

GVERSE® GeoGraphix®

GeoGraphix 2019.3

Release Notes



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GeoGraphix® and Discovery™ on OpenWorks® 2019.3

LMKR is pleased to announce the release of the GeoGraphix® and Discovery™ on OpenWorks® 2019.3 software.

This release introduces GVERSE® Petrophysics, an integrated log analysis solution for comprehensive interpretation. It also includes many new features and performance improvements, which are highlighted in the New Features section of this document. This document also provides important information regarding the system requirements and valuable resources that will allow you to get the most out of the GeoGraphix 2019.3 release.

Note: New users or users upgrading from other versions of GeoGraphix need a valid LMKR license. The LMKR License Management Tool (LMT) must be installed to configure the license. Download the latest LMT from the LMKR Support Portal > [Downloads](#) page. See the “LMKR Licensing” section of the Installation Guide for Release 2019.3 for more information.

Note: If working in a network environment, in order for all computers to work together on shared projects, ALL computers (clients and servers) must be updated to the same version of the software. It is intentional that computers with different versions of GeoGraphix software cannot and should not be connected with each other.

GeoGraphix 2019.3 is an integrated product suite that incorporates shared data management and geological, petrophysical, and geophysical interpretation software. It utilizes a Sybase (SAP SQL Anywhere) database in GeoGraphix Discovery mode, or accesses the OpenWorks®/SeisWorks® (Oracle) database in Discovery on OpenWorks mode.

This release consists of the following:

GVERSE® Petrophysics

- GVERSE® Petrophysics is a 64bit petrophysical application designed to assist geoscientists and petrophysicists in analyzing and interpreting well log data, and characterization of the reservoir using simple to advanced log interpretation workflows in a large multi-well multi-user environment.

GVERSE® Geomodeling

- An integrated environment for modeling that incorporates existing mapping and cross section features of smartSECTION® with a newly built 3D View. It takes your smartSECTION interpretations to a whole new level with 3D modeling, while also enabling you to fully utilize the existing smartSECTION features.

GVERSE® Geophysics

- An intuitive and easy-to-use seismic interpretation system with powerful 3D visualization and interpretation capabilities. GVERSE Geophysics enables geoscientists to execute end-to-end workflows for basic interpretation and more advanced geophysical tasks.

GVERSE® FieldPlanner

- This application intelligently populates wells over an entire field based on defined hazards, lease areas, and constraints. It uses an advanced optimization algorithm to lay out hundreds of wells in minutes. It works with you by taking into account surface hazards, existing wells in the area, and lease boundaries to maximize lateral length in the zone.

Pro 3D

- Enables interpreters to get the most from their data by quickly creating powerful and informative base maps, fence diagrams and seismic backdrops. Using the Pro 3D window you can show IsoMap® structural surfaces, cultural layers, wells, seismic data, cross sections and fence diagrams in the 3D Scene.

Field Planning

- The advanced field planning tool is designed to reduce the time required for efficient field development. It provides the ability to create, save, analyze and manage multiple field plan scenarios before committing them to the database. Designed for horizontal well plans, the Field Planner includes determination of the optimum location and orientation of wells. These proposed wells can all be visualized by creating a layer for display in GeoAtlas™.

Data Manager™ includes ProjectExplorer™, Coordinate System Manager™, WellBase™, SeisBase™, QueryBuilder™, LandNet™, LeaseMap™, and ZoneManager™.

- The GeoGraphix and Discovery on OpenWorks project and data management engine

GeoAtlas™

- The map display and montage environment working on ESRI MapObjects

IsoMap®

- The gridding contouring engine, featuring 10 powerful gridding algorithms

XSection™

- A fully integrated geological interpretation tool and cross section display tool

smartSECTION®

- Map view for viewing GeoAtlas layers and defining cross sections for picking tops and faults for structural and sequence stratigraphic analysis

Discovery™ 3D

- The 3D scene viewer that uses the most recent video and X-Box tools to display seismic and geologic data in three dimensions

pStaX™

- The post stack processing module for enhancing seismic character and detecting anomalies related to geologic features

SCAN™

- The patented semblance calculation for enhanced fault interpretation

LogM Advanced Synthetics™

- The geophysical application used for interactively editing well logs and evaluating synthetic trace character response

LogM Modeling™

- The 2D forward seismic waveform, ray tracing and structural modeling tool to predict seismic response away from the well

STRUCT™ Model Entry

- The comprehensive forward seismic structural modeling tool that is used to determine the seismic response of complex geologic structures in areas where there is little or no well control

Discovery™ on OpenWorks®

- Enables the GeoGraphix software to access OpenWorks and SeisWorks projects, and uses the OpenWorks and SeisWorks data within the GeoGraphix framework

Xchange Tools

WellXchangePlus™

- Transfer well information to or from two GeoGraphix projects, or between GeoGraphix and OpenWorks

SeisXchange™

- Transfer seismic data between Geophysics and SeisWorks

GridXchange

- Transfer of map point sets and grids from GeoGraphix to OpenWorks

Note: SeisBase, LandNet, LeaseMap, LogMModelBuilder (LogM Modeling), LogM Well Editor (LogM Advanced Synthetics), Field Planner, and Advanced 3D Visualization (Pro 3D) are not available in the current version of Discovery on OpenWorks.

New Features at a Glance

The new features available in the GeoGraphix 2019.3 release are listed below.

GVERSE Petrophysics

- Graphically splice curve data for different runs in a well. Click [here](#) for details.
- Use a Petrophysics filter to display the wells with curves lying fully or partially in the corresponding zones. Click [here](#) for details.
- Display Survey Curves using the Azimuth and Inclination survey data. Click [here](#) for details.
- Sort list of well and computed curves sets in Assign Field Data and Delete Computed Curves feature. Click [here](#) for details.
- Import LAS files with alphanumeric text. Click [here](#) for details.
- Manage your input controls in UDE using a context menu. Click [here](#) for details.
- Efficiently retrieve and highlight the image names from the image list using key words and display them in GVERSE Petrophysics. Click [here](#) for details.

DepthRegistration

- Efficiently retrieve and highlight the image names from the image list using key words. Click [here](#) for details.

GVERSE Geomodeling

- Add XSection cross sections in the active interpretation. Click [here](#) for details.
- Create well to well spatial cross sections in Map View. Click [here](#) for details.
- Calculate Perforation, DST and IP in selected zones. Click [here](#) for details.
- Show/Hide projected tops in Cross Section View. Click [here](#) for details.
- Load GeoAtlas maps in the active interpretation. Click [here](#) for details.
- Export Interwell points in a (.csv) file format. Click [here](#) for details.
- Select multiple wells in Map View using a Polygon tool and include them for cross section creation. Click [here](#) for details.
- Add/Remove Modeled Zones from the Geomodel. Click [here](#) for details.
- Display the Surface Well Intersections in the Map View. Click [here](#) for details.
- Manage the well distance postings in a projected cross section based on the surface and TD projections. Click [here](#) for details.
- Performance improvements in Refresh All Views. Click [here](#) for details.
- Performance improvements on reloading surfaces and faults. Click [here](#) for details.
- Performance improvements on reloading a well. Click [here](#) for details.

XSection

- Pick formations with multiple observation number. Click [here](#) for details.

GVERSE Geophysics

- Simplified synthetic workflows in SynView – an integrated editor with no extra license required. Click [here](#) for details.
- Pick structures on volumes. Interpolate seeds or track signatures to extract geobodies from seismic. Click [here](#) for details.
- Detect faults automatically or pick manually with flexible tools for vertical, horizontal and 3D displays. Click [here](#) for details.
- Create scatter plots for seismic, surfaces and well logs for insight into relationships between data. Click [here](#) for details.
- Add new or adjust existing picks for formation tops and fault cuts in a well directly from GVERSE Geophysics. View & interact with multiple observations for each formation or fault in a well. Click [here](#) for details.
- Easily balance 2D, 3D and 2D-3D datasets and auto-calculate phase, gain and time relationships. Click [here](#) for details.
- Experience fast & reliable depth conversion with options suitable for all conversion requirements. Click [here](#) for details.
- Use the power of machine learning and neural networks to classify facies on horizons with automatic waveform classification by a self-organizing maps algorithm. Click [here](#) for details.
- Leverage the latest in technology to minimize your learning curve and focus on what's important. A true multi-screen, ribbon-based interface puts everything you need right in front of you. Click [here](#) for details.

GVERSE Planner

- Export the Survey Easting and Northing to a custom coordinated system. Click [here](#) for details.

GeoAtlas

- ESRI ArcGIS 10.7.x support is added. Click [here](#) for details.
- Specify X/Y location with more accuracy and precision. Click [here](#) for details.
- Export maps in Geospatial Image File Format. Click [here](#) for details.
- Search for well data, and apply conditional pies based on zone definition. Click [here](#) for details.

ProjectExplorer

- Easily configure a GeoGraphix server without manually configuring the DCOM settings. Click [here](#) for details.

QueryBuilder

- For a better user experience, workspace management is made easier with the introduction of interactive tabs with relevant functionalities. Click [here](#) for details.
- Create filters based on the wells containing the dip meter data. Click [here](#) for details.

WellBase

- 64-bit environment to work with larger projects. Click [here](#) for details.
- Workspace management is made easier with the introduction of interactive tabs with relevant functionalities grouped together. Click [here](#) for details.
- TIBCO Spotfire Analyst integration with GeoGraphix allows you to visualize GeoGraphix data for data mining, analysis, and QC. Click [here](#) for details.
- Calculate grid convergence angle for well surveys in bulk. Click [here](#) for details.
- Display survey projection for well(s) after calculating the grid convergence angle. Click [here](#) for details.
- Delete duplicate well data from multiple data types. Click [here](#) for details.

ZoneManager

- Create interpolated tops from the intersection of IsoMap surface with wells. Click [here](#) for details.

System Requirements

In the following sections, you will find hardware and software system requirements for this release of GeoGraphix and Discovery on OpenWorks:

- GeoGraphix Workstation
- GeoGraphix Project Server

System requirements can vary considerably, depending on your computing environment and software objectives. Please contact your Sales Representative or Customer Support if you have questions or need more information about system requirements.

Important Notes:

- New users or users upgrading from other versions of GeoGraphix also need valid LMKR licenses. Please contact COS@lmkr.com to request a license. For information on license requirements for GVERSE applications, refer to their respective release notes and installation documents on the LMKR Support Portal > Knowledge Center > [Release Notes and Installation Guides](#) page. The LMKR License Management Tool (LMT) must be installed to configure the license. Download the latest LMT from the LMKR Customer Support Portal > [Downloads](#) page. See the “LMKR Licensing” section of the Installation Guide for Release 2019.3 for more information.
- Discovery on OpenWorks is compatible with OpenWorks for Windows 5000.10.6.03 and SeisWorks 5000.10.
- Refer to the LMKR Customer Support > Knowledge Center > [System Requirements](#) page for up-to-date information on system requirements for all GeoGraphix and GVERSE applications.

Workstation

System Requirements

We recommend using the latest Microsoft service packs and security patches. The following table lists the supported operating systems and the hardware requirements.

Supported Operating System	Memory	CPU
Windows® 7 Professional x64	8 GB RAM Minimum	Core i5 Minimum
Windows® 7 Enterprise x64	16+ GB RAM recommended	Core i7 Quad-core and
Windows® 7 Ultimate x64	Note: 32 GB RAM recommended	above with latest
Windows® 10 Professional x64	for GVERSE Geophysics.	generation recommended
Windows® 10 Enterprise x64	SSD drives recommended	

Note 1: GVERSE Geophysics and GVERSE Geomodeling specifically require Windows platform update package KB2670838 installed on the machine, in case the operating system is Windows 7.

Graphics Requirements

Applications Support Level	Graphic Card Requirements
All GeoGraphix Applications including Discovery 3D, advanced 3D visualization (Pro 3D), and GVERSE Geomodeling	2 GB VRAM Minimum 4 GB VRAM Recommended DirectX 11 capable hardware (see Note 2 below)
GVERSE Geophysics	<p>Minimum</p> <ul style="list-style-type: none"> Any DirectX 11.1 capable card comparable with Nvidia® GeForce GTX 430 with 1GB VRAM. DirectX is not shipped with GeoGraphix 2019.3. You must download and install it separately. 1366 x 768 screen resolution <p>Recommended</p> <ul style="list-style-type: none"> Any DirectX 11.1 capable card comparable with Nvidia® GeForce GTX 1060 with 6GB VRAM. DirectX is not shipped with GeoGraphix 2019.3. You must download and install it separately. 1920 x 1080 screen resolution

Note 1: Microsoft DirectX End-User Runtime (June 2010) is required to run Discovery 3D, advanced 3D visualization (Pro 3D), GVERSE Geomodeling, and GVERSE Geophysics.

Note 2: To run Discovery 3D, advanced 3D visualization (Pro 3D), and GVERSE Geomodeling, it is recommended that an NVIDIA DirectX 11 compatible card be used. We recommend using the latest video drivers and MS updates for your system.

Additional Requirements and Recommendations

- DVD - ROM required for media installation. You do not need this if you have downloaded the installation from the **LMKR Support Portal > Downloads** page.
- DCOM/Firewalls configured to allow remote access. Only necessary if sharing projects on the network. For DCOM configuration recommendations, refer to the **LMKR Support Portal > Knowledge Center > White Papers** page.
- Microsoft .NET Framework 4.7.2 runtime is required.

Software Prerequisites

This release has several prerequisites that are required to run the software, as well as prerequisites that are used to enhance the software. The prerequisites can be downloaded from the LMKR Support Portal, or from the respective link(s) provided.

Microsoft .NET Framework 3.5

This is specifically required if you are using smartSECTION on a Microsoft Windows® 10 operating system. The Microsoft .NET 3.5 can be downloaded from Microsoft's website and then installed. It is also available in the 3rd Party installers shipped with Discovery 2019.3.

MATLAB Runtime R2018a (9.4)

GVERSE Field Planner requires MATLAB Runtime R2018a (9.4).

The MATLAB Runtime R2018a (9.4) software can be downloaded from MATLAB's website and then installed. It is also available in the Downloads section of the LMKR Support Portal.

Microsoft .NET Framework 4.7.2

Discovery 2019.3 must have Microsoft's .NET 4.7.2 installed. The Microsoft .NET 4.7.2 can be downloaded from Microsoft's website, and then installed. It is also available in the 3rd Party installer shipped with Discovery 2019.3.

ESRI ArcGIS Runtime Engine

The functionality within GeoAtlas related to geo-referenced images and CAD files requires the ESRI ArcGIS 10 Engine Runtime with ESRI ArcGIS 10.2.x or 10.3.x or 10.4.x or 10.5.x or 10.6.x or 10.7.x. ESRI ArcGIS license must be configured by running **ArcGIS Administrator** with administrative rights, and selecting the **ArcGIS Engine Runtime (Single Use)** option in the wizard. If the ArcGIS Engine is not installed, a message box will appear but the setup will continue.

The **ArcGISConfigurationTool.exe** utility is provided in **Utilities** shipped with GeoGraphix. IT Support teams can program and run this utility to remotely configure GeoGraphix on network machine(s) that have ArcGIS Runtime installed. For details, refer to the **Utilities** documentation.

ESRI ArcGIS Engine 10.6.1 Patch Installation

If ESRI ArcGIS Engine 10.6.1 is installed on the machine, you must also install the ESRI ArcGIS Engine patch (ArcGIS-1061-E-BDP-Patch.msp) to ensure smooth execution of various Field Planner and GeoAtlas workflows. The patch can be downloaded from the ESRI website [here](#).

Microsoft DirectX 11 End-User Runtimes

Discovery 3D, Pro3D, smartSECTION, GVERSE Geophysics and GVERSE Geomodeling require Microsoft's DirectX 11 June 2010 End-User Runtimes to work properly. The Discovery 3D application works only on the Windows 7 (64-bit) or higher operating system. Discovery 3D is not installed unless the computer has Windows 7 (64-bit) or higher. Further Discovery 3D requires a DirectX 11 compatible display card. DirectX 11 June 2010 End-User Runtimes can be installed by downloading the Discovery Third Party Installer.

Platform Update for Windows 7

GVERSE Geomodeling and GVERSE Geophysics specifically require Windows platform update package KB2670838 installed on the machine, in case the operating system is Windows 7.

Microsoft Internet Explorer 10 or 11

Microsoft Internet Explorer 10 or 11 must be installed in order to launch GVERSE NOW.

Optional Software Requirements

The following table lists the software requirements for using different tools available in GeoGraphix.

Tools	Software Requirements
Spreadsheet import utility in WellBase, SeisBase, and LeaseMap	Excel 2007, 2010, 2013, 2016 or 2019 (32 or 64 bit), including Office 365 (offline version). In case the macros are not working in Excel, ensure the gxdb.xla file is present in the relevant Microsoft Office Library installation folder.
Selected Help files	Adobe Reader
For Discovery on OpenWorks, GridXchange, and SeisXchange	OpenWorks for Windows 5000.10.6.03 – Basic or Full (recommended) Install available on Landmark’s LSM. (See Notes on the next page), and SeisWorks 5000.10 (for seismic workflows)
ESRI geo-referenced images and ESRI CAD file import in GeoAtlas	ESRI ArcGIS Runtime Engine 10.2.x or 10.3.x or 10.4.x or 10.5.x or 10.6.x or 10.7.x (included in the 3rd Party Installer).
For LOGarc™ Version 4.1.0.3 access in smartSECTION	To use the LOGarc™ feature, the LOGarc™ Version 4.1.0.3 software must be downloaded from IHS LogTech Canada, LTD and a valid account must be in place. You must have administrator rights to the computer on which you will load the software.

Note for Discovery on OpenWorks: The OpenWorks Full installation requires Hummingbird Exceed. The Oracle client installation in use with the OpenWorks Full installation requires that the “Administrator” option be selected. The “Administrator” option type includes the SQL Plus and the Oracle Database Utilities components, which are needed to run Discovery on OpenWorks, as part of the total OpenWorks package.

Note: Hummingbird Exceed is not required for the OpenWorks Basic installation. If the OpenWorks Basic installation is used, the Oracle client installation can use the “Administrator” option, which will include all of the needed components. Or, the Oracle client installation for the OpenWorks Basic installation can use the “Custom” installation type. However, the following components must be installed with the “Custom” installation type:

- Oracle Database Utilities 12.1.0.2
- SQL *Plus 12.1.0.2
- Oracle JDBC/THIN Interfaces 12.1.0.2
- Oracle Net 12.1.0.2

You may experience the following error related to Oracle installation:

The SQLLoader.exe error may generate when working with Filters in GeoGraphix due to a missing Oracle DLL file. This is a known issue of Oracle 12.1.0.2 where oranfsodm12.dll is not shipped with the installer.

Workaround: After Oracle installation, create a copy of the oraodm12.dll file, rename it as oranfsodm12.dll, and then place the renamed file in the BIN folder of both 32-bit and 64-bit Oracle installations.

GeoGraphix Project Server

System Requirements

We recommend using the latest Microsoft service packs and security patches. The following table lists the operating systems which are supported.

Supported Operating System	Memory	CPU
Windows® Server 2008 R2 Standard x64	32 GB minimum	Intel Xeon Processor or equivalent
Windows® Server 2008 R2 Enterprise x64	64+ GB recommended	Quad 2.4GHz 64-bit or better
Windows® Server 2012 R2 Standard x64	SSD drives recommended	
Windows® Server 2016 Standard x64		

Additional Requirements and Recommendations

- DVD-ROM is required for media installation.
- DCOM/Firewall must be configured to allow remote access. For DCOM configuration recommendations, refer to the [LMKR Support Portal > Knowledge Center > White Papers](#) page.

Server performance is subject to a large number of variables. It is impossible to give specific recommendations here, but these are some guiding principles to use. In general, multi-user performance of a GeoGraphix project server is best when the server is dedicated to GeoGraphix and not shared with other applications, especially database applications or intensive file-system applications. In addition, consideration should be made for the number of GeoGraphix users and the size and number of concurrently accessed projects. At some point, having multiple project servers becomes a better solution than having all users on one server. Generally, somewhere between 10 and 20 users is when a second server might be suggested.

Networking

Networking performance depends on the number of users trying to access a server simultaneously, as well as the bandwidth requirements for those users. Recommendations for server bandwidth typically specify server connectivity at a higher bandwidth than an individual user. For instance, users running at 100 Mbit should be accessing a server running on a 1-Gbit backbone. If users are at 1 Gbit, consider running multiple 1-Gbit connections or a single higher-bandwidth connection on the server.

Database Cache

A large database cache is an important factor to consider when dealing with multiple users accessing large databases. The database engine is capable of addressing a practically unlimited amount of cache memory. The best way to size the memory is to estimate the memory requirements for other running applications and allow the database cache to dynamically allocate any remaining free memory. The engine will only allocate what it needs when using dynamic allocation up to the maximum specified.

It is highly recommended that you let the database engine use as much cache memory as it requires on the host server. Increasing database cache memory is the quickest and most effective way to improve database-related performance on large network projects.

On a workstation, it might be appropriate to reserve 1 to 2 GB for the OS and file system cache and 2 to 4 GB for other running applications. On a dedicated project server, not much memory needs to be reserved for other applications. The ideal maximum varies by the project size, the number of users, and other load considerations. But as a general rule, the higher you can set the maximum, the better.

Storage

A great deal of GeoGraphix's access patterns on a server deal with file I/O. Database access, raster images, and seismic data are examples of files that benefit substantially from a fast disk sub-system. Server environments also place a high importance on data integrity and reliability. At a minimum, consider using a RAID 5 (stripe-set with parity) array. As the size of disks increase, you may also want to consider a hot swap drive and/or RAID 6 (striped with dual parity). Using a controller card with its own cache can also help improve performance.

Network Attached Storage (NAS), Storage Area Networks (SAN), and Other Non-Windows Storage Solutions

There are two typical methods used for accessing external storage devices from a project server: iSCSI and CIFS.

- iSCSI allocates a block of storage on the external device and makes it appear to be a physical disk on the project server. This has the advantage of a 100% compliant file system. However, since the external device sees the allocation as one big file, it can make backing up and restoring of individual files using the external device's capabilities more difficult. Standard backup and restore procedures from the server will still work.
- Using CIFS for external storage devices depends greatly on the vendor's implementation of the CIFS protocol used by the Windows platform. In general, a 100% compliant implementation of CIFS for a performant system is required. In particular, vendor's implementation of the "File Change/Notify" functionality has been problematic. Devices based on Windows Storage Server should be 100% compatible since it shares its components with Windows. Implementations based on UNIX/Linux are where problems occur due to the fact that the kernel level support is not present. Due to these uncertainties with CIFS implementations LMKR does not technically support CIFS.

Compatibility with OpenWorks Software

The Discovery™ on OpenWorks® (DOW) software directly links a GeoGraphix application to the data in an OpenWorks® project, and provides a shared project environment for interpretation applications. Landmark Software has delivered the OpenWorks and DOW software for Release 5000 and will continue to provide updates and enhancements to these products. When planning your uptake of Release 5000 and verifying your workflow, you should consider version compatibility between the OpenWorks software and the Discovery on OpenWorks software.

In the compatibility table below, the table indicates the level of compatibility of previous releases and of upcoming scheduled and planned releases. This table will be updated as new releases are planned. The objective is to provide closely coupled compatible versions of the software to allow you to more easily take up current releases.

LMKR performs full release testing for those combinations indicated as Release, R, in the table, but may not exercise full release testing on other version combinations. For these iterative releases, LMKR performs compatibility testing between the OpenWorks and DOW software (indicated as Compatibility, C, in the table). See the table below for the level of testing for each version combination. Although LMKR does not anticipate any integration issue, in these cases it is recommended that customers also verify compatibility in their own environment.

LMKR supports the versions listed as Release in the table. However, while LMKR has completed compatibility testing, LMKR/GeoGraphix Support may not be able to fully support the versions listed as Compatibility in the table. When customers request support for a Compatibility environment, LMKR/GeoGraphix Support works on a best effort basis to troubleshoot any issues, and if an issue needs additional attention, LMKR/GeoGraphix Support reports such issues to LMKR Research & Development. The LMKR/GeoGraphix Support Team cannot guarantee any resolution service levels associated with issues from a compatibility environment.

Combinations which have not been tested, either in the full release or in a compatibility environment, are indicated by U (untested). P indicates the indicated versions are probably incompatible, as the OpenWorks version has a newer development kit (devkit) than that of the indicated DOW version. Blank cells in the table indicate that OpenWorks and GeoGraphix are incompatible and will not operate together.

For the most current version of this information and an overview of suggested compatibility test paths, please refer to the LMKR Technical Support Solution Document KBA-65218-F9D7D5.

Compatibility Matrix

Discovery on OpenWorks

OW License 5000		DOW License 5000.02											
GeoGraphix Version		2019.3	2019.2	2019.1	2017.3	2017.2	2017.1	2016.1	2015.1	2015.0	2014.0	2013.0	2012.0.0
OpenWorks Version	OW 5000.10.6.03	R	R	R	R	R	R	C	U	U			
	OW 5000.10.3.02	C	C	C	C	R	R	C	U	U			
	OW 5000.10.1.05							R	R	R			
	OW 5000.8.3.01							R		C	R		
	OW 5000.8.1.1											R	
	OW 5000.8.0.0												R
	OW 5000.0.3.5												C

Legend

R = Release level full testing

C = Compatibility level basic testing

U = Untested

P = Probably incompatible since OW and GeoGraphix are running different OW devkits.

A blank cell indicates that OW and GeoGraphix are incompatible

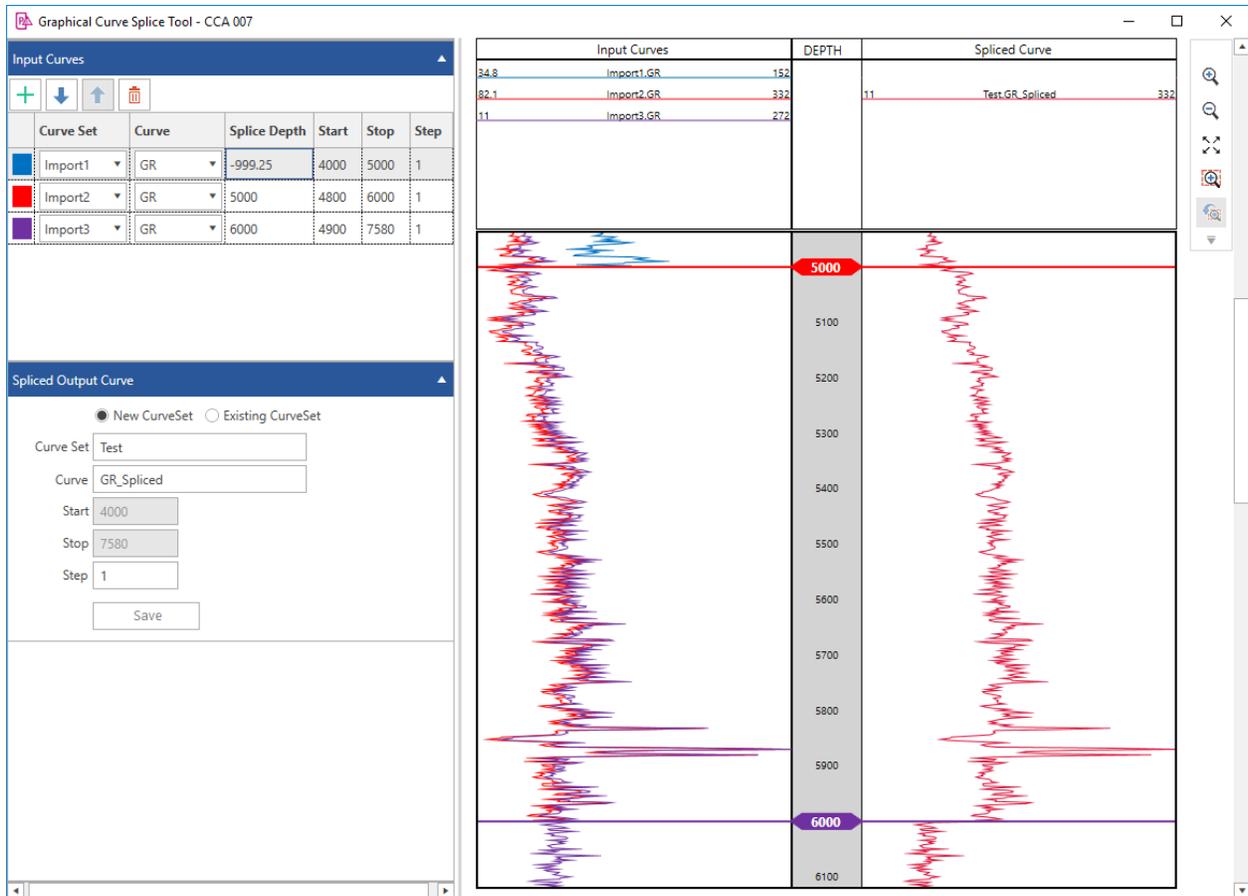
New Features

This section contains a brief description of the exciting new features included in the 2019.3 release.

GVERSE Petrophysics

Graphical Curve Splice

Introducing a tool that graphically splices the curve data for different runs in a well by allowing the user to combine two or more curves logged on different depth ranges to form a continuous composite curve. To launch the **Graphical Curve Splice** utility, select **Curves** tab >> **Graphical Curve Splice** option.

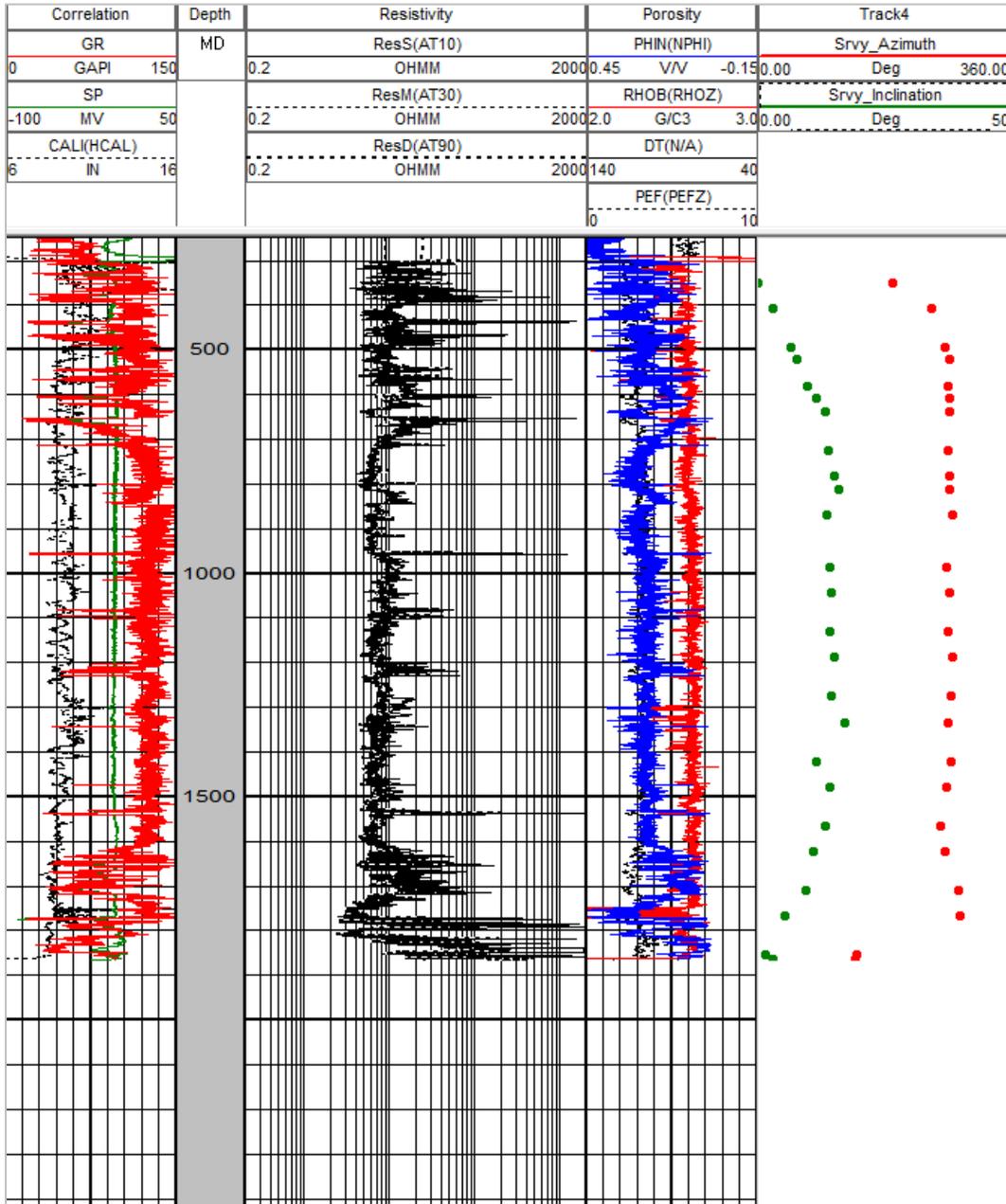


Filter Wells with Curves in Zone

Define a **Wells with Curves in Zone** filter to refine inventory that focuses on only wells with curves lying fully or partially in the corresponding zones. To apply the filter, select either **Home** tab >> **Open Well** option or **View** tab >> **Select Well** option and use **Filter** button.

Survey Curves

Display the Survey Curves in **GVERSE Petrophysics** using the Azimuth and Inclination survey data from **WellBase**. Use the Survey Curves as discriminator curve or as equations in UDE and display them in cross sections. To display Survey Curves in Log View, select **Home** tab >> **Survey Curves** option.



Data Sorting

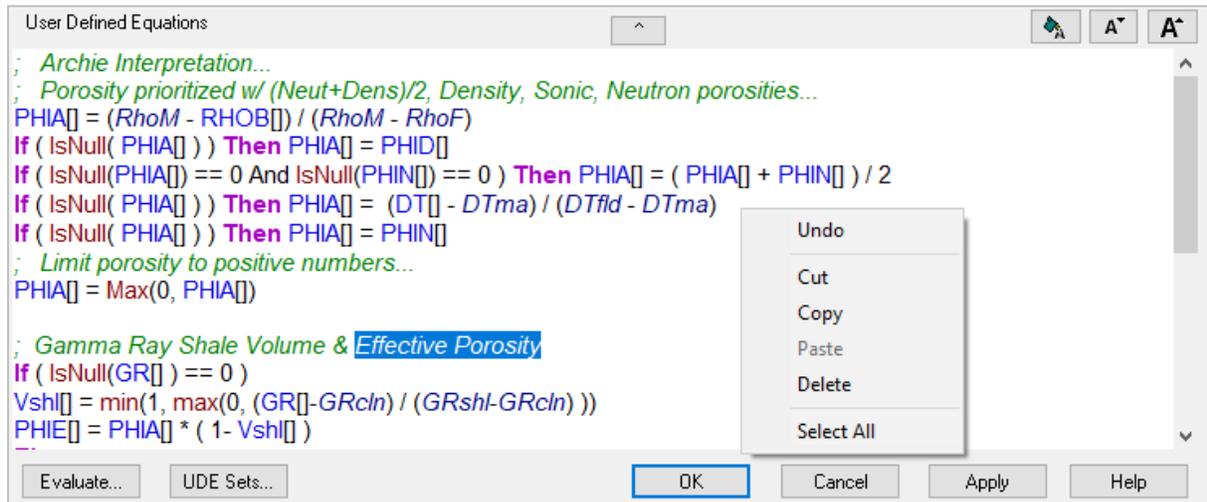
Attribute management is made easier with sorted list of Well with Computed Curve Sets in **Assign Field Data** and **Delete Computed Curves** feature.

Alphanumeric LAS Import

GVERSE Petrophysics integrates many types of data and starting from this release the user can easily import LAS files with alphanumeric text.

UDE Enhancements

Bringing together all important actions into one place using the right-click context menu. Manage your input controls in UDE using this menu.



Filter Image Names

Efficiently retrieve and highlight the Image Names in the Image List using key words in **DepthRegistration Default and Alias Image Names** feature. Use the filtered images in Image Track of Log Template in **GVERSE Petrophysics**.

DepthRegistration

Filter Image Names

Quickly retrieve and highlight the Image Names in the **Image List** using key words in **DepthRegistration Default and Alias Image Names** dialog box. From the menu bar, select **Edit >> Default and Alias Image Names**.

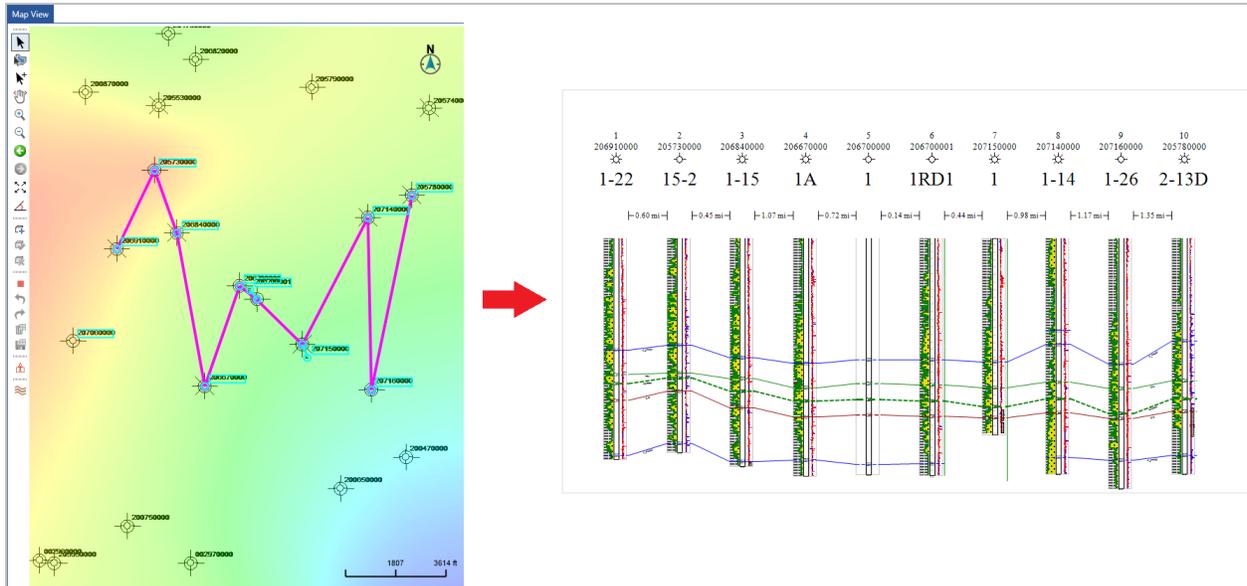
GVVERSE Geomodeling/smartSECTION

Adding XSection Cross Section

A new workflow, where it is possible to set up the loading of **XSection** cross sections in the active interpretation. Load the cross sections by selecting the **Add X Section Cross Section** option either from the **Home** tab or **Cross Section** tab.

Aerial Cross Section

Select multiple wells in the Map View and create well to well spatial cross sections in either **North-South**, **East-West** direction or in **Ascending Order of Well IDs**. To create aerial cross sections, right-click the selected wells and select **Create Cross Section** option from the context menu.



Perforations, DST and IP Calculation in Selected Zones

Calculate Perforations, Drill Stem Test and Instantaneous Potential within a defined zone by using check boxes in the **Calculate Well(s) in Zone** dialog box.

Show/Hide Projected Tops

A new option to hide projected tops has been added, which looks for the projected tops (white triangles) in a projected cross section and hides them while keeping the projected surfaces visible. This option is accessed under the **Control Points** group box of the **Display Options** tab in the **Cross Section Display Preferences** dialog box and cross section context menu.

Open GeoAtlas Map

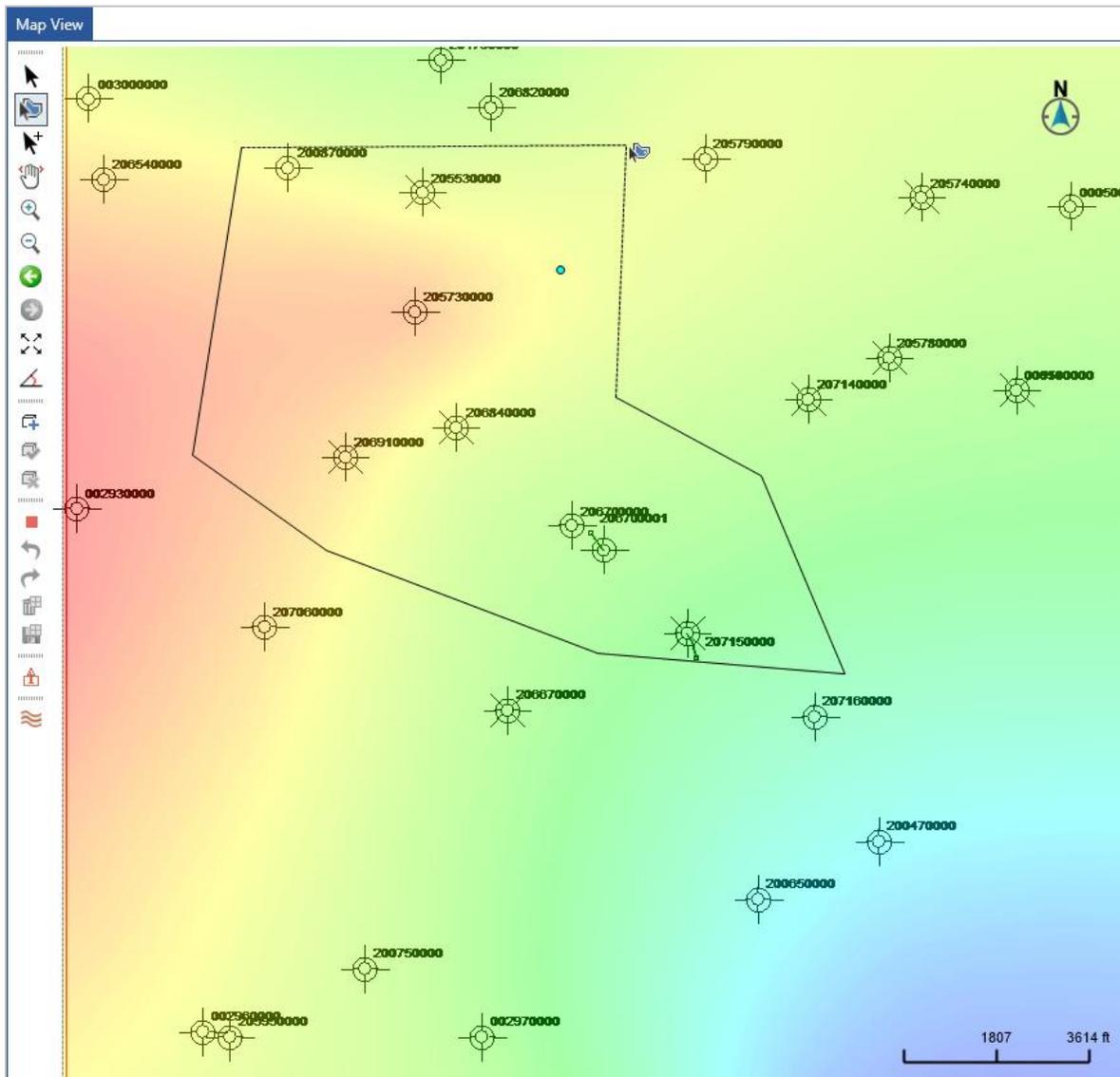
This new functionality introduces a workflow of adding a **GeoAtlas** map in the active interpretation. To load a **GeoAtlas** map, select **Open GeoAtlas Map** either from the **Home** or **Layer** tabs.

Export smartSTRAT Interwell Points

smartSTRAT now supports the export of all the tie points and fault offsets to a (.csv) file format using **Tie Points** tab of the **smartSTRAT** dialog box.

Polygonal Selection

The **Polygonal Selection** tool allows you to quickly generate a polygon around the desired wells in Map View to include the selected wells for cross section creation. This tool can be accessed from the **GVERSE Geomodeling** toolbar.

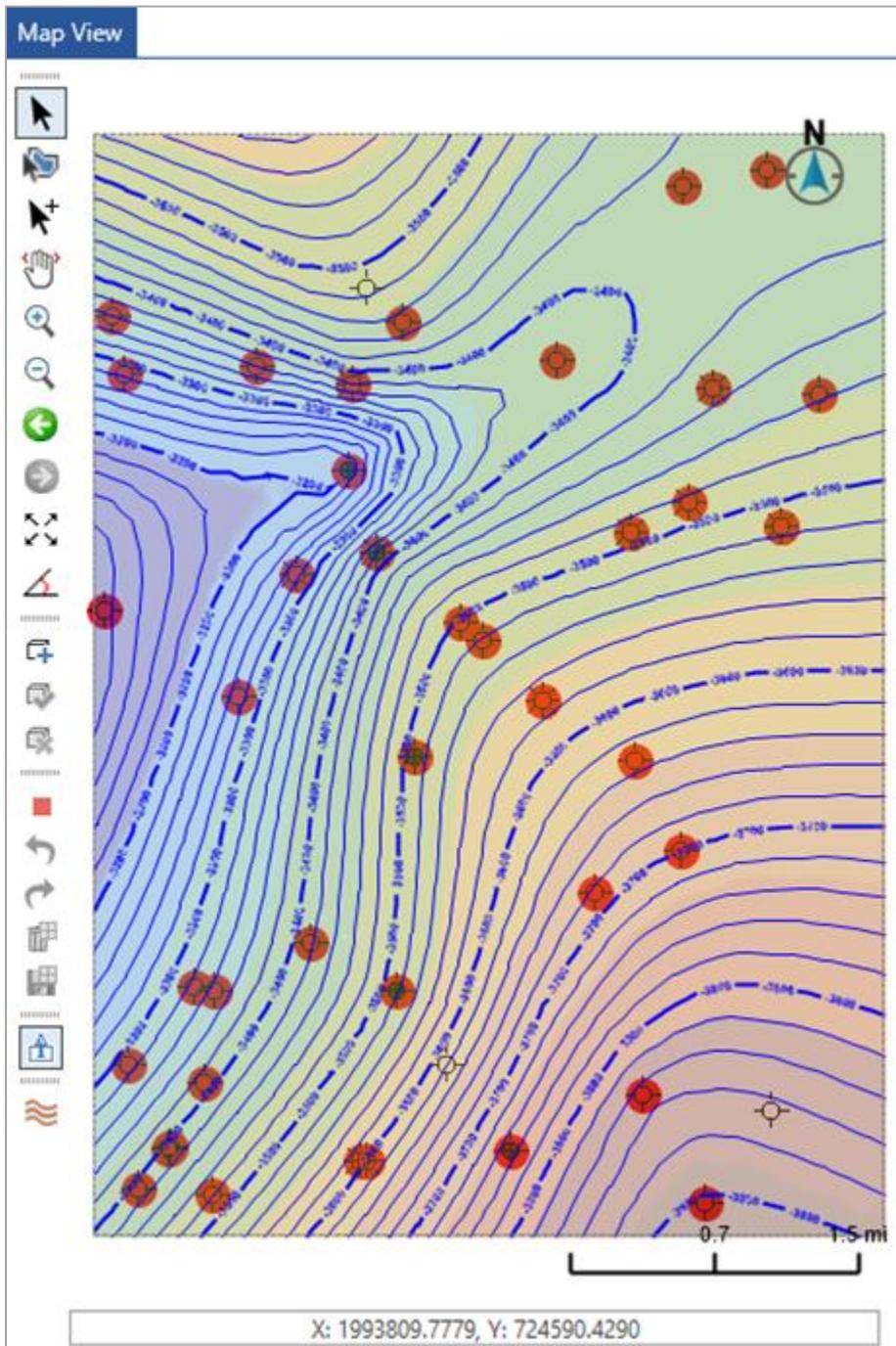


Add or Remove Modeled Zones from the Geomodel

An additional option is provided inside the **GeoSurface Model Properties** dialog box to toggle the modeling of zones, thereby allowing you to include or exclude the zones from the active model.

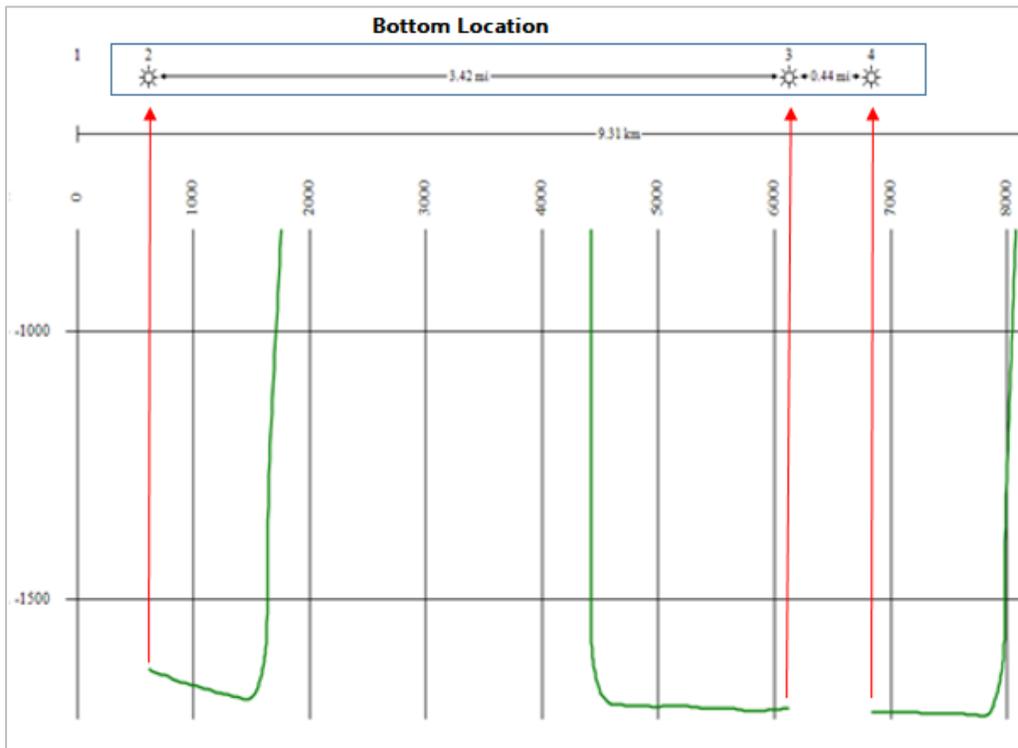
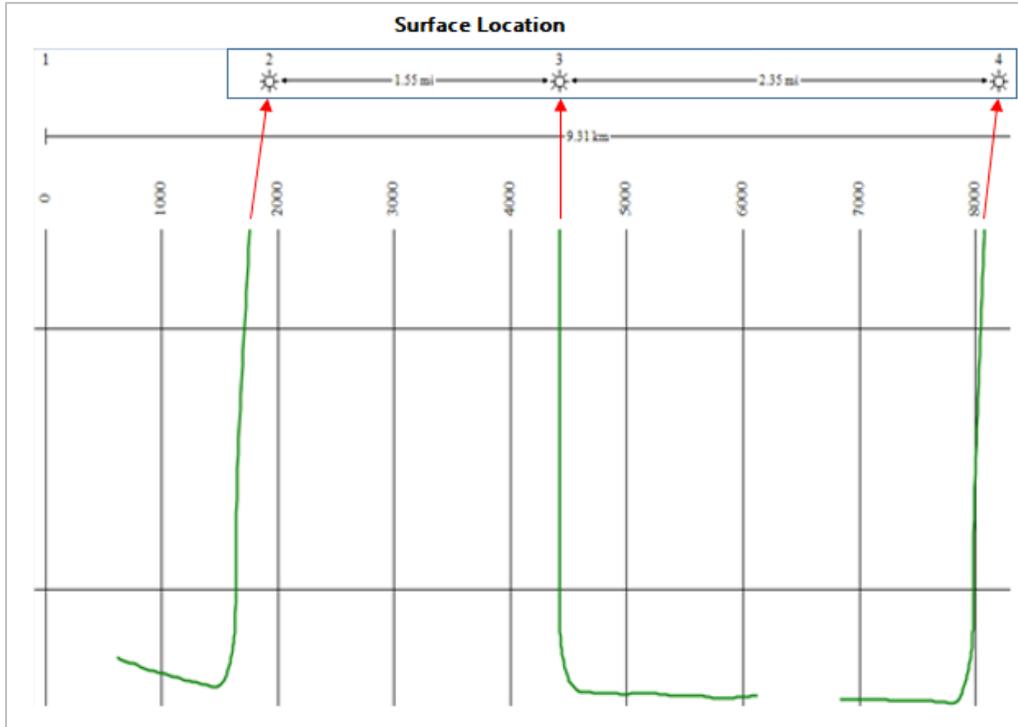
Surface Well Intersections

You can now turn on the **Surface Well Intersections** from the **GVERSE Geomodeling** toolbar that displays intersection points as (pies) on the wells intersecting the active surface in the Map View. This is useful in removing unnecessary wells from the model or cross-sections.



Distance between Wells in Cross Section

Manage well distance postings in a projected cross section based on the surface and TD projections. This functionality enables you to align the distance annotations at the surface or bottom-hole location in the Cross Section View. This operation is available in the **Well Distance** group box of the **Marginalia** tab in the **Cross-Section Display Preferences** dialog box.



Refreshing All Views

Refresh all views in a couple of seconds to quickly update data changes in the geomodel.

Reloading Surface

Reload surface in a fraction of a second after adding and modifying well points in the database.

Reloading Wells

Reload wells in a few seconds after updating the well or log data.

XSection

Pick Formations with Multiple Observation Number

Display multiple observation number for formations in **XSection** using **Display multiple observations** check box from the **Formation Tops** tab in the **Edit Cross Section** dialog box.

GVERSE Geophysics

Create End-to-End Synthetic Seismograms

Create and edit synthetic seismograms in a sleek new interface.

Work with deviated wells.

Extract wavelets from 2D & 3D seismic data.

Create averaged wavelets by combining multiple wavelets.

View and compare seismic power spectrum with wavelets.

Save wavelets at project level and access across interpretations.

Apply processing to input logs.

Estimate sonic from density and vice versa.

Calibrate sonic log with checkshots and other T-D tables.

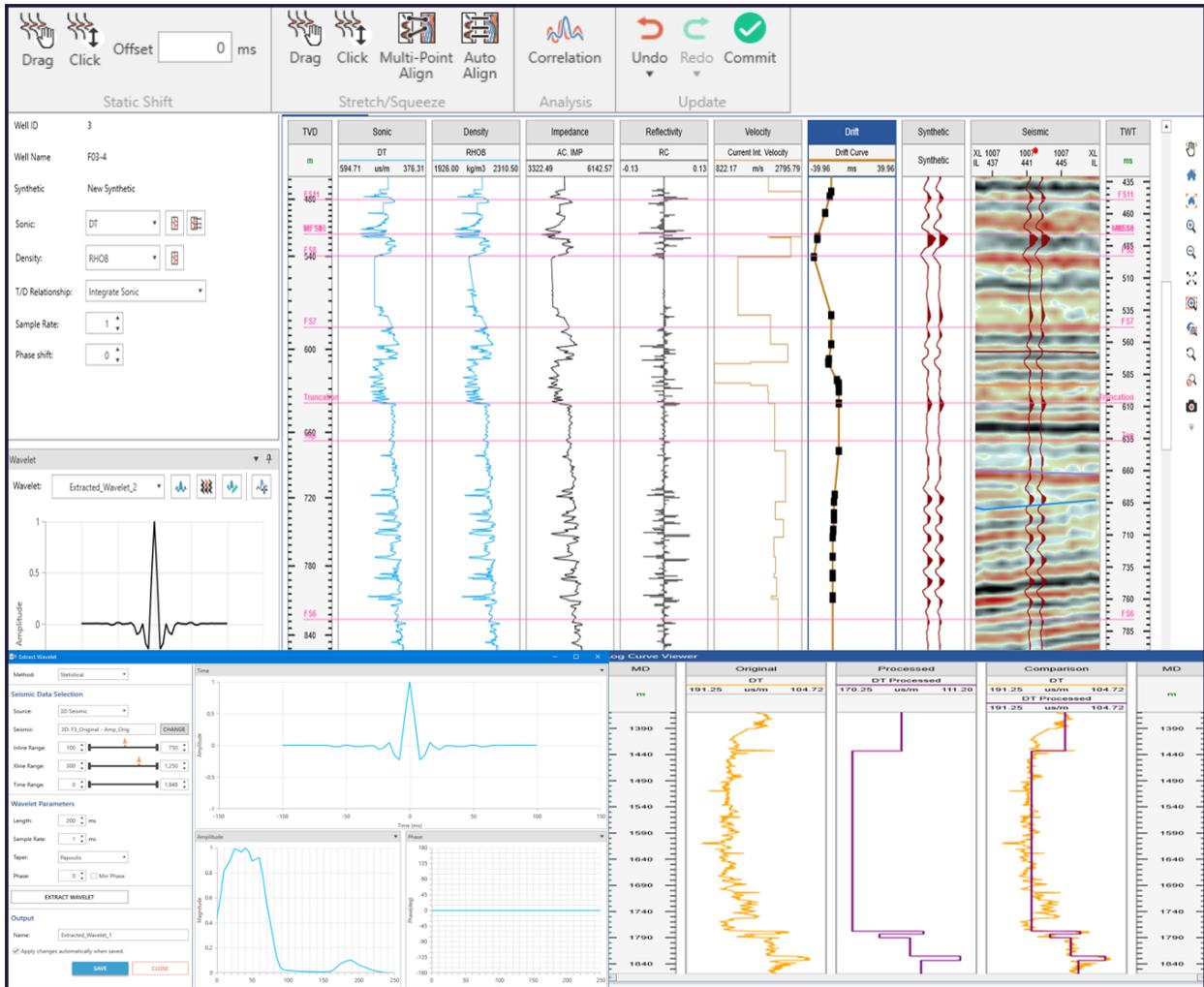
Edit synthetic with multi-point stretch squeeze and auto-align functions.

Save complete edit history in database to undo/redo edits anytime.

QC edits with interval velocity and drift curve plots.

Add custom track to view any available well log.

Restore wavelets or input logs if removed from database.



Do More with Geobodies

Map geobody surfaces and thickness.

Create IsoMap layers from geobodies.

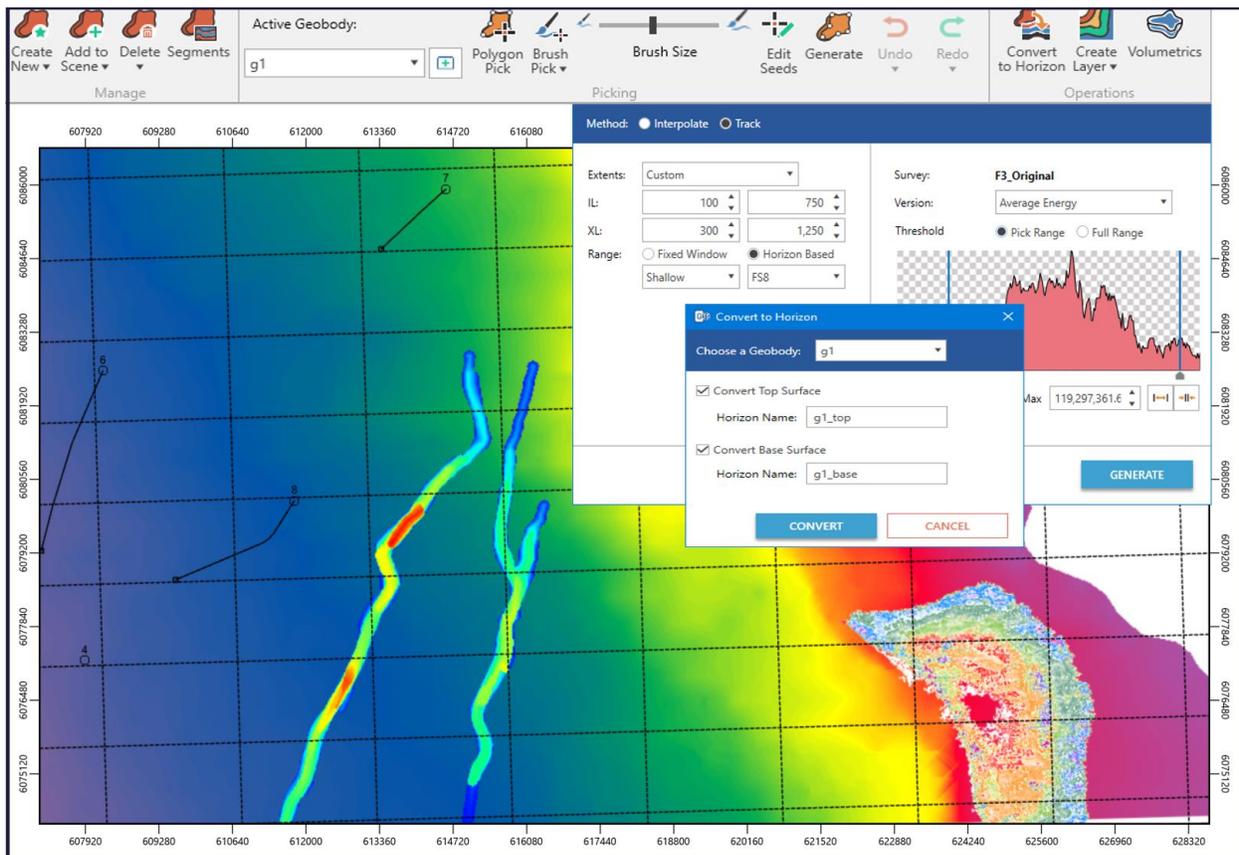
Convert a geobody surface into a horizon.

Compute attributes on geobodies.

View depth converted geobodies in Virtual Depth mode.

Limit geobody tracking between two horizons.

Edit geobody seed picks.



Detect Faults Automatically

Auto-pick segments or surfaces with a single click.

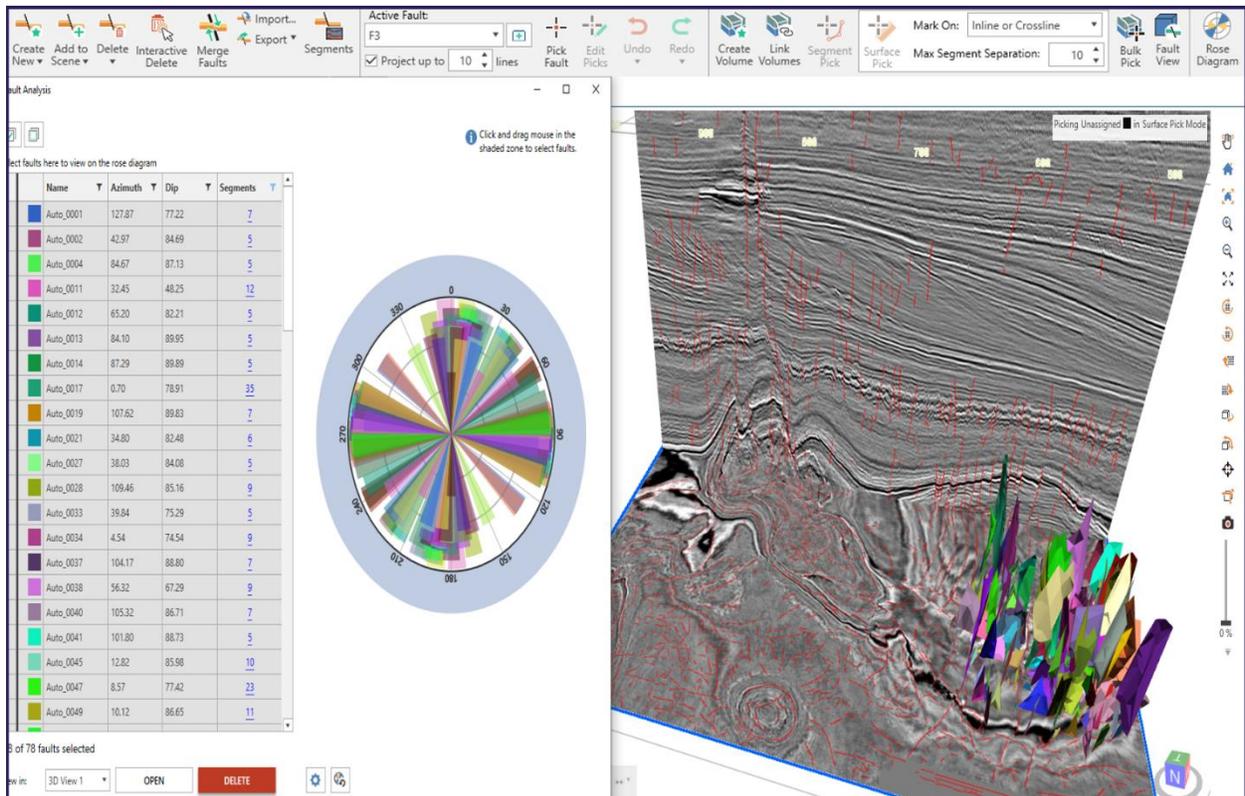
Create fault surfaces in bulk for all faults detected in a seismic volume.

Use Rose diagram for rapid fault analysis.

Project faults on unpicked sections to assist manual picking.

Adjust picks with advanced editing and batch actions.

Save each fault as a separate file in bulk exports.



Crossplot Volumes and Attributes

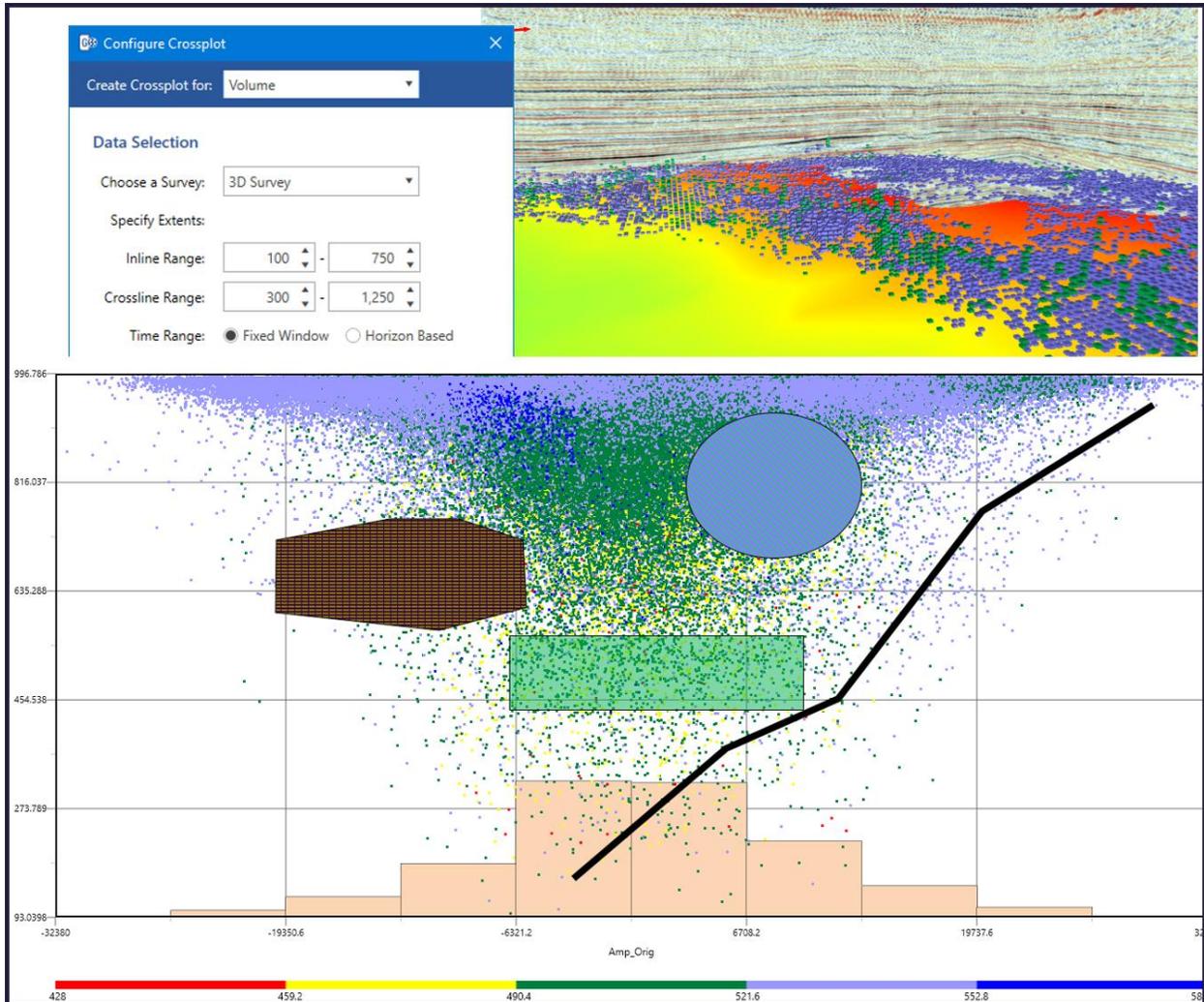
Create scatter plots for seismic volumes, attribute surfaces and well data.

Plot at seismic sections, horizons, well locations or a volume.

Highlight interesting data with a complete annotation toolset.

View anomalies on maps or 3D.

Save and share crossplots.

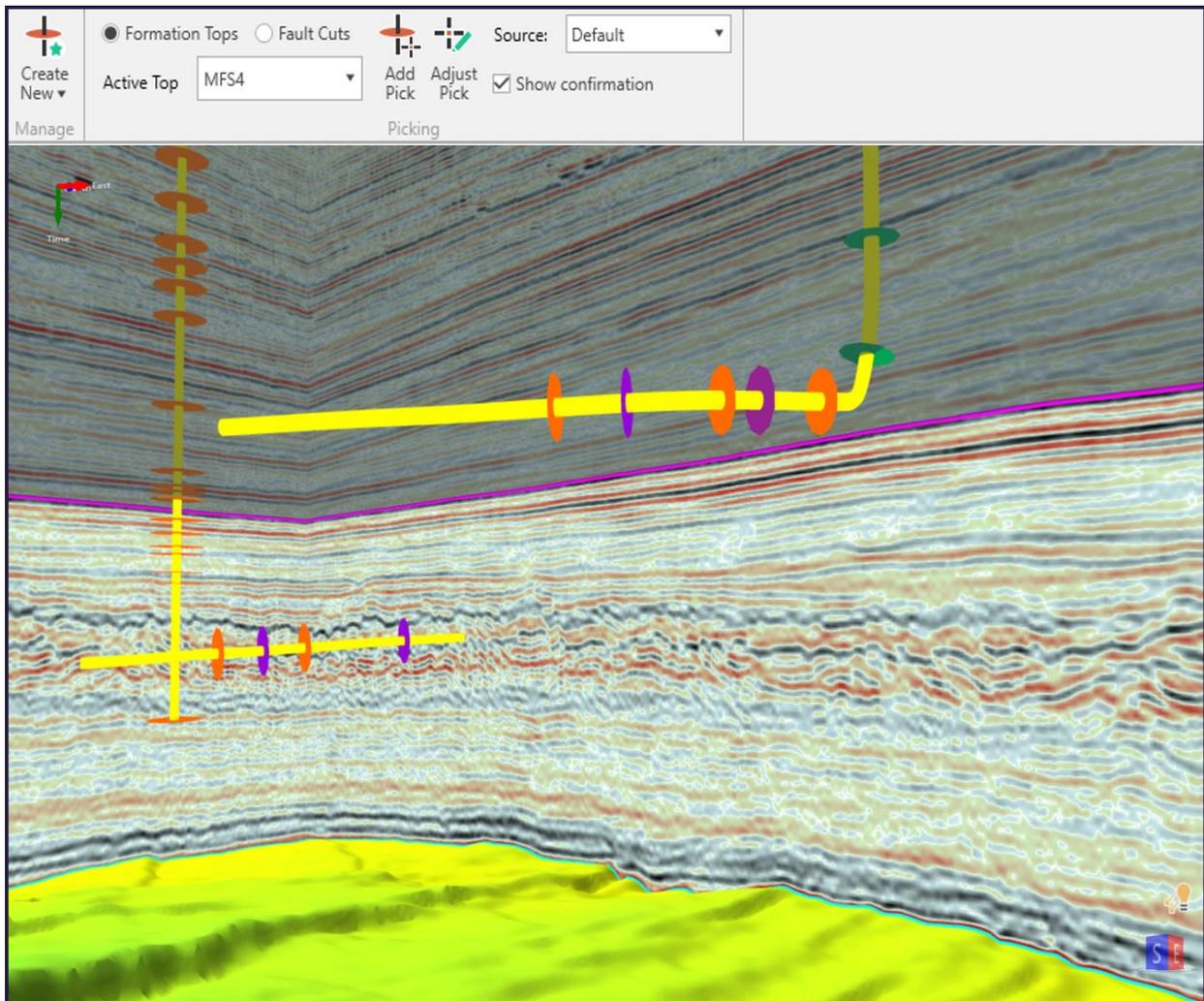


Pick and Edit Well Tops

Add new picks for formations and faults in a well.

Adjust existing picks for formations and faults.

View and interact with multiple observations in a well.



Balance 2D Lines with Ease

Add, edit and search shifts for all 2D lines in one location.

Import and export shift values.

Use a revamped line balancing tool to quickly match lines and auto calculate shifts.

The screenshot displays the 'Line Balancing' software interface. At the top, there are controls for 'Wiggles', 'Trace Count' (set to 10), 'Rainbow' color scheme, and zoom levels (10 and 20). Below this, 'Start Time (ms)' and 'End Time (ms)' are both set to 100. Two line grids, 'Line1' and 'Line2', are shown with stationing (XL 163, IL 101, etc.).

The central 'Tie Table' window contains the following data:

Program Name	Line Name	Static Shift (ms)	Phase Shift (deg)	Gain (db)
DipLines	SSIS-Grid-Dip1_Seis	7	-27.19	-2.49
DipLines	SSIS-Grid-Dip2_Seis	-3	37.05	-0.84
DipLines	SSIS-Grid-Dip3_Seis	-5	27.3	-4.65
DipLines	SSIS-Grid-Dip4_Seis	1	-17.05	0.38
StrikeLines	SSIS-Grid-Strike1_Seis	0	0	0
StrikeLines	SSIS-Grid-Strike2_Seis	0	-17.05	0.38
StrikeLines	SSIS-Grid-Strike2_Seis	-8	27.79	-0.15
StrikeLines	SSIS-Grid-Strike4_Seis	3	26.7	-0.96
				0.41
				-4.65

An 'Import Shift Values' dialog box is open, showing options for 'File', 'Import only to program' (set to DipLines), 'Rows to Skip' (0), 'Delimiter' (Comma), and a table for defining shift parameters (Line Name, Static Shift, Phase Shift, Gain) with units and 'Ignore' checkboxes. Buttons for 'IMPORT SHIFTS' and 'CANCEL' are at the bottom.

On the right side, there are three plots:

- Map:** A grid with two intersecting lines, one blue and one green.
- Cross Correlation:** A plot of 'Coefficient' vs 'Time (ms)' showing 'Correlation' (blue) and 'Envelope' (black) curves. The 'Lag (ms)' is set to +/- 100.
- Amplitude Spectrum:** A plot of 'Magnitude' vs 'Frequency (Hz)' showing 'Amplitude' (black) and 'Seismic Spectrum' (red) curves. Filter settings are F1: 5, F2: 10, F3: 50, F4: 60.

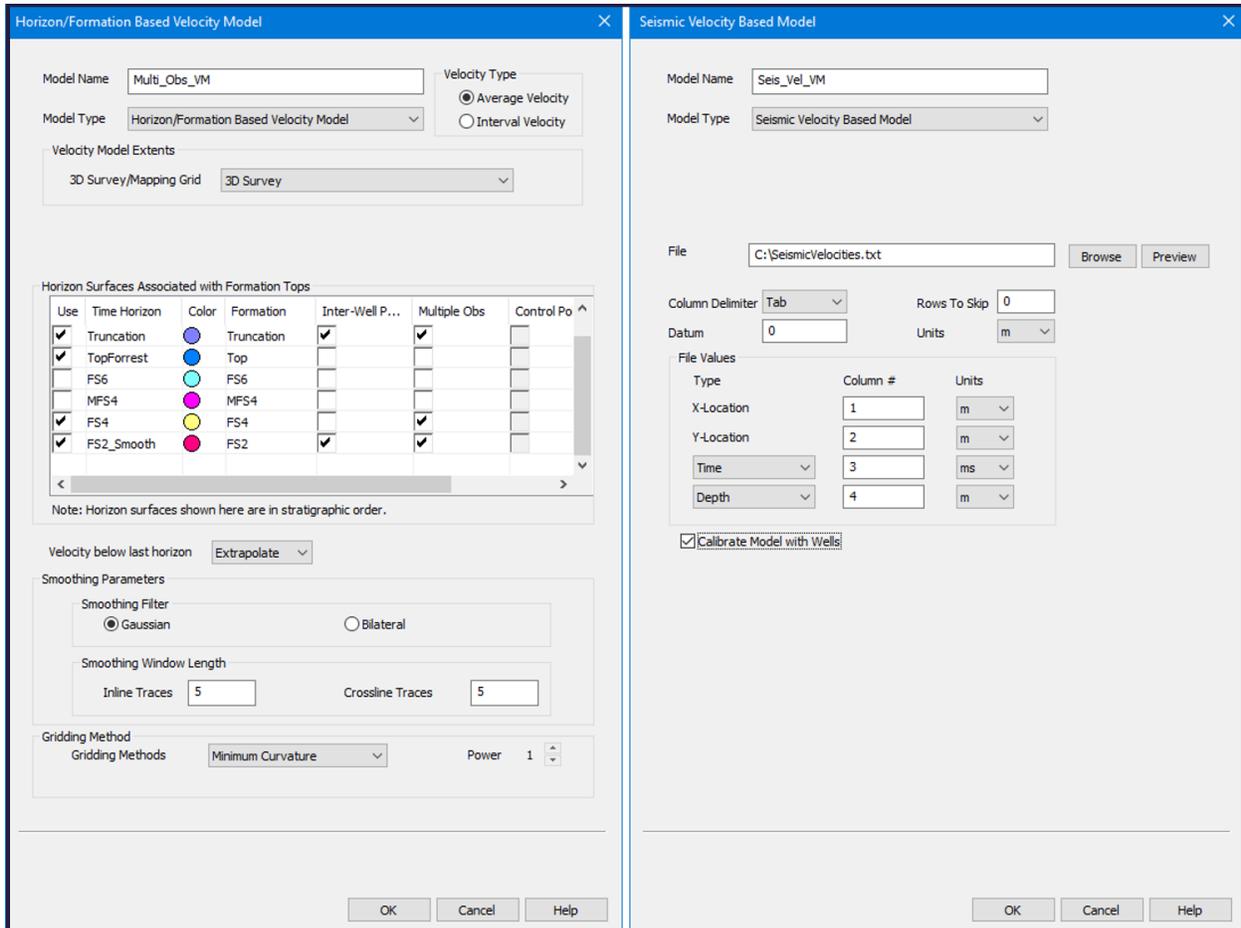
Buttons for 'UPDATE SHIFT TABLE' and 'CLOSE' are located at the bottom right of the interface.

Build Better Velocity Models

Create efficient velocity models from seismic velocity data.

Incorporate multiple observations for accurate gridding.

Build more reliable models with improvements in triangulation algorithm.

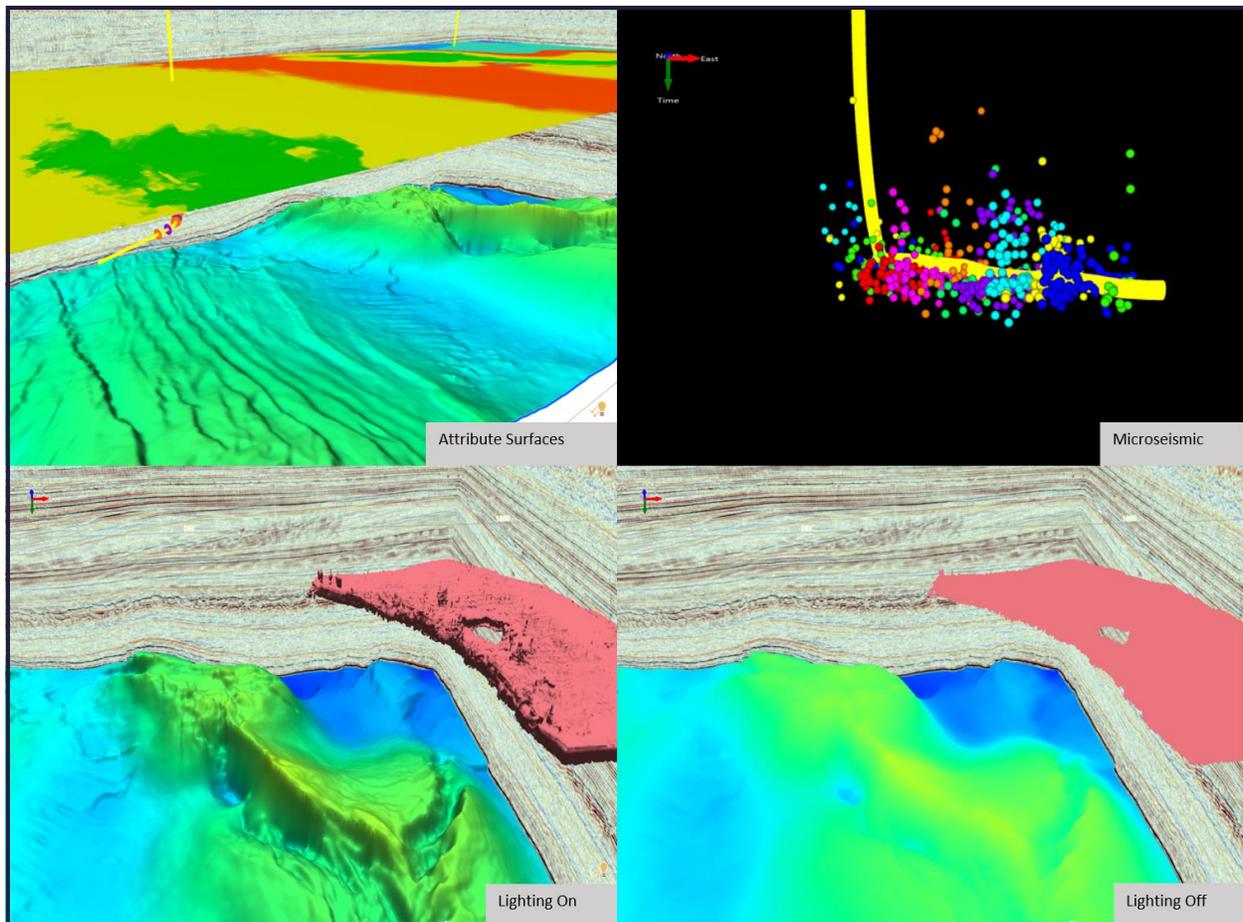


Use AI for Facies Classification

Classify facies on horizons using AI and neural networks with automatic waveform classification by a self-organizing maps algorithm.

Visualize even more in 3D

- Display microseismic data in 3D scene.
- Observe crossplot points in 3D.
- Display newly generated attribute surfaces.
- Display multiple observations for formations and faults.
- Sync vertical and horizontal seismic windows with 3D displays.
- An innovative lighting interface.



Improve Efficiency

- Improved default color palette controls, including seismic data versions.
- Minimize mis-clicks with color-coded action labels on all warning messages.
- A redesigned navigation bar.
- Read start times directly from traces headers when loading 2D seismic lines.
- Sort formation annotation list by name or associated horizon.

Control vertical exaggeration by ratio on seismic displays.

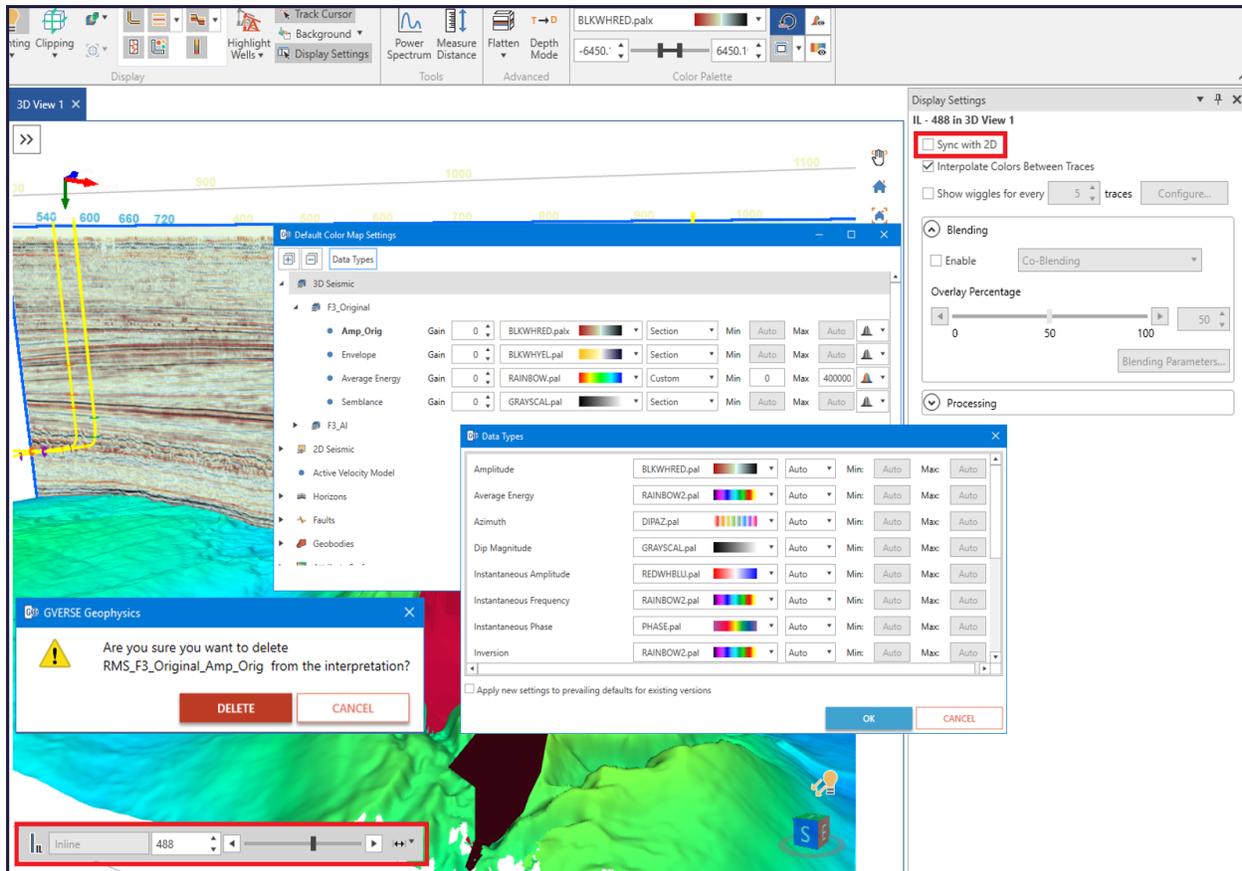
Control well display by UWI or name.

Follow well bore when creating well-to-well arblines.

Take pictures of power spectra for your presentations.

Select multiple 2D lines to export directly from map.

Find faults for reassigning to faster with a redesigned menu.



GVERSE Planner

Customized Coordinate Conversion

Export the Survey **Easting** and **Northing** to a custom Coordinate System using the **Convert to Custom Coordinate System** option on the **Survey** tab in **GVERSE Planner** window.

GeoAtlas

ESRI ArcGIS 10.7.x Supported

All GeoGraphix applications support the latest ESRI ArcGIS 10.7.x versions.

Go To XY Tool

Specify the location with more precision by using the **Go To XY** tool on the **View** toolbar. Type in the X, Y coordinates using a desired coordinate system and navigate to them on the map.

Export Map in Geospatial Image File Format

GeoAtlas now supports the export of maps in **Geospatial Image File Format – GeoTIFF (*.tiff)**. To do so, select **File >> Export >> Map >> Export Map**.

Ability to Search Well Data by Zone

Efficiently search and update the scout field data using **Filter by Zone option**. This is useful in applying conditional pies on the wells lying in the selected zone and satisfying the search criteria.

ProjectExplorer

GGX Server Configuration Tool

Easily configure the GeoGraphix server without manually configuring the DCOM settings with every server installation of GeoGraphix. To access this utility, select **Tools >> Configure Server**.

QueryBuilder

Easy-to-Navigate User Interface

Working with data in **QueryBuilder** is made easier with the introduction of **interactive tabs** with relevant features grouped together for better user experience. Customized **Quick Access** toolbar, data filtering tools, and print options; all of these are easily accessible with the latest **QueryBuilder** user interface.

Filtering Wells Using Dipmeter Data

For WellBase data, a new table for **Dipmeter Data** is added; enabling users to create filters based on the wells containing dipmeter data.

WellBase

64-bit Application

Work effortlessly in WellBase with larger datasets, including formation tops and deviation surveys, in the 64-bit environment.

Easy-to-Navigate User Interface

WellBase database management system navigation is made easier with the introduction of **interactive tabs** with relevant features grouped together for better user experience.

Customized **Quick Access** toolbar, **WellBase** tools, Data Managers, Import/Export options, and Layer creation and update options; all of these are easily accessible with the latest **WellBase** user interface.

TIBCO Spotfire Integration with GeoGraphix

With the **TIBCO Spotfire Analyst AI** solutions visualize **GeoGraphix** data, arranged in different templates, for data mining, analysis and QC. **Spotfire Analytics** integration with **GeoGraphix** helps you to:

- View **GeoGraphix** wells along with their complete information in **Spotfire**.
- Filter abnormal values in different data types and clean your well data.
- Create **WellBase** filter(s) based on different parameters determined after data analysis.
- Add zone attributes in **Spotfire**.

Grid Convergence Angle Calculation

Calculate the grid convergence angle in **WellBase** for well surveys in bulk from the **Tools** tab or for individual wells in a survey.

Survey Grid Updated

Survey page in **WellBase Information Manager** displays the Survey projection for well(s) after the calculation of the grid convergence angle.

Delete Duplicate Data

Delete duplicate data from perforation (perfs), drill stem tests (DSTs), initial potentials (IPs), cores, and completions tables for certain wells using the Delete Duplicate Data option in the Bulk Update menu on the Well tab in WellBase.

ZoneManager

Create Interpolated Tops

Create interpolated tops from the intersection of an **IsoMap** surface with wells in a selected filtered list to accurately determine the amount of depth-related data (perforations, cores, DSTs etc.) associated with **ZoneManager** zones.

Fixed Issues

The following customer reported issues were fixed in this release.

GVERSE Petrophysics

ID	Description
197172	Fixed the erroneous cursor position calculation in the Edit UDE dialog box. Previously, in case of a syntax error in an equation, a wrong character position was being highlighted.
197608	A right-click context menu is now added to the UDE text control of the “Edit User Defined Equations” dialog.
202964	In a network environment, creating IsoMap layers from GVERSE Petrophysics sometimes resulted in a ‘server busy’ message. This issue has been fixed.
208718	Fixed the UDE settings related to interpretation sets. Previously, it was not being saved within a session.
209249	Fixed the query syntax for adding import records in the table of “Import History” in Project Explorer view. Previously LAS files with an apostrophe in the file name were being imported with errors.
210003	Fixed the query syntax for adding import records in the table of “Import History” in Project Explorer view. Previously, importing curve names with an apostrophe resulted in an error message.

GVERSE Geophysics

ID	Description
196422	In certain scenarios, erratic display was observed on vertical sections when horizons were flattened. This issue has been fixed.
209978	Changing the horizon usage in Horizon Manager caused the application to crash using certain datasets. This issue has been fixed.

WellBase

ID	Description
193611	In certain cases, connection with the database could not be established while using the macro to import data from spreadsheet. This issue has been fixed.
193890	Fixed an issue which was causing different well IDs in the Scout Ticket and the WellBase title bar.
197392	Alaska County codes were incorrect which resulted in assignment of pseudo-codes. This issue has been fixed.
203193	A few notes in the WellBase Help file contained obsolete information. The Help file is now updated.
205222	Records with null Top MDs (Top TVDs) showed 0 TVD while recalculating surveys, which subsequently resulted in incorrect calculation of TVDSS. This issue has been fixed.
211129	WellBase did not detect SpotFire Analyst if it was installed anywhere other than the default path within the active user profile. This issue has been fixed.

GVERSE FieldPlanner

ID	Description
201032	Lease Planner was not working correctly after recalculating blown extents. This issue has been fixed.

GeoAtlas

ID	Description
171710	Shapefile import failed due to an unsupported projection file. This issue has been fixed.

211294	The Expression button for an advanced Label for LYR files pointing to SDE data did not work. This issue has been fixed.
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ProjectExplorer

ID	Description
179965	Many performance improvements in rendering data while working with bigger projects with multiple layers and AOIs.

ZoneManager

ID	Description
203120	Importing large sized IsoMap layers in ZoneManager resulted in an exception error. This issue has been fixed.
204508	An attribute could not be created if it had a forward slash '/' in the name. This issue has been fixed.

Known Issues

This section lists the known issues in this release.

GVERSE Geomodeling/smartSECTION

ID	Description
190798	Zone map values are different from those present in WellBase .
190843	Cos10 fault picks that reverse direction snap to a polygon.
192401	Color fill in S. Pelto project differs from COS8.1.
194930	Surface Offset not visible in cross section.
196402	Inconsistent modeling results when adding second well top on the well.

GVERSE Geophysics

ID	Description
199116	<p>GVERSE Geophysics 3D Module – Geobody generation using full extents caused the application to crash in a 32-bit environment.</p> <p>Workaround: Generate the geobody in a 64-bit environment. However, if you must generate the geobody in a 32-bit environment, limit the extents to a smaller region to avoid the application crash.</p>
197262	<p>GVERSE Geophysics Main Interface – Drawing a composite lines sometimes results in the line intersecting itself primarily because the closest trace for each line at the intersection lies on the other side of the intersection.</p>

WellBase

ID	Description
208790	<p>Spotfire does not launch from WellBase if it is upgraded from version 10.6 to 10.8.</p> <p>Workaround: Uninstall Spotfire and then install version 10.8 using its own installer (do not upgrade from 10.6). Or,</p> <p>Use our Spotfire utility to fix this problem. It fixes the Spotfire registry entries.</p>

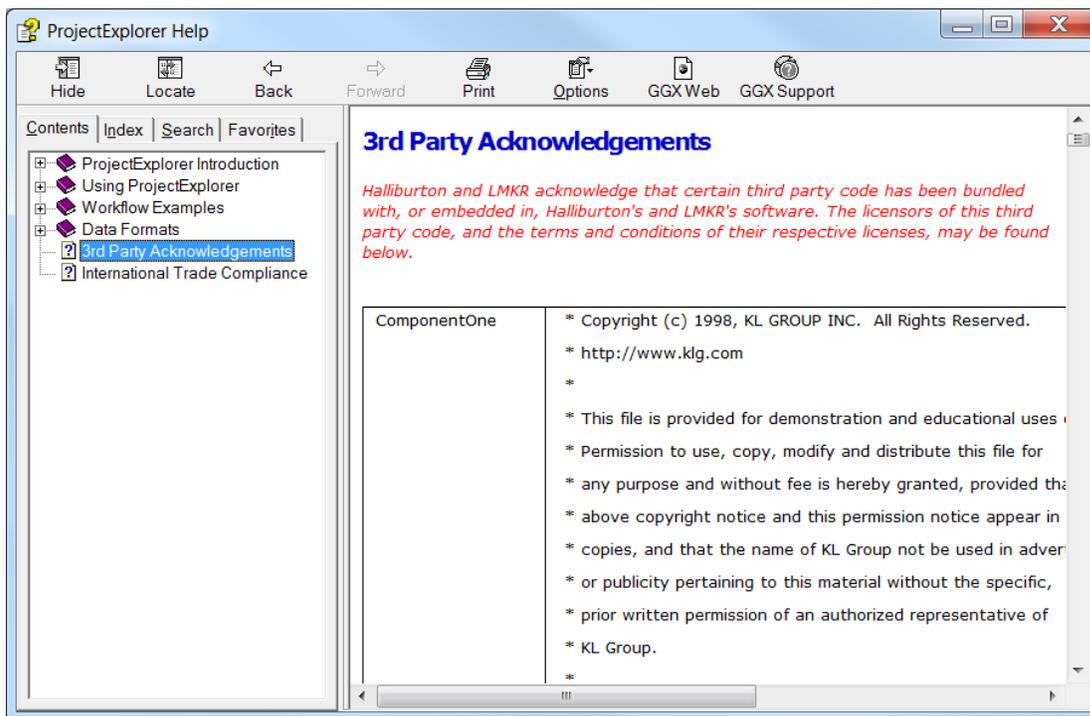
Third Party Applications

LMKR uses various third-party applications in the development of its software.

LMKR acknowledges that certain third party code has been bundled with, or embedded in, its software. The licensors of this third party code, and the terms and conditions of their respective licenses, may be found in the GeoGraphix Help files:

1. Open your help files.
2. In the list of topics on the left, locate the **3rd Party Acknowledgements** topic and click to open the topic.

A list of third party applications and their details display.



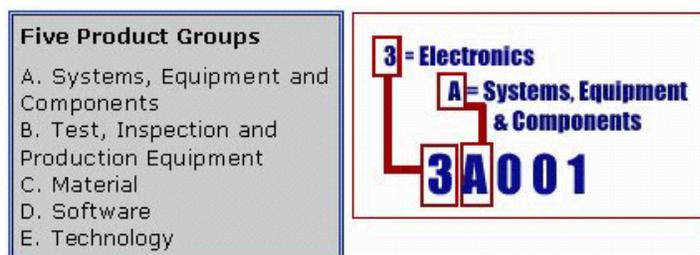
International Trademark Compliance

This application is manufactured or designed using U.S. origin technology and is therefore subject to the export control laws of the United States. Any use or further disposition of such items is subject to U.S. law. Exports from the United States and any re-export thereafter may require a formal export license authorization from the government. If there are doubts about the requirements of the applicable law, it is recommended that the buyer obtain qualified legal advice. These items cannot be used in the design, production, use, or storage of chemical, biological, or nuclear weapons, or missiles of any kind.

The ECCNs provided here represent LMKR's opinion of the correct classification for the product today (based on the original software and/or original hardware). Classifications are subject to change. If you have any questions or need assistance please contact us at support@lmkr.com.

Under the U.S. Export Administration Regulations (EAR), the U.S. Government assigns your organization or client, as exporter/importer of record, responsibility for determining the correct authorization for the item at the time of export/import. Restrictions may apply to shipments based on the products, the customer, or the country of destination, and an export license may be required by the Department of Commerce prior to shipment. The U.S. Bureau of Industry and Security provides a website to assist you with determining the need for a license and with information regarding where to obtain help.

The URL is: <http://www.bis.doc.gov>.



Definitions

CCATS (Commodity Classification Automated Tracking System) - the tracking number assigned by the U.S. Bureau of Industry and Security (BIS) to products formally reviewed and classified by the government. The CCATS provides information concerning export/re-export authorizations, available exceptions, and conditions.

ECCN - Export Control Classification Number - The ECCN is an alpha-numeric code, e.g., 3A001, that describes a particular item or type of item, and shows the controls placed on that item. The CCL (Commerce Control List) is divided into ten broad categories, and each category is further subdivided into five product groups. The CCL is available on the [EAR Website](#).

The ECCN number, License Type, and the CCATS Numbers for this product are included in the table below. Also included is the date the table was last updated.

Product/Component/R5000	ECCN Number	License	CCATS Number	Last Updated On
GeoGraphix	--	-	-	-
LMKR License Manager	5D002C.1	ENC	G055172	6/19/2007

Contacting LMKR Support

LMKR is committed to providing the highest level of technical customer support in the industry. With an average tenure of more than thirteen years, our highly trained and experienced staff of technical analysts is comprised of geoscientists, engineers, land professionals, petrophysicists, and system specialists.

Please refer to our Customer Support timings mentioned below to ensure that you have access to our support analysts assigned to your region. When getting in touch with LMKR support, please remember that real-time support will not be available during bank holidays or after office hours. If you do get in touch with LMKR Support outside of work hours, please leave a voice message with a brief description of the issue that you are facing. Your voice message will be used to automatically create a support case for you. This will enable our analysts to attend to your issue and provide you with a resolution as soon as possible

North and South America	Europe, Middle East & Africa
<p>Monday – Friday 8 am-6 pm CST* Toll Free (US/Canada) : +1 855 GGX LMKR (449 5657)</p> <p>Colombia: +57 1381 4908</p> <p>United States: +1 303 295 0020</p> <p>Canada: +1 587 233 4004</p> <p><i>*Excluding bank holidays</i></p>	<p>UK: Monday - Friday 8 am – 5 pm* +44 20 3608 8042</p> <p>UAE: Sunday - Thursday (Dubai GMT+4) 8 am – 5 pm* +971 4 3727 999</p> <p><i>*Excluding bank holidays</i></p>
Asia Pacific & Australian Continent	Southwest Asian countries
<p>Malaysia: Monday - Friday (Kuala Lumpur GMT+8) 9 am – 6 pm* +60 32 300 8777</p> <p><i>*Excluding bank holidays</i></p>	<p>Pakistan: Monday - Friday (Islamabad GMT+5) 9 am – 6 pm* +92 51 209 7400</p> <p><i>*Excluding bank holidays</i></p>

Helpful Links

Name	Website Address
LMKR home page	http://www.lmkr.com
LMKR Support Portal	http://support.lmkr.com