistivity {F}	
MNOR .OHM-M	: Micro Normal Resistivity {F}	
MPERM .MD	: Permeability {F}	
NPHI .PU	: Neutron porosity {F}	
PE .BARNS/E	: Photoelectric factor {F}	
RHOB .GM/CC	: Bulk Density {F}	
SGRD .OHM-M	: Shallow Laterolog Resistivity {F}	
SP .MV	: Spontaneous Potential {F}	

Continue

Check boxes color code identifies at a glance, which curve is selected and type of log curve, i.e. cyan – porosity type log curve, orange – resistivity type log curve, etc.

Click on the “Continue” button to read and parse the LAS file into the cross section web app. The user will notice that on the “Load Data” dialog the LAS file name “1022012442.las” is entered into the “Log ASCII Standard (LAS) Files” panel. And the Log Data and Perforations data Type are marked with a “YES” under the KGS Column in the Data Type Panel.

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: 1022012442.las

2:

3:

PC ASCII Files:

Tops CSV:

Data Type	3.0	LAS	CSV	KGS
Log Data				YES
Perforations				YES

The perforations data will automatically load if the data is present in the Perforations Database Table for the selected well. The well header summary data is also automatically downloaded to the “Load Data” panel also.

Click on the “Top Picks” button to load the “Move/Merge KGS Data” dialog, which will display in the “KGS Stratigraphic Units” panel a list of Tops Sources, i.e., “HUG ELOG-EM”, “MKD” and “MKD-07/2006”. Load the both MKD Top sources by clicking on the “MKD” tops source and then in the “Add to User’s Stratigraphic Units List” radio buttons, select the “Add to List” radio button. Click on the “Add All” button to copy the list of tops to the “User’s Stratigraphic Units” table. Then Click on the “MKD-07/2006” tops source radio button and then click on the “Add All” button to copy the top to the “User’s Stratigraphic Units” table.

Move/Merge KGS Data.

KGS Stratigraphic Units:

☐ HUG ELOG-EM

☐ MKD

☒ MKD-07/2006

Add to User's Stratigraphic Units List:

☐ Remove & Replace ☒ Add to List ☐ Add New Units Only

Source	Top	Base	Name	Rank
MKD-07/2006	2,789	2,807	Matfield Shale	FORMAT

User's Stratigraphic Units:

Source	Top	Base	Name	Rank	
MKD	2,538	2,580	Krider Limestone	MEMBER	P ▲
MKD	2,629	0	Gage Shale	MEMBER	P
MKD	2,712	0	Fort Riley Limestone	MEMBER	P
MKD	2,777	2,789	Florence Limestone	MEMBER	P
MKD-07/2006	2,789	2,807	Matfield Shale	FORMATION	P
MKD	2,807	0	Wreford Limestone	FORMATION	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	2,853.5	Speiser Shale	FORMATION	P
MKD	2,853.5	2,894.5	Funston Limestone	FORMATION	P
MKD	2,894.5	2,910.5	Blue Rapids Shale	FORMATION	P
MKD	2,910.5	2,929	Crouse Limestone	FORMATION	P
MKD	2,929	2,933.5	Easley Creek Shale	FORMATION	P
MKD	2,933.5	2,947	Middleburg Limestone	MEMBER	P
MKD	2,947	2,957.5	Hooser Shale	MEMBER	P
MKD	2,957.5	2,962.5	Fine Limestone	MEMBER	P

Buttons: Add, Add All, Clear Selection, Clear Selection, Remove, Remove All, Load Data, Close

The MKD-07/2006 has only one top pick, but the MKD in the source name implies that it is add on to the MKD top picks.

Click on the “Load Data” button to import the tops data in the “User’s Stratigraphic Units” table to the “Load Data” panel. Notice that in the “Data Type” Panel the Tops Data has a “YES” in the KGS Column.

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: 1022012442.las

2:

3:

PC ASCII Files:

Tops CSV:

Data Type	3.0	LAS	CSV	KGS
Log Data			YES
Tops Data			YES
Perforations			YES

Now select the “Close” button in the “Search for Data on KGS Server” dialog since all the data that can be imported for the Newby 2-28R has been imported. Now click on the “Add Well Data” button in the “Load Data” dialog to transfer the Newby 2-28R well data to the Cross Section Panel.

File

Memory Usage: 13%

Memory Usage - PC Total Available Memory 19%

Load XML Status: 0%

Cross Section Well/Location List

L=Log Data, T=Tops, G=Geologist Report

LTG	Well Name	API-Number	Status	Latitude	Longitude	Elevation	Town	Range	Sec	KEY
LT	Newby 2-28R	15-189-22225	GAS	37.317	-101.355	3.112	31S	37W	28	150107100926

Order

Up

Down

Plot

Map

Cross Section

Modify Well Header Information Data

Modify

Well List Actions

New Well

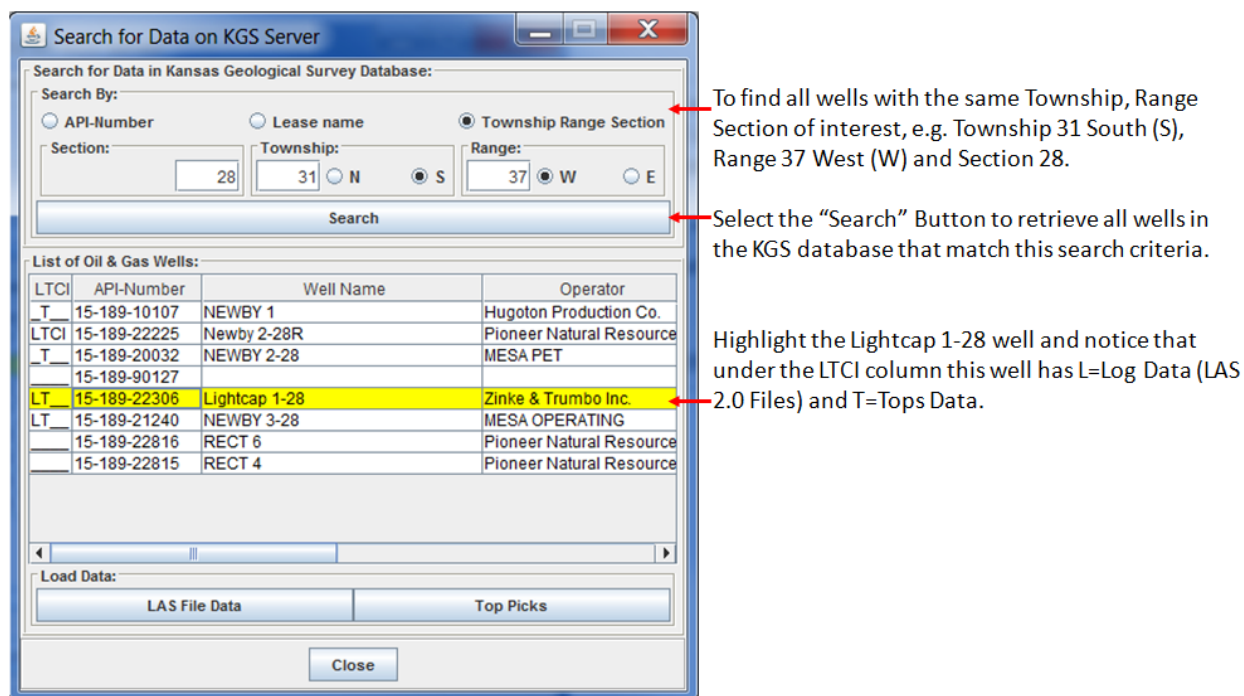
Remove

Remove All

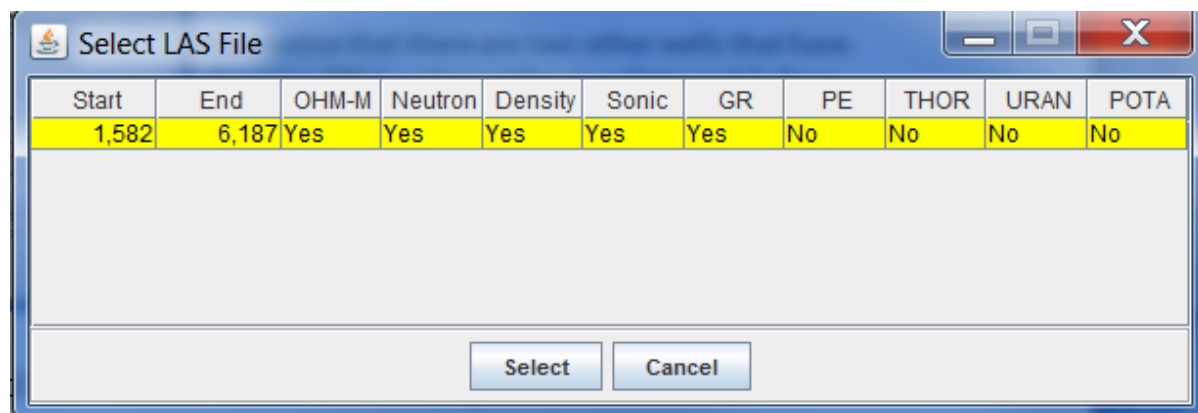
Notice that in the LTG column identifies the data type that was imported from the KGS database and file server, i.e. L=Log Data and T=Tops Data. Notice that the “Cross Section” Plot button, Modify Well Header Information Data “Modify” button and the “Remove”, “Remove All”, “Up” and “Down” buttons are now enabled, because there is a well in the “Cross Section Well/Location List” table. The “Map” button will not enable until there is at least two wells in the table.

➤ **Lightcap 1-28 (15-189-22306)**

Click on the “**New Well**” button on the Cross Section Panel to open the “Load Data” dialog. The user then clicks on the “Well Data” icon button to open the “Search for Data on KGS Server” dialog.



Click on the “LAS File Data” button to load the “Select LAS File” dialog.



Highlight the LAS File, notice that with this well the KGS Database has defined the log curve types that are part of the LAS version 2.0 files, i.e. it has Resistivity Logs (OHM-M), Neutron Porosity (Neutron), Bulk Density (Density), Acoustic Transit Time (Sonic), Gamma Ray (GR), and Photoelectric Factor (PE) Logs. Now click on the “Select” Button to display the “LAS File Curve Sections” dialog, which lists all the data sections in the LAS File. This example only has Log Data so only one panel will be displayed with a “~Log_Definition” tab.

LAS File Curve Sections

~Log Definition

Start Depth: 1582.0 End Depth: 6187.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

X	MNEM	.UNITS : DESCRIPTION
<input checked="" type="checkbox"/>	DEPT	.F : 1 DEPTH
<input type="checkbox"/>	? (AIT10)	.OHMM : 2 Shallow Resistivity
<input type="checkbox"/>	? (AIT30)	.OHMM : 3 Medium Resistivity
<input type="checkbox"/>	? (AIT90)	.OHMM : 4 Deep Resistivity
<input checked="" type="checkbox"/>	CILD	.MMHO/M : Deep Induction Conductivity
<input checked="" type="checkbox"/>	SP	.MV : Spontaneous Potential
<input checked="" type="checkbox"/>	DT	.USEC/FT : Acoustic transit time
<input checked="" type="checkbox"/>	GR	.API : Gamma Ray
<input checked="" type="checkbox"/>	SPHI	.PU : Sonic porosity
<input checked="" type="checkbox"/>	DPHZ	.PU : Density porosity
<input type="checkbox"/>	? (HCALI)	.IN : 11 Caliper
<input type="checkbox"/>		

~Log Definition

MNEM	.UNITS	: DESCRIPTION	ASSOCIATIONS
DEPT	.F	: 1 DEPTH {F}	
CILD	.MMHO/M	: Deep Induction Conductivity {F}	
SP	.MV	: Spontaneous Potential {F}	
DT	.USEC/FT	: Acoustic transit time {F}	
GR	.API	: Gamma Ray {F}	
SPHI	.PU	: Sonic porosity {F}	
DPHZ	.PU	: Density porosity {F}	
HDRA	.GM/CC	: Bulk Density Correction {F}	
NPHI	.PU	: Neutron porosity {F}	
PEFZ	.BARNSE	: Photoelectric factor {F}	
RHOZ	.GM/CC	: Bulk Density {F}	
HMIN	.OHM-M	: Micro Inverse Resistivity {F}	
HMNO	.OHM-M	: Micro Normal Resistivity {F}	

Continue

List of Log curves that will be imported into the web app.

Check boxes color code identifies at a glance, which curve is selected and type of log curve, i.e. cyan – porosity type log curve, orange – resistivity type log curve, etc.

Click on the “Continue” button to read and parse the LAS file into the cross section web app. The user will notice that on the “Load Data” dialog the LAS file name “1027928289.las” is entered into the “Log ASCII Standard (LAS) Files” panel. And the Log Data Type is marked with a “YES” under the KGS Column in the Data Type Panel.

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: 1027928289.las

2:

3:

PC ASCII Files:

Tops CSV:

Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data	.....	YES			Tops Data	NO	.....	
Perforations	NO	.....						

The perforations data will automatically load if the data is present in the Perforations Database Table for the selected well. The well header summary data is also automatically downloaded to the “Load Data” panel also.

Click on the “Top Picks” button to load the “Move/Merge KGS Data” dialog, which will display in the “KGS Stratigraphic Units” panel a list of Tops Sources, i.e., “MKD” and “SEALS”. Load the both Top sources by clicking on the “MKD” tops source and then in the “Add to User’s Stratigraphic Units List” radio buttons, select the “Add to List” radio button. Click on the “Add All” button to copy the list of tops to the “User’s Stratigraphic Units” table. Then Click on the “SEALS” tops source radio button and then click on the “Add All” button to copy all the tops to the “User’s Stratigraphic Units” table.

Move/Merge KGS Data.

KGS Stratigraphic Units:

☐ MKD
☒ SEALS

Add to User's Stratigraphic Units List:

☐ Remove & Replace ☒ Add to List ☐ Add New Units Only

Source	Top	Base	Name	R
SEALS	2,820	3,145	Council Grove	GROU
SEALS	2,820	2,840	Speiser Shale	FORM
SEALS	2,840	2,878	Funston Limestone	FORM
SEALS	2,878	2,898	Blue Rapids Shale	FORM
SEALS	2,898	2,915	Crouse Limestone	FORM
SEALS	2,915	2,924	Easy Creek Shale	FORM
SEALS	2,924	2,936	Middleburg Limestone	MEMB
SEALS	2,936	2,945	Hooser Shale	MEMB
SEALS	2,945	2,952	Eiss Limestone	MEMB
SEALS	2,952	2,961	Stearns Shale	FORM

User's Stratigraphic Units:

Source	Top	Base	Name	Rank	
MKD	2,516	2,532	Herrington Limestone	MEMBER	P
MKD	2,532	2,538	Paddock Shale	MEMBER	P
MKD	2,538	2,579	Krider Limestone	MEMBER	P
MKD	2,579	2,592	Odell Shale	FORMATION	P
MKD	2,592	2,627	Winfield Limestone	FORMATION	P
MKD	2,627	0	Gage Shale	MEMBER	P
MKD	2,656	0	Towanda Limestone	MEMBER	P
MKD	2,703	0	Fort Riley Limestone	MEMBER	P
MKD	2,765	2,772	Florence Limestone	MEMBER	P
MKD	2,772	2,795	Matfield Shale	FORMATION	P
MKD	2,795	2,820	Wreford Limestone	FORMATION	P
SEALS	2,820	3,145	Council Grove	GROUP	P
SEALS	2,820	2,840	Speiser Shale	FORMATION	P
SEALS	2,840	2,878	Funston Limestone	FORMATION	P
SEALS	2,878	2,898	Blue Rapids Shale	FORMATION	P
SEALS	2,898	2,915	Crouse Limestone	FORMATION	P

Buttons: Add, Add All, Clear Selection, Remove, Remove All, Load Data, Close

The “SEALS” source has tops that are picked below the “MKD” Source tops picks and should be included to import all the possible top picks to the Lightcap 1-28 Well.

Click on the “Load Data” button to import the tops data in the “User’s Stratigraphic Units” table to the “Load Data” panel. Notice that in the “Data Type” Panel the Tops Data has a “YES” in the KGS Column.

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: 1027928289.las

2:

3:

PC ASCII Files:

Tops CSV:

Data Type 3.0 LAS CSV KGS **Data Type** 3.0 LAS CSV KGS

Log Data YES **Tops Data** YES

Perforations NO

Now select the “Close” button in the “Search for Data on KGS Server” dialog since all the data that can be imported for the Lightcap 1-28 has been imported. Now click on the “Add Well Data” button in the “Load Data” dialog to transfer the Lightcap 1-28 well data to the Cross Section Panel.

File Load XML Status: 0%

Memory Usage: 12% **Memory Usage - PC Total Available Memory** 16%

Cross Section Well/Location List

L=Log Data, T=Tops, G=Geologist Report

LTG	Well Name	API-Number	Status	Latitude	Longitude	Elevation	Town	Range	Sec	KEY
LT	Newby 2-28R	15-189-22225	GAS	37.317	-101.355	3,112	31S	37W	28	150107100926
LT	Lightcap 1-28	15-189-22306	D&A	37.328	-101.346	3,102	31S	37W	28	150107101643

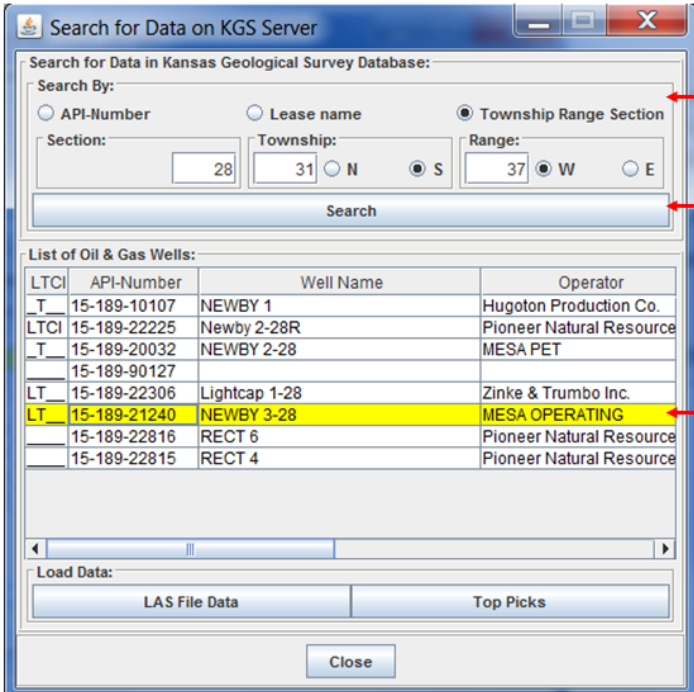
Order Up Down

Plot Map Cross Section **Modify Well Header Information Data** Modify **Well List Actions** New Well Remove Remove All

Notice that in the LTG column identifies the data type that was imported from the KGS database and file server, i.e. L=Log Data and T=Tops Data. At this point notice that the “Map” button is now enabled, which allows the user to display a map of the two wells plotted to give a sense of the location.

➤ **Newby 3-28 (15-189-21240)**

Click on the “**New Well**” button on the Cross Section Panel to open the “Load Data” dialog. The user then clicks on the “Well Data” icon button to open the “Search for Data on KGS Server” dialog.



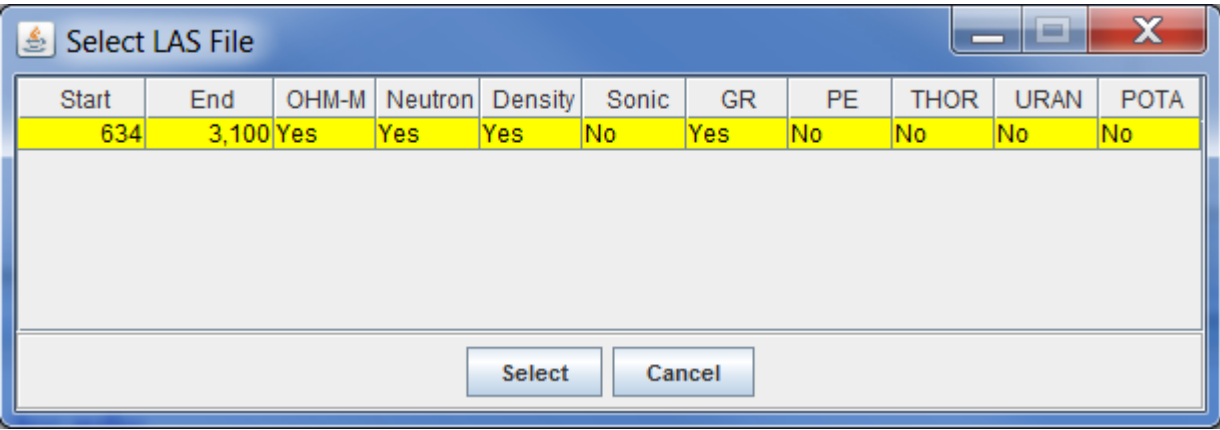
To find all wells with the same Township, Range Section of interest, e.g. Township 31 South (S), Range 37 West (W) and Section 28.

Select the “Search” Button to retrieve all wells in the KGS database that match this search criteria.

Highlight the NEWBY 3-28 well and notice that under the LTCI column this well has L=Log Data (LAS 2.0 Files) and T=Tops Data.

LTCI	API-Number	Well Name	Operator
T	15-189-10107	NEWBY 1	Hugoton Production Co.
LTCI	15-189-22225	Newby 2-28R	Pioneer Natural Resource
T	15-189-20032	NEWBY 2-28	MESA PET
	15-189-90127		
LT	15-189-22306	Lightcap 1-28	Zinke & Trumbo Inc.
LT	15-189-21240	NEWBY 3-28	MESA OPERATING
	15-189-22816	RECT 6	Pioneer Natural Resource
	15-189-22815	RECT 4	Pioneer Natural Resource

Click on the “LAS File Data” button to load the “Select LAS File” dialog.



Start	End	OHM-M	Neutron	Density	Sonic	GR	PE	THOR	URAN	POTA
634	3,100	Yes	Yes	Yes	No	Yes	No	No	No	No

Highlight the LAS File, notice that with this well the KGS Database has defined the log curve types that are part of the LAS version 2.0 files, i.e. it has Resistivity Logs (OHM-M), Neutron Porosity (Neutron), Bulk Density (Density), Acoustic Transit Time (Sonic), and Gamma Ray (GR) Logs. Now click on the “Select” Button to display the “LAS File Curve Sections” dialog, which lists all the data sections in the LAS File. This example only has Log Data so only one panel will be displayed with a “~Log_Definition” tab.

LAS File Curve Sections

Start Depth: 634.0 End Depth: 3100.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

X	MNEM	.UNITS : DESCRIPTION
<input checked="" type="checkbox"/>	DEPT	.F : DEPTH
<input checked="" type="checkbox"/>	CALI	.IN : Caliper
<input checked="" type="checkbox"/>	NPHI	.PU : Neutron porosity
<input checked="" type="checkbox"/>	RHOB	.GM/CC : Bulk Density
<input checked="" type="checkbox"/>	GR	.API : Gamma Ray
<input checked="" type="checkbox"/>	ILD	.OHM-M : Deep Induction Resistivity
<input checked="" type="checkbox"/>	ILM	.OHM-M : Medium Induction Resistivity
<input checked="" type="checkbox"/>	SP	.MV : Spontaneous Potential
<input checked="" type="checkbox"/>	GRD	.OHM-M : Deep Laterolog Resistivity

~Log_Definition

MNEM	.UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT.F		: DEPTH {F}	
CALI.IN		: Caliper {F}	
NPHI.PU		: Neutron porosity {F}	
RHOB.GM/CC		: Bulk Density {F}	
GR.API		: Gamma Ray {F}	
ILD.OHM-M		: Deep Induction Resistivity {F}	
ILM.OHM-M		: Medium Induction Resistivity {F}	
SP.MV		: Spontaneous Potential {F}	
GRD.OHM-M		: Deep Laterolog Resistivity {F}	

Continue

Check boxes color code identifies at a glance, which curve is selected and type of log curve, i.e. cyan – porosity type log curve, orange – resistivity type log curve, etc.

Click on the “Continue” button to read and parse the LAS file into the cross section web app. The user will notice that on the “Load Data” dialog the LAS file name “1011640904.las” is entered into the “Log ASCII Standard (LAS) Files” panel. And the Log Data Type is marked with a “YES” under the KGS Column in the Data Type Panel.

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: 1011640904.las

2:

3:

PC ASCII Files:

Tops CSV:

Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data	.....	.....	.....	YES	Tops Data	NO	.....	.....	.....
Perforations	NO	.....	.....	.....		

The perforations data will automatically load if the data is present in the Perforations Database Table for the selected well. The well header summary data is also automatically downloaded to the “Load Data” panel also.

Click on the “Top Picks” button to load the “Move/Merge KGS Data” dialog, which will display in the “KGS Stratigraphic Units” panel a list of Tops Sources, i.e., “ACO-1”, “ELOG-EM”, “HUG ELOG-EM” and “MKD”. Clicking on each source name radio button will show that only the “HUG ELOG-EM” tops source will have the necessary tops. Load by clicking on the “HUG ELOG-EM” tops source and then in the “Add to User’s Stratigraphic Units List” radio buttons, select the “Add to List” radio button. Click on the “Add All” button to copy the list of tops to the “User’s Stratigraphic Units” table.

Move/Merge KGS Data.

KGS Stratigraphic Units:

☐ ACO-1
☐ ELOG-EM
☒ HUG ELOG-EM
☐ MKD

Add to User's Stratigraphic Units List:

☐ Remove & Replace ☒ Add to List ☐ Add New Units Only

Source	Top	Base	Name	R
HUG ELOG-EM	0	2,826	Chase	GROU
HUG ELOG-EM	723	0	Day Creek Dolomite	FORM
HUG ELOG-EM	1,110	1,200	Blaine	FORM
HUG ELOG-EM	1,248	1,410	Cedar Hills Sandstone	FORM
HUG ELOG-EM	1,695	1,760	Stone Corral	FORM
HUG ELOG-EM	2,181	2,519	Wellington	FORM
HUG ELOG-EM	2,280	0	Hutchinson Salt	MEMB
HUG ELOG-EM	2,498	0	Hollenberg Limestone	MEMB
HUG ELOG-EM	2,530	2,826	Chase	GROU
HUG ELOG-EM	2,530	2,538	Herington Limestone	MEMB
HUG ELOG-EM	2,538	2,542	Paddock Shale	MEMB

User's Stratigraphic Units:

Source	Top	Base	Name	Rank	
HUG ELOG-EM	723	0	Day Creek Dolomite	FORMATION	P
HUG ELOG-EM	1,110	1,200	Blaine	FORMATION	P
HUG ELOG-EM	1,248	1,410	Cedar Hills Sandstone	FORMATION	P
HUG ELOG-EM	1,695	1,760	Stone Corral	FORMATION	P
HUG ELOG-EM	2,181	2,519	Wellington	FORMATION	P
HUG ELOG-EM	2,280	0	Hutchinson Salt	MEMBER	P
HUG ELOG-EM	2,498	0	Hollenberg Limestone	MEMBER	P
HUG ELOG-EM	2,530	2,826	Chase	GROUP	P
HUG ELOG-EM	2,530	2,538	Herington Limestone	MEMBER	P
HUG ELOG-EM	2,538	2,542	Paddock Shale	MEMBER	P
HUG ELOG-EM	2,553	2,583	Krider Limestone	MEMBER	P
HUG ELOG-EM	2,583	2,596	Odell Shale	FORMATION	P
HUG ELOG-EM	2,596	2,632	Winfield Limestone	FORMATION	P
HUG ELOG-EM	2,632	0	Gage Shale	MEMBER	P
HUG ELOG-EM	2,656	2,700	Towanda Limestone	MEMBER	P
HUG ELOG-EM	2,710	2,750	Fort Riley Limestone	MEMBER	P

Click on the “Load Data” button to import the tops data in the “User’s Stratigraphic Units” table to the “Load Data” panel. Notice that in the “Data Type” Panel the Tops Data has a “YES” in the KGS Column.

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: 1011640904.las

2:

3:

PC ASCII Files:

Tops CSV:

Data Type 3.0 LAS CSV KGS Data Type 3.0 LAS CSV KGS

Log Data YES Tops Data YES

Perforations NO

Now select the “Close” button in the “Search for Data on KGS Server” dialog since all the data that can be imported for the Newby 3-28 has been imported. Now click on the “Add Well Data” button in the “Load Data” dialog to transfer the Newby 3-28 well data to the Cross Section Panel.

File Load XML Status: 0%

Memory Usage: 18% Memory Usage - PC Total Available Memory 15%

Cross Section Well/Location List

L=Log Data, T=Tops, G=Geologist Report

LTG	Well Name	API-Number	Status	Latitude	Longitude	Elevation	Town	Range	Sec	KEY
LT	Newby 2-28R	15-189-22225	GAS	37.317	-101.355	3,112	31S	37W	28	150107100926
LT	Lightcap 1-28	15-189-22306	D&A	37.328	-101.346	3,102	31S	37W	28	150107101643
LT	NEWBY 3-28	15-189-21240	GAS	37.326	-101.343	3,102	31S	37W	28	150107105841

Order

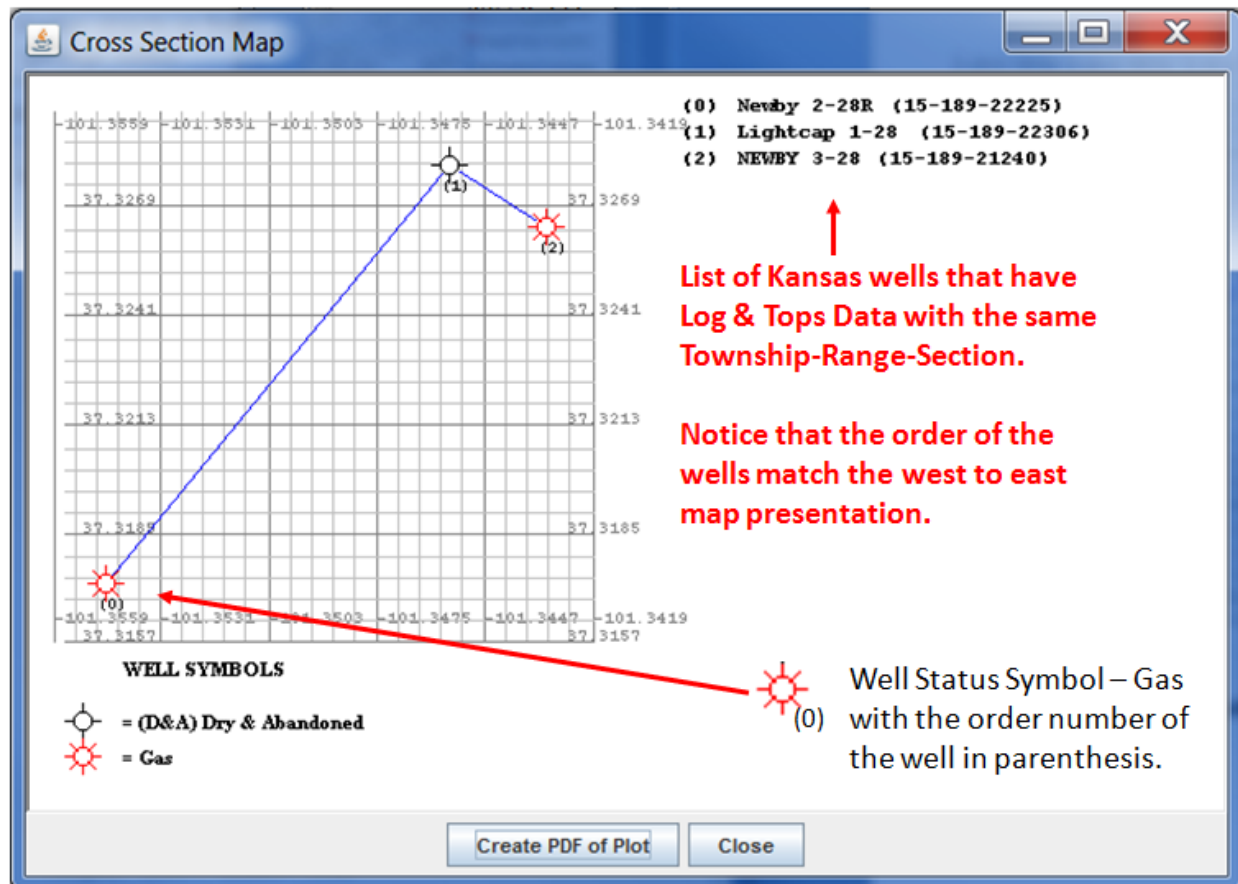
Up

Down

Plot Map Cross Section Modify Well Header Information Data Modify Well List Actions New Well Remove Remove All

Now click on the “Map” button to display the map plot to view the selected wells. The well locations are plotted on latitude versus longitude map grid to help the user visualize the location of the well in relative 2-dimensional space and to also verify that the order of the wells follow a logical presentation. If the wells were out of order with respect to each other the user will see the blue cross section lines crossing. The user can correct any errors in the well order by clicking on the “Up” or “Down” buttons on the Cross Section Panel. As the user will see that the order of the wells are correct and no further action needs to be taken. The user can click on the “Create PDF of Plot” button to create a Portable Network Graphic (PNG) image of the cross section map. The user will see a search PC dialog that will allow the user to search their PC directory structure

to save the PNG image. Once the image is saved a HTML web page will display with a “Create a PDF Document of this PNG Image” URL Link at the top of the page above the cross section map image. Click on the link to launch the Create PDF (Portable Document Format) from Image Applet that will allow the user to convert the saved PNG image to a PDF document.



The user now can create a cross section plot of the wells that have been selected. Click on the “Cross Section” Plot button to display the cross section of the three wells. The image below illustrates the cross section of the three wells that have been imported into the Cross Section Web App. The Cross Section Plot Control plots all three wells in a depth profile. The plot below represents the cross section of 3 Kansas wells with the same Township Range and Sections, i.e. Township 31 South (S) – Range 37 West (W) and Section 28. The plot is plotted by elevation depth from 700’ down to 0’ at a 100 feet / inch scale.



Gamma Ray Colorlith (RGB) Cross Section
Township 31S - Range 37W - Section 28

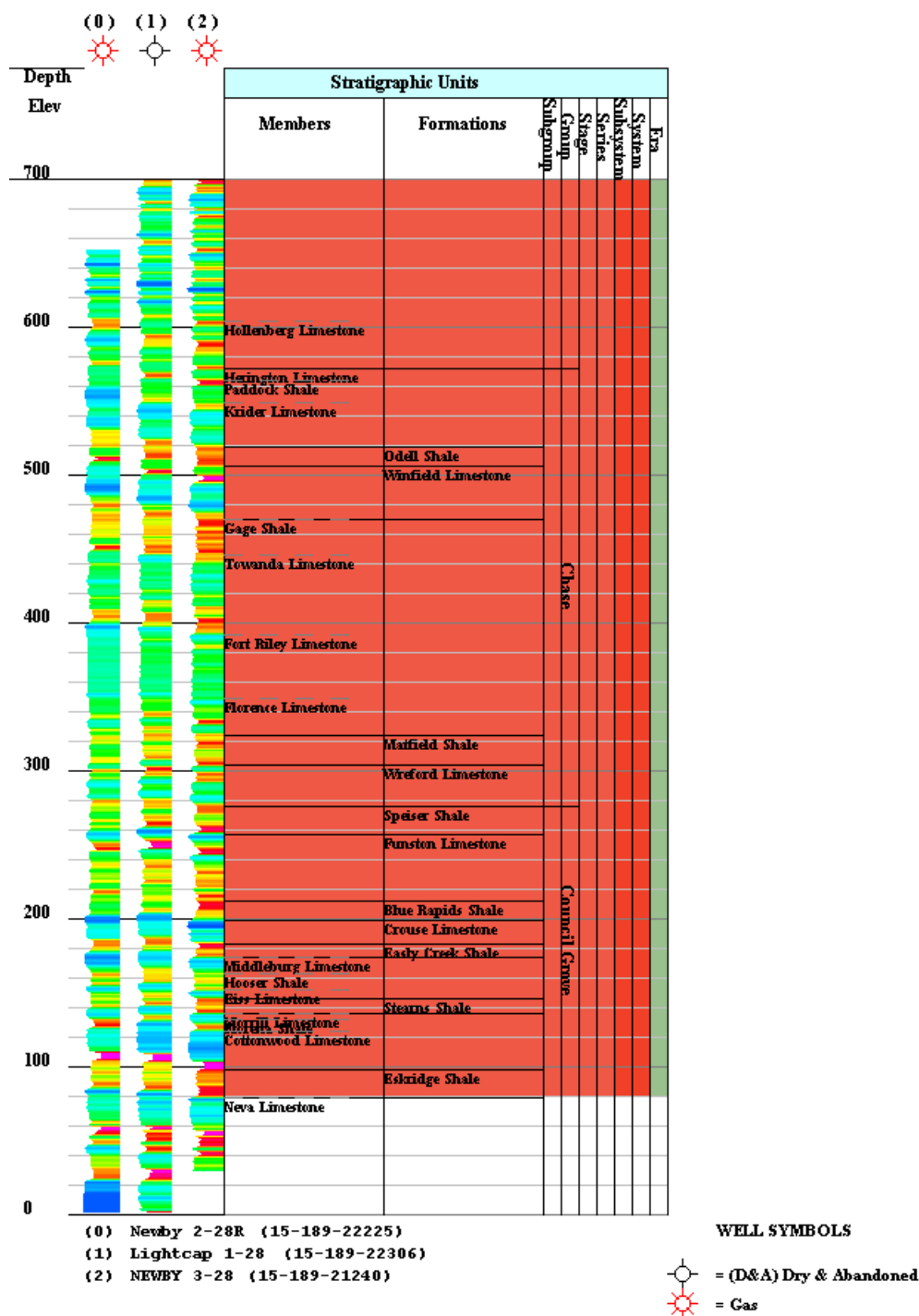


Figure: Cross Section of three Kansas wells in the same Township-Range-Section Location, i.e. Township 31S-Range 37W-Section 28 plotted by Elevation from 700 to 0 feet at 100 feet/inch scale.

Importing Well Data from User's PC

Download either the ASCII Text Files directly or the Zip files extracting the contents into a directory. The problem with the ASCII Text Files being downloaded directly from a web page is that the web page will alter the contents so it does not retain the basic structure and add HTML text to the file. The preferred method if you have Zip or WinZip is to download the zip files to your PC and extract.

Well Data: Wellington KGS 1-32, Sumner County, Kansas

Type	ASCII Text Files
LAS 2.0	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington-KGS-1-32.las
Tops	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington-KGS-1-32_Tops.csv

Type	Zip Files
LAS 2.0	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington-KGS-1-32.zip
Tops	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington-KGS-1-32_Tops.zip

Well Data: Wellington KGS 1-28, Sumner County, Kansas

Type	ASCII Text Files
LAS 3.0	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington_KGS_1-28_LAS3.las

Type	Zip Files
LAS 3.0	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington_KGS_1-28_LAS3.zip

Well Data: Meridith 3, Township 31 South, Range 1 West, Section 28, Sumner County, Kansas

Type	ASCII Text Files
LAS 3.0	http://www.kgs.ku.edu/Gemini/Tools/documentation/Meridith_3-T31S-R1W-sec28.las

Type	Zip Files
LAS 3.0	http://www.kgs.ku.edu/Gemini/Tools/documentation/Meridith_3-T31S-R1W-sec28.zip

This example will focus on well data that are on the user's PC. The three wells for this example are as follows,

1. Wellington KGS 1-32 (15-191-22591)
2. Wellington KGS 1-28 (15-191-22590)
3. Meridith 3 (15-191-21556)

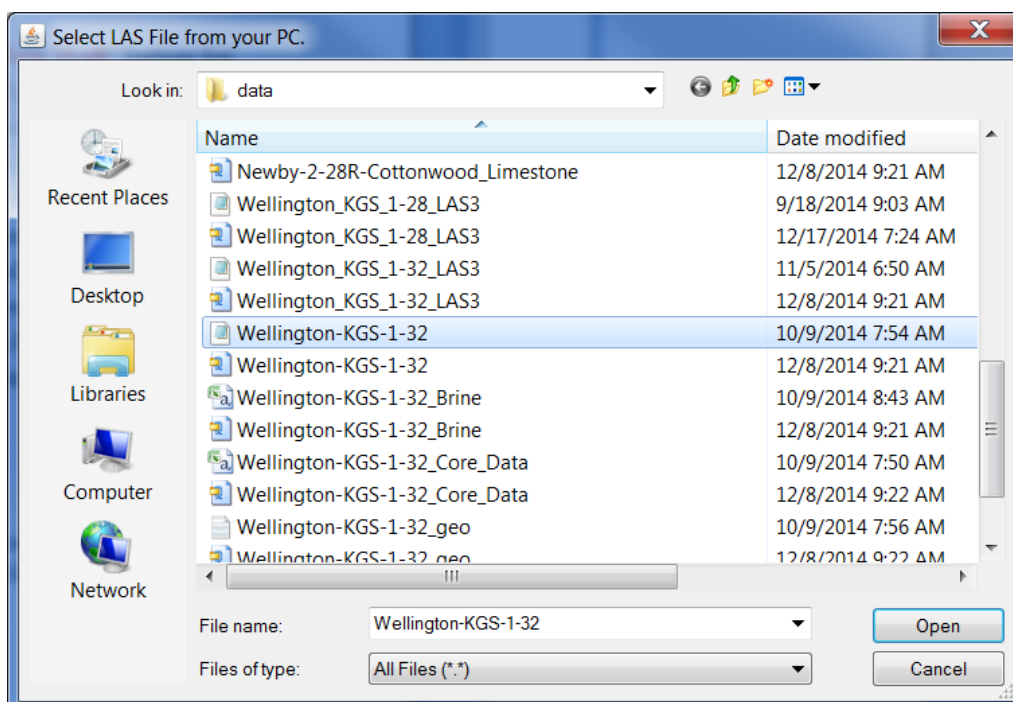
The user must load the well data for each well separately by clicking the “**New Well**” button for each well loading the well data with the “Load Data” dialog. Clicking the “Add Well Data”

button at the bottom of the “Load Data” dialog will transfer the well data to the Cross Section Panel. The details of loading well data from the User’s PC can be found by going to the Importing PC Data - Download Well Data to PC Section (page 27) of this document for loading the Wellington KGS 1-32 well data example. The Wellington KGS 1-32 has three separate files the Log ASCII Standard (LAS) version 2.0 file, Tops Comma Separated Values (CSV) file and the Geologist Cuttings/Core Description ASCII Delimited file. The other two wells are Log ASCII Standard (LAS) version 3.0 Files with the same data types loaded in the individual files, i.e. the LAS 3.0 file will hold not only the log data, but also the tops, measured core data, geologist cuttings/core description, etc.

➤ **Wellington KGS 1-32**

○ **Import Log ASCII Standard (LAS) version 2.0 File**

Click on the “**New Well**” button on the Cross Section Panel to open the “Load Data” dialog. The user then clicks on the “LAS version 2.0 & 3.0” icon button to open the “Select LAS File from your PC” dialog.



Highlight “Wellington-KGS-1-32” LAS File and click on the “Open” button to open the “LAS File Curve Sections” dialog, which lists all the data sections in the LAS File. This example only has Log Data so only one panel will be displayed with a “~Log_Definition” tab.

LAS File Curve Sections

~Log_Definition

Start Depth: 0.0 End Depth: 5248.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

X	MNEM	.UNITS : DESCRIPTION
<input checked="" type="checkbox"/>	AHT30	.OHM-M : Array Induction Resistivity-30
<input checked="" type="checkbox"/>	AHT20	.OHM-M : Array Induction Resistivity-20
<input checked="" type="checkbox"/>	AHT10	.OHM-M : Array Induction Resistivity-10
<input checked="" type="checkbox"/>	RT	.OHM-M : Deep Resistivity
<input type="checkbox"/>	? (RMUD)	.ohmm : RMUD
<input checked="" type="checkbox"/>	RHOB	.GM/CC : Bulk Density
<input type="checkbox"/>	? (QN)	.NONE : NearQuality
<input type="checkbox"/>	? (QF)	.NONE : FarQuality
<input checked="" type="checkbox"/>	PE	.BARNS/E : Photoelectric factor
<input type="checkbox"/>	NPHS	.PU : Neutron porosity
<input type="checkbox"/>	? (NPHL)	.% : Neu Por Lime
<input checked="" type="checkbox"/>	NPHI	.PU : Neutron porosity

~Log_Definition

MNEM . UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT .F	: Depth {F}	
GR .API	: Gamma Ray {F}	
CALA .IN	: Caliper {F}	
DT .USEC/FT	: Acoustic transit time {F}	
SP .MV	: Spontaneous Potential {F}	
RXRT .RATIO	: Rxo/Rt ratio {F}	
AHT90 .OHM-M	: Array Induction Resistivity-90 {F}	
AHT60 .OHM-M	: Array Induction Resistivity-60 {F}	
AHT30 .OHM-M	: Array Induction Resistivity-30 {F}	
AHT20 .OHM-M	: Array Induction Resistivity-20 {F}	
AHT10 .OHM-M	: Array Induction Resistivity-10 {F}	
RT .OHM-M	: Deep Resistivity {F}	
RHOB .GM/CC	: Bulk Density {F}	
PE .BARNS/E	: Photoelectric factor {F}	
NPHI .PU	: Neutron porosity {F}	
DRHO .GM/CC	: Bulk Density Correction {F}	
MINV .OHM-M	: Micro Inverse Resistivity {F}	
MNOR .OHM-M	: Micro Normal Resistivity {F}	
POTA .%	: Potassium Concentration {F}	
URAN .PPM	: Uranium Concentration {F}	
THOR .PPM	: Thorium Concentration {F}	

Continue

Check boxes color code identifies at a glance, which curve is selected and type of log curve, i.e. cyan – porosity type log curve, orange – resistivity type log curve, etc.

Click on the “Continue” button to read and parse the LAS file into the cross section web app. The user will notice that on the “Load Data” dialog the LAS file name “Wellington-KGS-1-32.las” is entered into the “Log ASCII Standard (LAS) Files” panel. And the Log Data Type is marked with a “YES” under the LAS Column in the Data Type Panel.

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: Wellington-KGS-1-32.las

2:

3:

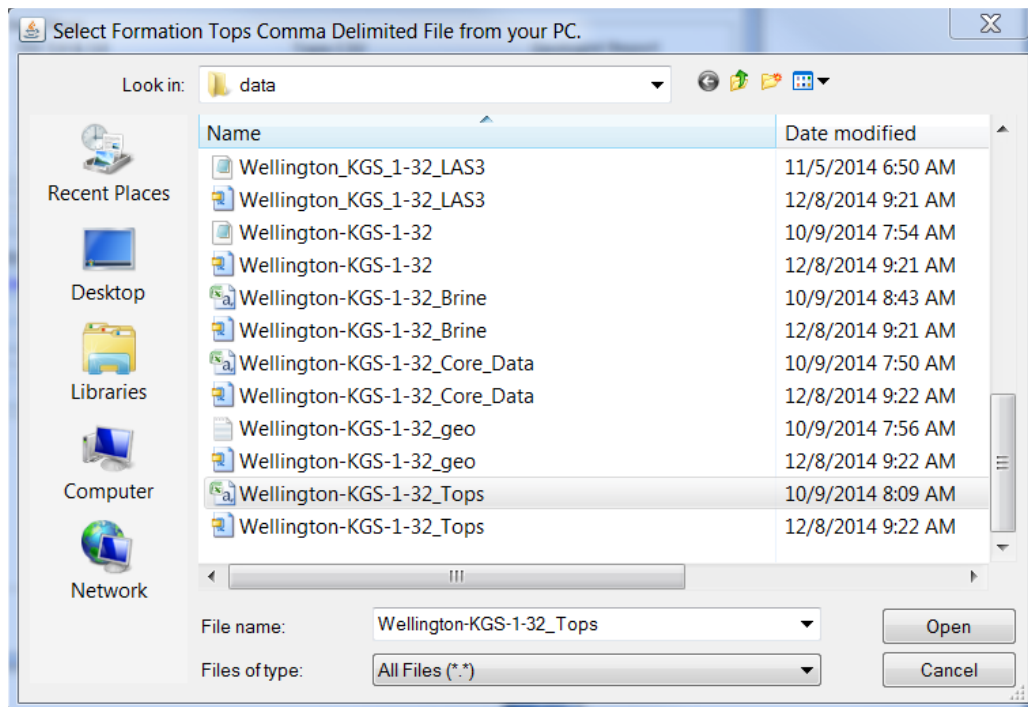
PC ASCII Files:

Tops CSV:

Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data	.....	YES	.....		Tops Data	NO	.....	.....
Perforations	NO	.....	.....				

- **Import Tops Comma Separated Values (CSV) ASCII Delimited File**

The user now clicks on the “Tops CSV” icon button to open the “Select Formation Tops Comma Delimited File from your PC” dialog.



Highlight “Wellington-KGS-1-32_Tops” CSV File and click on the “Open” button to open the “Map File Column Number to Region Column” dialog, which will parse the Tops CSV file first two lines and map the column number (starting at 1, 2, 3 ...) of the data header to the Tops data structure variables. As the user sees the “File Column Number” column are matched to the Tops data structure variables.

The Wellington KGS 1-32 Tops CSV example has two introduction lines, the first line is the well header information and the second line is the actual column labels for the tops data, illustrated below,

Line 1 Well Header Info	Wellington KGS 1-32, 15-191-22591, T31S R1W sec. 32, GL:1259, KB:1272
Line 2 Data Column Labels	Top, Name, Rank, System, Subsystem, Series, source
Line 3 Data Start	620, Chase, GROUP, Permian, , Wolfcampian, PG
	748, Towanda Limestone, MEMBER, Permian, , Wolfcampian, PG
	1595, Wabaunsee, GROUP, Carboniferous, Pennsylvanian, Upper, PG
	1622, Root Shale, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
	1662, Stotler Limestone, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
	1920, Severy Shale, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
	1980, Topeka Limestone, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
	2312, Lecompton Limestone, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
	2402, Heebner Shale, MEMBER, Carboniferous, Pennsylvanian, Upper, PG
	2703, Stalnaker Sandstone, BED, Carboniferous, Pennsylvanian, Upper, PG
	3039, Kansas City, GROUP, Carboniferous, Pennsylvanian, Upper, PG
	3169, Stark Shale, MEMBER, Carboniferous, Pennsylvanian, Upper, PG

Figure: Partial Contents of the Wellington-KGS-1-32_Tops.csv File.

Map File Column Number to Region Column

1st Line of Comma Delimited File:
Wellington KGS 1-32, 15-191-22591, T31S R1W sec. 32, GL:1259, KB:1272

2nd Line of Comma Delimited File:
Top, Name, Rank, System, Subsystem, Series, source

Formation Tops Columns:

Start Reading Data at Row Assume Row & Column Count is 1,2,3 ...

Region Column Name	File Column Number
Depth Top	<input type="text" value="1"/>
Depth Base	<input type="text" value="0"/>
Stratigraphic Unit Rank [SYSTEM, GROUP, etc.]	<input type="text" value="3"/>
Stratigraphic Name	<input type="text" value="2"/>
Alternate Name	<input type="text" value="0"/>
Era	<input type="text" value="0"/>
System	<input type="text" value="4"/>
Subsystem	<input type="text" value="5"/>
Series	<input type="text" value="6"/>
Subseries { Pennsylvanian & Mississippian Series }	<input type="text" value="0"/>
Stage	<input type="text" value="0"/>
Group	<input type="text" value="0"/>
Subgroup	<input type="text" value="0"/>
Formation	<input type="text" value="0"/>
Start Age (Ma)	<input type="text" value="0"/>
End Age (Ma)	<input type="text" value="0"/>

The “Map File Column Number to Region Column” Dialog allows the user to map the data in the Tops CSV File to the web app data structure variables. The program first reads the first and second line of the CSV File looking for the data column headers. The lines are each parsed to single out the data column headers and to match those headers to the tops data structure. The program then assigns the column number to the Region Column Name starting at column 1,2,3, ... if the file column name used matches the expected region column name.

The Wellington KGS 1-32 Tops CSV File example above line 2 has only the Top, Tops Name, Rank, System, Subsystem, Series and Source as the column name variables. The program was able to map each of the column headers to the tops data structure, except Source, i.e.

Column	File Column Label	Tops Data Name
1	Top	Depth Top
2	Name	Stratigraphic Name
3	Rank	Stratigraphic Unit Rank
4	System	System
5	Subsystem	Subsystem
6	Series	Series
7	Source	

When the user selects the “Load Data” button on the “Map File Column Number to Region Column” Dialog the data is parsed into the Cross Section Program, where the Tops CSV file name is entered into the “PC ASCII Files:” Panel as well as the data type source.

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: Wellington-KGS-1-32.las

2:

3:

PC ASCII Files:

Tops CSV: Wellington-KGS-1-32_Tops.csv

Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data	.....	YES	.....		Tops Data	.....	YES	.....
Perforations	NO	.....	.....				

Now click on the “Add Well Data” button in the “Load Data” dialog to transfer the Wellington KGS 1-32 well data to the Cross Section Panel.

File

Load XML Status: 0%

Memory Usage: 13%

Memory Usage - PC Total Available Memory 18%

Cross Section Well/Location List

L=Log Data, T=Tops, G=Geologist Report

LTG	Well Name	API-Number	Status	Latitude	Longitude	Elevation	Town	Range	Sec	KEY
LT	WELLINGTON KGS #1-32	15-191-22591		0	0	0	31S	1W	0	150107112140

Order

Up

Down

Plot

Map

Cross Section

Modify Well Header Information Data

Modify

Well List Actions

New Well

Remove

Remove All

Notice that in the LTG column identifies the data type that was imported from the KGS database and file server, i.e. L=Log Data and T=Tops Data. Notice that the “Cross Section” Plot button, Modify Well Header Information Data “Modify” button and the “Remove”, “Remove All”, “Up” and “Down” buttons are now enabled, because there is a well in the “Cross Section Well/Location List” table. The “Map” button will not enable until there is at least two wells in the table.

Notice also that the Status, Latitude, Longitude and Elevation columns are missing data. Highlight the Wellington KGS #1-32 row and click on the “Modify” button to display the “Edit Header Information” dialog displaying the well header information data. The user can manually enter the fields if they have access to the data or if this is a Kansas Well search the KGS

Database for the well header information by clicking on the “Search KGS Database for Well Header Information” button at the top of the “Edit Header Information” dialog, which will display the “Search for Data on KGS Server” dialog. This dialog allows the user to search by API-Number, Partial Lease Name or by Township Range Section. Since the API-Number is known, enter the API-Number in the “Enter API-Number” text field and select the “Search” button to search the KGS Database for the well data.

Search KGS Database for Well Header Information Button

Displays a “Search for Data on KGS Server” Dialog that allows the user to .

Identification Panel

KGS & PC Primary KEY – Identification Numbers for the well

API-Number – API Number of Well
Well Status - Status, i.e. OIL, GAS, etc.

Name – Lease Name & Number

Other Well Information Panel

Operator Name & KGS Database KEY

Field Name & KGS Database KEY

Location Information Panel

State Name

County Name

Location

Township Range Section

XY Position

Latitude

Longitude

UTM Zone

UTM X Position

UTM Y Position

Z-Position

Depth – Total Depth of Well

Elevation – by Ground Level

Elevation – by Kelly Bushing

Elevation – by Derrick Floor

Comments – User Comments, not saved to the LAS version 3.0.

Header Information Source Buttons:

• **Show Initial Header Data** – Shows the Header Information initially loaded into Program.

• **Show KGS Well Header Data** – Shows the Header Information loaded from KGS Database.

Buttons:

Status – Displays “Select Status of Data” Dialog, user searches for the well status list for status of well.

Kansas TRS to Latitude, Longitude & Elevation – The buttons calls a KGS database routine to compute the Latitude, Longitude and Elevation from the Township, Range and Section.

Compute UTM – This button calls a UTM Java Math Package to convert Latitude & Longitude into UTM X, Y Coordinates.

OK – Transfer Data Values to Program

Close – Close this Dialog

NOTE: Initially the Basic Header information is loaded from the LAS version 2.0 file and other fields like Comments, Location are loaded from the Geologist Report Header Section.

The Header Information Dialog displays the contents of the header information data structure. The user can edit the fields and select the “Ok” Button to transfer the information back to the Profile Program and any summary information will be updated in the Profile Control and Plot.

As this example illustrates there are missing fields in the header information data. The user can select the “Search KGS Database for Well Header Information” Button, which will display a “Search for Data on KGS Server” Dialog that will allow the user to build a query that will download all wells that match the query.

This will display the “Search for Data on KGS Server” Dialog, see image below. This dialog allows the user to search the KGS database for well header data. In this example, the well of interest will be the Wellington KGS 1-32.

LTCI	API-Number	Well Name	Operator
	15-191-19025-...	WELLINGTON UNIT 58-INJ	TERRA RESOURCES,
LT	15-191-10272	DeTurk 3	Stelbar Oil Corp., Inc.
T	15-191-10054	WELLINGTON UNIT was Kamas 7 ...	Sinclair Prairie Oil Co.
T	15-191-10254	Wellington Unit 96	Stelbar Oil Corp. and D
T	15-191-43925	BARLOW 2	SHAWVER E B
T	15-191-19022	WELLINGTON UNIT - KAMAS LEAS...	COOPERATIVE REFGA
T	15-191-10296	Cora Stone 'A' 1	Stelbar Oil Corp., Inc.
LT	15-191-19021	Wellington Unit 141	Coop. Refining Assoc.
LT	15-191-22591	WELLINGTON KGS 1-32	BEREXCO LLC
T	15-191-10062	JOHN LUDWIG 1	STELBAR OIL CORP
T	15-191-43878	MURPHY 7	TRANSWESTERN OIL
T	15-191-10263	Wellington Unit 112	Stelbar Oil Corp., Inc.
T	15-191-10104	WELLINGTON UNIT, was PEASEL ...	SHAWVER E B
T	15-191-10100	WELLINGTON UNIT, was ERKER 9...	STELBAR OIL CORP IN

Search for Well Header Data in KGS Database Search By:

• **API-Number** – The user can search the KGS Database for well data by API-Number. The Format for the API is SS-CCC-99999 where

- SS – Two Digit State Code
- CCC – Three Digit County Code
- 99999 – 5 Digit Well Number

• **Lease Name** – The user can search for well data by lease partial phrase, i.e. “Wellington”, which will look for all wells with the phrase “Wellington” in the lease name.

• **Township-Range-Section** – Search for a list of Wells by a specific area.

List of Kansas wells that match the search criteria

Load Well Header Buttons

• Select – Download the header information for the well selected.

• Close – Close this dialog

NOTE: LTCI Column in Table: L-LAS Files; T-Formation Tops; C-Measured Core Data; I-Core Images

As the Summary image suggests there are 3 methods for searching for the well header information within this dialog,

- By API-Number – KGS has a specific format for the API-Number, i.e. SS-CCC-99999 where SS is the state code for Kansas 15, CCC is the county code for Wellington KGS 1-32 it is 191 for Sumner County and the 5-Digit Well Number for the Wellington KGS 1-32 is 22591.

- By Partial Lease Name – The stored procedure used to retrieve the well header information allows the user to enter a partial phrase, in this example Wellington. The program places a ‘%’ in front and back of the phrase and sends the request to the Database, i.e. “%Wellington%”.

- By Township Range Section – This search is by location in Kansas, this search also allows the user to enter just the Township and Range to search for wells, e.g. to look for the Wellington KGS 1-32, enter Township as 31 set the S (South) Radio button and Range as 1 set the E (East) Radio button.

The user only needs to enter the above data and select the “Search” Button to display the list of Wells in the Kansas Database that match the search criteria. In the image below the Lease Name “Wellington” is entered to search for all wells in Kansas with the Phrase Wellington in it. The user searches through the list until they find the well of interest. In this example it is the Wellington KGS 1-32, which is highlighted.

LTCl	API-Number	Well Name	Operator
	15-191-19025-...	WELLINGTON UNIT 58-INJ	TERRA RESOURCES,
LT	15-191-10272	DeTurk 3	Stelbar Oil Corp., Inc.
T	15-191-10054	WELLINGTON UNIT was Kamas 7 ...	Sinclair Prairie Oil Co.
T	15-191-10254	Wellington Unit 96	Stelbar Oil Corp. and D
T	15-191-43925	BARLOW 2	SHAWVER E B
T	15-191-19022	WELLINGTON UNIT - KAMAS LEAS...	COOPERATIVE REFGA
T	15-191-10296	Cora Stone 'A' 1	Stelbar Oil Corp., Inc.
LT	15-191-19021	Wellington Unit 141	Coop. Refining Assoc.
LT_I	15-191-22591	WELLINGTON KGS 1-32	BEREXCO LLC
T	15-191-10062	JOHN LUDWIG 1	STELBAR OIL CORP
T	15-191-43878	MURPHY 7	TRANSWESTERN OIL
T	15-191-10263	Wellington Unit 112	Stelbar Oil Corp., Inc.
T	15-191-10104	WELLINGTON UNIT, was PEASEL ...	SHAWVER E B
T	15-191-10100	WELLINGTON UNIT, was ERKER 9...	STELBAR OIL CORP IN

The user clicks on the “Select” button to transfer the header information to the Edit Header Information Dialog.

LAS File Information

☒ Show Initial Header Data
 ☐ Show KGS Well Header Data

Search KGS Database for Well Header Information

Identification:
 KGS Primary Key: PC Primary Key:
 API-Number: Status:
 Name:

Other Well Information:
 Operator Name: Operator Code:
 Field Name: Field Code:

Location Information:
 State: County:
 Location:
 Township: Range: ☒ N ☐ S E ☐ W Section:

Kansas TRS to Latitude, Longitude & Elevation

XY Position:
 Latitude: Longitude:
 UTM Zone: Compute UTM
 UTM-X: UTM-Y:

Z-Position:
 Depth: Elevation: Kelly Bushing: Derrick Floor:

Comments:
 Lease: Wellington KGS Well 1-32 (15-191-22591) ; operator: BEREXCO LLC; Field: Wellington
 Location: T31S R1W, Sec. 32 : NE SW NE NE : 955 South, 877 West, from NE corner
 Longitude: -97.4423481 ; Latitude: 37.3154639
 County: Sumner
 Total Depth: 3660 ; Elevation: 1259 GL

KGS Database Information

☐ Show Initial Header Data
 ☒ Show KGS Well Header Data

Search KGS Database for Well Header Information

Identification:
 KGS Primary Key: PC Primary Key:
 API-Number: Status:

Name:

Other Well Information:
 Operator Name: Operator Code:
 Field Name: Field Code:

Location Information:
 State: County:
 Location:
 Township: Range: ☐ N ☒ S E ☐ W Section:

Kansas TRS to Latitude, Longitude & Elevation

XY Position:
 Latitude: Longitude:
 UTM Zone: Compute UTM
 UTM-X: UTM-Y:

Z-Position:
 Depth: Elevation: Kelly Bushing: Derrick Floor:

Comments:
 Lat Long added from legal survey on intent. (DS-DRL 1-10-2011)

Location is from the Geologist report header section the 2nd line of the ASCII Text file.

Comments are from the Geologist report header section the lines before the start of the data in the ASCII Text file.

The “Show KGS Well Header Data” radio button will become enabled if the KGS well header information has been downloaded. The user can move between the initial header information by selecting the “Show Initial Header Data” radio button the KGS well header information by selecting the “Show KGS Well Header Data” radio button.

There a number of buttons on the panel that will allow the user to change or compute data in the header information. The “Kansas TRS to Latitude, Longitude & Elevation” Button computes the latitude, longitude and elevation from the township, range and section by making an Oracle PL/SQL Stored Procedure, e.g.

http://chasm.kgs.ku.edu/ords/igstrat.TRS2LL_pkg.getXML?iTownship=31&sTownship=S&iRange=1&sRange=E&iSection=32

The call will return a XML with the latitude, longitude and ground level elevation.


```

<?xml version="1.0"?>
<!DOCTYPE headers [
<!ELEMENT headers (data*)>
<!ATTLIST headers records CDATA #IMPLIED>
<!ELEMENT data (info*,
                other?,
                loc?,
                xy?,
                z?,
                comments?,
                misc?,
                cnt?)>
<!ELEMENT info EMPTY>
<!ATTLIST info kid CDATA #IMPLIED
               well_kid CDATA #IMPLIED
               key CDATA #IMPLIED
               type CDATA #IMPLIED
               api CDATA #IMPLIED
               name CDATA #IMPLIED
               status CDATA #IMPLIED
               error CDATA #IMPLIED>
<!ELEMENT other EMPTY>
<!ATTLIST other operator CDATA #IMPLIED
               oper_kid CDATA #IMPLIED
               field CDATA #IMPLIED
               field_kid CDATA #IMPLIED>
<!ELEMENT loc EMPTY>
<!ATTLIST loc state CDATA #IMPLIED
               state_cd CDATA #IMPLIED
               county CDATA #IMPLIED
               county_cd CDATA #IMPLIED
               loc CDATA #IMPLIED
               town CDATA #IMPLIED
               town_dir CDATA #IMPLIED
               range CDATA #IMPLIED
               range_dir CDATA #IMPLIED
               section CDATA #IMPLIED>
<!ELEMENT xy EMPTY>
<!ATTLIST xy latitude CDATA #IMPLIED
               longitude CDATA #IMPLIED
               zone CDATA #IMPLIED
               utm_x CDATA #IMPLIED
               utm_y CDATA #IMPLIED>
<!ELEMENT z EMPTY>
<!ATTLIST z depth CDATA #IMPLIED
               gl CDATA #IMPLIED
               kb CDATA #IMPLIED
               df CDATA #IMPLIED>
<!ELEMENT comments (#PCDATA)>
<!ELEMENT misc EMPTY>
<!ATTLIST misc user CDATA #IMPLIED
               access CDATA #IMPLIED
               source CDATA #IMPLIED
               date CDATA #IMPLIED>
<!ELEMENT cnt EMPTY>
<!ATTLIST cnt las CDATA #IMPLIED
               tops CDATA #IMPLIED
               core CDATA #IMPLIED
               images CDATA #IMPLIED]>
<headers records="1">
  <data>
    <loc town="31" town_dir="S" range="1" range_dir="E" section="32" />
    <xy latitude="37.311703" longitude="-97.339619" />
    <z gl="1277" />
  </data>
</headers>

```

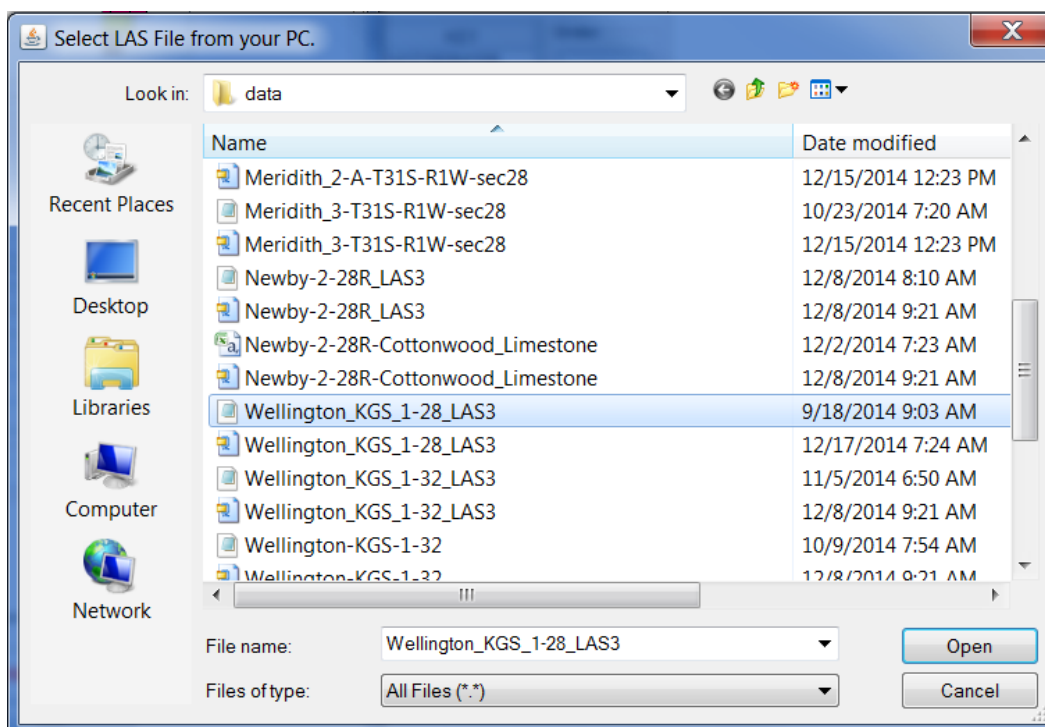
The “UTM” Button will compute the UTM XY coordinates from the latitude & longitude. The analysis uses A Working Manual by John P. Snyder, U.S. Geological Survey Professional Paper 1395, USG Printing Office, Washington, DC, 1987 (http://pubs.er.usgs.gov/djvu/PP/PP_1395.pdf).

Select the “Ok” button to update the Wellington KGS 1-32 Header Information in the Cross Section Panel.

LTG	Well Name	API-Number	Status	Latitude	Longitude	Elevation	Town	Range	Sec	KEY
LT	WELLINGTON KGS 1-32	15-191-22591	OTHER	37.315	-97.442	1.259	31S	1W	32	150107112140

- **Wellington KGS 1-28**
 - **Import Log ASCII Standard (LAS) version 3.0 File**

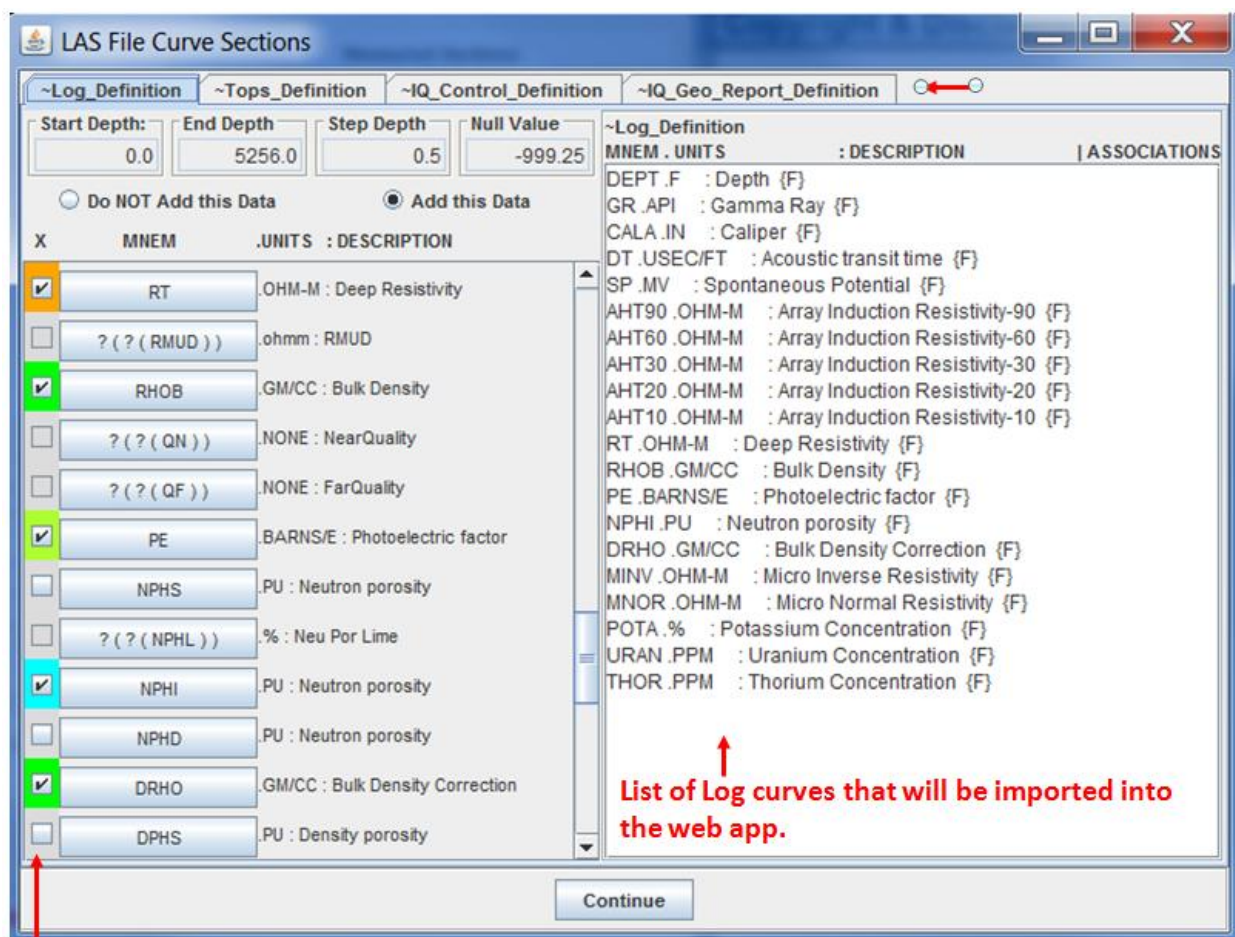
Click on the “**New Well**” button on the Cross Section Panel to open the “Load Data” dialog. The user then clicks on the “LAS version 2.0 & 3.0” icon button to open the “Select LAS File from your PC” dialog.



Highlight “Wellington-KGS-1-28” LAS File and click on the “Open” button to open the “LAS File Curve Sections” dialog, which lists all the data sections in the LAS File. This example contains Log Data, Tops Data and Geologist Description Data so there will be multiple tabbed panels displayed i.e.

- “~Log_Definition” tab – holds the LAS File Log Data Section
- “~Tops_Definition” tab – holds the Top Picks Data Section
- “~IQ_Control_Definition” tab – holds the Profile Plot Control Data Section, which allows the user to automatically re-plot the profile plot to pre-selected values, i.e. the selected Log Curves that were not originally defined in the LAS version 2.0 file.
- “~IQ_Geo_Report_Definition” tab – holds the Geologist Cuttings/Core Description Data Section.

Notice the last two panels have “~IQ_” before the description. These data sections are “user” defined sections, outlined in the Canadian Well Logging Society LAS 3 File Structure Document, http://www.cwls.org/wp-content/uploads/2014/09/LAS_3_File_Structure.pdf.



Check boxes color code identifies at a glance, which curve is selected and type of log curve, i.e. cyan – porosity type log curve, orange – resistivity type log curve, etc.

Click on the “Continue” button to read and parse the LAS file into the cross section web app. The user will notice that on the “Load Data” dialog the LAS file name “Wellington_KGS_1-28_LAS3.las” is entered into the “Log ASCII Standard (LAS) Files” panel. And the Log, Tops and Geologist Report Data Types are marked with a “YES” under the 3.0 Column in the Data Type Panel.

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: Wellington_KGS_1-28_LAS3.las

2:

3:

PC ASCII Files:

Tops CSV:

Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data	....	YES	....	....	Tops Data	....	YES	....	....
Perforations	NO	....	....	....		

Now click on the “Add Well Data” button in the “Load Data” dialog to transfer the Wellington KGS 1-28 well data to the Cross Section Panel.

File

Memory Usage: 17%

Memory Usage - PC Total Available Memory: 16%

Load XML Status: 0%

Cross Section Well/Location List

[L=Log Data](#), [T=Tops](#), [G=Geologist Report](#)

LTG	Well Name	API-Number	Status	Latitude	Longitude	Elevation	Town	Range	Sec	KEY
LT	WELLINGTON KGS 1-32	15-191-22591	OTHER	37.315	-97.442	1,259	31S	1W	32	150107112140
LT	WELLINGTON KGS 1-28	15-191-22590	OTHER	37.319	-97.433	1,270	31S	1W	28	150107112507

Order

Up

Down

Plot

Map

Cross Section

Modify Well Header Information Data

Modify

Well List Actions

New Well

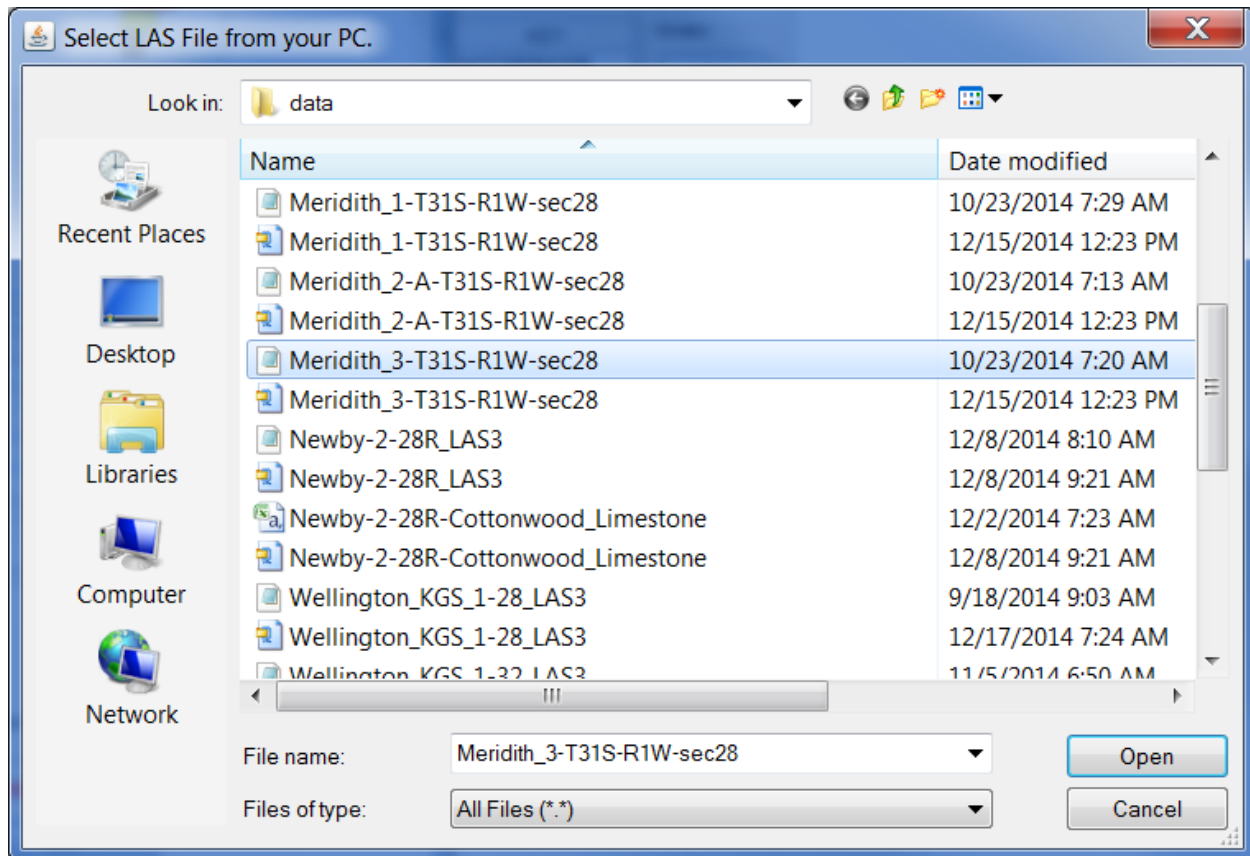
Remove

Remove All

Notice that in the LTG column identifies the data type that was imported from the KGS database and file server, i.e. L=Log Data, T=Tops Data and G=Geologist Report Data. At this point notice that the “Map” button is now enabled, which allows the user to display a map of the two wells plotted to give a sense of the location.

- **Meridith 3 (15-191-21556)**
 - **Import Log ASCII Standard (LAS) version 3.0 File**

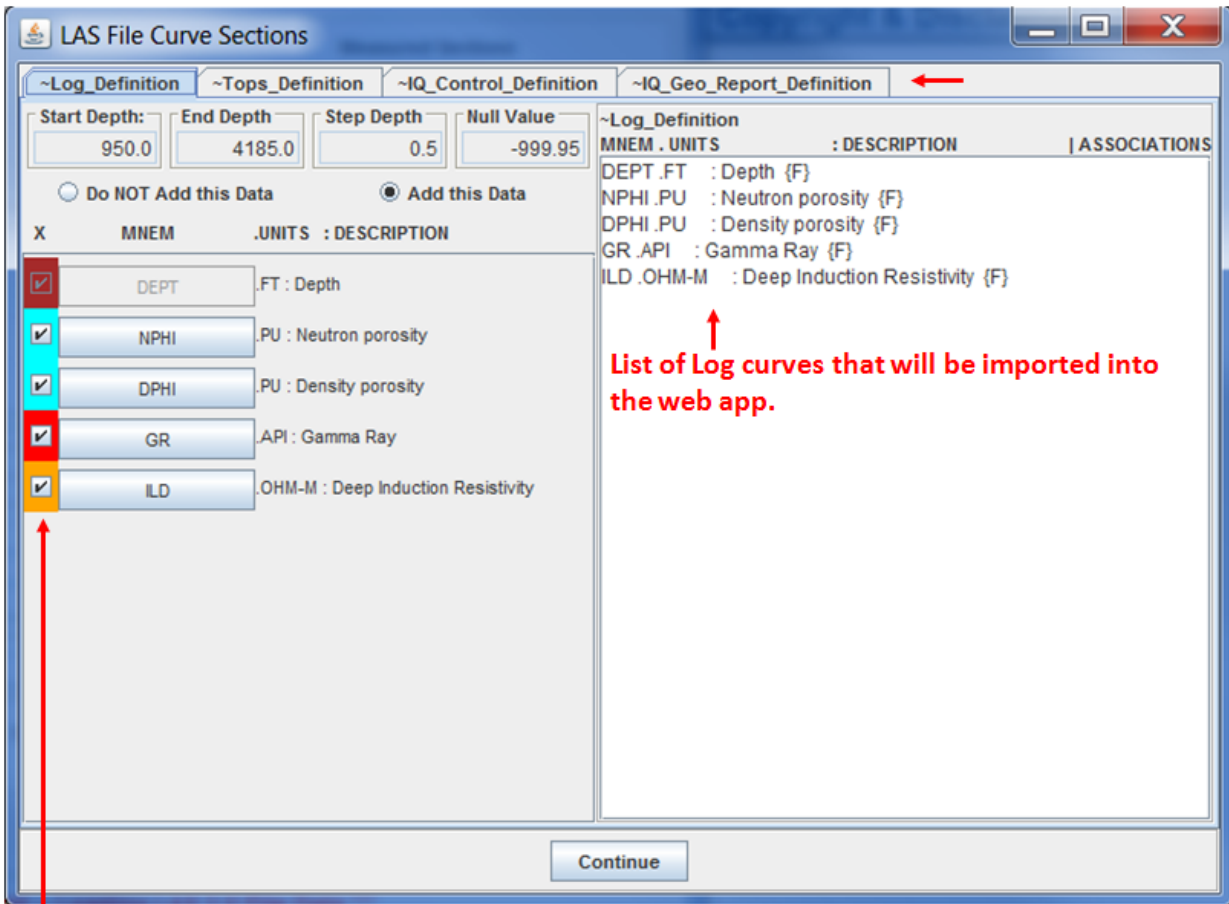
Click on the “**New Well**” button on the Cross Section Panel to open the “Load Data” dialog. The user then clicks on the “LAS version 2.0 & 3.0” icon button to open the “Select LAS File from your PC” dialog.



Highlight “Meridith_3-T31S-R1W-sec28” LAS File and click on the “Open” button to open the “LAS File Curve Sections” dialog, which lists all the data sections in the LAS File. This example contains Log Data, Tops Data and Geologist Description Data so there will be multiple tabbed panels displayed i.e.

- “~Log_Definition” tab – holds the LAS File Log Data Section
- “~Tops_Definition” tab – holds the Top Picks Data Section
- “~IQ_Control_Definition” tab – holds the Profile Plot Control Data Section, which allows the user to automatically re-plot the profile plot to pre-selected values, i.e. the selected Log Curves that were not originally defined in the LAS version 2.0 file.
- “~IQ_Geo_Report_Definition” tab – holds the Geologist Cuttings/Core Description Data Section.

Notice the last two panels have “~IQ_” before the description. These data sections are “user” defined sections, outlined in the Canadian Well Logging Society LAS 3 File Structure Document, http://www.cwls.org/wp-content/uploads/2014/09/LAS_3_File_Structure.pdf.



Check boxes color code identifies at a glance, which curve is selected and type of log curve, i.e. cyan – porosity type log curve, orange – resistivity type log curve, etc.

Click on the “Continue” button to read and parse the LAS file into the cross section web app. The user will notice that on the “Load Data” dialog the LAS file name “Meridith_3-T31S-R1W-sec28.las” is entered into the “Log ASCII Standard (LAS) Files” panel. And the Log, Tops and Geologist Report Data Types are marked with a “YES” under the 3.0 Column in the Data Type Panel.

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: Meridith_3-T31S-R1W-sec28.las

2:

3:

PC ASCII Files:

Tops CSV:

Data Type 3.0 LAS CSV KGS **Data Type** 3.0 LAS CSV KGS

Log Data YES **Tops Data** YES

Perforations NO

Now click on the “Add Well Data” button in the “Load Data” dialog to transfer the Meridith 3 well data to the Cross Section Panel.

File **Load XML Status:** 0%

Memory Usage: 19% **Memory Usage - PC Total Available Memory** 14%

Cross Section Well/Location List
L=Log Data, T=Tops, G=Geologist Report

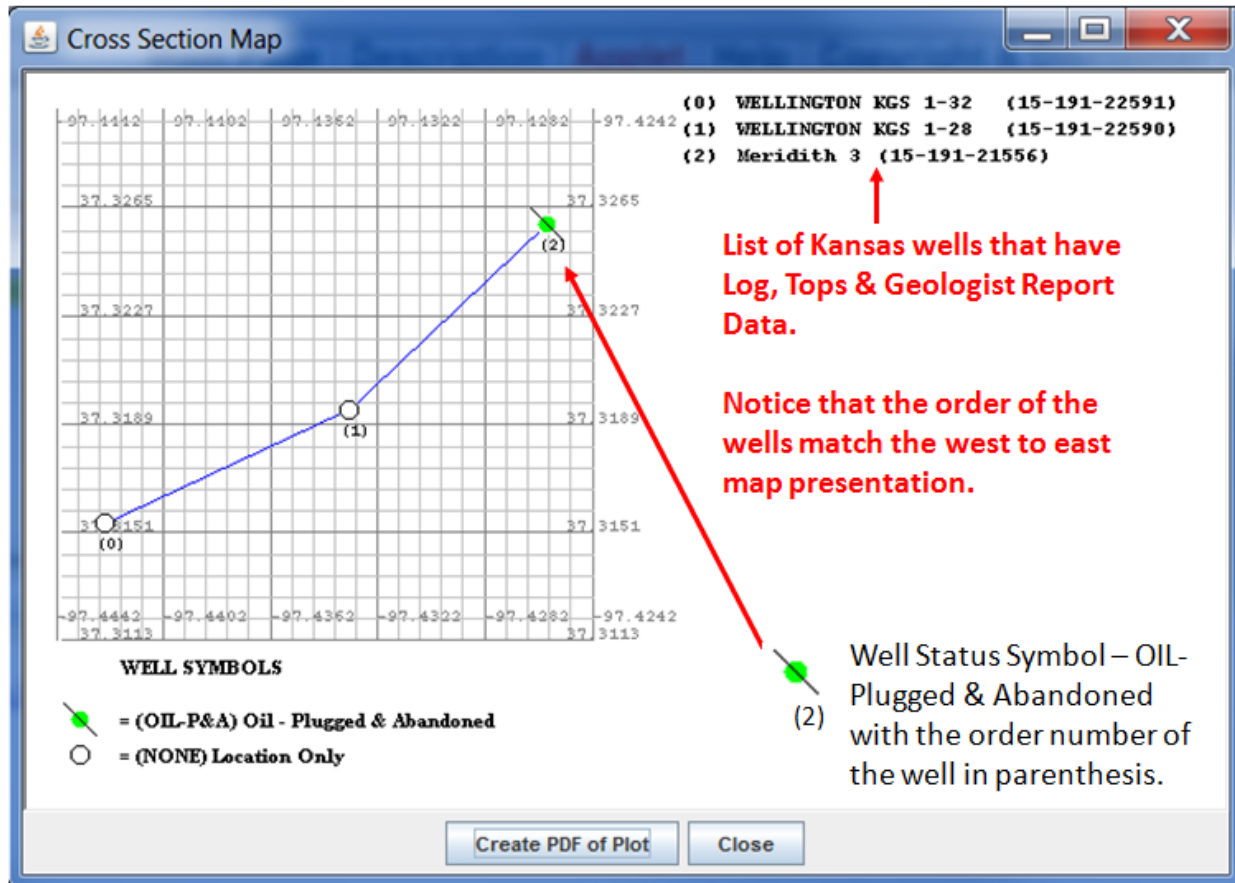
LTG	Well Name	API-Number	Status	Latitude	Longitude	Elevation	Town	Range	Sec	KEY
LT	WELLINGTON KGS 1-32	15-191-22591	OTHER	37.315	-97.442	1,259	31S	1W	32	150107112140
LT	WELLINGTON KGS 1-28	15-191-22590	OTHER	37.319	-97.433	1,270	31S	1W	28	150107112507
LT	Meridith 3	15-191-21556	OIL-P&A	37.326	-97.426	1,260	31S	1W	28	150107112933

Order
Up
Down

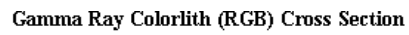
Plot **Modify Well Header Information Data** **Well List Actions**

Map Cross Section Modify New Well Remove Remove All

Now click on the “Map” button to display the map plot to view the selected wells. The well locations are plotted on latitude versus longitude map grid to help the user visualize the location of the well in relative 2-dimensional space and to also verify that the order of the wells follow a logical presentation. If the wells were out of order with respect to each other the user will see the blue cross section lines crossing. The user can correct any errors in the well order by clicking on the “Up” or “Down” buttons on the Cross Section Panel. As the user will see that the order of the wells are correct and no further action needs to be taken. The user can click on the “Create PDF of Plot” button to create a Portable Network Graphic (PNG) image of the cross section map. The user will see a search PC dialog that will allow the user to search their PC directory structure to save the PNG image. Once the image is saved a HTML web page will display with a “Create a PDF Document of this PNG Image” URL Link at the top of the page above the cross section map image. Click on the link to launch the Create PDF (Portable Document Format) from Image Applet that will allow the user to convert the saved PNG image to a PDF document.



The user now can create a cross section plot of the wells that have been selected. Click on the “Cross Section” Plot button to display the cross section of the three wells. The image below illustrates the cross section of the three wells that have been imported into the Cross Section Web App. The Cross Section Plot Control plots all three wells in a depth profile. The plot below represents the cross section of 3 wells imported from the user’s PC. The plot is plotted by elevation depth from -2200’ down to -3000’ at a 100 feet / inch scale.



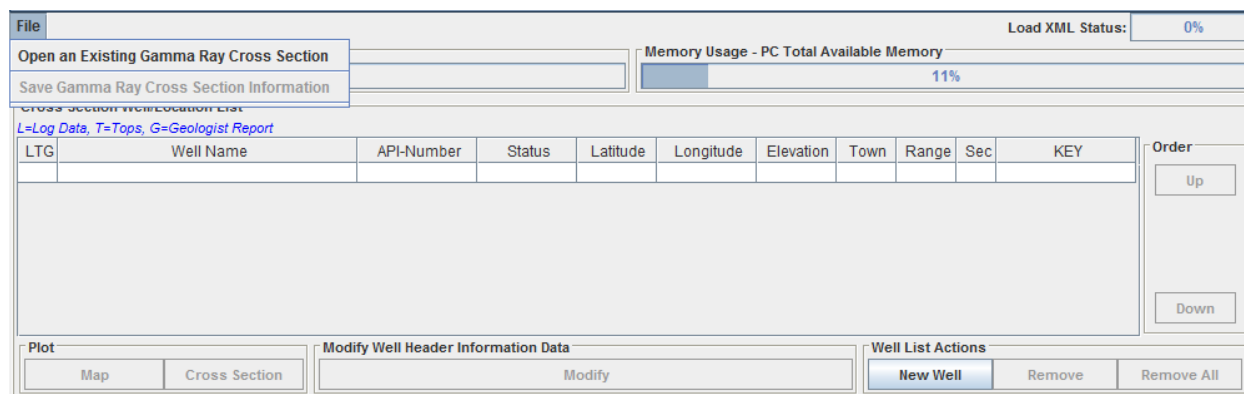
Import the XML (Extensible Markup Language) file from User's PC with a list of 56 wells

Download either the ASCII Text File directly or the Zip files extracting the contents into a directory. The problem with the ASCII Text Files being downloaded directly from a web page is that the web page will alter the contents so it does not retain the basic structure and add HTML text to the file. The preferred method if you have Zip or WinZip is to download the zip files to your PC and extract.

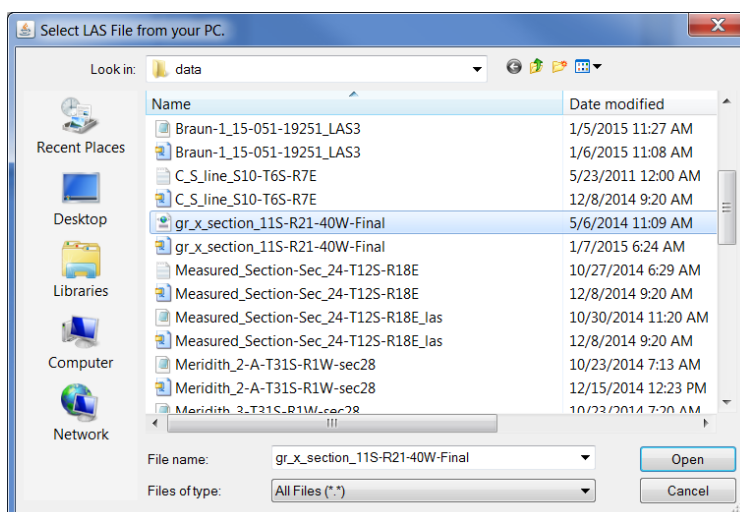
List of 56 Well Data LAS File Location & Tops along Township 11 South from Ranges 21-40 West.

Type	ASCII Text Files
LAS 3.0	http://www.kgs.ku.edu/Gemini/Tools/documentation/gr_x_section_11S-R21-40W-Final.xml
Type	Zip Files
LAS 3.0	http://www.kgs.ku.edu/Gemini/Tools/documentation/gr_x_section_11S-R21-40W-Final.zip

This example will focus on loading a cross section that was created by selecting wells data from the KGS Server and saved to a XML File.



Click on the “File” menu in the top left corner of the Cross Section panel and then select the “Open an Existing Gamma Ray Cross Section” menu option to open the “Select LAS File from your PC” dialog.



Highlight “gr_x_section_11S-R21-40W-Final” XML File and click on the “Open” button to automatically load the 56 Wells into the Gamma Ray Cross Section Panel. You will notice a pump jack dialog to show that the data is being loaded. You will also notice that the Load XML Status Bar Field will start to show the status of wells loaded.

The screenshot shows the software interface with the following components:

- File** menu bar.
- Memory Usage:** 18% (blue progress bar).
- Memory Usage - PC Total Available Memory:** 13% (blue progress bar).
- Load XML Status:** 16% (blue progress bar).
- Cross Section Well/Location List** section with a table of wells. The table has columns: LTG, Well Name, API-Number, Status, Latitude, Longitude, Elevation, Town, Range, Sec, KEY, and Order. The table is currently empty.
- Plot** section with buttons for **Map** and **Cross Section**.
- Modify Well Header Information Data** section with a **Modify** button.
- Well List Actions** section with buttons for **New Well**, **Remove**, and **Remove All**.

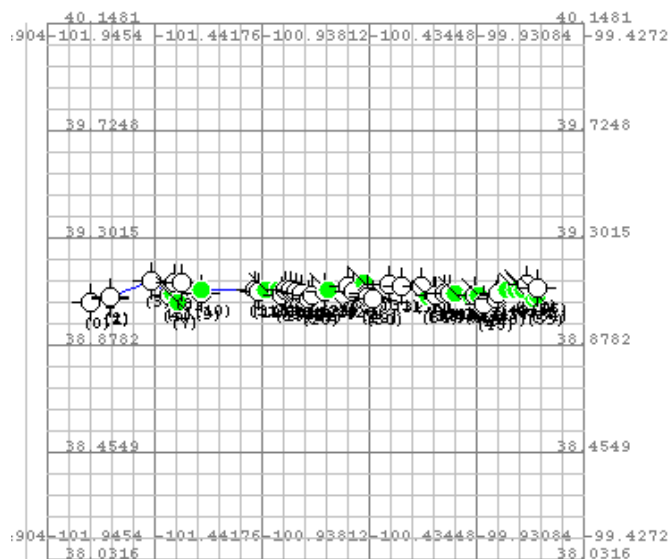
The Load XML Status Bar divides the number of wells loaded by the total number of wells in the list and multiplies by 100. When all the wells are loaded the “Cross Section Well/Location List” Table will show the wells.

The screenshot shows the software interface with the following components:

- File** menu bar.
- Memory Usage:** 33% (blue progress bar).
- Memory Usage - PC Total Available Memory:** 19% (blue progress bar).
- Load XML Status:** 100% (blue progress bar).
- Cross Section Well/Location List** section with a table of wells. The table has columns: LTG, Well Name, API-Number, Status, Latitude, Longitude, Elevation, Town, Range, Sec, KEY, and Order. The table is populated with 10 wells.
- Plot** section with buttons for **Map** and **Cross Section**.
- Modify Well Header Information Data** section with a **Modify** button.
- Well List Actions** section with buttons for **New Well**, **Remove**, and **Remove All**.




LTG	Well Name	API-Number	Status	Latitude	Longitude	Elevation	Town	Range	Sec	KEY	Order
LT	MILLS RANCH 1	15-199-20037	D&A	39.052	-101.736	3,649	11S	40W	35	150107115445_0	1
LT	PEARCE 1	15-199-20045	D&A	39.067	-101.648	3,404	11S	39W	28	150107115446_1	2
LT	D. PEARCE 1	15-199-20036	D&A	39.07	-101.647	3,407	11S	39W	28	150107115446_2	3
LT	J. O. GUNNELS, JR. 1	15-109-20002	D&A	39.134	-101.457	3,378	11S	37W	5	150107115446_3	4
LT	KLECKNER 1	15-109-00002	D&A	39.08	-101.37	3,245	11S	37W	24	150107115446_4	5
LT	EMEL 1	15-109-20265	OIL-P&A	39.084	-101.352	3,360	11S	36W	19	150107115447_5	6
LT	HADDOK 1	15-109-20263	D&A	39.127	-101.342	3,390	11S	36W	5	150107115447_6	7
LT	Fitzgerald 1	15-109-20207	OIL-P&A	39.054	-101.326	3,313	11S	36W	33	150107115447_7	8

Now click on the “Map” button to display the map plot to view the selected wells. The well locations are plotted on latitude versus longitude map grid to help the user visualize the location of the well in relative 2-dimensional space and to also verify that the order of the wells follow a logical presentation. If the wells were out of order with respect to each other the user will see the blue cross section lines crossing. The user can correct any errors in the well order by clicking on the “Up” or “Down” buttons on the Cross Section Panel. As the user will see that the order of the wells are correct and no further action needs to be taken. The user can click on the “Create PDF of Plot” button to create a Portable Network Graphic (PNG) image of the cross section map. The user will see a search PC dialog that will allow the user to search their PC directory structure to save the PNG image. Once the image is saved a HTML web page will display with a “Create a PDF Document of this PNG Image” URL Link at the top of the page above the cross section map image. Click on the link to launch the Create PDF (Portable Document Format) from Image Applet that will allow the user to convert the saved PNG image to a PDF document.

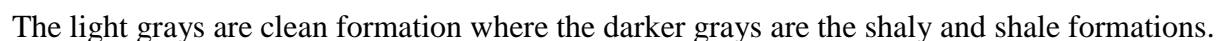


- (0) MILLS RANCH 1 (15-199-20037)
- (1) PEARCE 1 (15-199-20045)
- (2) D. PEARCE 1 (15-199-20036)
- (3) J. O. GUNNELS, JR. 1 (15-109-20002)
- (4) KLECKNER 1 (15-109-00002)
- (5) EMEL 1 (15-109-20265)
- (6) HADDOCK 1 (15-109-20263)
- (7) Fitzgerald 1 (15-109-20207)
- (8) KRONVALL 43-4 (15-109-20267)
- (9) SCHROEDER 1 (15-109-20245)
- (10) BERTRAND 2 (15-109-20205)
- (11) Pinkston 'A' 1 (15-109-20047)
- (12) AMRENS 'A' 1 (15-109-20051)
- (13) LINTEL 'B' 1 (15-109-20063)
- (14) SHARP 3 (15-109-20315)
- (15) Swart 1-23 (15-109-20106)
- (16) PIONEER 4 (15-109-20239)
- (17) Pioneer Feed Yard 1-18 (15-063-20866)
- (18) Wieland 1 (15-063-20828)
- (19) BLOOM 1 (15-063-20815)
- (20) WEBER 1 (15-063-20806)
- (21) Swart 19-1 (15-063-20741)
- (22) HARPER 'B' 1 (15-063-21019)
- (23) BRAUMAN 1 (15-063-20399)
- (24) VERHOEFF 1 (15-063-20440)
- (25) PRESS 1 (15-063-20346)
- (26) Gillespie, D.J. 1 (15-063-20596)
- (27) HARTMAN 1 (15-063-20653)
- (28) RIEDEL 1 (15-063-20002)
- (29) ZIEGLER 1 (15-063-20025)
- (30) Ziegler, Arlin 1 (15-063-20677)
- (31) Smithson, Howard 1 (15-063-20678)
- (32) ZERR 12-4 (15-063-20502)
- (33) INLOE 1 (15-063-20089)
- (34) WOLF 'I' 2 (15-063-20767)
- (35) JAMISON 'A' 1 (15-063-20777)
- (36) WOLF 'I' 1 (15-063-20729)
- (37) Doxon 1 (15-195-20216)
- (38) Dinkel 1 (15-195-21749)
- (39) Ziegler 1 (15-195-20517)
- (40) Connor 1 (15-195-20155)
- (41) Scanlon 1 (15-195-20630)
- (42) SCHRAUS 3 (15-195-21207)
- (43) Denning 1 (15-195-20524)
- (44) Denning, William 1 (15-195-21339)
- (45) ELMER M. LA RUE 1 (15-195-20284)
- (46) HOWAT 1 (15-195-20298)
- (47) Triple Creek 1 (15-195-21569)
- (48) CARPENTER 'B' 3 (15-195-21521)
- (49) Gagelman 'A' 1 (15-195-21076)
- (50) MCCONKEY 'A' 1 (15-195-21442)
- (51) Pyne 2 (15-195-21379)
- (52) Deutscher 1 (15-195-00452)
- (53) Lynd 1 (15-195-20821)
- (54) Razak 1 (15-195-21044)
- (55) Wiesner 1 (15-195-21682)

WELL SYMBOLS

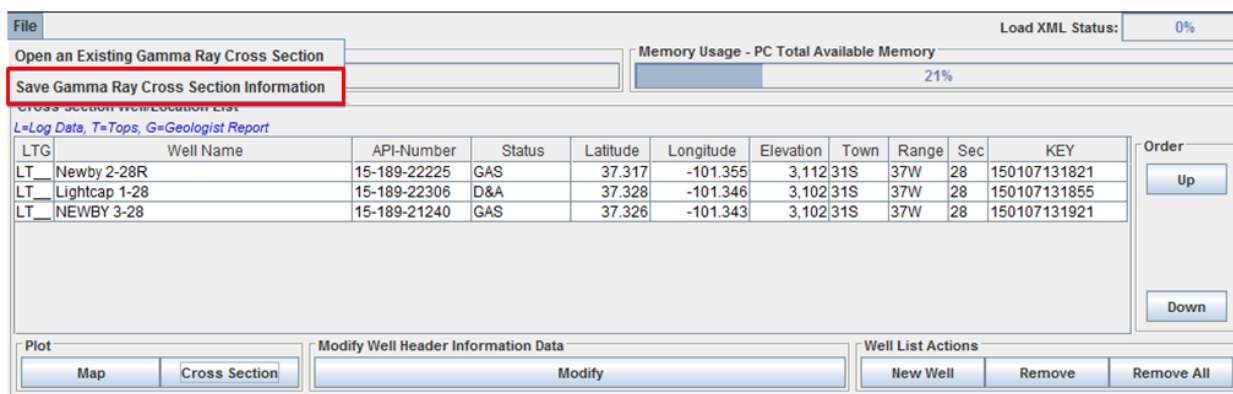
-  = (D&A) Dry & Abandoned
-  = Oil
-  = (OIL-P&A) Oil - Plugged & Abandoned



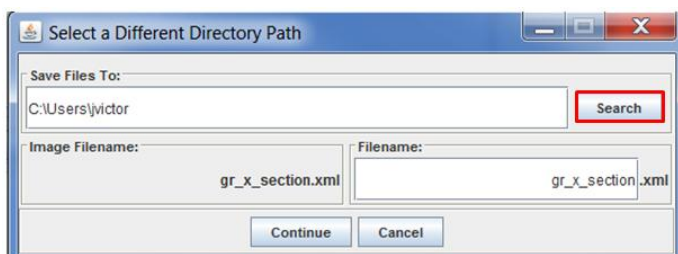


Exporting Gamma Ray Cross Section Well Data Information

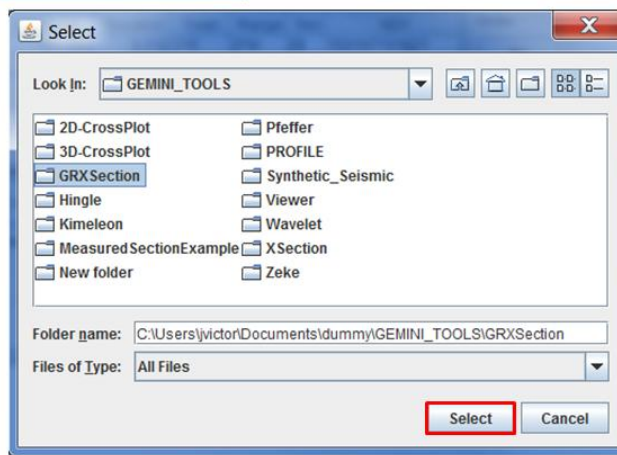
The user can save the gamma ray cross section to a XML (Extensible Markup Language) file, which will retain the Well Header Information, the URL directory path & the LAS filename and the Tops Data for each well. Since it takes time to load a large data set into the program the save capability allows the user to save their work. The 56 wells used to create the previous section of this document took about 6 hours to locate and evaluate each well for the type of data and quality of the tops data. It would be a shame not to be able to save that data to display at a later time or to add to it to extend it further across Kansas.



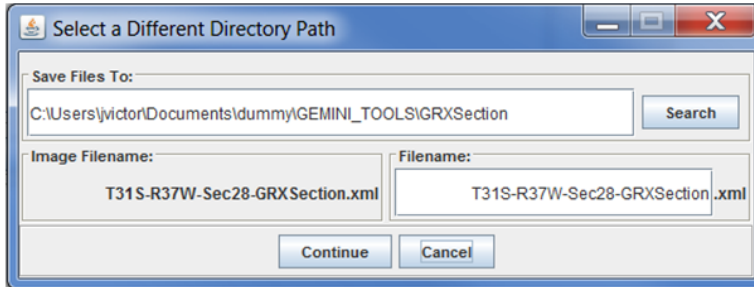
Select the “File” menu and then select the “Save Gamma Ray Cross Section Information” menu option in the Cross Section Panel. This will open the “Select a Different Directory Path” dialog.



Select the “Search” button to display the Directory Search Dialog to find the location on the PC to save the Gamma Ray Cross Section XML File with the LAS File Location Information along with Well Header and Tops Information of selected wells.



Click on the “Select” button to transfer the Directory Path back to the “Select a Different Directory Path” Dialog.



The user can change the file name of the Gamma Ray Cross Section XML File by changing the “Filename” text field default name of “gr_x_section”, e.g. “T31S-R37W-Sec28-GRXSection” to illustrate where the cross section was taken and what type of cross section.

Select the “Continue” button to save the gamma ray cross section information. The user can click on the XML File to see the contents, which will open up in a browser.

```

<?xml version="1.0"?>
<!DOCTYPE log>
- <log records="3">
- <well>
- <headers records="1">
- <data>
  <info status="GAS" name="Newby 2-28R" api="15-189-22225" type="WELL" key="" well_kid="1006159553"/>
  <other field_kid="1000149964" field="PANOMA GAS AREA" oper_kid="1027996936" operator="Pioneer Natural Resources USA Inc."/>
  <loc section="28" range_dir="W" range="37" town_dir="S" town="31" county_cd="189" county="STEVENS" state_cd="15" state="Kansas"/>
  <xy utm_y="4132456.82" utm_x="291354.07" zone="14.0" longitude="-101.3545478" latitude="37.317197"/>
  <z df="0.0" kb="3119.0" gl="3112.0" depth="3155.0"/>
  <comments> Replacement well.</comments>
  <misc date="06/13/2008" source="" access="0" user="dah"/>
  <cnt images="104" core="262" tops="78" las="3"/>
</data>
</headers>
- <las_files records="1">
  <las key="0" proprietary="0" end="3162.0" start="2342.0" log_null="-999.25" ver="2.0" filename="1022012442.las" path="http://www.kgs.ku.edu/WellLogs/31S37W" location="0" well_key="0"/>
</las_files>
- <strat records="23">
  <age name="Kridler Limestone" key="150107131815_2" source="MKD" form="Nolans Limestone" group="Chase" series="Cisuralian" system="Permian" era="Paleozoic" eon="Phanerozoic" level="Poor" base="2580.0" top="2538.0" alt_name="KRIDER" rank="MEMBER" id="3130601700" kid="1034662912"/>
  <age name="Gage Shale" key="150107131815_3" source="MKD" form="Doyle Shale" group="Chase" series="Cisuralian" system="Permian" era="Paleozoic" eon="Phanerozoic" level="Poor" base="0.0" top="2629.0" alt_name="GAGE" rank="MEMBER" id="3130605300" kid="1034662910"/>
  <age name="Fort Riley Limestone" key="150107131815_4" source="MKD" form="Barneston Limestone" group="Chase" series="Cisuralian" system="Permian" era="Paleozoic" eon="Phanerozoic" level="Poor" base="0.0" top="2712.0" alt_name="FTRLRY" rank="MEMBER" id="3130606300" kid="1034662898"/>
  <age name="Florence Limestone" key="150107131815_5" source="MKD" form="Barneston Limestone" group="Chase" series="Cisuralian" system="Permian" era="Paleozoic" eon="Phanerozoic" level="Poor" base="2789.0" top="2777.0" alt_name="FLRNC" rank="MEMBER" id="3130606700" kid="1034662901"/>
  <age name="Matfield Shale" key="150107131817_0" source="MKD-07/2006" form="Matfield Shale" group="Chase" series="Cisuralian" system="Permian" era="Paleozoic" eon="Phanerozoic" level="Poor" base="2807.0" top="2789.0" alt_name="MATFIELD" rank="FORMATION" id="3130607000" kid="1034662905"/>
  ...
  <age name="Neva Limestone" key="150107131815_22" source="MKD" form="Grenola Limestone" group="Council Grove" series="Cisuralian" system="Permian" era="Paleozoic" eon="Phanerozoic" level="Poor" base="0.0" top="3027.5" alt_name="C LM" rank="MEMBER" id="3130807100" kid="1027715099"/>
  <age name="Roca Shale" key="150107131815_23" source="MKD" form="Roca Shale" group="Council Grove" series="Cisuralian" system="Permian" era="Paleozoic" eon="Phanerozoic" level="Poor" base="3089.0" top="3072.0" alt_name="D SH" rank="FORMATION" id="3130808000" kid="1027715100"/>
</strat>
</well>

```

← Total Number of Well Data Records Saved

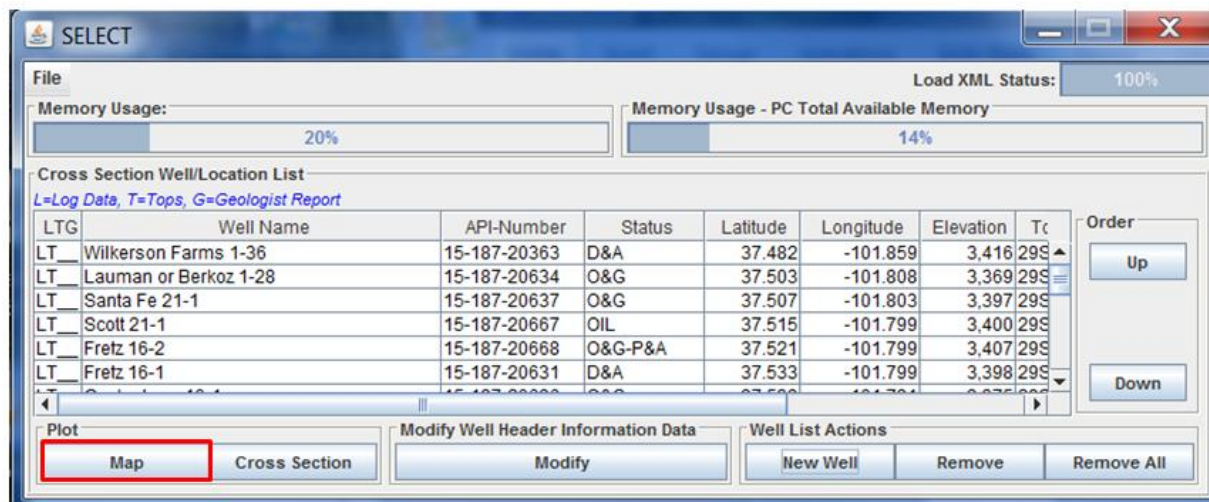
Well Header Information Section

LAS File Name & URL Directory Path

Tops for the selected well.

It doesn't matter how many wells were originally selected this XML file has everything it needs to retrieve the well data, i.e. LAS File and Well Header and Tops information for each well and rebuild the gamma ray cross section. As long as the URL Directory Path is not changed either in the Kansas Geological Survey (KGS) Server if the well data was retrieved from the KGS or from the user's PC the Gamma Ray Cross Section Web App will find the files and reload the gamma ray cross section.

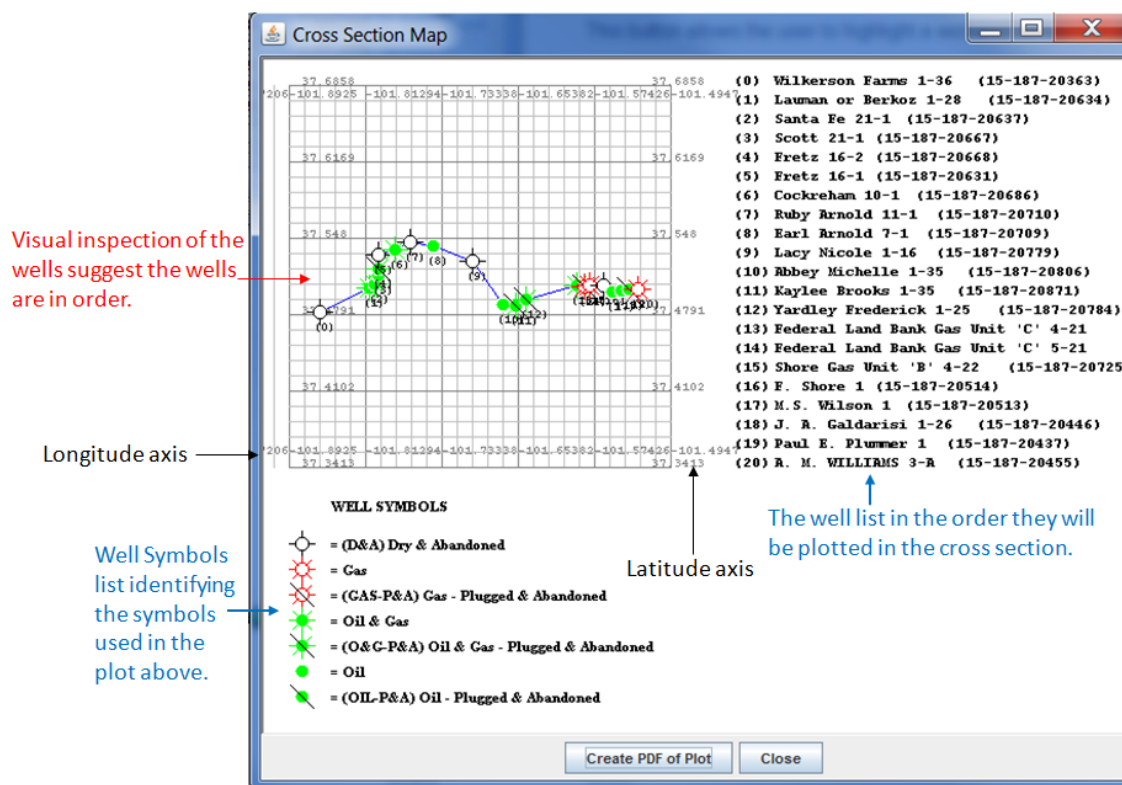
Cross Section Panel – Well Location Image Map



Is the Order of the well correct?

The "Cross Section Well/Location List" only lists the wells/locations that are in the list and the default order, which the cross section will plot.

Verifying the order of the wells/location in the list. Select the "Map" Button in the "Plot" Panel. The "Cross Section Map" Dialog will be displayed.



The "Create PDF of Plot" Button will create a PNG (Portable Network Graphics) Image with the link at the top of the HTML that is displayed with the above image to create a PDF (Portable Document Format) in the directory the user selects.

Note: The plot will only function correctly if each well/location has the latitude & longitude are present.

Cross Section Panel – Change the Order of the Selected Wells

File Load XML Status: 0%

Memory Usage: Memory Usage - PC Total Available Memory

27% 11%

Cross Section Well/Location List

L=Log Data, T=Tops, G=Geologist Report

LTG	Well Name	API-Number	Status	Latitude	Longitude	Elevation	Town	Range	Sec	KEY
LT	Santa Fe 21-1	15-187-20637	O&G	37.507	-101.803	3,397	29S	41W	21	150108074509
LT	Kendrick 22-1	15-187-20639	O&G	37.506	-101.785	3,387	29S	41W	22	150108074556
LT	Santa Fe 22-1	15-187-20640	O&G	37.507	-101.794	3,391	29S	41W	22	150108074641
LT	Santa Fe 22-2	15-187-20650	O&G-P&A	37.507	-101.791	3,389	29S	41W	22	150108074716

Order
Up
Down

Plot Modify Well Header Information Data

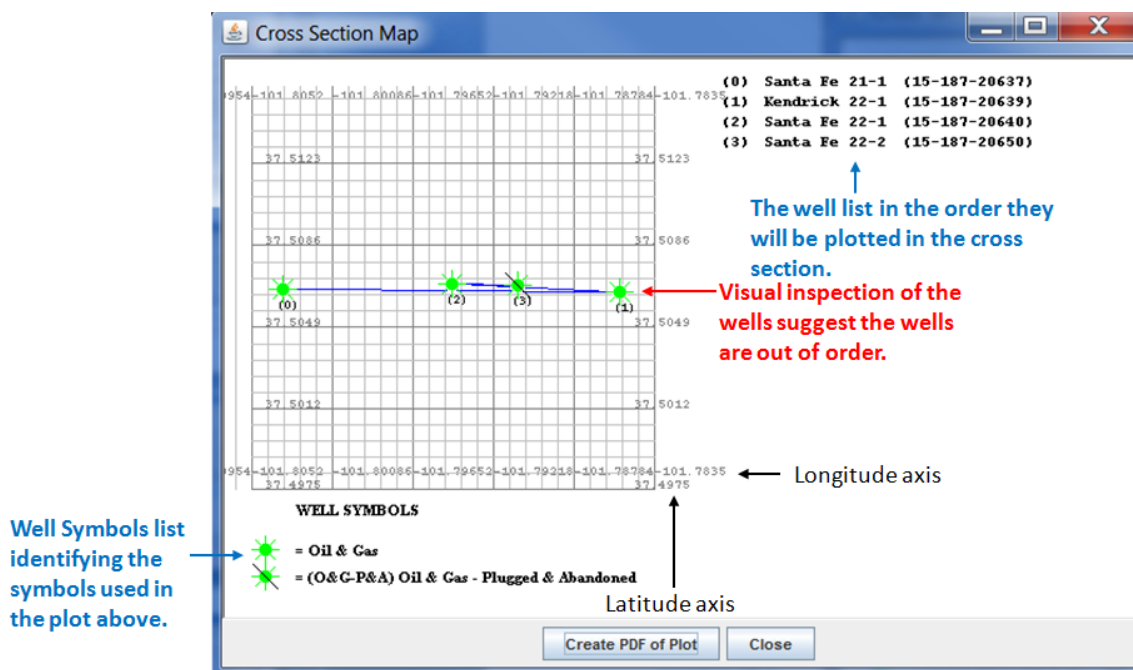
Map Cross Section Modify Well List Actions

New Well Remove Remove All

Is the Order of the well correct?

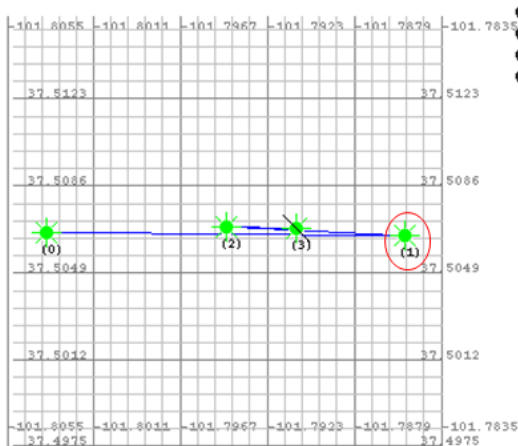
The "Cross Section Well/Location List" only lists the wells/locations that are in the list and the default order, which the cross section will plot.

Verifying the order of the wells/location in the list. Select the **"Map"** Button in the **"Plot"** Panel. The **"Cross Section Map"** Dialog will be displayed.



The **"Create PDF of Plot"** Button will create a PNG (Portable Network Graphics) Image with the link at the top of the HTML that is displayed with the above image to create a PDF (Portable Document Format) in the directory the user selects.

Note: The plot will only function correctly if each well/location has the latitude & longitude is present.



- (0) Santa Fe 21-1 (15-187-20637)
- (1) Kendrick 22-1 (15-187-20639) ←
- (2) Santa Fe 22-1 (15-187-20640)
- (3) Santa Fe 22-2 (15-187-20650)

(1) Kendrick 22-1 (15-187-20639)

Is in the wrong order and should be last in the well list. To correct the order you will need to select the well in the list by clicking the Kendrick 22-1 row in the Cross Section Well/Location List Table. See Kendrick 22-1 is highlighted in the Table below.

Click the "Down" Button to move the well down in the list.

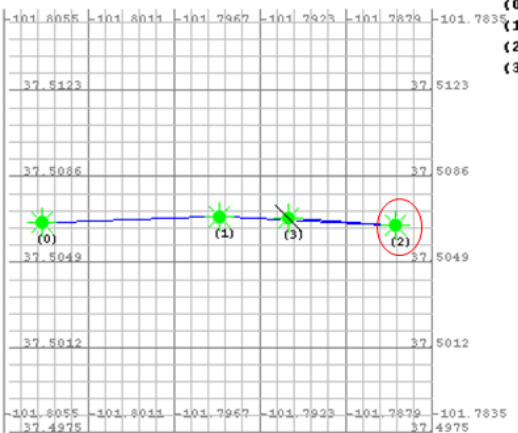
WELL SYMBOLS

- = Oil & Gas
- = (O&G-P&A) Oil & Gas - Plugged & Abandoned

Cross Section Well/Location List

L=Log Data, T=Tops, G=Geologist Report

LTG	Well Name	API-Number	Status	Latitude	Longitude	Elevation	Town	Order
LT	Santa Fe 21-1	15-187-20637	O&G	37.507	-101.803	3,397	29S	
LT	Kendrick 22-1	15-187-20639	O&G	37.506	-101.785	3,387	29S	
LT	Santa Fe 22-1	15-187-20640	O&G	37.507	-101.794	3,391	29S	
LT	Santa Fe 22-2	15-187-20650	O&G-P&A	37.507	-101.791	3,389	29S	



- (0) Santa Fe 21-1 (15-187-20637)
- (1) Santa Fe 22-1 (15-187-20640)
- (2) Kendrick 22-1 (15-187-20639) ←
- (3) Santa Fe 22-2 (15-187-20650)

Kendrick 22-1 (15-187-20639)

Has moved from position (1) to (2) and is still in the wrong order and should be last in the well list. As you can see Kendrick 22-1 is still selected,

Click the "Down" Button to move the well down in the list.

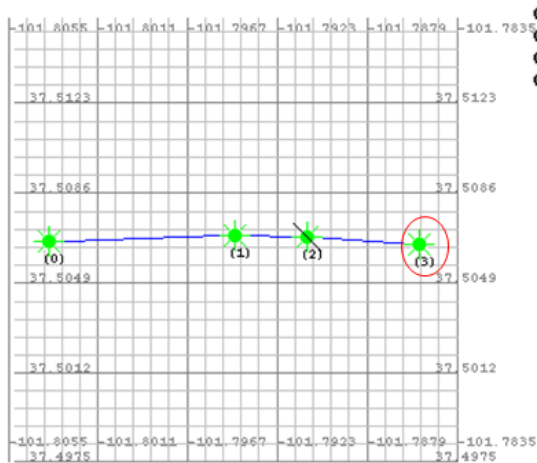
WELL SYMBOLS

- = Oil & Gas
- = (O&G-P&A) Oil & Gas - Plugged & Abandoned

Cross Section Well/Location List

L=Log Data, T=Tops, G=Geologist Report

LTG	Well Name	API-Number	Status	Latitude	Longitude	Elevation	Town	Order
LT	Santa Fe 21-1	15-187-20637	O&G	37.507	-101.803	3,397	29S	
LT	Santa Fe 22-1	15-187-20640	O&G	37.507	-101.794	3,391	29S	
LT	Kendrick 22-1	15-187-20639	O&G	37.506	-101.785	3,387	29S	
LT	Santa Fe 22-2	15-187-20650	O&G-P&A	37.507	-101.791	3,389	29S	



- (0) Santa Fe 21-1 (15-187-20637)
- (1) Santa Fe 22-1 (15-187-20640)
- (2) Santa Fe 22-2 (15-187-20650)
- (3) Kendrick 22-1 (15-187-20639) ←

Kendrick 22-1 (15-187-20639)

Is now in the correct order.

WELL SYMBOLS

- = Oil & Gas
- = (O&G-P&A) Oil & Gas - Plugged & Abandoned

Cross Section Well/Location List

L=Log Data, T=Tops, G=Geologist Report

LTG	Well Name	API-Number	Status	Latitude	Longitude	Elevation	Township	Order
LT	Santa Fe 21-1	15-187-20637	O&G	37.507	-101.803	3,397	29S	
LT	Santa Fe 22-1	15-187-20640	O&G	37.507	-101.794	3,391	29S	
LT	Santa Fe 22-2	15-187-20650	O&G-P&A	37.507	-101.791	3,389	29S	
LT	Kendrick 22-1	15-187-20639	O&G	37.506	-101.785	3,387	29S	

Up

Down

Cross Section Plot Control Dialog

The “Cross Section Plot Control” dialog allows the user to change the presentation of the Cross Section Plot, by depth range, by depth scale, Paint Gamma Ray Colorlith by Color or by Grays, Datum By: (Log Depth, Horizon and Elevation) , or add, modify or delete tops data through Tops Data Entry dialog.

Menu Option Buttons →

File – Menu Option

The file menu option allows the user to,

- Save Cross Section Control – Allows the user to save the location information for the Log ASCII Standard (LAS) files used in creating the cross section as well as the well header information and tops.
- Create PNG Image of Plot – Create a Portable Network Graphics (PNG) Image, which will launch a web page with the image with a link to run a Portable Network Document (PDF) Applet to save the PNG Image as an PDF Document.
- Exit – Exit the Cross Section Plot

Depth Scale – Menu Option

The depth scale menu option allows the user to change the scale (feet / inch) of the Cross Section Plot Data.

Plot Titles Panel
Allows the user to change the Plot Titles.

Paint Colorlith By Panel
Allows user to choose a Colored colorlith or gray scale colorlith.

Depth Scale & Range Panel
Displays the selected Depth Scale and allows the user to change the starting & ending depth of the cross section plot data.

Horizon Lines Panel
Turn Horizon Lines on or off (default)

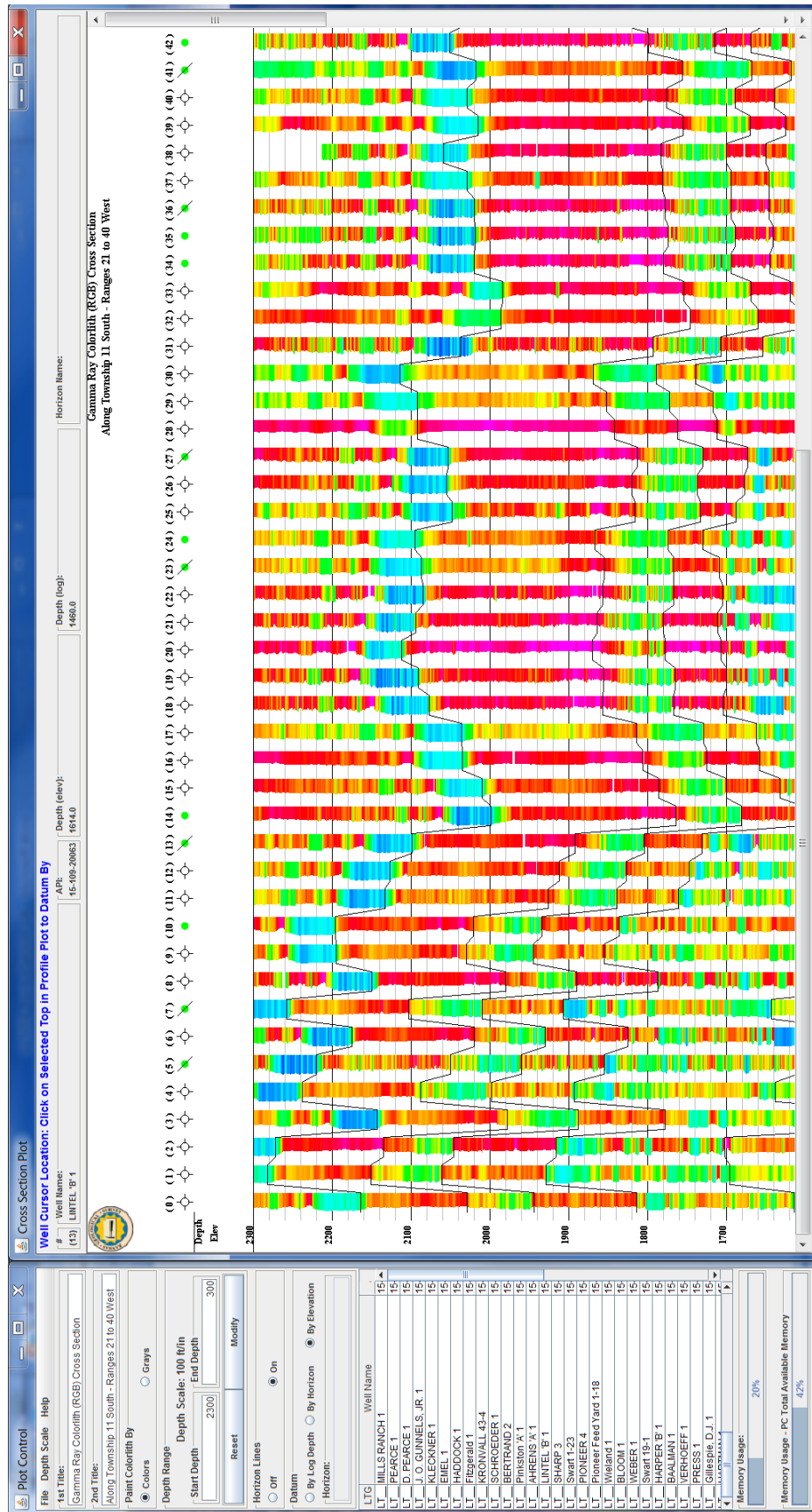
Datum Panel
The user can present the well/location cross section plot by Log Depth, by Horizon or by Elevation.

Well Header Information Table
Displays the Data loaded, well name, API-number, well status Latitude, Longitude, Elevation, and Township, Range & Section

Memory Usage Panel
The memory usage bars allow the user to see how much memory is used

Stratigraphic Units Plot Track – The user can left click the mouse on the well gamma ray colorlith plot track to display the “Enter Horizon Data” Dialog with the “Stratigraphic Units” Data Entry Panel displayed. This panel assists the user in adding, modifying or deleting tops from the profile plot. The user will need to keep track of which well is being modified. This dialog has two buttons to set the Stratigraphic Units for a top, i.e.

- ICS (International Commission on Stratigraphy) Chart Button displays the accepted stratigraphic units.
- 1968 Kansas Chart Button displays the Accepted Kansas stratigraphic units.



Adding Tops

Enter Horizon Data - Stratigraphic Units Panel

The Stratigraphic Units Panel allows the user to Add, Modify or Remove Stratigraphic Units. There are two files that are used to assist in mapping Stratigraphic Units to a specific top name.

- The 2010 International Commission on Stratigraphy Stratigraphic Units and RGB color for the Stratigraphic Units XML File (<http://www.kgs.ku.edu/software/gemini/data/ISC.xml>) are used to display the tops in the Stratigraphics Plot Track by Age (RGB Color).
- The Kansas Geological Survey (KGS) Stratigraphic Succession in Kansas, edited by D.E. Zeller, December 1968, updated 2012 (<http://www.kgs.ku.edu/software/gemini/data/kansas.xml>) will help map the Kansas Top Names to Stratigraphic Units, System, Sub-System, Series, etc. and to map the top depth of one top pick to the base depth of another top pick.

Confidence Level of the tops selection.

Stratigraphic Unit Rank radio buttons, defines & sets the location of the unit on the Stratigraphic Unit Plot Track.

Stratigraphic Name & Alternate Name

Add/Modify – Move data to Table.
Clear – Clear all text fields.

List of Stratigraphic Units (Tops).

Starting Depth & Ending Depth of Stratigraphic Name

International Commission on Stratigraphic Units. User selects the ICS Chart button to display Standard Units.

Stratigraphic Name belongs to section. Allows the user to place a member, bed, etc. with a formation, group, etc.

“Stratigraphic Units Selected” Table.

Table Buttons
Modify – Modify the Stratigraphic Units Data.
Remove – Remove Stratigraphic Unit from table.
Remove All – Clear all content Units from the table.

Enter Horizon Data: Stratigraphic Units

Starting Depth: 635.0 Ending Depth: 0.0

Data Entry Panel: Formation Tops

Confidence: ☒ Excellent ☐ Fair ☐ Good ☐ Poor

Rank: ☒ Unknown ☐ Eon ☐ Era ☐ Super Group ☐ System ☐ Group ☐ Subsystem ☐ Subgroup ☐ Series ☐ Formation ☐ Subseries ☐ Member ☐ Stage ☐ Bed

International Commission on Stratigraphy

Eon: Era: System: Subsystem: Series: ICS Chart

Stratigraphic Name is apart of, Stage: Super Group: Group: Subgroup: Formation: 1968 Kansas Chart

Stratigraphic Name: Alternate Name: Begin Age (Ma): 0.0 +/- End Age (Ma): 0.0 +/-

Add Clear

Stratigraphic Units Selected:

Top	Base	Name	Level	Eon	Era
620	0	Chase	Poor	Phanerozoic	Paleozoic
748	0	Towanda Limestone	Poor	Phanerozoic	Paleozoic
1,595	0	Wabaunsee	Poor	Phanerozoic	Paleozoic
1,622	0	Root Shale	Poor	Phanerozoic	Paleozoic
1,662	0	Stotler Limestone	Poor	Phanerozoic	Paleozoic
1,920	0	Severy Shale	Poor	Phanerozoic	Paleozoic
1,980	0	Topeka Limestone	Poor	Phanerozoic	Paleozoic
2,312	0	Leocompton Limestone	Poor	Phanerozoic	Paleozoic
2,402	0	Heebner Shale	Poor	Phanerozoic	Paleozoic
2,703	0	Stalnaker Sandstone	Poor	Phanerozoic	Paleozoic
3,039	0	Kansas City	Poor	Phanerozoic	Paleozoic
3,169	0	Stark Shale	Poor	Phanerozoic	Paleozoic
3,273	0	B-KCTY	Poor	Phanerozoic	Paleozoic
3,364	0	Marmaton	Poor	Phanerozoic	Paleozoic
3,452	0	Pawnee Limestone	Poor	Phanerozoic	Paleozoic
3,497	0	Cherokee	Poor	Phanerozoic	Paleozoic

Modify Remove Remove All Cancel Help

The KGS Stratigraphic Succession of Kansas edited by D. E. Zeller, Dec. 1968, updated 2012 (http://www.kgs.ku.edu/PRS/Ozark/TYPE_LOG/Stratigraphic/index.html).

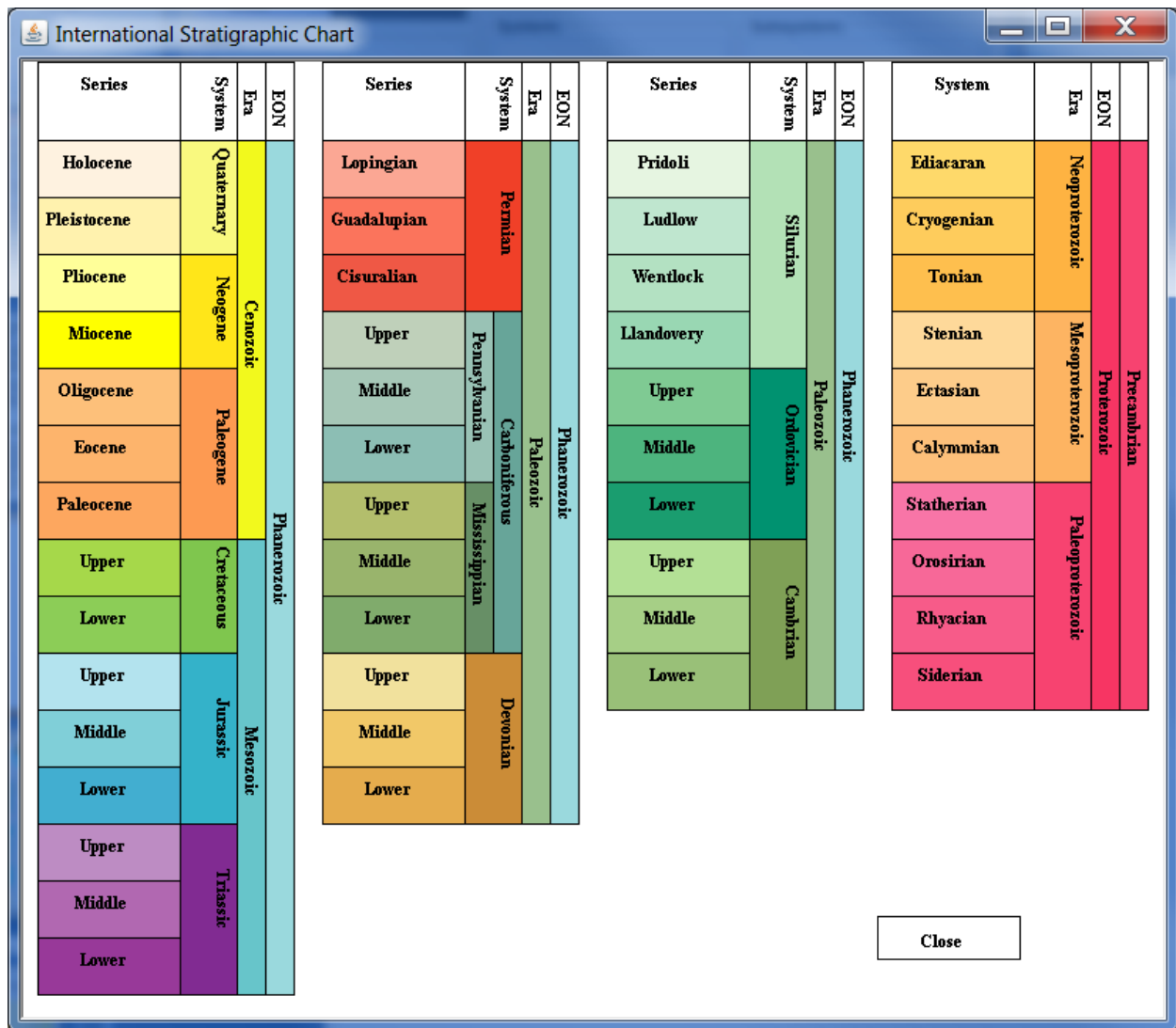


Figure: The 2010 International Commission on Stratigraphy Stratigraphic Units and RGB colors for the Stratigraphic Units.

Add Shawnee Group to the Stratigraphic Units List

This first example is to add a Shawnee Group, which is part of the KGS Stratigraphic Succession in Kansas. First place the mouse in the Stratigraphic Units Plot Track and left click with the mouse to display the “Enter Horizon Data” Dialog with the “Stratigraphic Units” Panel.

Left mouse click on the last colorlith (Wellington KGS 1-32) Plot Track to display the “Enter Horizon Data” Dialog with the “Stratigraphic Units” Panel will be displayed with the list of tops.

Enter Horizon Data: Stratigraphic Units

Starting Depth: 2312.0 Ending Depth: 0.0

Data Entry Panel: Formation Tops

Confidence: ☐ Excellent ☐ Fair ☐ Good ☒ Poor

Rank: ☒ Unknown ☐ Eon ☐ Era ☐ Super Group ☐ System ☐ Group ☐ Subsystem ☐ Subgroup ☐ Series ☐ Formation ☐ Subseries ☐ Member ☐ Stage ☐ Bed

International Commission on Stratigraphy

Eon: Era: System: Subsystem: Series: ICS Chart

Stratigraphic Name is apart of, Stage: Super Group: Group: Subgroup: Formation: 1968 Kansas Chart

Stratigraphic Name: Alternate Name: Begin Age (Ma): +/- End Age (Ma): +/-

Add Clear

Stratigraphic Units Selected:

Top	Base	Name	Level	Eon	E
620	0	Chase	Poor	Phanerozoic	Paleozoic
748	0	Towanda Limestone	Poor	Phanerozoic	Paleozoic
1,595	0	Wabaunsee	Poor	Phanerozoic	Paleozoic
1,622	0	Root Shale	Poor	Phanerozoic	Paleozoic
1,662	0	Stotler Limestone	Poor	Phanerozoic	Paleozoic
1,920	0	Severy Shale	Poor	Phanerozoic	Paleozoic
1,980	0	Topeka Limestone	Poor	Phanerozoic	Paleozoic
2,312	0	Lecompton Limestone	Poor	Phanerozoic	Paleozoic
2,402	0	Heebner Shale	Poor	Phanerozoic	Paleozoic
2,703	0	Stalnaker Sandstone	Poor	Phanerozoic	Paleozoic
3,039	0	Kansas City	Poor	Phanerozoic	Paleozoic

Modify Remove Remove All Cancel Help

Depth Log

Stratigraphic Units

Members Formations

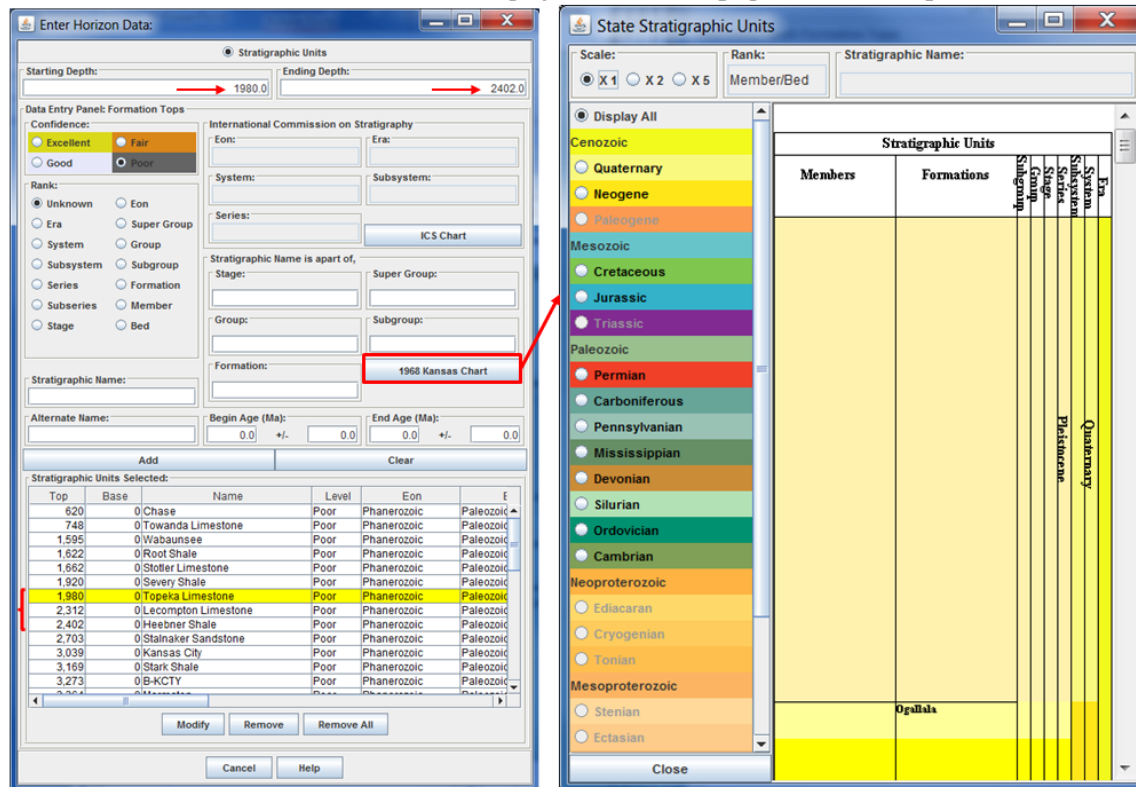
1800 1900 2000 2100 2200 2300 2400 2500

Left click on this last gamma ray colorlith plot track.

(0) Meridith 3 (15-191-21556)
(1) WELLINGTON KGS 1-28 (15-191-22590)
(2) WELLINGTON KGS 1-32 (15-191-22591)

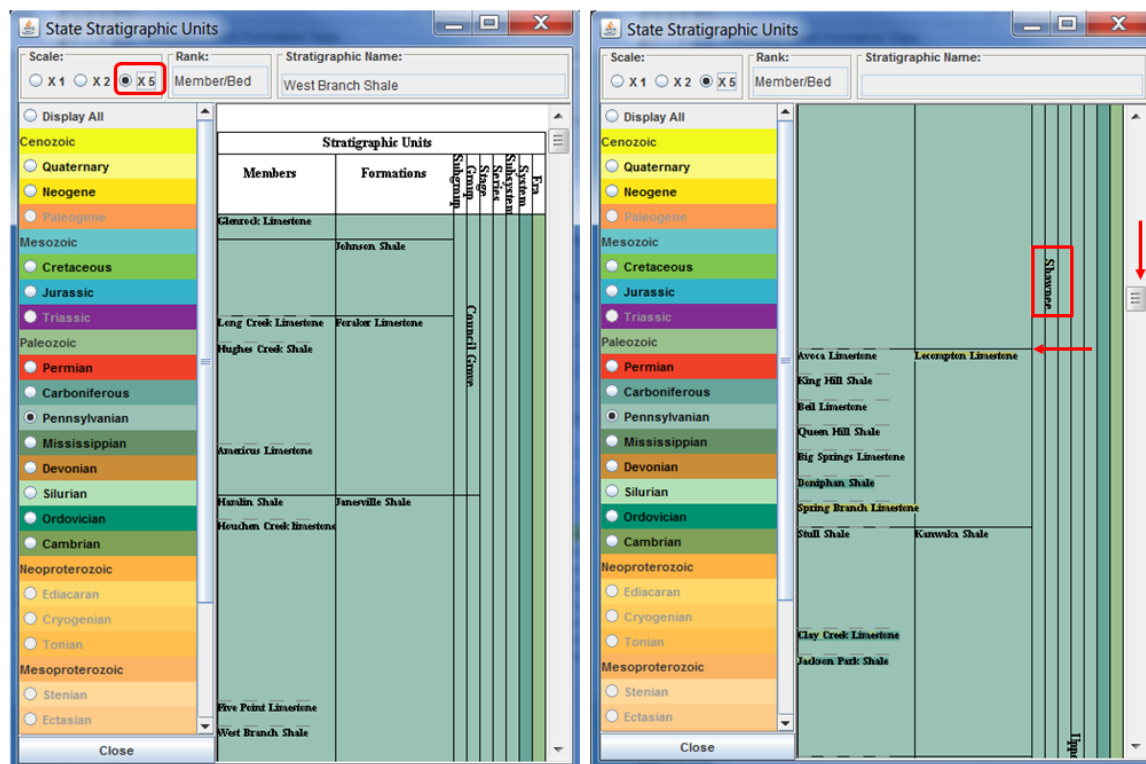
The user can manually enter the tops with as much information as they wish to display. If the stratigraphic unit is part of the Kansas Stratigraphic Units List all necessary fields can be loaded by using the “1968 Kansas Chart” button to display the list of Kansas Stratigraphic Units.

The Topeka Limestone, Lecompton Limestone and the Heebner Shale belong to the Shawnee Group, set the Starting Depth text field to 1980 and the Ending Depth text field to 2402. Click on the “1968 Kansas Chart” Button to display the State Stratigraphic Units Dialog.

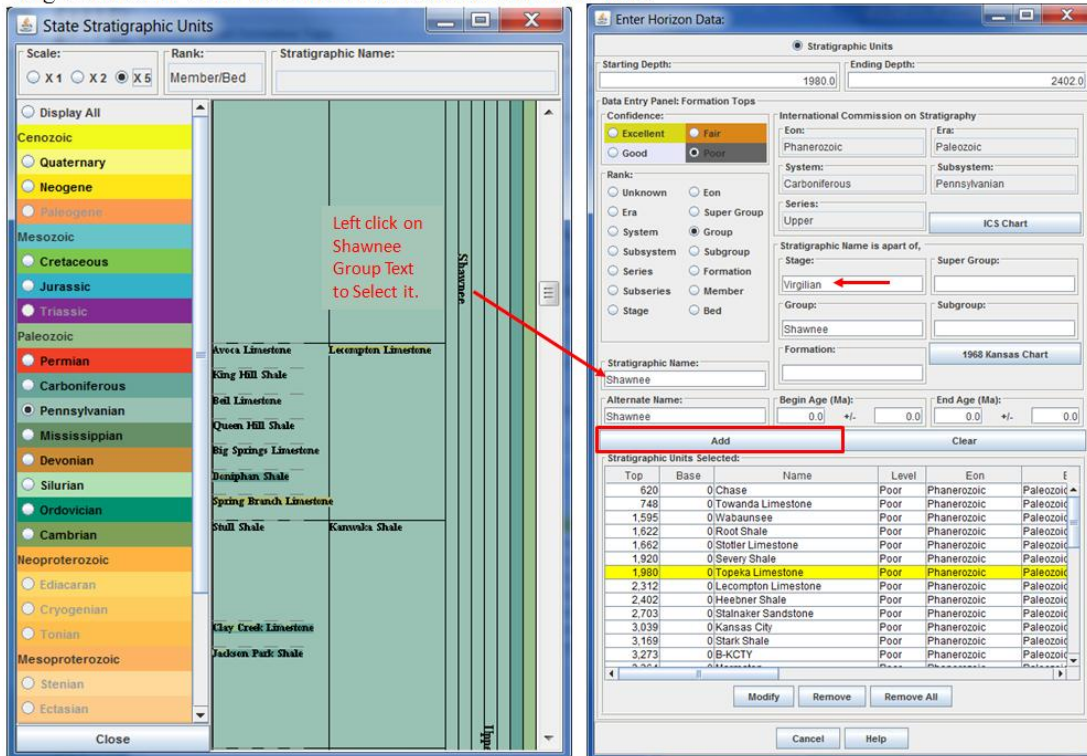


Change the Scale to X5, select the “Pennsylvanian” radio button.

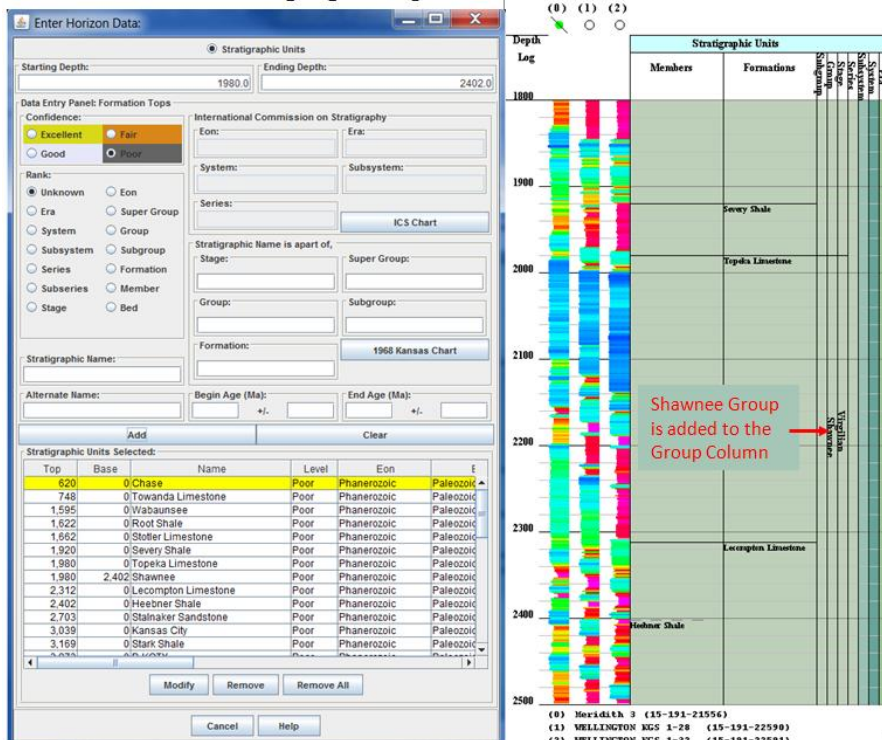
Scroll down to the Lecompton Limestone Formation. Notice it is part of the Shawnee Group.



Left mouse click on the Shawnee Group text to transfer all the Stratigraphic Units to the “Stratigraphic Units” Panel on the “Enter Horizon Data” Dialog. Notice also that the Shawnee Group belongs to the Virgilian Stage. Select the “Add” Button to move Shawnee into the table.



Notice that the Shawnee Group is added to the Group Column of the Stratigraphic Units Plot Track. Shawnee was added to the “Stratigraphic Units Selected” table, see the highlighted top in the table.



Add Unknown Bed (SG-A Bed) to the Stratigraphic Units List

This second example is to add an unknown bed (SG-A Bed) to the Stratigraphic Units List, which is not part of the KGS Stratigraphic Succession in Kansas. This example will enter the basic information to the Depth Range text fields, the Stratigraphic Name text field and setting the Rank as a BED. The Stratigraphic Units will be provided by the International Commission on Stratigraphy Dialog by selecting the “ICS Chart” Button. The “International Stratigraphic Chart” Dialog displays the stratigraphic units as a series of colored boxes, each stratigraphic unit is has the recommended RGB (Red-Green-Blue) Color defined by the International Commission on Stratigraphy. The user only needs to click the colored box to select all the stratigraphic data associated with the selected stratigraphic unit and transfer the data back to the “Stratigraphic Units” Panel in the “Enter Horizon Data” Dialog.

- (1) Add SG-A to the “Stratigraphic Name” Text field.
- (2) Select the Bed Radio Button in the Rank Panel
- (3) Set the Starting Depth to 2477.0 and the Ending Depth to 0.0 Limestone Depth Range.
- (4) Click on the “ICS Chart” Button to display the International Stratigraphic Chart Dialog.

The left screenshot shows the 'Enter Horizon Data' dialog. It has a 'Stratigraphic Units' tab. The 'Starting Depth' is 2477.0 and 'Ending Depth' is 0.0, both marked with red (3). The 'Rank' panel has 'Bed' selected, marked with red (2). The 'Stratigraphic Name' field contains 'SG-A', marked with red (1). The 'ICS Chart' button is highlighted with a red box and marked with red (4). The 'Stratigraphic Units Selected' table at the bottom lists various geological units.

The right screenshot shows the 'International Stratigraphic Chart' dialog. It displays a grid of stratigraphic units. A red arrow points to the 'Upper' box in the 'Pennsylvanian' system, marked with red (5). The chart is organized by 'Series', 'System', and 'Eon'.

(5) Left mouse click in the Upper Series Color Box under the Pennsylvanian System to transfer the Upper Pennsylvanian Stratigraphic Units Data to the “Stratigraphic Units” Panel on the “Enter Horizon Data” Dialog.

Enter Horizon Data:

Stratigraphic Units

Starting Depth: 2477.0 Ending Depth: 0.0

Data Entry Panel: Formation Tops

Confidence: ☒ Excellent ☐ Fair ☐ Good ☐ Poor

Rank: ☐ Unknown ☐ Eon ☐ Era ☐ Super Group ☐ System ☐ Group ☐ Subsystem ☐ Subgroup ☐ Series ☐ Formation ☐ Subseries ☐ Member ☒ Stage ☐ Bed

Stratigraphic Name: SG-A

Alternate Name: SG-A

Begin Age (Ma): +/- End Age (Ma): +/-

Add Clear

Stratigraphic Units Selected:

Top	Base	Name	Level	Eon	E
620	0	Chase	Poor	Phanerozoic	Paleozoic
748	0	Towanda Limestone	Poor	Phanerozoic	Paleozoic
1,595	0	Wabunsee	Poor	Phanerozoic	Paleozoic
1,622	0	Root Shale	Poor	Phanerozoic	Paleozoic
1,662	0	Stotter Limestone	Poor	Phanerozoic	Paleozoic
1,920	0	Severy Shale	Poor	Phanerozoic	Paleozoic
1,980	0	Topeka Limestone	Poor	Phanerozoic	Paleozoic
1,980	2,402	Shawnee	Poor	Phanerozoic	Paleozoic
2,312	0	Lecompton Limestone	Poor	Phanerozoic	Paleozoic
2,402	0	Heebner Shale	Poor	Phanerozoic	Paleozoic
2,703	0	Stalnaker Sandstone	Poor	Phanerozoic	Paleozoic
3,039	0	Kansas City	Poor	Phanerozoic	Paleozoic
3,169	0	Stark Shale	Poor	Phanerozoic	Paleozoic

Modify Remove Remove All

Cancel Help

Notice that the Stratigraphic Units Data from the ICS Chart is transferred to the "International Commission on Stratigraphy" Panel.

Now Select the "Add" Button to transfer the Stratigraphic Units Data for the SG-A Bed to the "Stratigraphic Units Selected" Table.

Notice that the SG-A Bed is added to the Members Column of the Stratigraphic Units Plot Track. SG-A Bed was added to the "Stratigraphic Units Selected" table, see the highlighted top in the table.

Enter Horizon Data:

Stratigraphic Units

Starting Depth: 2477.0 Ending Depth: 0.0

Data Entry Panel: Formation Tops

Confidence: ☒ Excellent ☐ Fair ☐ Good ☐ Poor

Rank: ☒ Unknown ☐ Eon ☐ Era ☐ Super Group ☐ System ☐ Group ☐ Subsystem ☐ Subgroup ☐ Series ☐ Formation ☐ Subseries ☐ Member ☒ Stage ☐ Bed

Stratigraphic Name: SG-A

Alternate Name: SG-A

Begin Age (Ma): +/- End Age (Ma): +/-

Add Clear

Stratigraphic Units Selected:

Top	Base	Name	Level	Eon	E
620	0	Chase	Poor	Phanerozoic	Paleozoic
748	0	Towanda Limestone	Poor	Phanerozoic	Paleozoic
1,595	0	Wabunsee	Poor	Phanerozoic	Paleozoic
1,622	0	Root Shale	Poor	Phanerozoic	Paleozoic
1,662	0	Stotter Limestone	Poor	Phanerozoic	Paleozoic
1,920	0	Severy Shale	Poor	Phanerozoic	Paleozoic
1,980	0	Topeka Limestone	Poor	Phanerozoic	Paleozoic
1,980	2,402	Shawnee	Poor	Phanerozoic	Paleozoic
2,312	0	Lecompton Limestone	Poor	Phanerozoic	Paleozoic
2,402	0	Heebner Shale	Poor	Phanerozoic	Paleozoic
2,477	2,477	SG-A	Poor	Phanerozoic	Paleozoic
2,703	0	Stalnaker Sandstone	Poor	Phanerozoic	Paleozoic
3,039	0	Kansas City	Poor	Phanerozoic	Paleozoic

Modify Remove Remove All

Cancel Help

