Trimble Business Center

Release Notes

Version 5.00

TRANSFORMING THE WAY THE WORLD WORKS

Welcome to Trimble Business Center 5.00!

Trimble Business Center 5.00 merges Trimble Business Center and Trimble's Business Center - HCE (Heavy Civil Edition) to provide a complete office software solution for survey and construction professionals. Having the ability to work in a single software environment streamlines operational efficiency while minimizing the costs of data management, software maintenance, and training.

TBC 5.00 includes major enhancements and improvements in the following key areas:

- **Data integration**
  TBC 5.00 includes support for mobile mapping and terrestrial scanning data imported from systems such as the Trimble MX9 mobile mapping system and the Trimble TX6 and TX8 3D terrestrial scanner. In addition, high-quality flight data from Delair UAS systems can be combined with other sensor data for the rapid creation of vivid orthomosaics and highly accurate surface models. Survey and construction professionals can now easily integrate these multisensor data types together within the single software environment; streamlining their workflow and increasing productivity.

- **Enhanced point cloud deliverables**
  TBC 5.00 includes intelligent new tools for the creation of CAD and GIS deliverables, corridor inspection reports, and tunnel as-built analysis from rich 3D point clouds. The addition of automated feature extraction, powered by Trimble eCognition, dramatically reduces the time to extract features, such as trees, poles and signs, from point cloud data. New multislice capabilities, combined with the cutting plane tool, allow users to quickly extract cross-sections from point clouds at intervals along a linear geometry, further streamlining corridor re-design and maintenance reporting.

- **Customizable software platform**
  The new Trimble Macro Language (TML) allows survey and construction professionals to customize data computations and add new CAD and GIS workflows to fit specific local requirements. By extending out-of-the-box software capabilities, customers can further increase operational efficiency, reducing the time to create client deliverables.

Available editions

TBC 5.00 offers the following editions, each of which is designed to support a set of related workflows that focus on a specific user type. The higher editions include the functionality of the previous lower-priced editions. For example, the Surface Modeling edition includes the functionality of the Field Data edition along with the features licensed to the Surface Modeling edition. The Survey Intermediate edition includes the functionality of the Surface Modeling and Field Data editions along with the functionality licensed to the Survey Intermediate edition, and so on through the Infrastructure Construction edition.

- **Viewer (unlicensed)** is intended for field operators, allowing them to quickly import field data and design data for a quick check, and export to Trimble Access, SCS900, and GCS900 using Trimble native file formats. Using TBC in this mode does not require a user to own a TBC license and provides limited ability to make any modifications to the data.

- **Field Data** is intended for field surveyors, machine operators,and third-party CAD drafting professionals, allowing them to export data to other packages using a standard format, perform basic CAD functions, process feature codes, maintain data quality control, and work with level data.

- **Surface Modeling** allows survey managers and contractors to create and edit surfaces and alignments, which is essential to finding and fixing errors before they are sent to the field for construction. This edition supports the creation of cut/fill maps and earthwork reports while working with surface boundaries, breaklines, contours, and surface densification. And it provides basic point cloud management capabilities.

- **Survey Intermediate** includes the ability to perform GNSS data post-processing, surveying traverse and network adjustments, and site calibrations. Using Survey Intermediate, users can also work with background images and perform labeling and dimensions tasks before exporting information to the field or other office software packages.

- **Survey Advanced** is the recommended edition for most survey professionals, enabling most required field-to-finish operations. Survey Advanced allows users to work with Trimble Vision data and workflows; leverage the imaging capabilities of field device; process and create cadastral survey data; work with enhanced COGO and CAD drafting tools; design and inspect corridors; and create plan sets, cross-sections, and profile sections automatically. The ability to program and load custom macros is also included in the Survey Advanced edition. For more information on the new macros support, see the "Macros and extensions" section below.

- **Site Modeling** is recommended for survey and construction site managers. Since surfaces and volumes can be calculated only after the data is properly elevated, the Site Modeling edition quickly converts 2D or improperly elevated CAD data into objects that can be sent to the field for construction. The Project Cleanup command saves hours-to-days by cleaning up messy CAD data.

- **Site Construction** enables construction professionals to reduce costs and improve profits by efficiently moving earth only once. The site mass haul capabilities help determine how much to move, from where, to where, and what it will cost to get it all done. In addition, site takeoff tools save time and decrease the learning curve by using one piece of software to apply site improvements to specify materials and depths, and get an accurate report of quantities and costs for site takeoffs.

- **Infrastructure Construction** is recommended for civil contractors and large enterprise organizations as it contains all of the above editions of TBC, providing a completely integrated software environment for automated generation of fully parametric corridor intersections and roundabouts and cul-de-sacs, reducing the complex and labor-intensive design task to minutes. With this edition, users can define haul roads and costs, compute borrow and waste requirements, assign haul and material costs for earthworks bidding, and compute mass haul for specific sites and corridors to ensure that you operate at maximum efficiency for maximum profitability.

For additional information about any of the available editions, contact your Trimble distributor.

Available add-on modules

TBC 5.00 offers the following licensed add-on modules:

- **Aerial Photogrammetry** is intended for survey and construction service providers and UAS operators, allowing users to work with UAS data inside TBC. This module also includes a tightly integrated UASMaster utility. This module requires the Surface Modeling edition.

- **Drilling Piling Compaction** is ideal for creating drill plans and reports for the Trimble DPS900 Machine Control System for drilling and piling contractors. This module requires the Surface Modeling edition.

- **GIS** is intended for professionals who are providing client deliverables in an ESRI environment. This module enables seamless integration of high-accuracy survey data from Trimble Access software into GIS. This module requires the Field Data edition.

- **Mobile Mapping** is intended for Trimble MX9 Mobile Mapping users who can use this module to perform mobile mapping scan data processing, colorization, registration, and related management tasks. This module requires the Survey Advanced edition.

- **Mobile Mapping MX9 Laser Correction** is intended for Trimble MX9 Mobile Mapping users who can use this module to resolve laser range ambiguities and correct for systematic errors. This module requires the Survey Advanced edition and the Mobile Mapping add-on module.

- **Scanning** enables survey and construction professionals to be more efficient in working with point cloud data. Users can register and georeference 3D scanning data, classify and extract features, and create deliverables from system SX10 and third-party derived point clouds. This module requires the Survey Advanced edition.

- **Tunneling** is intended for tunnel contractors, allowing users to create and edit tunnel models for Trimble Access Tunnels and create customized as-built and geometry reports from total station or scanning instruments. This module requires the Survey Advanced edition.

- **Utility Modeling** is intended for civil contractors by providing takeoff capabilities, enabling storm, sanitary, water, gas, and cable utility lines to be modeled, along with the trench work required for construction. This module requires the Site Modeling edition.

For additional information about any of the available add-on modules, contact your Trimble distributor.

Installing or updating

For installation or update instructions, see the appropriate bullet below.

Notes:
- Trimble Business Center (TBC) licensing information is contained in a Sentinel HASP hardware or software key connected to or installed on your computer. If no key has been connected or installed, TBC allows you to import and view data only. It does not allow you to use any licensed features. To view your license after installation is complete, select View License Manager on the Start Page. For a description of the features available in each licensed configuration, see "Licensed Features" in the online Help.
- After installation, be sure to select Check for Updates on the Start Page to ensure you have the latest updates for Trimble Business Center.

Warning!
When installing Trimble Business Center and various support applications (for example, Microsoft DirectX and WIndows Mobile Device Center), you may be prompted to reboot your system multiple times to ensure the proper installation of these applications. To prevent the possibility of lost or corrupted data, it is highly recommended that you save all files and close all other applications prior to performing this installation.

- **New users installing TBC to use with a single-user license:**

    a. Before you insert the new Sentinel HASP hardware key you received in your installation package, install TBC from the TBC installation package downloaded from the Trimble website.

    b. Before running TBC for the first time, insert the new Sentinel HASP hardware key into an available USB port on your computer.

    All licensed features will be available when you run TBC. Your 1-year warranty begins the first time you open the software.

- **Existing users installing this version of TBC:**

    Install TBC from the installation package downloaded from the Trimble website.

Important Note! This version is available to users whose current warranty expiration date is **1 November 2018 or later**. If your warranty expires prior to this date and you proceed with the installation, licensed features will not be available. Contact your distributor to purchase a warranty extension. In the TBC ribbon, select Support > License Manager to verify your warranty expiration date.

New users installing TBC to use with a multi-user license installed on a network:

▪ Ensure your computer can connect to the network server where the HASP multi-user network license is installed. When you run the software after installation is complete, it will automatically search the network to locate the license.

▪ Ensure no HASP hardware key is connected to your computer during installation.

▪ See your administrator for more information.

Note to Administrators: For instructions on installing a HASP network key (multi-user license) and viewing and managing license information, select Network Licensing Read Me on the Tools menu on the TBC installation DVD.

New features

Following are the new features included in the various editions and add-on modules for this version of Trimble Business Center. To view context-sensitive help at any time while using TBC, press F1.

Field data

▪ **Traverse Adjustment enhancements** - The Traverse Adjustment feature has been enhanced as follows:

▪ Traverse lines are displayed in purple to make them more easily distinguishable in the graphic views.

▪ Each traverse line includes an optional mid-point arrow indicating the "direction" of the traverse (based on the point sequence) in the graphic views.

▪ Each traverse point includes an inverted triangle to make it more easily distinguishable in the graphic views.

▪ Setting up the start and end station orientation in the Adjust Traverse command pane has been simplified through a minor layout change.

(See "Create, Edit, and Adjust a Traverse" in the TBC Help.)

▪ **Full QZSS satellite support** - TBC provides full support for four new satellites that have been added to the QZSS constellation, including support for kinematic and static data, raw data check-in, session checking and editing, RTX post-processing, baseline processing, and reporting.

- **New Internet download options for static data** - Three new Internet download source options enable multi-GNSS constellation users to download precise orbits when working with static data: CODE Rapid Orbits, MGEX Final Orbits (multi-GNSS), and MGEX Rapid Orbits (multi-GNSS). Since May 2003, the Center for Orbit Determination in Europe (CODE)) has offered in its products GPS and GLONASS ephemerides referring to one and the same reference frame—in essence, a realization of the most recent ITRF release(s). The Multi-GNSS Experiment (MGEX) is a pilot program that has been set-up by the IGS to track, collate, and analyze all available GNSS signals. This includes signals from the BeiDou, Galileo, QZSS, and NAVIC systems, as well as from modernized GPS and GLONASS satellites and any space-based augmentation system (SBAS) of interest.

  Note: MGEX observation and navigation data is provided on a best-effort basis and may not offer the same level of consistency, quality, and availability as legacy GPS/GLO data sets from the core IGS network. RINEX3 files in the MGEX repository may be generated.

- **Spectra Precision SP20 handheld receiver support** - TBC provides full processing support for field data collected with the new Spectra Precision SP20 handheld receiver. The new receiver is based on a MobileMapper50/TDC100 smart phone into which a dual frequency GNSS module is plugged to reach cm accuracy measurement in a handheld configuration. The SP20 has a very similar interface to the Spectra Precision SP60 and SP80 receivers.

- **Import GPS Pathfinder Office COR files** - You can now import COR (.cor) files containing feature geometry and attributes resulting from SSF (.ssf) file post-processing with GPS Pathfinder Office. The COR file format is exactly the same as the SSF file format except that the COR file does not include GNSS data (no observation or ephemeris data) so additional post-processing is not possible or necessary. This enhancement allows users who have historic feature data in COR-formatted files to compare that data with new data, or import it into TBC so it can then be exported in a different format. (See "Import GPS Pathfinder Office Files (.cor)" in the TBC Help.)

- **Trimble GNSS Planning Online** - The Trimble GNSS Planning Online web-based application (www.gnssplanningonline.com), which is accessible from the File > Tools menu and the Start Page in TBC, has been updated to HTML5 and will run in all browsers without the previous need to install Microsoft® Silverlight. GNSS Planning Online is an extremely useful tool in determining the best period of time to collect GNSS data. Simply select your location; date, time, and duration; and constellations used by your receiver. The application provides the maximum count of visible satellites, the best satellite geometry, and the best ionosphere conditions using easy-to-read charts and graphic displays. (See "Trimble GNSS Planning Online" in the TBC Help.)

- **Coordinate System Database enhancements** - The following enhancements have been made to the default Coordinate System Database (current.csd):

  - Removed the United Kingdom National Grid definition
  - Updated the HBG18 (Belgium) geoid reference to the global ellipsoid

- Added the Israel/IG05-12/Israeli Grid 05/12 system

- Added the Hungary/VITEL/Vitel 2014 system

- Updated Russian datums and zones

- **12d import/export enhancements** - The 12d importer and exporter have been enhanced as follows:

  - The 12da importer includes the following enhancements:

    - It has been extended to support the conversion of 12d drainage strings into Business Center Utility entities.

    - A Utility Network is created for each 12da file import to contain related Utility entities.

    - Utility Runs are created for each drainage string contained in the 12da file.

    - Utility Nodes are created for each pit contained within the 12da drainage string.

    - Utility Lines are created for each pipe contained in the 12da drainage string and connected to the relevant Utility Nodes.

    - Site Improvement Materials are created for each unique pit and pipe type contained in the 12da file and assigned to Utility Nodes.

  - The ability to export 12da files has been added to the existing ability to export 12dxml files.

  - Other improvements include:

    - Improvements to display of 12da TIN surfaces upon import.

    - Properly assign names/descriptions to text 12d 4d strings.

    - CAD points are now included in all 12d exports.

  (See "Import 12d Files" and "Export 12d Files" in the TBC Help.)

- **ADA XML file support** - You can import into TBC ADA XML files (in addition to the current support for 12DA and 12DAZ files) for the Australia / New Zealand markets.

- **LandXML importer enhancements** - The LandXML importer includes additional options for creating layers during import to separate data contained in the LandXML file. This allows you to manage and use the data faster. (See "Import LandXML Files" in the TBC Help.)

- **Trimble Earthworks design file support** - You can import into TBC design data contained in Trimble Earthworks .DSZ files.

- **Updated Convert to RINEX utility** - The Convert to RINEX utility application, which is installed along with TBC, converts Trimble GNSS measurement files in DAT, T00, T01, T02, RT17, RT27, or .cap format to RINEX version 2.10, 2.11, 3.02, or 3.03 formats. The new version 3.08.0 corrects issues with observables and combined ephemeris data. It also removes dependency on the Visual Studio 2008 runtime library.

Adjustment and COGO

- **ALTA/NSPS Allowable Relative Tolerance Report** - The new ALTA/NSPS Allowable Relative Tolerance Report provides *relative positional precision* information and exceeded point tolerances required to support ALTA/NSPS Land Title Surveys anywhere in the United States. Relative positional precision is defined as the RMS value of the semi-major axis values of two points for which an error ellipse has been computed. In support of this workflow, you can now specify in the Project Settings whether the Network Adjustment computes error ellipses for side shots so that they can be included in the report. (See "Run an ALTA/NSPS Allowable Relative Tolerance Report" in the TBC Help.)

CAD and drafting

- **Create and view subplanes and plane sets** - The Plane Manager, which enables you to define a set of properties that specify the orientation and position of a plane that displays in your graphic views, has been enhanced to support the creation of *subplanes* along a linear path at predefined interval. Together, these related subplanes make up a *plane set*. This allows you, for example, to easily and quickly define a separate plane for each floor in a building, or provide cut-away views at predefined station intervals along a road corridor. You can then view any of the subplanes in the Cutting Plane View with the aid of a navigation slider, allowing you to perform checks on the point cloud, create CAD linework directly on the plane, create an orthophoto, or create a rectified image from station imagery (if available). (See "Create and Edit Planes" in the TBC Help.)

  The Cutting Plane View's new slider, along with movable subplane grips in the 3D View, allow you to easily move a subplane or create a new subplane at any location without having to open the Plane Manager. (See "Cutting Plane View" in the TBC Help.)

- **Divide Lines verification step enhancement** - When you use the Divide Lines command to divide a polyline, linestring, or other line object into multiple segments, markers indicating the ends of new line segments resulting from the division are now displayed immediately after clicking the Apply button and the divided line is highlighted. This provides the feedback you need to verify that the results are as expected. (See "Divide an Existing Line into Multiple Segments" in the TBC Help.)

- **Layer Manager enhancements** - The Layer Manager command includes the following enhancements:

  - The Layer Manager command pane is non-modal, meaning that your changes to many layer properties (color, line style, etc.) will appear in graphic views in real-time as you make them. Changes to layer names appear immediately in the View Filter Manager (VFM). If you delete an empty layer in the manager, it is also removed from the VFM. Since the Layer Manager is non-model, other commands can also be run while it is open.

- The Layer Manager command pane can be floated anywhere on your screen or another monitor. It can also be resized, as well as docked by clicking and dragging the titlebar to a pane edge in the program.

- You can sort layers by clicking the Name, Color, Linestyle, Width, or Protected, column heading.

- You can use standard [Shift] + click and [Control] + click hotkeys to multi-select several layers to change their properties at the same time. Each change to multiple layers can be reverted using a single undo.

- You can launch the Layer Manager command from the Feature Definition Manager, but in this case the Layer Manager is modal: it cannot be docked, and you must click OK to see your changes in views and the VFM. requires a schema change for FXL file.

- The Layer Manger command gives you access to functions that were previously in the Layer Options commmand (which has been removed).

(See "Manage Layers" in the TBC Help.)

- **Include alignment and surface information in point labels** - You can now include alignment and surface information in point labels and label tables. You select the targeted alignment and surface in the Point Styles tab in the Label Style Manager and Label Table Style Manager.

  - The new alignment *station* and *offset* label fields display values based on the nearest point on the selected alignment's centerline to the labeled point.

  - The new *surface elevation* label field displays the elevation of the surface at the 2D position of a selected point within the surface boundary.

  - The new *delta surface elevation* label field displays the elevation difference between the labeled point and the nearest point on the selected surface.

  These new label types are in addition to the many label types that were already available for assignment to points, lines, and polygons in earlier versions of TBC. (See "Work with Labels" and "Work with Label Tables" in the TBC Help.)

- **Mirror Objects command** - Use the Mirror Objects command to duplicate objects with an inverted transformation across one axis (the 'mirror line'). The new objects that are created have the same properties as their source objects. The command can transform objects in 3D space and can use a cutting plane as the mirror line. (See "Mirror Objects" in the TBC Help.)

- **Dynamically edit text objects** - Quickly edit existing text or multi-line text by double-clicking it with the active view. You can:

  - Click in the string or press [shift] + [<] and [>] arrow keys to move to a new position within the string.

  - Select and change characters.

  - Insert characters at the caret's positon.

- Use [Control] + [C], [Control] + [X], [Control] + [V] to copy, cut, and paste characters within the string or from text object to text object. These options are also available from a context menu when the text is in edit mode.

- Press [Enter] to create another line after the caret.

- Enter and edit Japanese and Chinese characters text using the Input Method Editor. You can also choose from various typefaces based on language you are using.

(See "Create and Edit Text" in the TBC Help.)

- **Position leader line connections to object labels** - You can now control where leader lines attach to point labels, line labels, and polygon labels by editing the Leader position (top, middle, or bottom) setting for each label object the Properties pane. (See "Create Label Leader Lines" in the TBC Help.)

- **Include/exclude processed feature lines and polygons in surfaces** - In the past when creating a point, line, or polygon feature definition in the Feature Definition Manager (FDM), you could use the "Include in surface" option to specify whether the point can or cannot be included in a surface in TBC. The "Include in surface" feature has been enhanced so that now when you specify to include or exclude a feature point in a surface, any line or polygon feature resulting from the processing of the feature point is also included or excluded in the surface. You can change the "Include in surface" setting if needed using the Properties pane for the point, line, or polygon in TBC. (See the FDM online Help and the "Create a Surface" topic in the TBC Help.)

- **Autodesk interoperability enhancements:** TBC has been enhanced to better support Autodesk interoperability:

  - **Enhanced line style support for AutoCAD** - TBC has been enhanced to help ensure that lines displayed in DXF/DWG files look as similar as possible when viewed in TBC and Autodesk's AutoCAD, AutoCAD Map 3D, and AutoCAD Civil 3D applications. Enhancements include the following:

    - You can now import linetypes into your project from either a custom Autodesk LIN (.lin) file or the standard Autodesk acadlt.lin linestyle file that is now installed with TBC (no need to have AutoCAD installed).

    - If you import a DWG/DXF file with standard (non-custom) Autodesk linetypes that use standard shapes, TBC automatically searches for the associated SHX shapefile so that it can import the shapes into the project. It searches first in the DWG/DXF source folder and then, if AutoCAD is installed, in the Autodesk support file path. If it is not found there, the application automatically imports the required AutoCAD line symbols from the standard Autodesk ltypeshp.shx shapefile that is now installed with TBC. This ensures that the line symbols display correctly in TBC even if the shapefile was not included with the DWG/DXF file and AutoCAD is not installed. (Note: If custom linetypes and custom shapes are used, a custom shapefile must be provided with the DWG/DXF file.)

- If you import a DWG/DXF file with custom Autodesk linetypes that use custom shapes and the referenced custom SHX shapefile is located in the the same folder as the DWG/DXF file, TBC automatically copies the custom shapefile into the TBC project folder. This allows it to then automatically export the same custom shapefile to the destination folder when you export the DWG/DXF file. This ensures that the line symbols display correctly when the DWG/DXF file is opened in AutoCAD.

- **DWG/DXF linework export enhancements** - You can now export linework from TBC to Autodesk's AutoCAD, AutoCAD Map 3D, and AutoCAD Civil 3D applications as 2D polylines at a specified elevation. You can control the decimal precision during the export and specify a prefix or suffix for exported layer names so that proper data from TBC can be exported for convenient drafting in AutoCAD. (See "Export CAD Files (.dxf/.dwg)" in the TBC Help.)

- **Enhanced unit support for AutoCAD** - Support for drawing units when importing and exporting DWG and DXF files has been enhanced as follows:

  - You can now select "Unitless" for the drawing unit when exporting DWG and DXF files, allowing the destination application to specify the units. When "Unitless" export is selected, the drawing unit defaults to meters.

  - DWGUNITS and INSUNITS are correctly set when exporting DWG and DXF files per the user's Export Unit setting and now includes support for US survey feet.

- **Enhanced line style management** - TBC has been enhanced to make importing line styles as quick and easy as possible. No need to open the Line Style Manager and then search for the file containing the line styles you want to import. Simply drag and drop any supported line style file onto the Plan View in TBC, just like you import data files. The Line Style Manager automatically opens, allowing you to select the line styles you want to import from the file into the project. Supported line style files include:

  - TGO line style (.ltp)

  - Trimble line style (.linestyle)

  - AutoCAD drawings (.dwg and .dxf)

  - AutoCAD linetypes (.lin)

  (See "Manage Line Styles" in the TBC Help.)

- **PDF vector extraction enhancement** - The PDF vector extraction feature includes improvements to layer management and layer grouping, making the organization of data from a PDF quicker upon import. (See "Import Vector PDF Data" in the TBC Help.)

- **Standardize Layer command enhancement** - You can use the Shift key to select individual objects or groups of objects and assign them to a layer. (See "Standardize Layers" in the TBC Help.)

Corridor

- **Create a corridor interchange** - Use the Create Interchange command to build a multi-level corridor junction (interchange) with ramps for the transitions between a main highway alignment and another highwway alignment that crosses above or below the first alignment. (See "Create a Corridor Interchange" in the TBC Help.)

- **Create corridor interchange ramps** - Use the Create Ramp command to build transitions from one highway alignment to another. Then you can control the shape of the ramp using properties for the various lines used to form it. A set of ramps is created automatically when you create a corridor interchange, but you can manually create ramps without an existing interchange or add additional ramps using this command. (See "Create and Edit a Corridor Interchange Ramp" in the TBC Help.)

- **Use a half-sine spiral** - When creating an alignment, you can now use a spiral that transitions from no change to a constant radius at a variable rate. The half sine spiral is useful for rail and other high-speed cases in which the vehicle cannot be steered (a clothoid spiral would make for a hard transition). (See "Alignment Spiral Options" in the TBC Help.)

Specialty solutions

Scanning

- **Extract point features and attributes from a point cloud** - Use the Extract Point Feature command to select an object in a point cloud (for example, a tree) and automatically create a new point at the base of the object with an assigned feature code and feature attributes. To assist in populating attribute values for the feature from extracted scan data, you can map the feature code's attributes, which are defined in an imported *Feature Definition Library (.fxl)* file, to attributes extracted by the command. For any feature attribute that cannot be mapped to an extraction attribute, you can enter the attribute value manually. This provides a quick, flexible, and efficient means of extracting features and attributes in scanned areas. Note that extraction can be performed in Manual mode (you manually select one feature object at a time) or Automatic mode (the application automatically selects all feature objects of the same type). (See "Extract Point Features from a Point Cloud" in the TBC Help.)

  The attribute mapping you perform can be saved as a map in a Feature Extraction Attribute (.exl) file and shared with other users who can import it into their project and be assured their mapping matches yours, without the need to manually repeat the map creation process. (See "Export Feature Extraction Attribute Map Files (.exl)" and "Import Feature Extraction Attribute Map Files (.exl)" in the TBC Help.)

- **Support for TZF and FLS point cloud files** - You can now import into TBC raw scan data contained in a Trimble TZF (.tzf) file or a Faro FLS (.fls) file, along with associated images, stations, and other related files. This allows you to work with 3D high-speed scanning data in the same TBC software environment along with other survey data.

- **Automatic scan registration** - This new feature in the Register Scans command allows you to perform a plane-to-plane registration of multiple scans quickly and easily. Once your scans are registered (if necessary), you can use all of the available point cloud commands to work with the processed point cloud, including creating and classifying regions, specifying rendering settings, extracting point features, and creating deliverables such as orthophotos and rectified images. (See "Register, Refine, and Georeference Point Cloud Scans" in the TBC Help.)

- **LAS exporter enhancement** - The LAS (.las) point cloud exporter has been enhanced as follows:
  - You can select to export point cloud data in the latest LAS version 1.4 record format.
  - Exported LAS files include ASPRS classification code values.

Aerial Photogrammetry

- **Import Delair UAS photogrammetry data** - TBC supports the import of Delair UX11 UAV photogrammetry data contained in a JXL file exported from Delair's After Flight field software. This data, with or without post-processed high-precision station positions from Delair, can be adjusted in TBC's Aerial Photogrammetry module with the Adjust Photo Station or Advanced UAS workflows. Using TBC, you can create point cloud, orthomosaic, and/or raster digital elevation models and then use surface, CAD, and other tools to create deliverables. The data can be passed through to UASMaster for adjustment and deliverable creation as well, then passed back to TBC if desired. (See "Import Delair Files" in the TBC Help.)

Mobile Mapping

- **Import, process, and register Trimble MX9 raw data** - TBC now supports Trimble MX9 laser and image data collection. Use the new tools to do the following (as applicable):
  - View and overlay image, laser, and trajectory data.
  - Navigate in Plan View, 3D View, and Run View.
  - Import and apply a post-processed trajectory to image and/or laser data.
  - Correct *multiple-time around* (MTA) laser range ambiguities with the MM MX9 Laser Correction module.
  - Create and colorize a point cloud.
  - Georeference MX9 data with the registration tool.
  - Use TBC's point cloud, CAD, and GIS tools to work with the MX9 data.
  - Export the data to TMX.

Tunneling

- **Assign tunnel as-built points from point cloud data** - Use the new From point cloud option to sample and extract points from a point cloud and assign them to a tunnel at specified stations. This option converts the points used in the As-Built Tunnel Report into points with IDs, optional layers, and/or feature codes. (See "Assign Tunnel As-Built Points" in the TBC Help.)

- **Volumes in custom As-Built Tunnel Report** - When generating a custom As-Built Tunnel Report, you can now include additional overbreak and underbreak volumes (both between stations and totaled for the length of the tunnel). (See "Run As-Built Tunnel Reports" in the TBC Help.)

- **Road corridor cross-sections in the Tunnel View** - Include cross-sections from a road corridor template in the view of a tunnel so you can check how the tunnel shape corresponds to the road's shape. (See "Tunnel View" in the TBC Help.)

- **Tunnel rotation entry and display** - When entering and displaying rotations for a tunnel shape, the default is now horizontal angle (previously, it was zenith angle), regardless of the display method specified in Project Setting > Units > Vertical Angle. Slope percentage and slope ratio are still valid entry methods, but they are converted to and displayed as horizontal angles. The slope ratio order (H:V or V:H (run to rise or rise to run)) is controlled by Project Setting > Units > Vertical Angle >Slope ratio type. (See "Edit Tunnel Rotation" in the TBC Help.)

- **Create as-built tunnel mesh** - Use the Create As-Built Tunnel Mesh command to create one or more 3D meshes from point cloud or topo point data to review the scanned shape of a constructed tunnel in the Plan or 3D View. As-built tunnel meshes can be added to drafting sheet sets and exported as CAD (.dwg) files, ust like the Design Tunnel Mesh object. (See "Create an As-Built Tunnel Mesh" in the TBC Help.)

Platform

- **TBC macros** - TBC now supports a programming interface that enables you to create 'macro' commands that can be run like native commands. Using Trimble Macro Language (TML) you can code most of the same operations as a Trimble TBC programmer, with the exception of creating new object types; TML has access to most of the same UI controls and features. With TML, you can add a command, include an icon, add it to a ribbon, run it from the Command pane, and even add help.

  To write and use TML commands, **you must have the Survey Advanced Edition or above**. With this edition, you will see the installed macro commands in the Command pane's All Commands list (their names begin with "_" to move them to the top of the alphabetical list and make them easier to find). These macros were created as examples to demonstrate how to do common TML programming tasks.

  Note: Because it requires programming, creating your own TML commands is recommended for those with coding experience or the desire to learn programming.

- **Program macros** - Use more than a dozen installed macros (including the ones listed below) and/or write your own macro commands so that you can customize and automate unique functions that you use frequently. Macro commands appear just like native commands in TBC. You can either cut-and-paste code snippets from the pre-defined macros to create your own macros or you can write them 'from scratch'. Once you copy and modify or write a macro and place it in a specified macros folder, it will appear alphabetically in the All Commands list in TBC. To open the help system for all macro commands, launch a macro command and press F1.

  - **Create Arc from 3D Points** - Use this macro command to create an arc from three points with elevations in a non-planimetric plane. For example, after creating a 'cut/fill' map on a vertical surface (from point cloud data) using the Create Cut/Fill Map command, you can create arcs in that vertical plane.

  - **Add Isopach to Surface** - Use this macro command to add the depth indicated by an isopach layer to the points contained within a DTM layer. Determine the depth of the isopach at the location of each point on a DTM surface, and then add that depth to the elevation of selected points.

  - **Assign Names from Inside Text** - Use this macro command to find text objects inside closed lines/polygons and assign the text as the line name/automatically name each closed line with the text encompassed by the shape so when he exported the lines, they were named by the text.

  - **Convert to Linestring** - Use this macro command to convert many CAD lines (breaklines, polylines, arcs, rectangles, etc.) and horizontal alignments into linestrings, without having to edit each one.

  - **Create Points from Surface** - Use this macro command to export vertices from a surface to a point cloud .xyz file which is then imported.

  - **Edit Alignment as Spreadsheet** - Use this macro command to edit or create a horizontal alignment (HAL) in a spreadsheet (runs a Microsoft© Excel plug-in) rather than in the Alignment Editor. Using this command, you can also enter a vertical alignment (VAL) and slope table with the HAL.

  - **Offset Surface** - Use this macro command to create new surface as an offset to another surface. This command does not rebuild the surface triangles, it simply makes a copy of an existing surface and shifts it up or down on the Z axis. You can also leave the delta elevation at 0.00 to make a copy in place.

  - **Quick Line** - Use this macro command to create a linestring in the simplest way. This is like drawing a polyline that actually creates a linestring with elevations, but without the other parameters like VPIs, deflections, etc.

  - **Select Point Cloud by Boundary** - Use this macro command to select point cloud data using an existing boundary, rather than having to click points to specify the boundary (as is needed in Select by Boundary).

  - **Show My Toolbar** - Use this macro command to show a floating, customizable toolbar of your favorite commands.

  - **Switch Text** - Use this macro command to switch the text string of two text objects, including options on what text properties to include in the swap.

- **Toggle Ribbon Tabs** - Use this macro command to quickly toggle between all ribbon tabs and the tabs you use most, simply by clicking an icon on the Quick Access Toolbar.

- **VPI at Elevation** - Use this macro command to add vertical points of intersection at all instances of a specified elevation along a linesting. This can help you enter points from an alignment plan in which they are defined by station and offset.

- **View Project Data** - Use this macro command to list all the objects found in the current project, revealing the object references that are actually in your project. This is helpful if you are writing your own macros.

- **List Project Objects** - Use this macro command to list the class names and numbers of graphical objects in the current project, alphabetized by assembly name. This is helpful if you are writing your own macros.

- **Community** - We have created a TBC Macros and Extensions Community to provide getting started information. The community is a place where you can share questions, answers, and macros that you create. We hope to inspire community members to create their own commands and even to offer their services for customization. (See Write and Use Macro Commands in the macros help file, which is accessible by pressing F1 when you have a macro command open in TBC).

- **Trimble Connect enhancements** - Trimble Connect is a web-based set of networking tools that surveyors and construction contractors can use to share data and collaborate with internal and external partners and clients. This feature has been enhanced as follows:

  - **Easier access to Trimble Connect** - Quickly and easily log in Trimble Connect right when TBC opens by clicking the handy link on the Start Page, or at anytime by clicking the Trimble Connect icon located in the upper-right corner of the TBC window. When logged in, your Trimble Connect account is set as the default External Services Profile and enables you to access Trimble Connect-based applications quicker, like Trimble Sync Manager or Toggle Background Maps.

  - **Enhanced saving of project data to Trimble Connect** - When saving a project remotely to Connect, you can now choose to save the project subfolder files as well. This allows you to store and share complete TBC projects on Trimble Connect. (See "Save a File Remotely" in the TBC help.)

  - **Enhanced opening of project data from Trimble Connect** - When opening a project stored remotely on Connect, you can now choose to import the project subfolder files as well. (See "Open/Import a Remote File" in the TBC help.)

- **Display theme options** - The Options dialog now allows you to select the display theme you want to use while working in TBC. The theme you select determines the ribbon, window background, icon, and label colors.This allows you to chose the visual scheme that is most pleasing and comfortable for you. (See "Startup and Display Options" in the TBC Help.)

- **Enhanced Status Bar** - The Status Bar, located at the bottom of the TBC window, has been enhanced to include numerous new commands that are just a click away. Newly added commands allow you to quickly make rectangle or polygon selections, display or hide line markers and labels, display lines as solid or dashed, and display a background map.

- **Property Pane enhancement** - You can now launch the Properties pane separately from the Command pane. When the Properties pane opens, it is now docked next to the Project Explorer on the left side of the application window (or where you positioned it last). The Properties pane can be undocked/floated by clicking-and-dragging its titlebar; it can be moved to a second monitor or redocked to any side of the application window. (See "View and Edit an Object's Properties" in the TBC Help.)

- **Show/hide sets of ribbon tabs** - Use the Set Ribbon Tabs command to modify your ribbon by selecting one of several pre-defined layouts. Each layout gives you access to a different set of ribbon tabs to match your needs. (See Select Ribbon Tabs to Display in the TBC help.)

- **New Start Page** - The Start Page has been updated with a new layout and added functionality. Included are thumbnails and project names for recently opened projects, making existing projects easier to find and re-open than ever. In addition, you can use the Start page to create a new project, log in Trimble Connect, view notifications, and view the TBC News.

Resolved issues

The following issues **have been fixed** in this version of TBC:

- Vector text did not work for cut/fill maps.

- A DWG exported from TBC was changing Civil3D units.

- An orthorectified image was not visible in 3D View when the Cutting Plane View is opened.

- The Points to Surface delta elevation field did not specify as positive or negative.

- The RINEX exporter did not support RINEX version 3.03.

- The template position property value always displayed in meters.

- Line feature code connected unexpectedly in TBC vs Trimble Access.

- Selecting points on a Projected Cut/Fill Map showed UCS coordinates.

- Orthorectified image frame lines were not visible in 3D View.

- The Create Subgrade Surfaces command required miscellaneous bug fixes and stability improvements.

- The Area Length Count report was slow to generate EXCEL files when there was a large amount of source data selected.

- There were issues associated with plotting high-resolution images through Dynaviews using the Sheet Plotting workflows.

- On import, certain Bentley MX (.fil) files written in specific formats of the GENIO standard were missing data.

- You could not import 12d Model 12DAZ files into TBC without having to rename the file to .zip.

Known issues

See "Known Issues" in the TBC Help for a complete list of known issues associated with the software and related utilities, along with possible workarounds.

Miscellaneous notes

- **Export Autodesk® ReCap® files** - To export an Autodesk ReCap file, you must have the latest version of ReCap 360™ Pro installed on your computer with a valid license. Unlike previous versions of ReCap 360 Pro, you can install the newest version before or after the installation of TBC and the two applications will sync automatically without the need to run a plug-in utility.

- **"Use for" property for total station observations** - In pre-v4.10 versions of TBC, the "Use for" property for total station observations applied only to backsights of Resection station setups. In all other cases, regardless of the "Use for" property selection, the "Horizontal and vertical" option was always used. Starting with TBC v4.10, the "Use for" selection in new projects applies to all observations for all station setup types.

  Note: If you use TBC v4.10 (or later) to open a project that was created in a pre-v4.10 version of TBC, the displayed "Use for" selection will function as it has in the past. Therefore, no changes to older projects are required. If you change the "Use for" selection for an observation, it will begin to function with the TBC v4.10 behavior for just that observation.

- **Disabling a laptop integrated graphics card** - If you are using a laptop computer with both an integrated (on-board) graphics card (for example, Intel®) and a discrete graphics card (for example, NVIDIA®) enabled, TBC may freeze when you are working with point clouds. To avoid this problem, you must select to disable the integrated graphics card and use only the discrete graphics card when working with scan registration. Follow these steps:

  a. Open your Windows Control Panel, select BitLocker Drive Encryption, and select to suspend protection - if it is turned on. This is required to make the BIOS change required to disable the integrated graphics card.

b. Restart your laptop computer and select to enter the BIOS setup utility as soon as the first image displays (prior to Windows launching) by pressing the appropriate shortcut key (for example, F1, F2, F10, ESC, or DEL). The BIOS shortcut is typically displayed briefly on the screen during startup.

c. Once in the BIOS setup utility, navigate to the location of the graphics card control and use the appropriate method to disable the integrated graphics card. The method for doing this will vary depending on the BIOS setup utility. You can search the Internet for specific instructions.

For example, for a Dell® laptop implementing NVidia Optimus™ technology, you would select Settings > Video > Switchable Graphics in the BIOS setup utility, and then uncheck the Enable Switchable Graphics check box.

d. Save changes and exit the BIOS setup utility to continue computer startup.

e. If BitLocker Drive Encryption was suspended, turn it back on.

Additional notes:

- Your laptop computer consumes more power when using the discrete graphics card exclusively. If it is running in battery mode, you should re-enable the integrated graphic card when you are done working with scan registration.

- Do not use Device Manager to disable the integrated graphics card. Device Manager disables the card just for Windows, not for the entire motherboard, causing the integrated graphics card to still load first.

- Some laptops do not allow you to disable the integrated graphics card.

- **ArcGIS versions and Windows operating systems** - When using TBC to connect or write data to an ArcGIS Enterprise Geodatabase provider, see your ArcGIS user documentation to determine which versions of the ArcGIS products are supported on the various versions of the Windows operating system.

- **OpenCL Runtime driver** - OpenCL Runtime is a graphics accelerator driver required when TBC is performing automatic tie point matching or dense point cloud creation. If the driver is not installed, an error message is displayed indicating OpenCL Runtime cannot be found. In this case, you must download OpenCL Runtime from https://software.intel.com/en-us/articles/opencl-drivers#phiwin and install it on your computer using the instructions provided.

- **VCE compatibility** - As a general rule, you cannot open a VCE project file created in a newer version of TBC in an older version of TBC.

- **Windows 8 users** – Some components in TBC require Microsoft .NET Framework 3.5 to operate. If the .NET Framework 3.5 is not installed, you are prompted to install it when you install TBC. If your computer is connected to a domain that does not allow you to directly connect to Windows Updates on the Internet to enable and install .NET 3.5, you may need to change your group policy settings. See your system administrator for assistance.

  For more information, see http://technet.microsoft.com/en-us/library/dn482065.aspx

- **Windows XP users** – Some components in TBC require Microsoft .NET Framework 4.5, which is not supported by the Windows XP operating system. To run this version of TBC, you must install a different operating system. See "System requirements" for complete operating system requirements.

- **TabletSync transfers -** If you use TabletSync to transfer large files (for example, panoramas) into TBC, it can take a long time for the upload to complete. As an alternative, you can shorten the transfer time by copying the files from the tablet onto a USB memory stick and copying the files from the stick into TBC.

- **TSPX file format -** TBC no longer supports the creation of TSPX (.tspx) files used to open TBC project data in Trimble RealWorks. As a workaround, you can export whole point clouds (not scans) to an .e57 or .las file format, which can be imported into RealWorks. You can export other types of data to an appropriate format (for example, points to .jxl, linework to .dxf, and images to.jpg) that also can be imported into RealWorks.

- **Proxy server settings** - If you receive an error when trying to access an external server to process data (for example, export KML graphic files to Trimble InSphere for use in panoramas displayed in Google Earth), you may need to specify a proxy server for your LAN using Internet Properties > Connections > LAN settings > Proxy Server.

System requirements

Operating system:	Microsoft Windows® 10 (64-bit version)
	Microsoft Windows 8 (64-bit version)
	Microsoft Windows 7 (64-bit version with Service Pack 1)
Processor:	Dual-core 1.80 GHz or better recommended
	Quad-core 2.80 GHz or better (additional cores with hyper-threading support highly recommended for Aerial Photogrammetry, Mobile Mapping, and Scanning modules)
Random access memory (RAM):	4 GB or more recommended
	32 GB or more recommended for Aerial Photogrammetry, Mobile Mapping, and Scanning modules

Hard disk space available:	10 GB or more recommended
	100 GB or more on solid-state drive required for Aerial Photogrammetry, Mobile Mapping, and Scanning modules
	The recommended SSD overall hard drive capacity is 500GB or more for Aerial Photogrammetry, Mobile Mapping, and Scanning modules
Monitor:	1280 x 1024 or higher resolution with 256 or more colors (at 96 DPI)
I/O Ports:	USB 2.0 port required if HASP hardware key is used
Graphics:	DirectX 11 compatible graphics card with 512 MB memory or more
	OpenGL version 3.2 or later required when working with point cloud data (latest version recommended)
	8 GB graphics card or higher (for example, NVIDIA Quadro P4000) required when working with Aerial Photogrammetry, Mobile Mapping, and Scanning modules
	Note: If you are using a laptop computer with both an integrated (on-board) graphics card and a discrete NVIDIA graphics card enabled via Optimus technology, your computer must allow you to select to disable the integrated graphics card and use only the discreet graphics card when working with point cloud data. See "Disabling a laptop integrated graphics card" in the "Miscellaneous notes" section earlier in this document.

Important!
It is critical that you keep your graphics driver(s) updated if you are working with point cloud data.
Whether your computer has one or multiple graphics cards installed, you must ensure each has been updated with the latest driver provided by the card's manufacturer. The best way to determine if your driver needs to be updated and, if so, perform the update is to visit the card manufacturer's website. For more information, see "Update and Configure Your Graphics/Video Driver" in the online Help.
(If, instead, you decide to update your driver using the Windows Device Manager and the "Search automatically" option, the program may suggest using a Microsoft-approved WHQL version of the driver. However, to ensure you have the latest bug fixes and new features for your graphics card, it is recommended that you use the latest manufacturer version instead.)