

**MARS®**

**MERRICK ADVANCED REMOTE SENSING SOFTWARE  
RELEASE NOTES**

CURRENT VERSION: 2017.2

RELEASE DATE: SEPTEMBER 15, 2017



**MERRICK®**



[www.merrick.com](http://www.merrick.com)

# MARS® v2017.2 Release Notes

Revised: September 12, 2017 (Builds 8301.01 – 8302.00)

---

## Contents

New Features: .....	2
Enhancements: .....	3
List of Bug Fixes.....	4

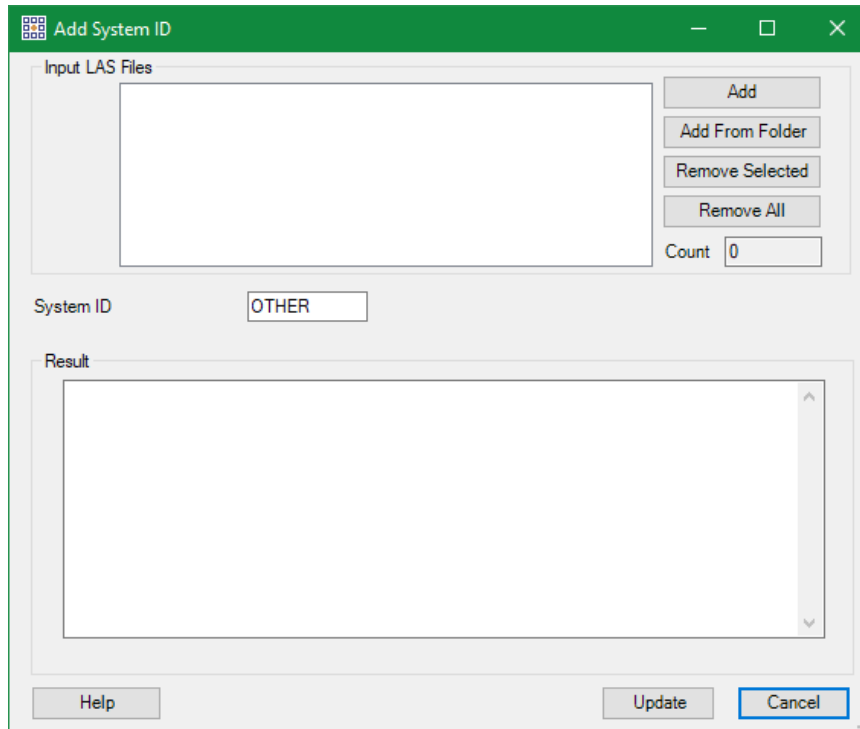
---

## New Features:

### **New tool implemented to populate 'System Identifier' field in the headers of LAS files.**

---

A new tool – 'Add System ID' – has been implemented to populate or edit the 'System Identifier' field in the Public Header Block of LAS files. This field can hold up to 32 bytes (characters) of information. If a value is already present in the file header(s), it will be silently overwritten by the tool. This tool will not allow complete removal of existing entries.



### **Several new shortcut keys implemented.**

---

A new shortcut key – 'Ctrl-J' – has been implemented to color points or TINs by RGB values stored at the point level.

This shortcut is the equivalent of clicking the 'Color by RGB' rendering option button  on the 'View' tab.

Additionally, three new shortcuts that help speed up hand-filtering have been implemented: 'Q' to enable the panning tool, 'W' to start the 'Place Adjustable Cross-Section Line' tool (when a Cross-Section/Profile window is open), and 'E' to start the 'Filter Region' tool that allows a box to be dragged over an area being filtered.

---

## Enhancements:

### **Performance enhancements to LAS loading, navigating, and rendering.**

Many significant improvements have been made to LAS loading times, point and TIN rendering, and Pan/Zoom operations.

### **Tile shapefile should not be already loaded in either 'Reference Shapefiles' or 'Breaklines' layers prior to loading in 'Tiles' layer.**

When a shapefile is added to the 'Tiles' layer, MARS® will check and silently remove it first from the 'Reference Shapefiles' or 'Breaklines' layers *if the same path/file exists in either of those layers.*

### **'Add Spatial Index' tests for blank 'System Identifier' field in LAS file headers and populates any that are found.**

When using the standalone 'Add Spatial Index' tool or choosing 'Spatially Index LAS Files and Add Them to Project' if prompted during loading, all files will be tested for empty 'System Identifier' header fields. If blanks are found, the tool will populate this field with 'OTHER'. Files with values already in place will not have this field altered.

### **QC Module USGS 1.2 tool tests for blank 'System Identifier' field in LAS file headers.**

In the QC Module 'USGS NGP – Version 1.2' drop-down tool, test DPH-1 now tests for blank 'System Identifier' fields in the headers of both swath and tiled LAS files, and reports on them in the sub-section DPH-1.1 tables.

### **Overlap bit-flagged points forced on for 'Flightline Separation – JPEG 2000' export type.**

Since Overlap bit-flagged points often delineate the area to be measured in a 'Flightline Separation – JPEG 2000' raster export type, those points are now forced on as part of the export.

Bit Flags

Include

- Synthetic
- Withheld
- Overlap
- Edge of Collection Scan

Flagged points only

## Breaklines can now be saved at the root of a drive.

Breaklines saved using the 'Save Breaklines to Shapefile(s)' button on the 'Breaklines' tab can now be stored in the root folder of a drive.

## Changes to final PDF report highlighting for QC Module USGS 1.2 test DPH-14.

Improvements have been made to test DPH-14 in the QC Module 'USGS NGP – Version 1.2' drop-down tool. PDF report highlighting of non-zero point counts has been enhanced to emphasize anything above the minimum USGS class requirements (yellow background), as well as disallowed class/bit-flag combinations (red font).

## Withheld flagged points not used in most tools and tests of the 'QC Module'.

Points flagged as Withheld are no longer used in any processing for the 'LiDAR Workflow QC – 1 LiDAR Data Checks', 'LiDAR Workflow QC – 2 LiDAR Calibration Checks', or 'USGS NGP – Version 1.2' tools in the QC Module drop-down list, except for tests DPH-12 and DPH-14 in the 'USGS NGP – Version 1.2' tool.

## Withheld flagged points not used in 'Check Point Report' tool.

All points flagged as Withheld are now omitted from any processing and reporting when running the 'Check Point Report' tool.

## List of Bug Fixes:

- Bug fixed causing striping in tiled IMG Grid intensity raster exports.
- Bug fixed allowing Flightline Separation raster export output to be clipped to a boundary even when that option was unchecked.
- Bug fixed preventing optional classification reassignment from working when using the 'Folder' option of the 'Clear Bit Flags' tool.
- Bug fixed causing an error when using the 'Set Keypoint Bit Flag' option of the 'Class to Bit Flag' tool.
- Bug fixed creating tiled Regular Flightline Separation rasters when the Measurable option was chosen.
- Bug fixed in the QC Module 'LiDAR Workflow QC – 1 LiDAR Data Checks' drop-down test DC7 that was incorrectly using Withheld flagged points in Flightline Separation raster creation.
- Bug fixed in the QC Module 'LiDAR Workflow QC – 2 LiDAR Calibration Checks' drop-down test CC1 that was incorrectly using Withheld flagged points in both Regular and Measurable Flightline Separation raster creation.
- Bug fixed in the QC Module 'USGS NGP – Version 1.2' drop-down test DPH-11.1.2 that was incorrectly using Withheld flagged points in Flightline Separation raster creation.
- Bug fixed causing shortcut key 'I' (Inspect) to fail when used in the Cross-Section/Profile window.
- Bug fixed causing the 'Remove Duplicates' tool to fail when the entire LAS file has duplicate points.
- Bug fixed leaving Virtual Tile artifacts in exported Float Grid rasters when using the 'Auto Calculate Virtual Tile Size' option.

- Bug fixed that was not allowing all individual LAS entries in the Table of Contents to be unchecked for display.
  - Bug fixed in the 'Check Point Report' tool that was incorrectly using Withheld flagged points in processing.
  - Bug fixed to display an advisory message rather than cause a crash when no classes are selected for the 'Class to Bit Flag' tool.
  - Bug fixed causing wrong drop-down list option to display when using 'Edit Selected Set' for hand editing.
  - Bug fixed that prevented shortcut key 'Ctrl-M' from displaying the correct point classifications.
-

# MARS® v2017.1 Release Notes

Revised: May 18, 2017 (Builds 8300.01 – 8301)



## Contents

New Features: ..... 2

Enhancements: ..... 3

List of Bug Fixes..... 7

---

## New Features:

### New filter for modifying bit flag status implemented.

---

A new filter – ‘Change Bit Flags’ – has been implemented that allows for modifying the ‘set’ or ‘clear’ status of several bit flags. Options include re-classifying those points that have had bit flag modifications and limiting the operation to a single collection scan.

The screenshot shows a software dialog box titled "Change Bit Flag Options". It features several sections for configuration:

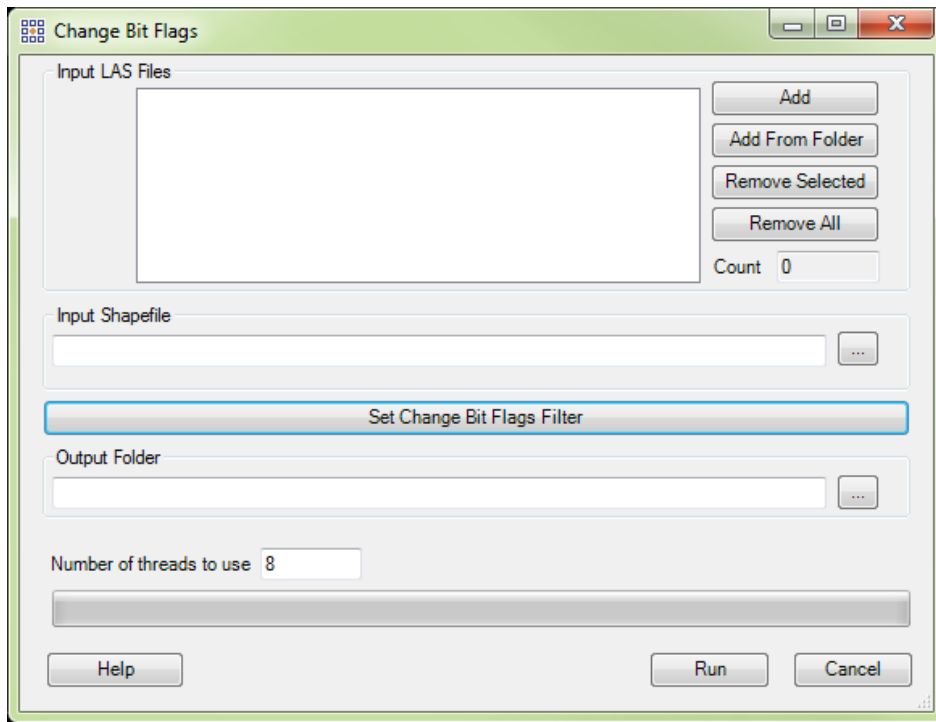
- Source/Target/Step Size:** A list of source classifications from 0 to 20, with a "Select" button.
- Reclass Option:** A checkbox for "Reclass Modified Points" and a "Target Class" field with a "Select" button.
- Step Size:** A text input field containing "3000".
- Overlap (%):** A text input field containing "0".
- Bit Flag Modification Options:** Four rows, each with a category name and two checkboxes: "Set" and "Clear". The categories are Synthetic, Model Keypoint, Withheld, and Overlap.
- Other Options:** A checked checkbox for "Use All Collection Scans" and a "Collection Scan Number" text input field.
- Comments:** A large empty text area for notes.
- Buttons:** "Help", "OK", and "Cancel" buttons at the bottom.

### New multi-threaded tool implemented to perform the same functionality as the new ‘Change Bit Flags’ filter (above) without loading the LAS data.

---

A new tool – ‘Change Bit Flags’ – has been implemented to perform the same functions as the ‘Change Bit Flags’ filter (mentioned above), but with multi-thread capability and with no need to load the LAS data first. Input LAS data is pathed out along with a pre-existing polygon shapefile to define the area(s) to be processed. An output folder is selected for the modified files. The tool can be found on the ‘Tools’ tab under the ‘Bit Flag Settings’ drop-down.





## **New panning method implemented using compatible mouse.**

When using a scroll-wheel mouse that has a button action for the wheel, panning can be done by pushing and holding the scroll wheel while moving the mouse.

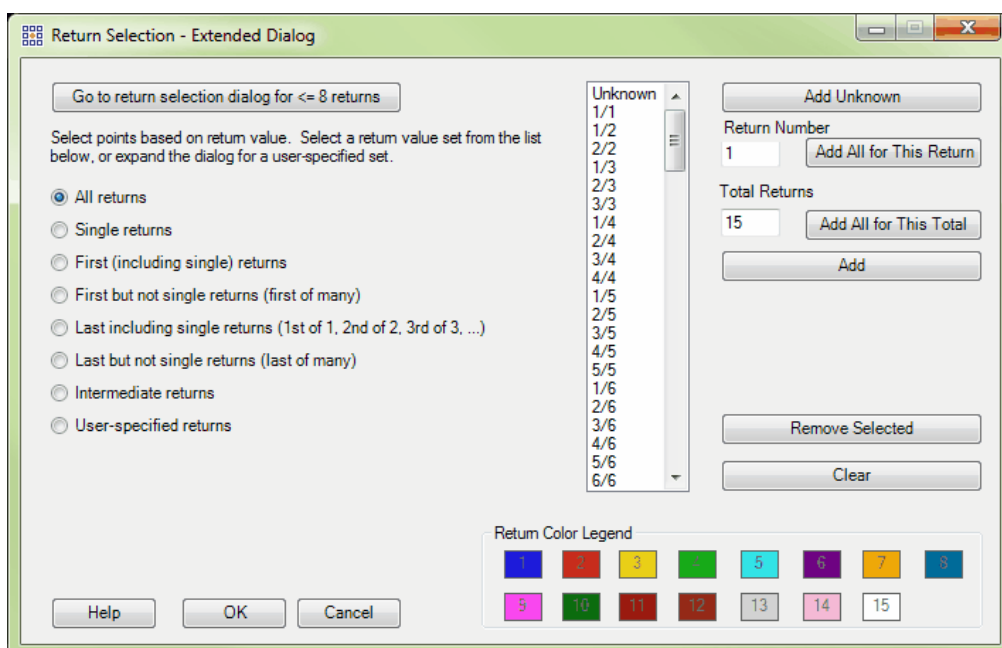
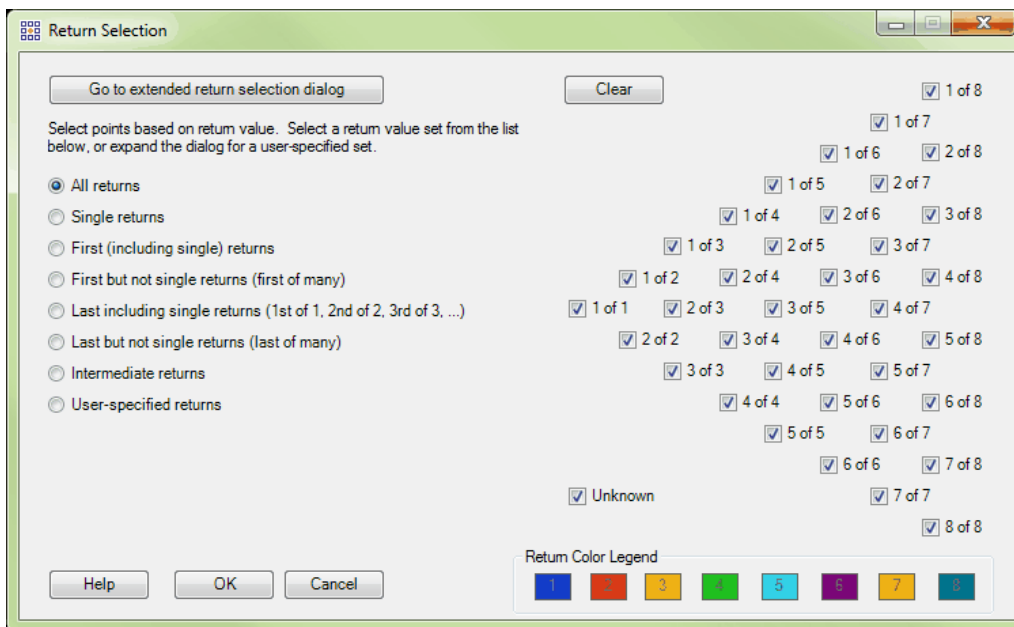
## **New shortcut key implemented to turn on display for Classes 2 and 8 only.**

A new shortcut key combination – ‘Ctrl-M’ – has been implemented to turn on display for Classes 2 and 8 only. Most pre-LAS v1.4 data used Class 8 for Model Keypoints (rather than bit flags) so this shortcut quickly enables all ground points to be displayed.

## **Enhancements:**

### **Extended returns can now be selected for viewing, filtering, and Export.**

All possible returns (up to 15 for LAS v1.4 data) can now be selected - in any combination - for viewing, filtering, and inclusion in ‘Export’.



## More complete and consistent LAS statistics provided for several tools.

Statistics that are reported in shapefile attribute tables for several tools – ‘Populate Statistics on Tile Scheme’, ‘Create Tile Scheme’, ‘Collection Scan Polygon Generator’ - and are now more homogenous across the tools and include more information. Bit flag counts by tile/file as well as extended return counts (for up to 15 discrete returns) are now included.

Default ground and reference classes in many tools have been modified to correspond to the ASPRS LAS v1.4 specification.

The default ground and reference classes have been changed for many tools' interfaces to correspond to the standard class numbers in the ASPRS LAS v1.4 specification.

### **'Make Color/Description Default' button removed from main 'Classifications Display Settings' interface.**

The 'Make Color/Description default' button has been removed from the 'Classifications Display Settings' interface that opens when the 'Classification' button is clicked in the 'Display Selection' section of the 'View' tab. These settings are hard-coded to comply with the ASPRS LAS v1.4 specification and should not be permanently changed. There is an option to make customized settings files that can be loaded for certain projects as needed without changing the default values that are used when a MARS® session is started.

### **Extraction tools removed from list of discrete filters in 'Batch Process Tiles'.**

The four extraction tools – Area by Slope, Building Polygons, Canopy Density, and Class Polygons – have been removed from the list of built-in filters that can be selected on the 'Script/Filters' tab of the 'Batch Process Tiles' tool. They can still be used with the various 'manual' extraction method tools and as part of a macro script.

### **'Projection' tab of 'Export' tool modified when exporting TIFF Grids.**

The 'WKT' (Well-Known Text) section of the 'Projection' tab of 'Export' has been disabled when exporting TIFF Grids. TIFF Grids store this information in a GeoTIFF format in the header of the raster file, or in a separate world (TFW) file.

### **'Exclude withheld points' checkboxes removed from all class selection interfaces.**

All class selection interfaces now omit the 'Exclude withheld points' checkboxes that were once used to control display and processing of classes 128-255. These classes were often treated as the withheld versions of classes 0-127 in older (pre-LAS v1.4) data. Withheld status is now determined by bit flag.

### **'Smart Clip' filter now uses scan angle rank values with LAS v1.4 PDRF 6 or higher data.**

LAS v1.4 PDRF 6 or higher data stores both the newer scan angle (-15000 to 15000) and legacy scan angle rank (-90 to 90) values per point. The easier-to-understand scan angle rank values, in degrees from nadir, are used by this filter just as they are for the similar 'Scan Angle' filter.

## **Non-visible Withheld points will no longer be selectable when hand filtering.**

When hand-filtering in either the LAS Map View or Cross-Section/Profile window, points that are bit-flagged as Withheld and are not turned on for display can no longer be selected and re-classified using any of the hand filtering tools: paintbrushes, Edit Line String Above/Below, Edit Scrape Above/Below, Edit Digitized Polygon, and Edit Selected Polygons.

## **Grid Type 'Intensity' only available for certain export types.**

Only the 'Grid - Esri ASCII Grid', 'Grid - Float Grid', 'Grid - IMG', and 'Grid - TIFF' Export Types allow selecting the 'Intensity' Grid Type.

## **'Use temporary local disk space ...' option requires a minimum amount of input information before the required space can be calculated.**

A warning pop-up will appear when trying to check on the 'Use temporary local disk space to speed up processing' option for either the 'LiDAR Workflow QC – 1 LiDAR Data Checks' or 'LiDAR Workflow QC – 2 LiDAR Calibration Checks' drop-down if there is not enough information provided on the 'Input' tab. At a minimum, the 'Required NPS' must be entered along with the path to the LAS Files to be tested.

## **Performance improvement in tiled Float Grid exports.**

Processing time has been significantly reduced for tiled Float Grid exports when using the 'TINned Surface Fill' option in the 'Fill Gap' section of the 'Grid' tab.

## **Intensity raster exports have cell values rounded to nearest integer.**

When exporting intensity rasters using either the 'Grid - Esri ASCII Grid' or 'Grid - Float Grid' export types, cell values will now be rounded to the nearest integer.

## **Output file naming changed for 'By Collection Scan' export Layout types.**

For Export types 'LAS' and 'Text – ASCII' when using the 'By Collection Scan' or 'By Collection Scan From User-defined Box' Layout formats, output files will be automatically named based on the collection scan numbers of the points they contain, plus any optionally supplied prefixes and suffixes.

---

## List of Bug Fixes:

- Bug fixed causing saved bookmarks to not be honored when a 3D viewing operation has taken place since the bookmark was saved.
  - Bug fixed causing 'Esri ASCII Grid' type intensity rasters to store cell values with non-zero decimal places.
  - Bug fixed preventing warning pop-up from appearing when 'Output Directory' is blank in Export.
  - Bug fixed causing NoData cells of Unsigned 16-bit Intensity IMG rasters to have a value of 0 (zero) rather than 65535.
  - Bug fixed causing 'Color by Ground Color' rendering option to not display RGB point colors when no image is loaded.
  - Bug fixed preventing several shortcut keys from working: 'underscore' ( \_ ), 'Ctrl-P', 'Shift-P', 'Shift-S'.
  - Bug fixed causing bad on-the-fly contours when part of a polygonal breakline (e.g., lake) is outside main window extent.
  - Bug fixed causing 'Lock to view 100%' to remain enabled after all LAS files are unloaded.
  - Bug fixed causing a program hang in QC Module 'LiDAR Workflow QC – 1 LiDAR Data Checks' drop-down test DC4 and 'LiDAR Point Density – Float Grid' export type when Withheld bit-flagged points exist.
  - Bug fixed in QC Module 'USGS NGP – Version 1.2' drop-down test DPH-11.2 causing a crash if no Project Boundary is pathed out.
  - Bug fixed preventing the 'Blend' rendering option from working in some situations when coloring by Elevation Throughout or Elevation Repeat with the TIN rendering method enabled.
-

# MARS® v2017 Release Notes

Revised: March 15, 2017 (Builds 8200 – 8300)

---

## Contents

New Features: .....	2
Enhancements: .....	3
List of Bug Fixes.....	15

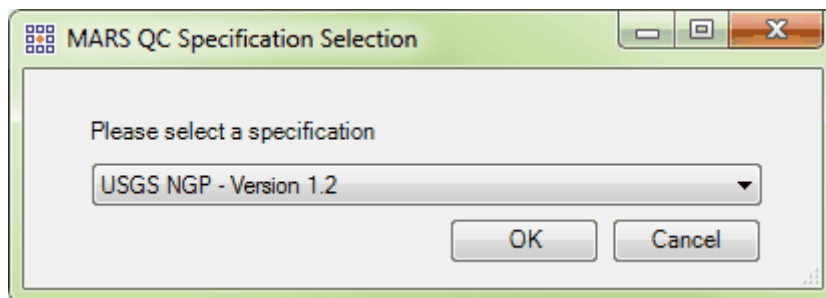
---

## New Features:

### New tool – ‘USGS NGP – Version 1.2’ – added to the QC Module for testing LAS v1.4 datasets against the latest USGS NGP Lidar Base Specification Version 1.2.

---

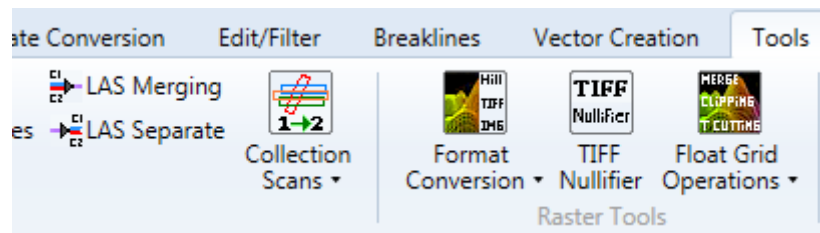
A new version of the USGS tool has been added within the QC Module (‘QA/QC’ tab). Named ‘USGS NGP – Version 1.2’, this tool is designed exclusively for use with LAS v1.4 datasets. (Note: the original ‘USGS NGP – Version 1.0’ tool still exists for testing older versions - LAS v1.0 through LAS v1.3 - of lidar data. The tool tests for compliance with the latest USGS lidar specifications, as contained in the document [USGS NGP Lidar Base Specification Version 1.2](#) (November 2014), and also does file integrity testing. Results are presented in PDF form and include pertinent descriptions from the USGS document, tables, histograms, rasters, screen captures, and more.



### New tool – ‘LAS Separate’ – for splitting multi-channel files into their individual channels.

---

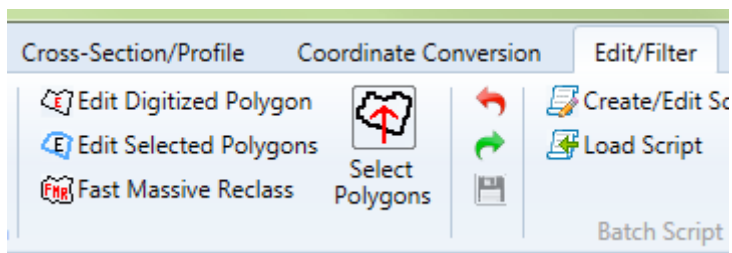
A new tool – ‘LAS Separate’ – has been added to the ‘Tool’ tab. It separates merged multi-channel LAS v1.4 files into separate individual channel files, one file for each scanner channel value found in the original merged file. The Scanner Channel bit flag values must be present in the original merged file for this tool to work - possible bit flag values are 0, 1, 2, and 3.



### New button – ‘Select Polygons’ – for selecting one or more pre-loaded shapefile polygons prior to using the ‘Edit Selected Polygons’ tool.

---

A new button – ‘Select Polygons’ – has been added to the ‘Edit/Filter’ tab to allow selection of any pre-existing polygon(s) before the ‘Edit Selected Polygons’ tool is used for point reclassification. A polygon shapefile must be loaded as a Reference Shapefile to use this tool.



---

## Enhancements:

**‘Check Point Report’ (previously known as Control Report) has been updated to test in accordance with the latest ASPRS and USGS accuracy guidelines.**

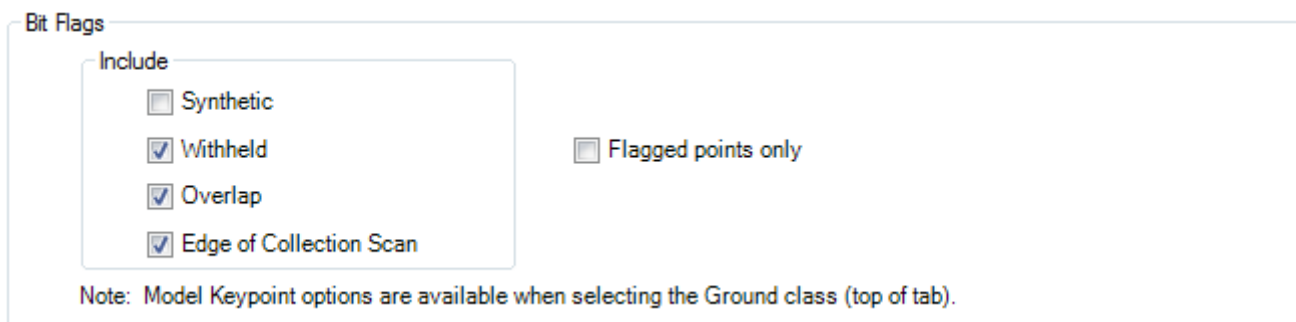
---

The ‘Check Point Report’ tool (‘QA/QC’ tab) has been completely re-designed to test lidar datasets against the latest ASPRS vertical accuracy guidelines, found in [ASPRS Positional Accuracy Standards for Digital Geospatial Data, \(EDITION 1, VERSION 1.0\)](#) that was published in November 2014. The tool also incorporates many of the latest USGS vertical accuracy specifications, as described in the [USGS NGP Lidar Base Specification Version 1.2](#) document, also published in November 2014.

**‘Filters’ tab of ‘Export’ now includes the option of including/excluding those points that have specific bit flags set.**

---

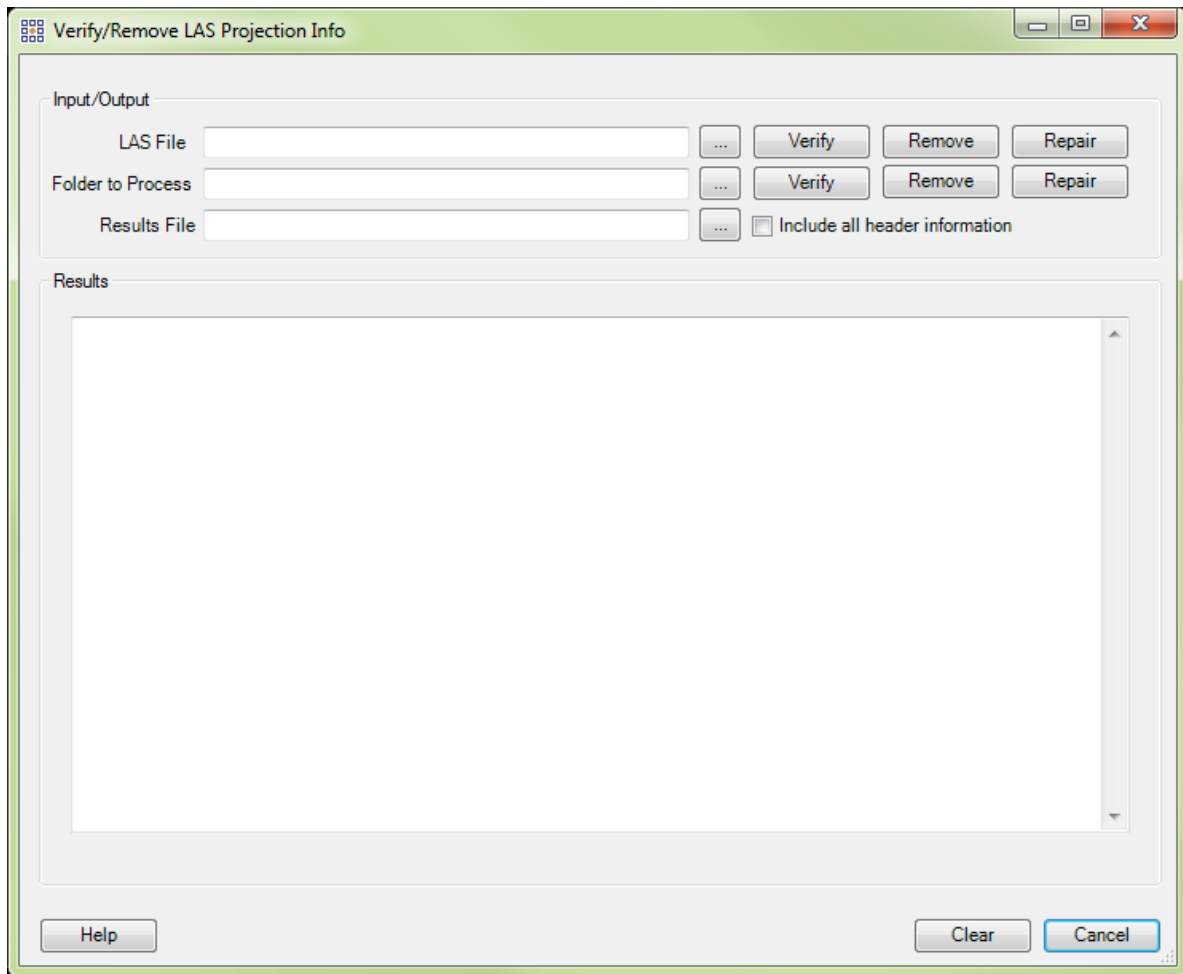
On the ‘Filters’ tab of the ‘Export’ tool, a new section allows for user-selectable inclusion/exclusion of lidar points that have specific bit flags set. In the example below, points that have the ‘Synthetic’ bit flag set to on will not be part of the export, but ‘Withheld’, ‘Overlap’, and ‘Edge of Collection Scan’ flagged points will be included. This option is particularly relevant to LAS v1.4 data, but older versions may have some of the bit flags set as well. Additionally, only those points that are bit-flagged in the included categories will be part of the export set if the ‘Flagged points only’ box is checked.





## 'Repair' button added to 'Verify/Remove LAS Projection Info' tool to fix some EVLR / VLR coordinate system tags.

A new button – 'Repair' – has been added to the interface of the 'Verify/Remove LAS Projection Info' tool. For LAS v1.4 files with incorrect combinations of 'User ID' and/or 'Record ID' values in superseded coordinate system EVLRs and VLRs, this function will correct those values to be in compliance with ASPRS requirements.

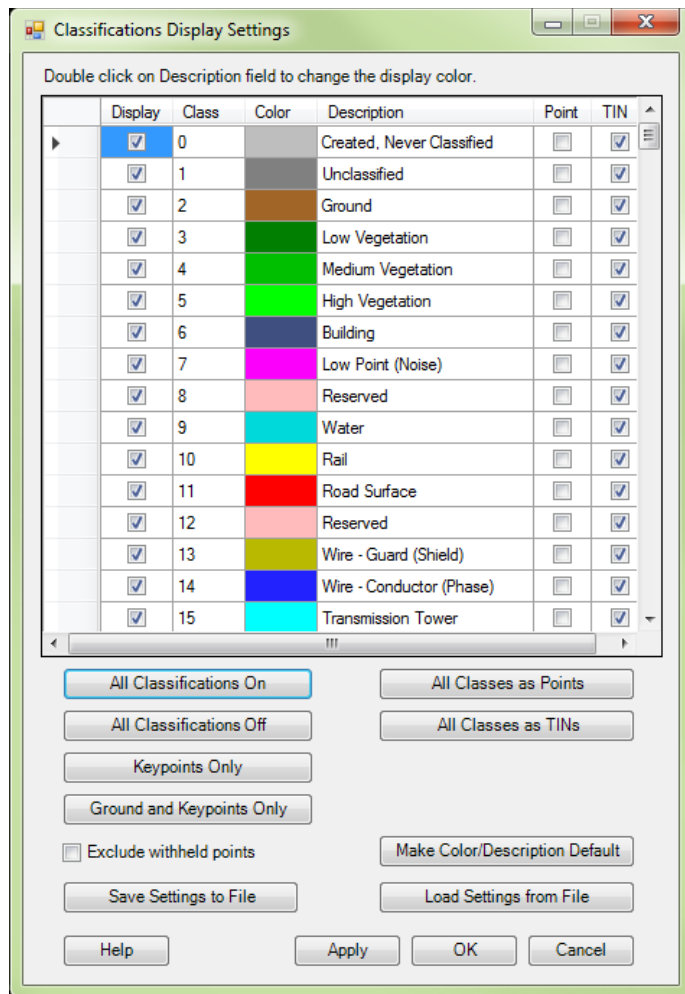


## A pop-up warning will appear if the wrong version of the QC Module is used.

If the version of LAS data being pathed out is incompatible with the version of the QC Module being run, a pop-up warning will appear. 'USGS NGP – Version 1.2' is intended only for LAS v1.4 data, and 'USGS NGP – Version 1.0' is intended only for LAS v1.3 or earlier data.

## New list of Classifications/Descriptions included to match ASPRS specification for LAS v1.4, Point Data Record Format 6 or higher.

A new list of point Classification/Description combinations is now included to match the ASPRS specification for LAS v1.4, PDRF 6 or higher data. An unlimited number of custom settings files can still be made for use with older version data or any other purpose.



### Changes made to some extraction tools when used in a macro script.

To simplify and enhance the functionality of the 'Area by Slope', 'Building Polygons', and 'Class Polygons' extraction tools within a batch macro script, several changes have been made to output shapefile naming. See the 'Extraction Tools' and 'Batch Filter/Extraction Processing' sections in the 'Data Classification (Manual and Batch)' topic of the Help File for details.

### Data must be spatially indexed before it can be processed with 'Remove Duplicates' tool.

To obtain accurate results, data must be spatially indexed before it can be processed with the 'Remove Duplicates' tool. If the data does not have spatial index records, a prompt will appear to remind the user.

## The format of projection system tags created is determined by the version of LAS files being exported.

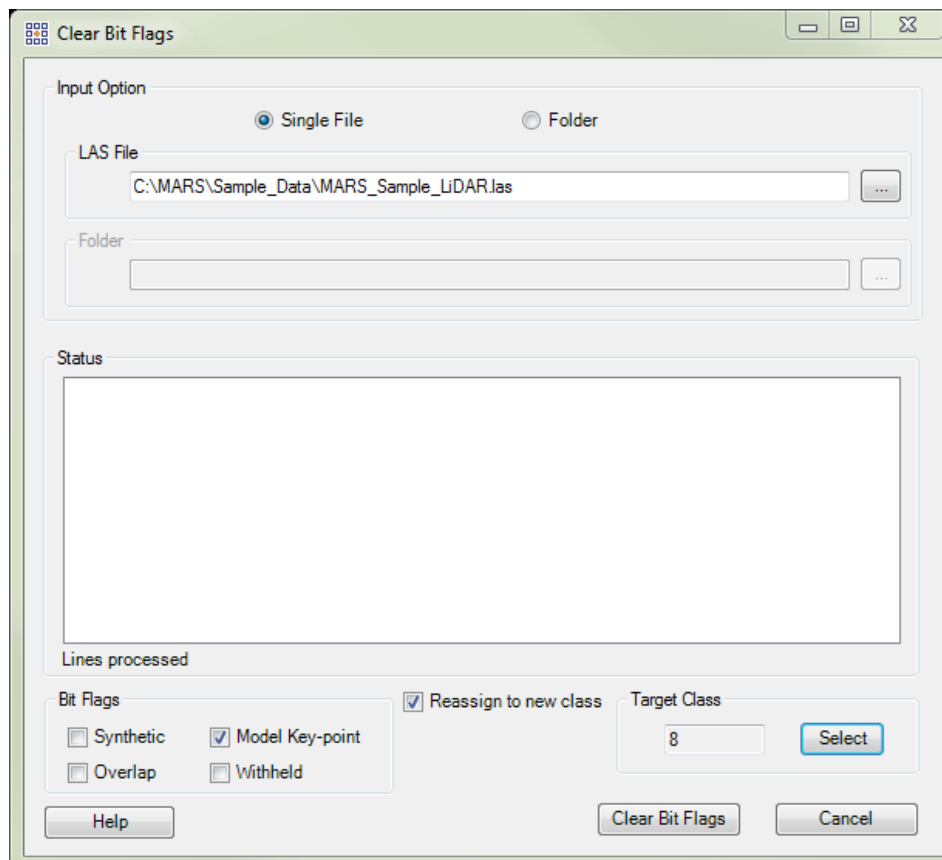
When writing coordinate reference (aka projection) system tags during 'LAS' and 'Grid – LAS' exports, the 'Export' tool now forces the GeoTIFF format for LAS v1.0 thru v1.3 files, and the WKT (Well-Known Text) format for LAS v1.4 files. For LAS v1.4, either a VLR or EVLR can be selected to store the WKT tag.

## 'Cache points into available RAM' option now disabled.

Due to LAS datasets becoming increasingly larger in file size (frequently surpassing the available RAM in a computer) as well as the possibility of lost work caused by an unexpected shutdown of MARS<sup>®</sup> prior to a save operation, the 'Cache points into available RAM' option ('Options' tab, 'Performance' button) has been disabled. LAS data will be read from disk and 'live' edit changes (such as hand filtering) are committed to disk as soon as they occur. Additionally, with newer, faster hard drives such as SSD, the performance difference between disk-based and RAM-based operations is constantly shrinking.

## 'Clear Bit Flags' tool allows cleared points to be assigned to a new class.

There is a new option for the 'Clear Bit Flags' tool that allows those points that have their bit flags cleared (set to '0' or off) to be reassigned to a different classification.

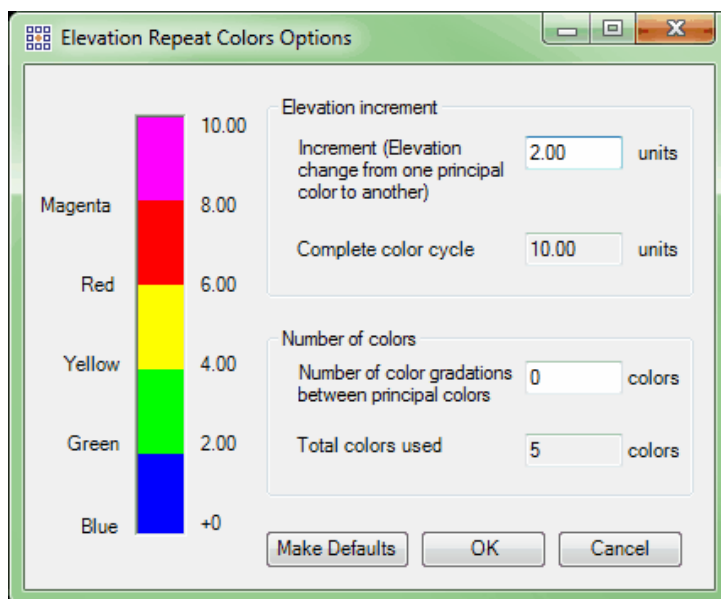


## 'Lock to view 100%' button now available at all times with new warning messages implemented.

The 'Lock to view 100%' button on the 'View' tab is now available for use at all times, including when the density of points displayed is naturally at 100% due to the extent of the 'LAS Map View' window. Confirmation pop-ups will appear when the tool is enabled and the 'Fit to View' button is clicked, or when selecting a layer in the Table of Contents and using the 'Zoom to' button. Display performance may be degraded in these situations.

## Status of 'Elevation Repeat Colors Options' parameters now saved in MPD.

The parameters set for the 'Elevation Repeat Colors Options' tool ('View' tab, Elevation Coloration Options dropdown) are now stored in a MARS® Project Document (MPD) file when it is created or saved.



## Order of items in a WKT-based CRS tag changed to match the latest USGS guidelines.

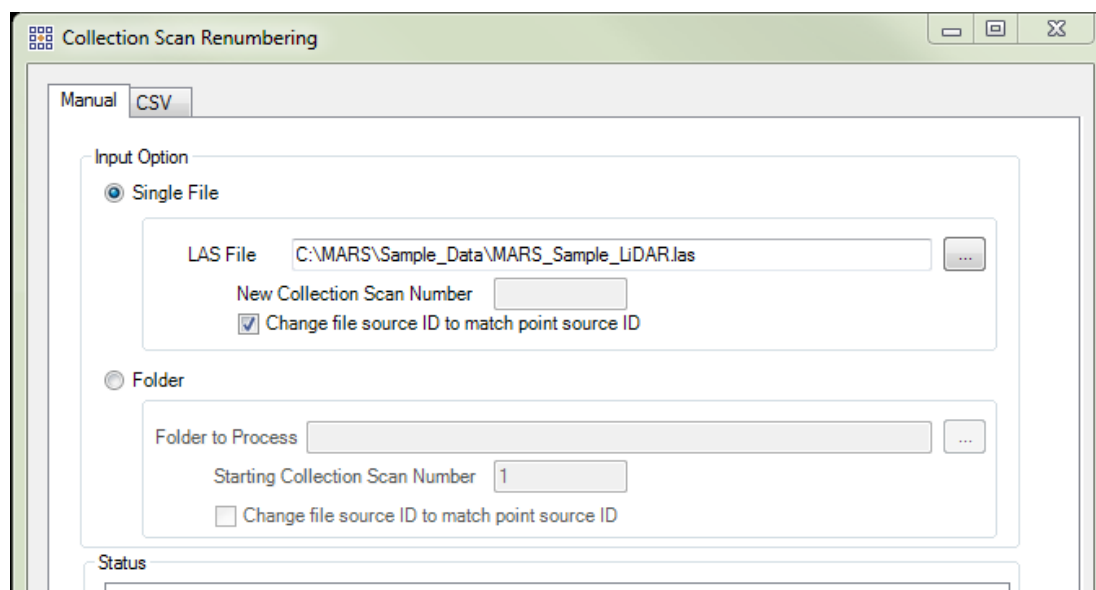
The order of elements in a WKT (Well Known Text) based CRS tag stored in a version 1.4 LAS file has been changed to match the latest USGS guidelines (dated July 2016).

## Change made to spelling of User ID entry for superseded WKT records after updated guidance received from USGS.

Anywhere an existing WKT record (VLR or EVLR) is superseded through the use of tools such as 'Add CRS Info', 'Export', 'GeoCalc', etc., the User ID for the superseded record is now correctly spelled as "LASF\_Spec".

## Option to set File Source IDs to match existing Point Source IDs during Collection Scan Renumbering.

There is a new option for the 'Manual' tab of the 'Collection Scan Renumbering' tool that uses existing Point Source IDs to set the File Source ID for processed files. The option is available for either the 'Single File' or 'Folder' method of renumbering.



## 'Remove Duplicates' tool criteria have been changed.

In order to be consistent with duplicate point testing in the QC Module 'USGS NGP – Version 1.2' drop-down (test DPH-1.2), the criteria for determining if points are duplicated have been modified to X, Y, and Z values and timestamp.

## Label change made to QC Module PDF report pages for Intensity testing.

For the QC Module 'USGS NGP – Version 1.0' and 'LiDAR Workflow QC – 1 LiDAR Data Checks' drop-downs, a label change has been made to the bottom of the tabular portion of the 'Report on Intensity' tests in the PDF reports. The label 'Average' below the individual file results now reads 'Overall Statistics' to properly reflect the results displayed.

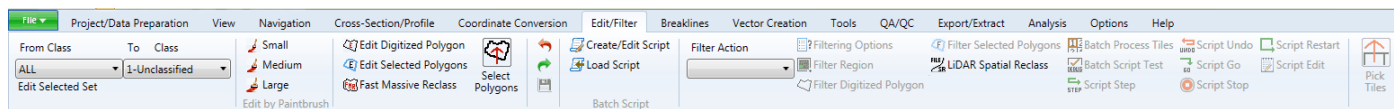
LDR031002_181630_1.LAS	00	25%
LDR031002_183237_1.LAS	00	25%
LDR031002_183709_1.LAS	00	25%
Overall Statistics	00	25%

'Extract by Tile' checkbox and label removed from the options interfaces of all shapefile producing extraction tools.

On the 'Area by Slope', 'Building Polygons', and 'Class Polygons' extraction tool options interfaces, the checkbox and label for 'Extract by Tile' have been removed since they are no longer needed.

## 'Edit/Filter' tab labeling changed for some tools to make space for a new editing button.

Several tools on the 'Edit/Filter' tab have new shorter labels to make room for the new 'Select Polygons' tool in the Edit section.



## Default output PDF file names changed for both versions of the USGS QC Module to differentiate between them.

The upcoming addition of a second USGS QC Module - 'USGS NGP – Version 1.2' – has created the need to modify the default names of the PDF reports produced to indicate which version created them – 'QC\_1\_0\_All.pdf' and 'QC\_1\_0\_All\_Summary.pdf' or 'QC\_1\_2\_All.pdf' and 'QC\_1\_2\_All\_Summary.pdf'.

## Enhancement made to GeoCalc and GeoEdit to make an additional Vertical Reference System entry visible.

An enhancement has been made to the 'geodata\_72.xvw' file (part of the Blue Marble Geographics package licensed in MARS®) to make an additional Vertical Reference System visible for selection. 'NAVD 88 (ftUS)', which uses an EPSG code of 6360, can now be selected from the **Vertical | North America | United States** section of the Vertical Coordinate System datasource.



Display Name	Name	Datum	Units	Area of Use	EPSG Code
NAVD88 height	NAVD88 height	North American Vertical Datum 1988	Meter	North America - Mexico and USA - onshore	5703
NAVD88 height (ftUS)	NAVD88 height (ftUS)	North American Vertical Datum 1988	US Survey Foot	USA - CONUS and Alaska - onshore	6360
NGVD29 height	NGVD29 height	National Geodetic Vertical Datum 1929	US Survey Foot	USA - CONUS - onshore	5702

## Multi-threading option implemented for 'Add CRS Info' tool.

To decrease processing time, an option to use multi-threading has been added to the 'Add CRS Info' tool.

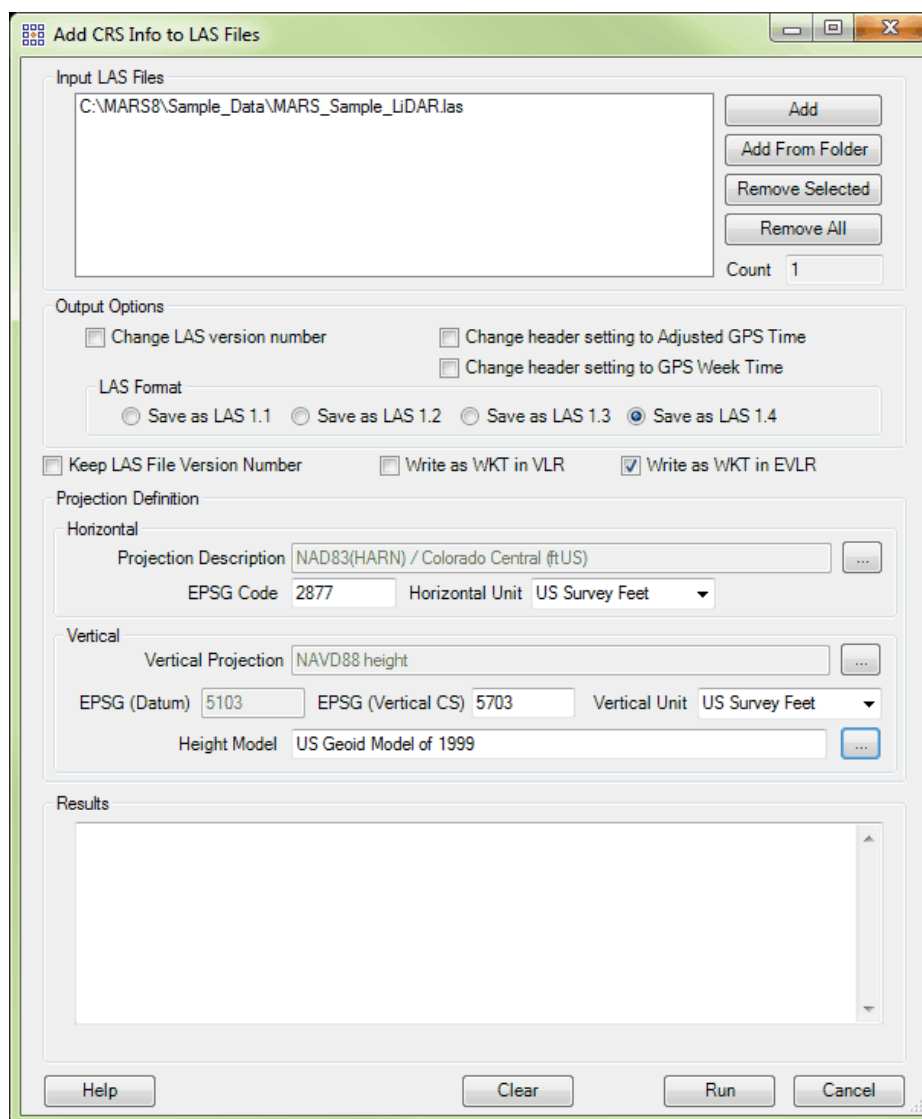
## Settings XML files renamed for both versions of the USGS QC Module to differentiate between them.

The upcoming addition of a second USGS QC Module - 'USGS NGP – Version 1.2' – has created the need to rename the settings XML files that are produced each time the Version 1.0 or 1.2 tools are run. The new naming will indicate which version was used.

 Settings\_USGS\_1\_0\_QC\_20160715\_100509.xml  
 Settings\_USGS\_1\_2\_QC\_20160722\_112847.xml

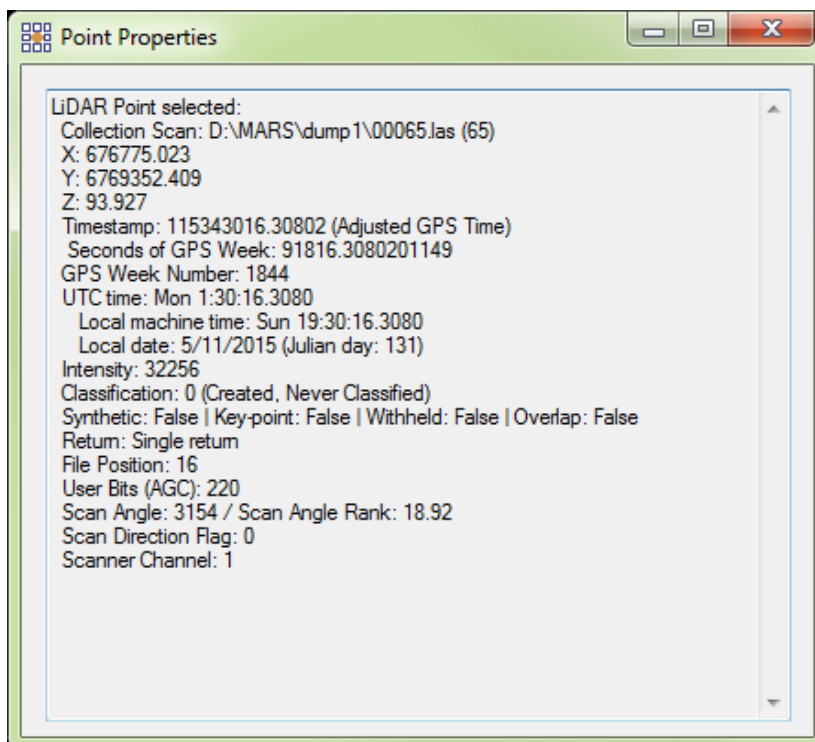
## 'Add CRS Info' (LAS files) tool enhanced to allow writing of WKT format coordinate reference system information for LAS v1.4 files in a VLR.

An option for writing WKT format coordinate reference system (CRS) information in a Variable Length Record (VLR) for LAS v1.4 files has been added to the 'Add CRS Info' (LAS files) tool. This will prevent having a mix of EVLRs and VLRs in the same LAS file when the existing records are in VLR format. Note that neither option is now set as a default – the user must select one before running the tool.



## Scanner Channel bit flag value displayed in 'Point Properties' window.

When available in the LiDAR data, scanner channel bit flag values (indicating which channel in a multi-channel system collected a return) will be displayed in the 'Point Properties' window when a point is identified with the 'Inspect' tool. This value can be stored in LAS v1.4, Point Data record Format 6 or higher data.



## Open Street Maps has been added to the list of 'Default Servers' available as a source to the WMS tool.

When using the 'Add WMS Images' tool to add Web Map Service layers to the LAS Map View window, 'Open Street Maps' is now an available option. Unlike the Bing Map layers, these are free to use and do not require a license token. There are four layers available from this server.

## Enhancements made to export options for Intensity rasters.

When exporting Intensity rasters to any of the available formats, the options for 'Data Type' on the 'Grid' tab of the 'Export' interface have been clarified and enhanced. The 'Float 32' option is now disabled since there is no need to use floating values to store integer intensity values. The two data types available are 'Int 32' (which is a signed data type), and 'Unsigned 16'.



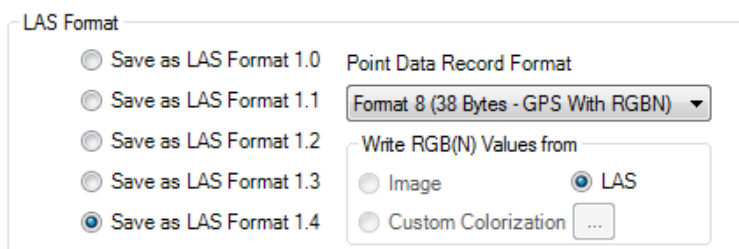


## Missing raster data in test 1.9.2 of QC Module 'USGS NGP – Version 1.0' drop-down explained.

Data from sensors that do not store differentiating Scan Direction values cannot be used to create rasters for QC Module 'USGS NGP – Version 1.0' drop-down test 1.9.2 (current Riegl airborne sensors are an example of this). An explanation of the absence of rasters will be listed in the PDF report for this test section.

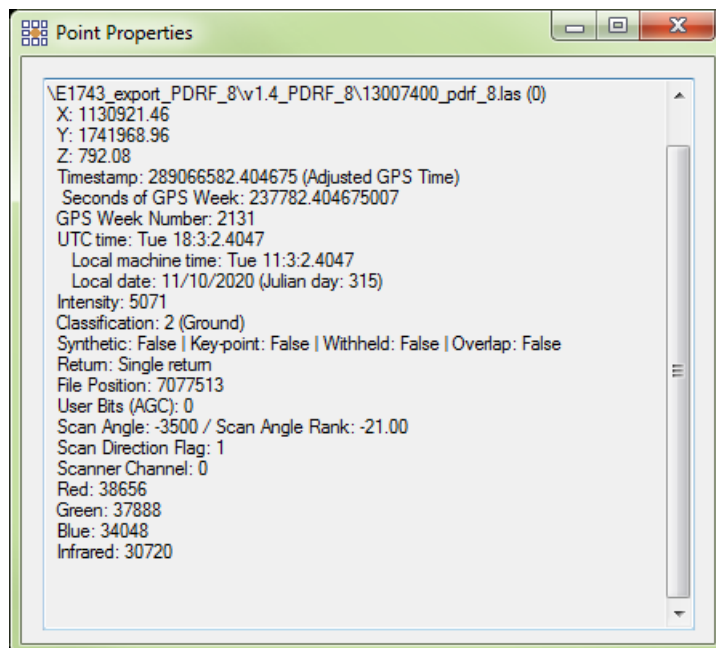
## Change to label text for LAS export type to include reference to infrared.

For the 'LAS' export type, the 'Write RGB Values from' section label has been changed to 'Write RGB(N) Values from' to include a reference to infrared values that can be stored in Point Data Record Format 8 LAS files.



## Point inspection tool now reports on NIR values for LAS v1.4 PDRF 8 data.

The LiDAR point inspection tool (  'Inspect' ) now reports 'Infrared' values along with RGB values for LAS v1.4 Point Data Record Format 8 data.

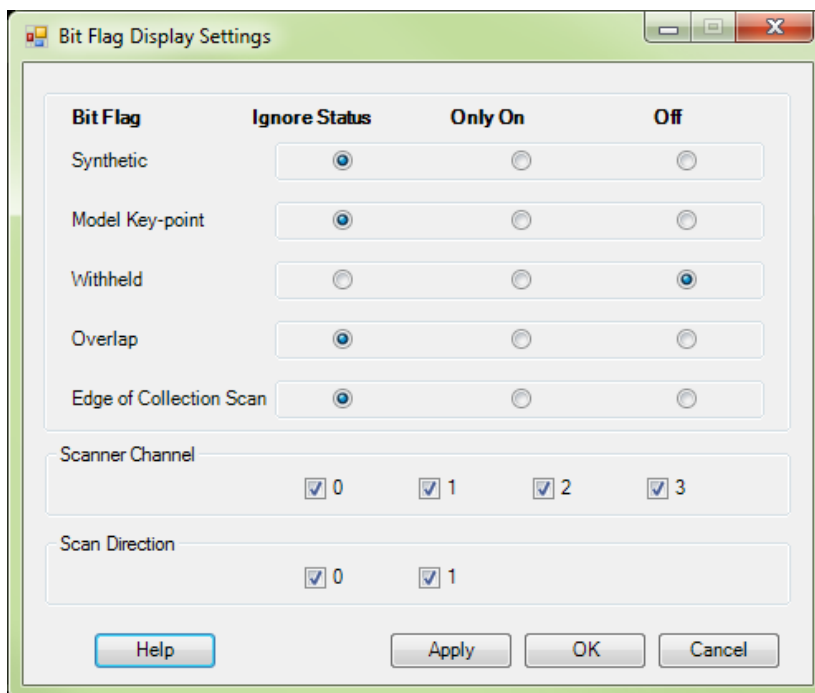


## Appearance of TIFF intensity rasters improved with certain source data.

The appearance of exported TIFF intensity rasters has been improved when the source LAS data contains 12-bit or 16-bit intensity values.

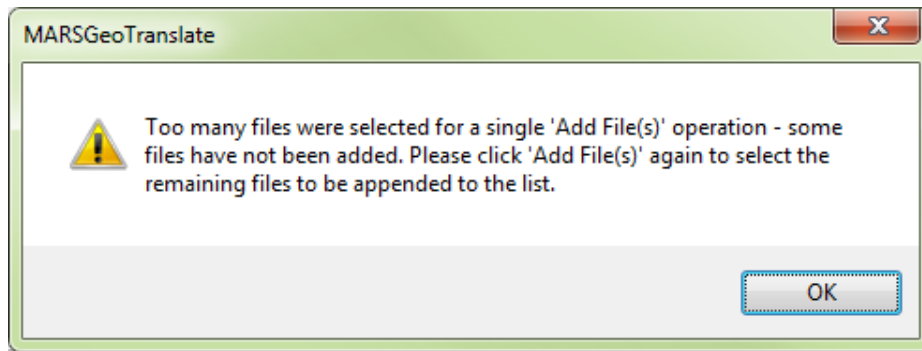
## Additional options implemented in 'Bit Flag Display Settings' tool.

The 'Bit Flag Display Settings' tool now includes options for viewing points by 'Scanner Channel' and 'Scan Direction' bit flag values (when available in the data). The default for the new settings is for all scanner channels and both scan directions to be displayed.



## GeoTranslate allows a larger number of files to be added and processed in one operation.

Due to a known bug (in a Blue Marble Geographics component), when files are added to the 'Import Data' box of the GeoTranslate interface, occasionally the path to one of the files becomes corrupt. When this happens, only those files in the selected list before the bad path are added to the list to be translated. MARS<sup>®</sup> now displays a message when this happens telling the user that only some of the selected files have been added, and that the 'Add File(s)' function can be used again to add the remaining files. This can be done as often as necessary until all needed files have been added.



### **'Bit Flag Display Settings' now independently controlled for main and cross-section windows.**

The settings made in the 'Bit Flag Display Settings' tool are now maintained independently for both the 'LAS Map View' and 'Cross-Section/Profile' windows.

### **Blank entry for 'Internal Buffer Size' value for Grid-based export types treated the same as a zero.**

A blank entry in the 'Internal Buffer Size' entry box when using the 'TINned Surface Fill' option for 'Fill Gaps' is now treated the same as a zero (0) for Grid-based export types.

### **'Projection' tab removed from 'Export' interface for 'Flightline Separation – JPEG 2000' export type.**

The 'Projection' tab has been removed from the 'Export' tool interface when the type is 'Flightline Separation – JPEG 2000' as this info cannot be stored for a JPEG 2000 raster.

### **Implemented Save Settings and Load Settings functionality for GeoCalc.**

The GeoCalc tool now has the capability of saving settings to an XML file and loading those settings at any later time.

### **'Inspect' tool displays same point properties when used Cross-Section/Profile window as in main window.**

The 'Inspect' tool now displays the same point properties in the pop-up window when used on points in the Cross-Section/Profile window as it does when used on points in the LAS Map View window.

## GeoCalc v7.2 SDK from Blue Marble Geographics has been implemented to include new and enhanced coordinate systems, datums, height models, and more.

The version 7.2 GeoCalc SDK is now included in MARS<sup>®</sup>. It includes many new and enhanced coordinate systems, datums, height models, and transformations. Of particular importance is the addition of the Geoid 2012B height model, to comply with the USGS LiDAR Base Specification's requirement that the latest hybrid geoid model published by NGS be used to convert ellipsoidal heights to orthometric heights. These same new and enhanced entries are also available in GeoEdit (individual coordinate point testing) and GeoTranslate (vector translation).

### List of Bug Fixes:

- Bug fixed causing a crash when trying to load the results shapefile from the 'Populate Statistics on Tile Scheme' tool.
- Bug fixed causing no output when using a discrete filter (not a macro) with Batch Process Tiles.
- Bug fixed causing LAS export to v1.4 data to set all Scanner Channel bit flag values to '0' (zero) for multi-channel data.
- Bug fixed causing 'LAS Splitting' tool error when data had more than 5 returns.
- Bug fixed causing crash of '3D Image' export type when using LAS v1.4 data.
- Bug fixed causing an error message when exporting to 'Hillshade – JPEG 2000' and using the 'TINned Surface Fill' 'Fill Gap' option.
- Bug fixed in page title names for QC Module 'USGS NGP – Version 1.0' drop-down test 1.6.2.
- Bug fixed causing display of data in Latitude/Longitude (Geographic) coordinate systems to be incomplete when viewed in 2D.
- Bug fixed causing incorrect RGBN values in the output when exporting to v1.4 PDRF 8.
- Bug fixed causing extra points to be re-classified when using the 'Scan Angle' filter.
- Bug fixed causing 'ghost' artifacts of removed LAS files to remain visible after the files were unloaded and new files were added.
- Bug fixed to allow LAS export to v1.4 PDRF 8 to work with all layout types.
- Bug fixed causing different results when hand filtering using the 'Filter Region', 'Batch Script Test', and 'Filter Digitized Polygon' tools in the same area.
- Bug fixed in '3D Image' export type causing the WKT tag in LAS v1.4 exports to display only a 'COMPD\_CS' section.
- Bug fixed causing incorrect Scan Angle Rank values in LAS v1.4 exports created from LAS v1.2 data.
- Bug fixed for Float Grid export causing water bodies with surrounding poly shapefiles to not be flattened.
- Bug fixed causing no output when using 'Export Area' on very large LAS files, even if dragged area was small.
- Bug fixed causing breakline 'Arcs' (shortcut key 'A' during compilation) to have their vertices set to Z values of '0' (zero).
- Bug fixed causing point display density to change when switching rendering methods.
- Bug fixed causing the wrong points (not the selected Source points) to be reclassified when using 'Filter Selected Polygons' with the 'Plane Analysis' filter.
- Bug fixed causing performance slowdowns after removing LAS files and adding new ones when an open Cross-Section/Profile window no longer has points in its extent.
- Bug fixed causing both the 'Batch Script Test' and 'Script Edit' tools to keep operating with the previously-loaded macro after switching to a new macro.
- Bug fixed causing a regular 'Flightline Separation' raster to be created when the 'Measurable RMSDz FSR' box was checked.
- Bug fixed causing a missing completion message when using the 'Remove Duplicates' tool.
- Bug fixed in GeoCalc causing output v1.4 files to display a 'Reserve' value of '43707' in WKT tag VLRs/EVLRs.

- Bug fixed causing no output when running 'Batch Process Tiles' with a single-step macro containing the 'Plane Analysis' filter.
- Bug fixed causing some exported points from '3D Image' export type to have RGB values of '0' (zero).
- Bug fixed regarding no output when either QC Module 'LiDAR Workflow QC – 1 LiDAR Data Checks' drop-down test DC4 or export to 'LiDAR Point Density – Float Grid' was run.
- Bug fixed causing a crash of the QC Module 'LiDAR Workflow QC – 2 LiDAR Calibration Checks' drop-down test CC1 when an NPS value of 0.3 units was entered.
- Bug fixed causing slowdowns in rendering performance for corridor-shaped data when a Cross-Section/Profile window was open.
- Bug fixed in 'Export' causing the incorrect 'Global Encoding' value in LAS file headers when the 'Single File from Selected Tiles' layout was used.
- Bug fixed causing the 'Undo' button and shortcut key 'Ctrl-Z' to stop working after using the 'Filter Digitized Polygon' tool.
- Bug fixed causing incorrect week number to be assigned to output file when using 'GPS Time Conversion' tool to convert to Adjusted GPS Time.
- Bug fixed causing no or partial output when using a discrete extraction tool with Batch Process Tiles.
- Bug fixed causing crash when exporting to '3D Image' after opening an MPD.
- Bug fixed when outputting LAS v1.4 data using 'Batch Process Tiles' causing incorrect: 'Global Encoding' file header values, Scanner Channel bit flag values, and extended return information.
- Bug fixed causing 'Depression Coder' tool to fail if multiple contour shapefiles were pathed out.
- Bug fixed causing LAS export of v1.4 data to create point extent and extended return errors.
- Bug fixed causing striped artifacts in some 'Hillshade – JPEG 2000' exports.
- Bug fixed regarding non-working shortcut keys 'S' (toggle loaded shapefiles on/off) and 'I' (toggle 'Inspect' tool on/off).
- Bug fixed causing crash if more than approximately 440 files were added to the 'Add CRS Info' tool in one processing run.
- Bug fixed causing 'From/To Class' settings for hand filter to reset to 'All' when a MPD file was opened that contained discrete class settings.
- Bug fixed causing crash if a non-numeric entry was made in the 'Set Cut Depth' entry box after using the 'D' shortcut key with the Cross-Section/Profile window open.
- Bug fixed causing a program hang when running QC Module 'USGS NGP – Version 1.0' drop-down test 2.5.
- Bug fixed causing some export layout types to fail when using extended return (>5) LAS v1.4 data.
- Bug fixed causing occasional program crashes when using the 'Fast TIN' performance mode during certain hand filtering operations.
- Bug fixed causing QC Module 'USGS NGP – Version 1.0' drop-down tests 0.0 and 1.4 to hang when 'ID' field was missing from tile layout shapefile.
- Bug fixed causing missing horizontal system EPSG code in WKT-based Coordinate Reference System (CRS) tags.
- Bug identified in 'Area by Slope' extraction tool causing the 'Generate Buffer (inner)' option to produce incorrect shapefiles. That option has been disabled until further notice.
- Bug fixed causing 'Ctrl-Z' keyboard shortcut to undo the last two operations when used after editing in the Cross-Section/Profile window.
- Bug fixed in 'Add CRS Info' tool causing incorrect 'Global Encoding' values in LAS file headers of LAS v1.4 files.
- Bug fixed causing 'Ctrl-A', 'Ctrl-G', and 'Ctrl-K' keyboard shortcuts to fail while in TIN rendering display mode.
- Bug fixed causing occasional shifts in exported Float Grid rasters when using the 'TINned Surface Fill' option.
- Bug fixed regarding missing 'Source Classifications' parameter info when viewing/editing the options of the 'Building Polygons' extraction tool as part of a macro script.
- Bug fixed causing a crash when choosing 'Measurable FSR' option in 'LiDAR Workflow QC – 2 LiDAR Calibration Checks' drop-down test CC1, 'USGS NGP – Version 1.0' drop-down test 1.9.1, or 'Flightline Separation – JPEG 2000' export.
- Bug fixed causing incorrect return statistics for the QC Module 'USGS NGP – Version 1.0' drop-down test 1.1.

- Bug fixed causing gaps in the QC Module 'LiDAR Workflow QC – 1 LiDAR Data Checks' drop-down tests DC5/DC6 and the QC Module 'USGS NGP – Version 1.0' drop-down tests 1.5/1.6 rasters.
  - Bug fixed causing incomplete above ground points when exporting to '3D Image' type.
  - Bug fixed causing a spatial indexing hang after GeoCalc has been used to translate LAS files.
  - Bug fixed regarding missing 'Change Vert Units' button and functionality in GeoEdit 7.2 and GeoCalc 7.2.
  - Bug fixed in the 'GPS Time Conversion' tool causing thinned points to have incorrect info.
  - Bug fixed causing the 'Reference Reclass' tool to miss some reclassifications when the 'Z Position' option is used.
  - Bug fixed causing a crash when exporting IMG (Imagine) intensity rasters from 16-bit intensity LiDAR data.
  - Bug fixed regarding the appearance of IMG intensity rasters exported from 12-bit intensity LiDAR data.
  - Bug fixed causing a crash when multi-threading the 'LiDAR Spatial Reclass' tool.
  - Bug fixed causing a crash when the 'Building Polygons' extraction tool is used in a macro script (Batch).
  - Bug fixed was preventing 1-point LAS files from loading.
  - Bug fixed that caused excessive dangles in contour shapefile exports.
-