



WebSteering

Stay ahead of the drill bit

2016.1



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Introduction

LMKR is pleased to announce the release of the GVERSE™ WebSteering™ 2016.1 software. This document provides an introduction to the WebSteering software features and benefits. It also lists the system requirements necessary to install and run the software.

What is GVERSE WebSteering?

GVERSE WebSteering software is designed specifically to help geoscientists geosteer horizontal wells in thin pay zones and to direct the bit in real time.

The GVERSE WebSteering software installs into the web browser with a few button clicks. Then it's a simple process to load LWD and surveys from the rig, add type logs and subsurface grids from GeoGraphix®, and start steering. At any point during this process, LWD data can be sent back to GeoGraphix for further analysis using GeoGraphix's feature-rich suite of tools. GVERSE WebSteering runs even when disconnected from your corporate network so whether you are in the office or working remotely, you can define your target surface and send updated drilling targets to the rig. The WebSteering software is part of the GVERSE application suite by LMKR (<http://www.lmkr.com/gverse>).

LMKR GVERSE consists of geoscience and engineering solutions focused on workflow optimization and enhancing productivity of teams working on diverse geological and geophysical projects. These applications help cut the processing time required for interpretations resulting in fast, easy to use scalable tools that are inter-operable with other known geoscience software suites; enabling a connected multi skilled workforce.

Main Features

The main features of the WebSteering software are as follows:

- A web-based software designed to work when it is connected to a GeoGraphix server as well as when it is not.
- Ability to help geologists build a more accurate target surface that can be used to drill the next well.
- This software can also be connected to a WITSML Server. Therefore, data loaded from the rig can be directly saved to GeoGraphix.
- Easy installation.
- Technical Geosteering based on Relative Stratigraphic Depth concepts (no distortion like vertical section projection).
- Capable of converting an LAS file into a Type Log.
- Automatically calculates True Vertical Depth (TVD), Northing, Easting and Vertical Sections from MD, Inclination and Azimuth.
- Directional survey calculations and related minimum-curvature interpolations for geosteering and graphing.
- Graphic display of data with full zooming capabilities and coupling of graphs including LWD, Wellbore directional survey data, and Type Log.

- Segment addition and management.
- Display can be customized e.g. line colors, min/max scale limits, linear scale format etc.
- Has the capability to process files that have been dragged-and-dropped on the interface.
- Requires GeoGraphix® Discovery.

Benefits

The GVERSE WebSteering software offers you the following benefits:

- **Flexible:** Flexibility in the location where you geosteer a horizontal well from – in the office, at home, or in the field
- **Simple:** Simplified Data Entry for LWD and survey data using drag-and-drop or WITSML. Data is transferred into LMKR GeoGraphix projects via the web with one button click.
- **Integration with GeoGraphix:** Integration with GeoGraphix applications, including selection of type logs and gridded surfaces from the GeoGraphix database, and use of Web Geosteering interpretations in GeoGraphix to produce more accurate target surfaces.

System Requirements

The following sections list the system requirements for the WebSteering software.

Software

The software that must be installed on the system running the WebSteering software are as follows:

- GeoGraphix Discovery 2015.1.x
- Microsoft .NET Framework 4.2 or greater
- LMKR License Management Tool 2015.1 for WebSteering license
The LMKR License Management Tool (LMT) must be installed to configure the WebSteering license.
- Adobe Reader for selected help files (optional)

Note: It is recommended that you run the WebSteering software on Internet Explorer 11.x.x and Google Chrome 42.x.x.x or later.

Operating System

To run the WebSteering software, you need the Windows® 7 operating systems installed on your system.

Note: It is recommend to use the latest Microsoft service packs and security patches.

Hardware

The hardware requirements for the WebSteering software are as follows:

- Quad 2.4 GHz 64-bit Intel® class or better
- 4 GB RAM or greater
- 1024x768 graphics resolution

Licenses

The following licenses are required to run the WebSteering software:

- GVERSE WebSteering 2016.1 license
- GeoGraphix Discovery 2015.1 license

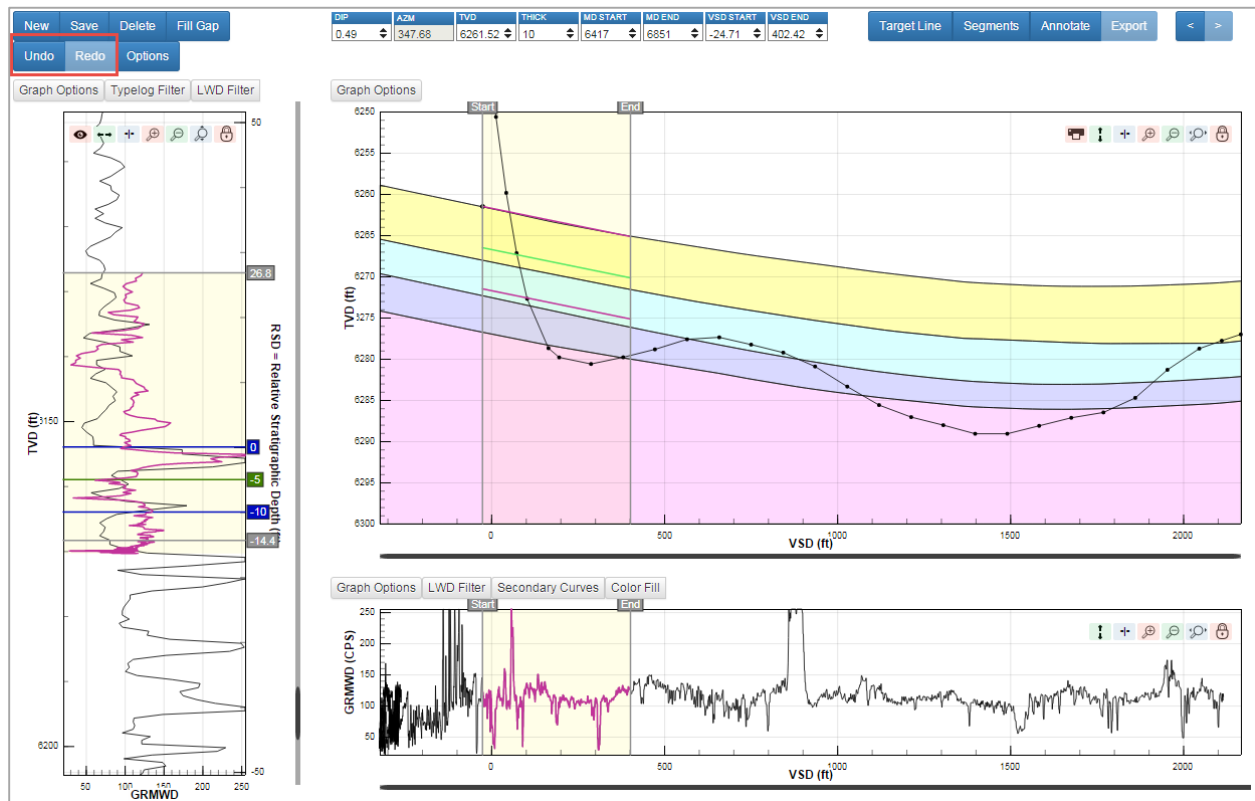
Note: Refer to the LMKR Customer Support Portal (<http://support.lmkr.com/>) for up-to-date information on the requirements.

New Features

This section contains a brief description of the exciting new features included in the 2016.1 release.

Undo and Redo

The Undo and Redo buttons have been added to the GeoSteer page. When you perform an action on any segment, click the Undo button to remove the last change. Similarly, if you want to revert your change (s) on any segment, click the Redo button. Keyboard shortcuts for undo <Ctrl + Z> and redo <Ctrl + Y> also work.



Saving Secondary Curves

The secondary curves selected on the LWD tab of the GeoSteer page can be saved to GeoGraphix using the Save to GeoGraphix button. Previously only primary curves were being saved to GeoGraphix.

Select Curves

Primary Curve

Secondary Curves

GR_N_WR

Vsh1I

GRMWD_N

PHID2

TEMPT ✓

GR_N

TVD


ROP ✓

Calculating Percentage of Wellbore in Zone

The percentage and length of the wellbore path that lies within each zone (formation) displays in the % Zone and Length columns on the Grids tab.

Grid		Chart		Map Coordinate System: NAD27 / Texas North Central							
Grid	Name	Grid Coord System	X	Y	Time	Line Color	Lithology Fill	Length	% Zone		
<input checked="" type="checkbox"/>	Surface 1	SPCS27 - Texas North Central	1,961,870	294,818	17:48 12-Feb-2016	#000000	Sandstone	80	4.3	<input type="button" value="Update"/>	<input type="button" value="Delete"/>
<input checked="" type="checkbox"/>	Surface 2	SPCS27 - Texas North Central	1,961,870	294,818	17:48 12-Feb-2016	#000000	Limestone	481	25.6	<input type="button" value="Update"/>	<input type="button" value="Delete"/>
<input checked="" type="checkbox"/>	Surface 3	SPCS27 - Texas North Central	1,961,964	294,912	17:48 12-Feb-2016	#000000	Dolomite	510	27.1	<input type="button" value="Update"/>	<input type="button" value="Delete"/>
<input checked="" type="checkbox"/>	Surface 4	SPCS27 - Texas North Central	1,961,870	294,818	17:48 12-Feb-2016	#000000	Anyhydrite	808	43.0	<input type="button" value="Update"/>	<input type="button" value="Delete"/>

Printing the Survey Track

You can now preview and print the final presentation plot using the Print Graph  icon on the GeoSteer page. Only the portion of the wellbore path from the landing point of the well to the bottom hole location is included. The target line (if any) is also included in the preview and print.

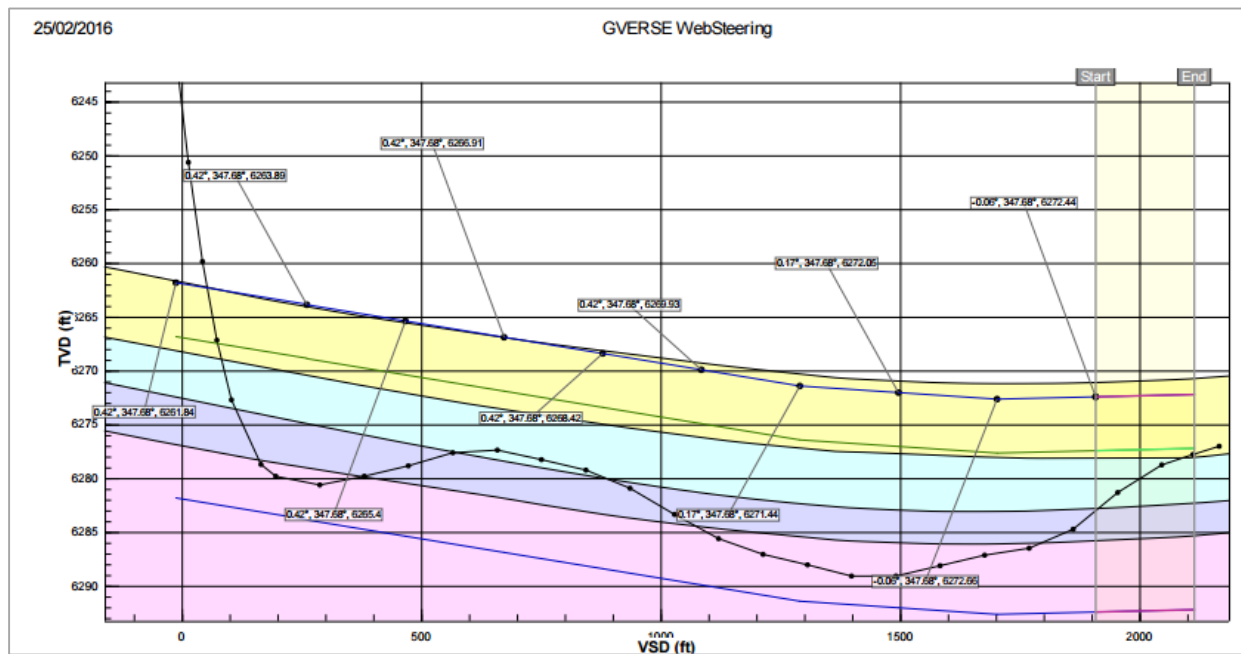
Select attributes from the Select Attributes pop-up dialog.

Select Attributes

Select Attributes to show in print view

- Sequence
- Dip
- Azimuth
- MD/VSD
- TVD

The selected attributes display in print preview.



Assigning Lithology Fills to Grids

You can assign lithology fills to grids on the Grids tab of the Dashboard page.

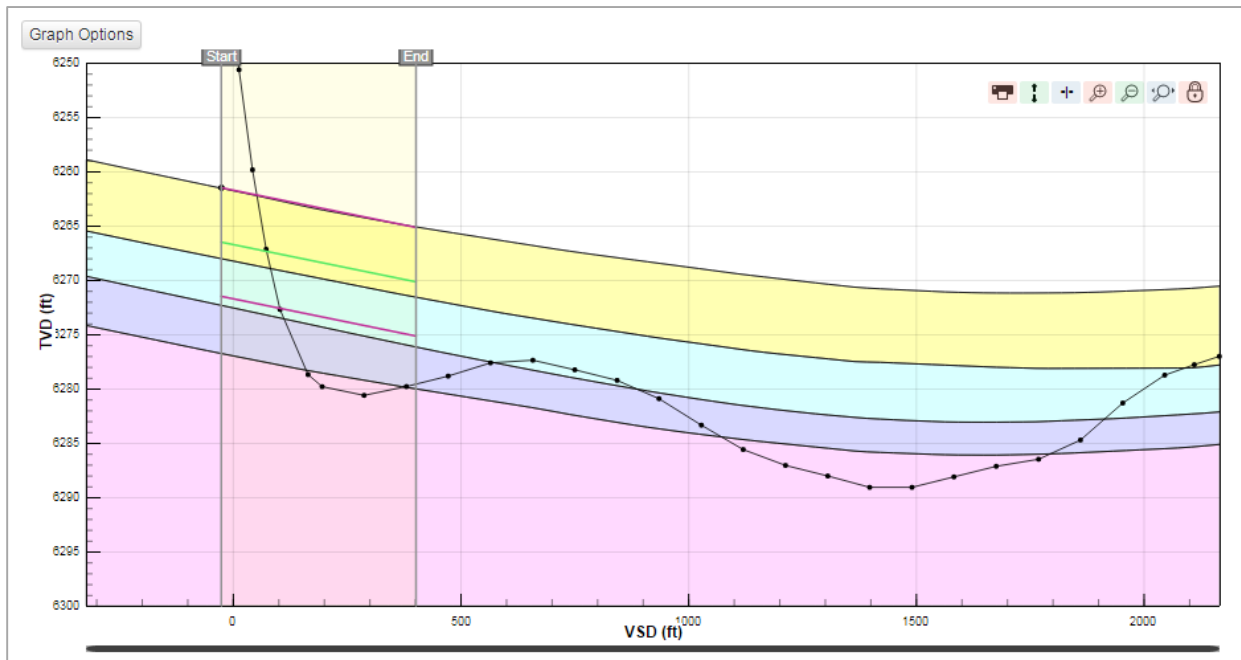
Map Coordinate System: NAD27 / Texas North Central

Grid	Name	Grid Coord System	X	Y	Time	Line Color	Lithology Fill	Length	% Zone	Update	Delete
<input checked="" type="checkbox"/>	Surface 1	SPCS27 - Texas North Central	1,961,870	294,818	17:48 12-Feb-2016	0000000	Sandstone	80	4.3	Update	Delete
<input checked="" type="checkbox"/>	Surface 2	SPCS27 - Texas North Central	1,961,870	294,818	17:48 12-Feb-2016	0000000	Limestone	481	25.6	Update	Delete
<input checked="" type="checkbox"/>	Surface 3	SPCS27 - Texas North Central	1,961,964	294,912	17:48 12-Feb-2016	0000000	Dolomite	510	27.1	Update	Delete
<input checked="" type="checkbox"/>	Surface 4	SPCS27 - Texas North Central	1,961,870	294,818	17:48 12-Feb-2016	0000000	Anhydrite	808	43.0	Update	Delete

Showing 1 to 50 of 3600 rows
50 records per page

Grid: Surface 3

The selected lithology fills display on the Survey track of the GeoSteer page.



Selecting Wells on the Basis of Lease Name and Number

You can now select well on the Type Logs tab on the basis of Well ID or Lease Name and Number from the Type Logs tab of the Dashboard.

The screenshot shows the 'Type Logs' tab in a software interface. On the left, there is a table with columns: MD, SHIFT TVD, VALUE, N/S OFFSET, E/W OFFSET, and RSD. Below this table, it says 'Showing 1 to 50 of 11235 rows' and '50 records per page'. On the right, there is a detailed view for a selected well (Well ID: 42221311580009, Curve: GR). This view includes a table with columns: Well ID, Curve, Top MD, Base MD, Top TVD, Base TVD, Color, and buttons for 'Convert' and 'Delete'. The 'Color' column shows '#1f0ede'. Below the table, there is a note: 'Drag and drop LAS file onto Typelog table'.

Type Logs

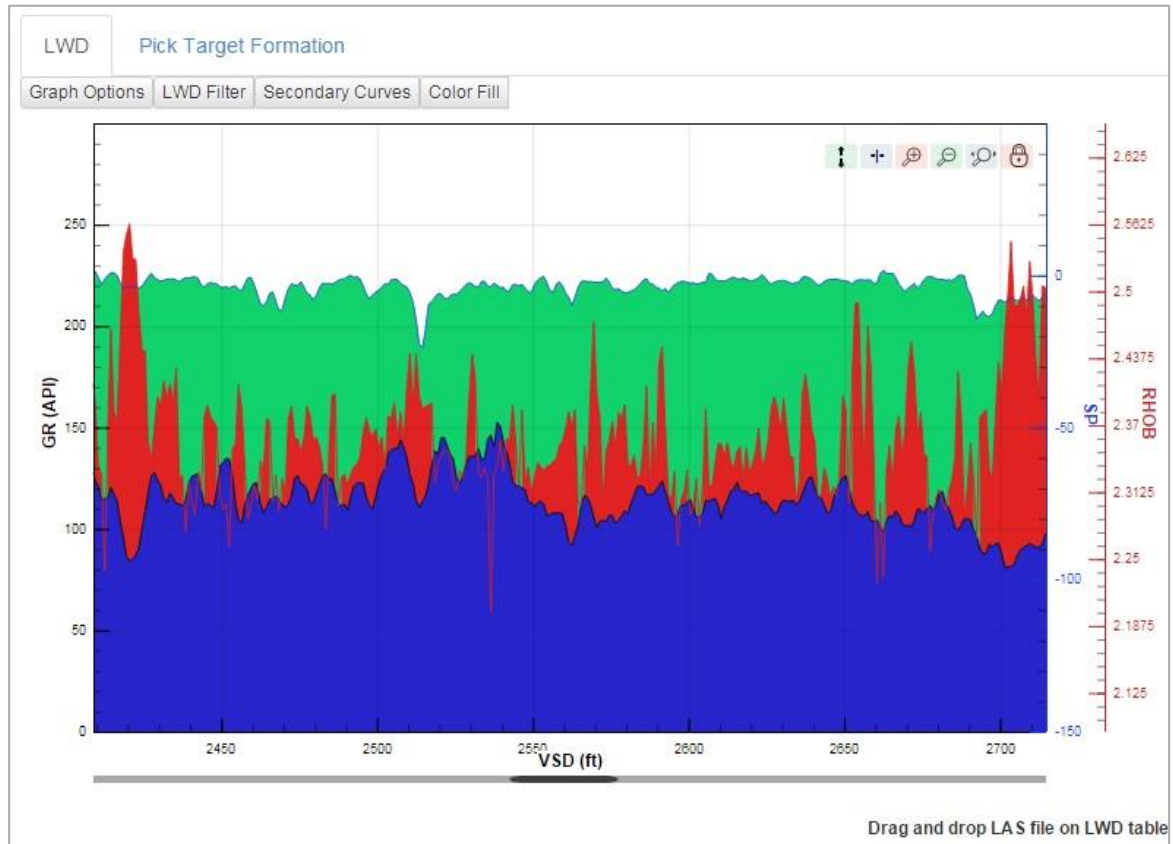
Only wells with vector logs display in the Wells drop-down list on the Type Logs tab of the Dashboard page.

Color Fill Log Curves

You can apply color fill between two log curves, or between a log curve and a constant value, from the LWD tab of the Dashboard page and the GeoSteer page.

The screenshot shows the 'Color Fill' configuration panel. It contains three rows of settings, each with a checked checkbox, a 'TOP' dropdown, a 'CONSTANT' dropdown, a 'BOTTOM' dropdown, a 'COLOR' dropdown, a 'TRANSPARENCY' dropdown, and a 'Delete' button. The first row has TOP: GR, CONSTANT: 0, BOTTOM: Const, COLOR: #2825cc, TRANSPARENCY: 0.5. The second row has TOP: RHOB, CONSTANT: 2, BOTTOM: Const, COLOR: #e12323, TRANSPARENCY: 0.5. The third row has TOP: SP, CONSTANT: -100, BOTTOM: Const, COLOR: #12d26d, TRANSPARENCY: 0.5. At the bottom of the panel is a large blue 'Add' button.

The same color fill displays on the LWD tab and GeoSteer page, irrespective of where it was set.

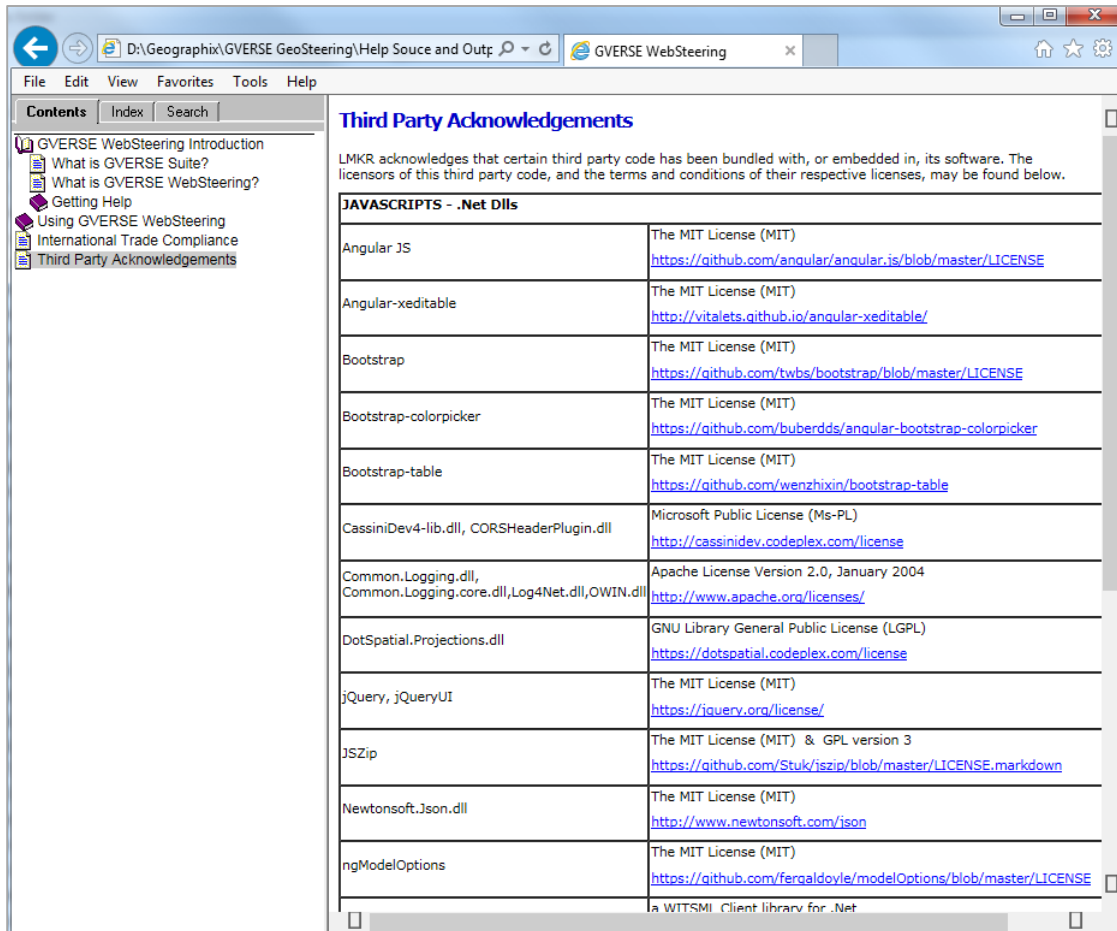


Third Party Applications

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 WebSteering software Help file.

To access the third party license agreements:

1. Click **Help** from the main menu bar.
2. Open the **Third Party Acknowledgements** help topic.



International Trade 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 (if available) 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.

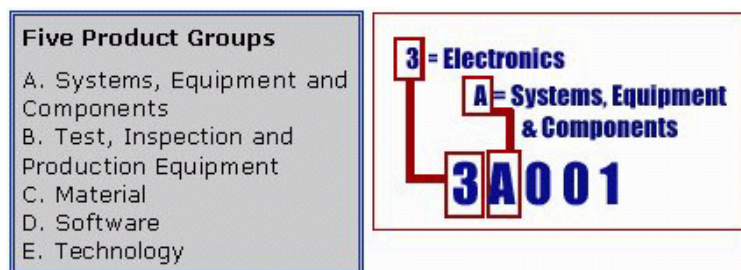
Under the U.S. Export Administration Regulations (EAR), the U.S. Government assigns your organization or client, as exporter/importer of record, responsibility for determining the correct authorization for the item at the time of export/import. Restrictions may apply to shipments based on the products, 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

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 following illustration is a sample:



The ECCN number (if available) and License Type for this product are included in the table below. Also included is the date the table was last updated.

Product/Component/R5000	EAR Number	License	Last Updated On
GVERSE Connect	EAR99	EAR	11/23/2015

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 8am-6pm CST Toll Free (US/Canada) : +1 855 GGX LMKR (449 5657) Colombia : +57 1381 4908 United States : +1 303 295 0020 Canada : +1 587 233 4004 *Excluding bank holidays</p>	<p>UK Monday - Friday 8am - 5pm +44 20 3608 8042 *Excluding bank holidays</p> <p>UAE Sunday - Thursday (Dubai GMT+4) 8am - 5pm +971 4 3727 999</p> <p>Egypt Sunday - Thursday +0800-000-0635 *Excluding bank holidays</p>
Asia Pacific & Australian Continent	Southwest Asian countries
<p>Malaysia Monday - Friday (Kuala Lumpur GMT+8) 9am - 6pm +60 32 300 8777 *Excluding bank holidays</p>	<p>Pakistan Monday - Friday (Islamabad GMT+5) 9am - 6pm +92 51 209 7400 *Excluding bank holidays</p>

Helpful Links

Name	Website Address
LMKR Homepage	http://www.lmkr.com
LMKR GVERSE	http://www.lmkr.com/gverse
LMKR Support Portal	http://support.lmkr.com