TotalGeo — Read Me

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How the program works, how to fill in each tab, and what the checks mean.

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Quick start — the usual order of work

1. **Connect the drill program folder.** When TotalGeo starts it looks for a program folder in its own folder (or one level down) and connects it by itself. If there isn't one it asks: **create a new folder**, **open a folder**, or **reopen** the one used last time. The line under the header buttons always shows whether a program folder is connected and where it is — click **Change…** there (or use the Holes tab) to switch. TotalGeo opens on the **Holes** tab: every hole in the folder is listed there, with the **most recent hole** (the one saved last) at the top — click **Open** to carry on with it (or **Continue** if it is already open), or open any other hole in the list.
2. **Start a hole. New hole** starts a blank hole but keeps your company, project, logged / drilled by, lists, QAQC materials and scheme from the last one, and starts the samples at the next sample number. **Open…** opens a saved hole (.json). **Import Excel…** reads a hole from the DDH Log Template (.xlsm) or from a log TotalGeo saved (*hole*_log.xlsx).
3. **Hole info** — enter the hole number and the **hole length** (the checks, RQD fill and Finalize all depend on it), then the collar and logging details. Check the QAQC materials, sampling settings and insertion scheme.
4. **Surveys** — down-hole survey depths, azimuths and dips.
5. **Lithology** — from 0 to the bottom of the hole, starting with Overburden.
6. **Alteration, Structure, Mineralization** — intervals as you see them in the core.
7. **Samples & Assays** — type the first sample number; the rest are laid out for you. Then type each To depth.
8. **Box lengths** and **RQD** — type the first RQD run and the rest fill in.
9. **Checks** — fix every error (red) and review the warnings (amber).
10. **Save** often (`Ctrl`+`S`), and **Finalize…** when the log is complete.

Entering data (all tables)

- **+ Add row** adds a row at the bottom; ┼ on a row inserts one below it; ✕ deletes a row (an **Undo** button appears at the bottom of the window).
- `Enter` saves the cell and moves down to the same column in the next row; `Enter` on the last row adds a new row. `Tab` moves across. In a Description box `Enter` starts a new line — use `Ctrl`+`Enter` to move down. Description boxes (and Comments on Hole info) **grow to fit** what is written in them, so a long description is shown in full.
- **Depths join up automatically:** a new row's From is the To above it (on Alteration, Structure and Mineralization only while **New row starts at the previous To** is ticked on that tab — Structure starts unticked, the other two ticked). On Lithology, Samples, Box lengths and RQD, changing a To also moves the next row's From with it (and changing a From moves the To above).
- **Drop-downs** end with **Add other…** — type a value that isn't in the list; it is used for that row and added to the Lists tab for next time.

- **Pick-several fields** (alteration minerals, structures, minerals, mineralization style and grain size) open a tick list; the box at the bottom adds values that aren't listed. Long lists (alteration, structure, mineralization) have a **search box** at the top: type part of a name to show only the entries containing it; **Enter** ticks the first one shown and clears the search for the next, ↓ moves into the list. Logging **codes** work too: **po** finds Pyrrhotite, **cpy** Chalcopyrite, **qz-ab** Quartz and Albite (Enter ticks both). A code typed in the box at the bottom goes in under its full name.
- **Lithology** opens a list with a **search box** too — click the box, or tab to it and just start typing. Each lithology shows its Litho code, and the search finds either: type part of a name (**porph**) or a code (**QFP**); the best match is highlighted and **Enter** picks it, or use ↓ / ↑ and Enter, or click one. **(blank)** at the top empties the box, **Esc** closes the list unchanged, and the box at the bottom adds a lithology that isn't listed.
- **Problems show as you type:** a red row number is an error, amber is a warning. The **Checks** column at the right of each table says what is wrong, and hovering over a red/amber cell shows it too.
- The bar above a table shows which depths are covered; ■ red marks overlaps and ▨ hatched marks unsampled gaps.
- **Sort by From** puts a table back in depth order.
- **Remove unused rows** (on every table tab) deletes rows with nothing typed in them — only what the program filled in by itself, like the From, the next box number or the RQD run depths. On Lithology, Box lengths and RQD only the unused rows after the last one in use go, so no gaps open up. It asks first, and **Undo** puts them back.

Tab by tab

Holes (the drill program)

- A drill program is a **folder of hole files** — keep it on SharePoint/OneDrive so it syncs. **Create program folder…** makes a new one (with a small "TotalGeo program.json" file that marks it as a program folder; a folder made by an earlier version has this file under another name, and it is read just the same) and starts it with a **fresh hole**: the hole that was open is saved first if it has changes, and nothing of it comes across but how you log — the code lists, the QAQC scheme and standards, the sampling settings and the PDF / export choices (a hole not yet saved anywhere can come into the new program instead, if you choose); **Open program folder…** connects an existing one and opens its **most recent hole** (the hole that was open is saved first if it has changes; if it's one of that program's holes already, it stays open — and a program with no holes yet starts with a fresh one). TotalGeo **remembers the program folders you have opened** on this computer. When it starts, the **Open a drill program** window lists them in a drop-down, the most recent first (with where each one is and when it was last opened): pick one and press **Open**. **Open a folder…** connects one that isn't on the list yet, and it is on the list from then on; **Create a new folder…** starts a new program; A program opened from a **new place** — the same folder name, moved or copied somewhere else — takes its old place on the list: the list keeps where you last opened it from, so a moved program needs **Open a folder…** once and is right

from then on (until then it shows as **(not found)**). **Remove from this list** takes a program off the list only (its folder and files stay where they are). The same window comes up from **Change…** beside the program's name. A copy of TotalGeo.exe kept in a program folder (or in the folder above its one program) on a computer where no other program has been opened goes straight into that program without asking. The Holes tab lists every hole in the folder with its length, how far it is logged, sample count and status; **Open** switches to that hole (saving the current one first if it has changes). New holes are saved into the folder by default.

- TotalGeo **starts on the Holes tab**. The box at the top shows the **most recent hole** — the one saved last, by anyone, with when and by whom — and opens it with one click (**Continue** if it is the hole already open, e.g. reopened from the automatic backup). That hole is also tagged most recent in the list.
- **Back up program…** makes a dated copy of the whole program — every hole file, the program's settings (lists, sections, targets, intervals, prices) and the lab results — as one zip file in a **Backups** folder inside the program folder, named with the date and time. Nothing in the folder is changed and an earlier backup is never replaced; if the open hole has unsaved changes it asks whether to save them first. Do it before importing logs or lab results, or before any change to many holes; the line beside the buttons shows when the last one was made. To go back to a backup, unzip it into an empty folder and open that folder as a program.
- **Import logs…** adds holes to the program from Excel logs — pick as many as you like: the DDH Log Template, or logs TotalGeo saved (*hole*_log.xlsx from Finalize, Draft Excel or Export all logs, e.g. to rebuild a program from its logs). A window lists each log with its hole, how it was read, its lithology intervals, samples and samples with lab results, and any notes; **Import** saves each as its own hole file in the program folder.
  - A hole the program already has (by hole number, or a file of the same name) is **left as it is** — nothing is ever saved over. Two logs of the same hole: the first is used.
  - Lab results in TotalGeo logs go into the program's **lab results**, one certificate per certificate number in the logs' Certif column (rebuilt from the logs: the result columns and the lab, not the lab's detection-limit row or method details). A certificate the program already has is kept as it is. To use the lab's own file instead, **Remove** the rebuilt one and **Import lab results…**.
  - Each hole gets the program's lists plus any value it uses. Holes come in **not finalized**, even from a FINAL log: check them, then **Finalize all holes…**. The open hole isn't changed.
- **Import lab results…** (also **Import assays…** on the Samples & Assays tab) reads a lab certificate — CSV, Excel or old Excel 97–2003 **.xls** (ALS, AGAT, MSALABS and others). It finds the column with your sample numbers, works out each result column's **element and unit** (skipping method codes like ME-ICP41a and the detection-limit row) and shows a preview — check it, as labs lay files out differently, and change the choices if something is off. **Only element (and oxide, e.g. Al2O3) results are imported** — sample weights, sieve tests and photon-assay error/status/fill-factor columns are left out. When the same element and unit come from more than one method, the main method keeps the plain label and the others are labelled **element_unit (method)** — e.g. Au_ppm (Au-GRA21), Ag_ppm (ME-OG46). Files with several sheets (AGAT's X01, X02 …) are combined; the lab's own QC sheets (Lab Duplicates, Lab Standards, QC, Summary) and sheets

with no element results are left out unless you tick them. A duplicate the lab wrote as **46962 C-DUP** is matched to sample 46962 when that number is logged and not on the certificate itself. The **certificate number** and **lab** are filled in from the file where possible (else the file name) — correct them there, or later with **Edit** in the lab results list.

- The results go onto the **Samples & Assays tab of each hole**, on the row with the matching sample number, with a column per element and unit (whatever the lab analysed — different methods and labs add their own columns). Each hole file in the folder is updated; if the open hole has unsaved changes, Save it to keep them. A later file overrides an earlier one for the same sample and element (re-assays). Values are kept as the lab wrote them (e.g. <0.005, or negative numbers for below detection in ALS .xls files).
- The program's CSV files — collars, surveys, assays, lithology, QAQC and the rest of the logs, for the database and the resource estimate — are written from **Data export** on the Data Files tab (until version 1.71 this was **Export program files…** here).
- **Export all logs…** saves the log of **every hole in the folder** into one folder you choose — **PDF + Excel**, **PDF only** or **Excel only** — the same files the hole's own Finalize and Draft Excel make. A finalized hole is saved as *hole*_log and marked FINAL; the others as *hole*_log_DRAFT, marked DRAFT with any errors counted. Each PDF has the sections and columns chosen for that hole (Preview PDF → Sections & columns). Nothing is finalized or changed, and files already in the folder are only replaced if you say so.
- **Finalize all holes…** finalizes every hole in the folder that passes its checks, the same as **Finalize…** on each hole: unused sample rows are removed, the hole is marked ✓ **Finalized** and saved, and its log (*hole*_log, FINAL — PDF + Excel, PDF only or Excel only) is saved into one folder you choose. First it shows a summary: the holes ready to finalize (with their warning counts), the holes that **can't be finalized yet** with what to fix in each (errors, a missing hole number or length, lithology not running from 0 to the hole length) — those are left as they are — and the holes already finalized, which are left alone. If any ready hole has warnings you're asked whether you're sure: finalize them all, only the holes without warnings, or cancel. Save the open hole first (it asks); if it is finalized it is shown finalized straight away.

Hole info

- **Hole information** — company, project, hole number, location (GPS), collar, hole length, core size, who logged/drilled it and when, comments. **Every box must be filled in** before the log can be finalized, except NTS sheet, Township, Claim no. and Comments (marked optional); once the hole has a number or anything logged, a box still empty is red and listed on the Checks tab.
- **QAQC materials** — the blanks and standards you insert. Rename one (e.g. to its CRM code) or add more; sample types and the insertion scheme follow the new names. **Certified values** lists their expected grades.
- **Sampling settings** — start batch number, samples per batch block (normally 50), maximum sample length, maximum box length, RQD run length (normally 3 m) and how many sample rows to pre-fill (normally 500).

- **QAQC insertion scheme** — which position in each block of sample numbers gets which QAQC insert (e.g. position 2 = Blank, 5 = Standard A, 12 = Coarse Reject). Changes apply to sample rows you haven't used yet; samples already logged keep the type they were bagged as.

Surveys

Depth, azimuth (0–359.99) and dip (−90 to 90), plus method and comment. Depths must be unique and inside the hole.

Lithology

One continuous column of rock from 0 to the hole length: each From must equal the To above it. Picking a lithology fills in its **Litho code** from the Lists tab (change it if needed). Log Overburden first.

Strip log — beside the table, the hole drawn to scale as you log it: lithology in colour, alteration (a bar for each mineral of the interval, side by side in the order listed: each bar's **colour is the mineral** — chlorite green, sericite yellow, hematite red, carbonate blue, K-feldspar salmon and so on, with the colours of the minerals in the hole shown under the strip log and at the foot of the PDF's strip-log pages — and its length the strength; point at an interval for each mineral's style and strength), mineralization (bar length = %, full at 10%), structures (a line at the angle TCA), a grade bar chart (choose the element at the top; gold in ppm, scale to the 95th percentile, darker bars past it) and the recovery % of each RQD run. Hover over anything for its details; click it to go to that row. The row you are on is outlined. **+** / **−** zoom (**Fit** shows the whole hole); click the depth scale to see the core photo at that depth. **Strip log** in the toolbar hides or shows it. Colours come from the rock names — set your own on the Lists tab.

Alteration

Pick one or more alteration minerals; each gets its own line with a **style** and **strength**. Intervals can't overlap — split an interval where the assemblage changes. The first interval starts at the top of bedrock (the first lithology after Overburden); type over it if it should start elsewhere.

Structure

Pick one or more structures; each gets its own **angle TCA/TOCA** (α — leave it blank if it can't be measured). For a point measurement use a short interval, e.g. 45.20–45.25. The first interval starts at the top of bedrock. Structures aren't continuous, so each new row's **From is left blank** for you to type (`Enter` on the last row puts the cursor there). Tick **New row starts at the previous To** in the toolbar to have it filled in from the row above instead — the choice is remembered on your computer. (Alteration and Mineralization have the same box, ticked to start with.)

Oriented core: also enter **β** — measured clockwise, looking down the hole, from the orientation line to the bottom of the ellipse (0–360°). TotalGeo works out the plane's **dip / dip direction** (e.g. 62° / 135°) from α, β and the hole's direction at that depth (between the surveys either side; the collar azimuth and dip if there are no surveys yet). Survey dips are negative downwards. **β from** in the toolbar says which line β is measured from: the bottom-of-hole line (usual) or the top-of-hole line. The dip and dip direction go in the PDF, the Excel workbook and the structure export.

Mineralization

Pick one or more minerals; each gets its own line with **style(s)**, **grain size(s)** (tick several if needed, e.g. Trace + Stringer/Fracture, Very Fine + Fine Grained) and **%** (only if not trace). The first interval starts at the top of bedrock.

Samples & Assays

- The switch at the top shows the **Samples** table, **QAQC** or **Lab submissions**. QAQC and Lab submissions work on the **whole program** or **this hole only** (choose beside the switch); their settings and the submissions are kept in the program folder's program file, shared by every hole.
- Click **+ Add row** and type the **first sample number** (e.g. F669001). The next rows are laid out for you, with blanks, standards and duplicates in their scheme positions and the batch number worked out.
- **New hole** does this for you: the samples start at the **next number after the last one used** — in the hole you had open or, with a program folder open, the highest of that series in any of its holes — and the start batch follows on. If this hole starts a different series (a new sample book), just **type over the first sample number**: the rows lay themselves out again from it. The same works later in a hole — type a new number on the first sample not logged yet and the rows after it follow on from the new number. Samples already logged are never renumbered.
- Then just type each **To** and press `Enter`: the From fills in from the previous sample and the cursor jumps to the next regular sample, skipping QAQC rows.
- **QAQC rows** (blanks, standards, coarse rejects, quarter cuts) never have depths. Duplicates show which sample they duplicate.
- **+ Unsampled gap** marks a stretch you deliberately didn't sample, so the depths stay continuous without using a sample number.
- Or just type the depths with the gap in them: when a sample's From is past the previous sample's To (or a To stops short of the next sample's From), you're asked whether it's a **sample gap**. **Yes** puts an Unsampled gap row in it, so it isn't an error. **No** leaves it to fix — or, if the two samples were joined, moves the previous sample's To to meet the new From, as before. **Sample added later** (when the two were joined) leaves the gap for a sample you'll add later.
- **Samples added later** (or out of order) can go anywhere in the table — usually in sample-number order, lower down. The From / To checks follow the depths down the hole, not the order of the rows, so a late sample that fills its stretch exactly is not an error, and neither are the samples either side of it. The assays export lists each hole's samples in depth order.
- Gaps already in the log (typed before, or imported) are flagged as errors with a **Sample gap** button beside the message in the Checks column: click it to put an Unsampled row in that gap. While there are any, **Fill N sample gaps…** shows on the toolbar: it lists them all, ticked, so you can untick the ones that are typing mistakes and fill the rest in one go. Both have Undo.
- **Import assays…** puts a lab certificate's results on the matching sample rows: a **Certif** column, then one column per element and unit. The table always fits the window, so its scroll bar along the bottom is on screen: drag it (or hold `Shift` and turn the mouse wheel) to reach the columns on the right, including the Checks. The line above the table lists the lab files the results came

from; ✕ removes one. With a drill program folder open the results are shared across the program (see Holes); without one they go into this hole only.

- **Faded rows** at the end are unused: they aren't checked or exported and are removed when you finalize. **Remove unused rows** deletes them now, along with any sample further up that never got a To (with Undo).
- **QAQC** — standards against their certified values (Hole info → Certified values; holes without their own borrow them by CRM code), blanks against the detection limit, and duplicate pairs. Failures list the samples to consider re-assaying; control charts show each standard over time.
- **Lab submissions** — pick the batches going to the lab, save a submittal sheet (Excel: one sheet for the lab, one internal), and track each shipment until its results are imported. Over 30 days without results is flagged overdue.

Intervals

- Intervals and composites from the lab results, for the **whole program** or **this hole only** (choose under **Holes** at the top). With a drillhole database set up on the **Data Files** tab, **Program and database** adds the database's holes that aren't logged, and **Database only** works from the database's assays alone — intervals without a single drill log. The tab has four parts, one showing at a time — **Composites**, **Custom intervals**, **Fixed-length** and **Metal equivalents** — picked with the buttons across its top, each with how many it holds.
- **Composites above a cut-off** — length-weighted composites at your cut-off, max. internal dilution and minimum length, with optional “including” intervals at a higher cut-off. **+ Add a run** adds another element or cut-off (e.g. Au ≥ 0.27 g/t including ≥ 1.0, and Ag ≥ 1.5 g/t); all runs are listed together, hole by hole, with a grade column per element headed with its unit — e.g. **Au (g/t)**, **Ag (g/t)**, **Cu (%)** — the run's own element in bold. **Also report across each interval** adds other elements' length-weighted grades over every interval (e.g. Ag and Cu across the Au intervals). **Save CSV…** saves them as data; **Save Excel…** saves a formatted table for a report — hole, From, To, Length and a grade column for each of the chosen elements (the runs' elements and the ones reported as well), the “including” intervals in italics under theirs, the cut-offs and how the composites are made in the notes under the table, set up to print with the heading row on every page. Custom intervals go on a second sheet of the same workbook.
- **Metal equivalents** (at the top of the tab: **Set up…** / **Show**) — NiEq, CuEq, ZnEq, PbEq, CoEq, AuEq, AgEq, PtEq, PdEq …: several metals' grades as the grade of one metal that would be worth the same. First the **price table**: **Add a metal** for each one, then its **price**, what the price is **per** (lb, troy oz, gram, kg or tonne — it starts at oz for the precious metals and lb for the base metals), and its **recovery** (blank is 100%). **Prices as of** is their date and **Source of the prices** where they came from (LME cash, a 3-year trailing average, a consensus long-term price…); if one metal's price is from somewhere else, write that in **Source, if not the one below** on its own row — as many different sources as there are metals. Then **+ Add an equivalent**: the metal it is **expressed as**, the other metals that count (**With these metals**), and the unit it is **in** (% to start with, g/t for a precious metal — as equivalents are usually quoted, even where the lab reports the metal in ppm). Its **formula** is written out beside it — e.g. **NiEq (%) = Ni (%) + 0.2941 × Cu (%) + 2.353 × Co (%)** — and follows the prices as you type. It is worked out sample by sample: each metal's grade

× price × recovery, added up, divided by the price × recovery of the metal it is expressed in, so that metal counts at its own grade; the units (ppm, ppb, %, g/t against lb, oz, gram, kg, tonne) are converted for you. The formula is written the usual way — base metals in %, precious metals in g/t — whatever unit the lab's columns are in.

- An equivalent is then an element like any other: pick it as a run's **Element** for composites at a cut-off on it (NiEq ≥ 0.3%), or tick it under **Also report across each interval**; the custom intervals, the fixed-length composites, the composites in the 3D view and on the sections have it too. It is also at the foot of every **list of elements** where assays are drawn or compared: the strip log's grade bars (and the PDF's strip-log pages), the 3D view's **Assays** colouring and its extra strips, a section's **assay bars**, the **Geochemistry** tab and **Suggest…** — so NiEq can be drawn down the holes or stepped out from like nickel itself. Where it is drawn, the legend writes its formula and which prices it is at. Wherever it is reported, the **grades of its metals are reported beside it**. A sample with no result for one of the metals counts as **zero for that metal**: the tab says for how many samples, and an interval's Notes say when it has such samples. A metal with no price, or not in the assays, is left out and flagged; without a price for the metal it is expressed in, the equivalent isn't worked out.
- **Prices used** — **Current** is live: change a price or a recovery and every equivalent follows at once, here, on the sections and in the 3D view. **Lock these prices…** keeps a copy of the prices, recoveries, sources and equivalents under a name and a date; that copy never changes, and it becomes the set in use, so the tables, sections and exports stay exactly as they were for a news release however the current prices move afterwards. Go back to **Current** to work live again, pick a locked set again before an export that has to match it, keep as many as you like, and **Delete this locked set** removes one. The **Excel table** adds, as notes under it, each equivalent's formula, the prices and recoveries, whether they are current or locked and their date, their sources, and how an equivalent is worked out; the **CSV** files carry the same in an **Equivalent_basis** column, and a simplified section writes the formula and the date of the prices under the drawing. The prices are yours to choose and to justify; an equivalent shouldn't be quoted without its metals' grades, the prices, the recoveries and the formula.
- **Estimated true widths** — under the runs, type the mineralized zone's **dip** and **dip direction** (“Zone dips 70° towards 150°”). Every composite, “including” interval and custom interval then gets an **Est. true width (m)** beside its core length: the core length × the sine of the angle between the hole (its azimuth and dip at that depth, from the surveys) and the zone — a hole square to the zone gives the core length itself, a hole at 60° to it 87% of it, a hole running along it close to nothing. Point at a width for its share of the core length. The Excel table and the CSV carry the column (the CSV also the dip and dip direction used), with a note saying what was assumed, and a simplified section says “true widths are estimated at 65–80% of them” under the drawing. They are estimates, as good as that one dip and dip direction are for each interval; leave the two boxes blank for core lengths only.
- **Custom intervals** — any stretch of a hole you type in (hole, From, To, a note), with the length-weighted grade of each element; “Sampled” shows how much of it has samples.
- **Fixed-length composites** — type a length (e.g. 2 m) and every hole is composited down from its first sample at that length, for modelling or plotting; save them as a CSV.

- Below-detection results count as half the detection limit; unsampled stretches and samples without results count as zero. Lengths are core lengths, not true widths. The 3D view shows the intervals.
- The settings are kept in the program folder's program file, shared by every hole.

Geochemistry

Read this first: the tab is only useful with a larger dataset and multi-element lab results. With few samples or holes, or with only gold (or one or two elements) analysed, its comparisons mean little or can't be made at all — it says so at the top when the data are thin (fewer than 300 samples with results, fewer than three holes, or fewer than ten elements with enough results). It shows what tends to occur together in the logs and the assays — not why — and it is only as good as the logging is consistent from hole to hole. Use it to find things worth a closer look, not as an interpretation.

- For the **whole program** or **this hole only** (choose at the top). Pick the **target element** (Au, Ni, Cu, Zn …). Every regular sample with lab results is one row: its elements, and the rock, alteration and mineralization logged across it — a mineral counts for a sample when it is logged across at least half of its length; the rock is the one across most of it.
- **In short** — the strongest of what follows, in plain words: only what has the samples and the size to be worth saying.
- **Elements that go with the target** — every other element ranked by Spearman's rank correlation with it (+1 they always rise together, −1 one rises as the other falls; 0.6 and over is strong, 0.4 moderate, 0.2 weak). It compares ranks, so skewed grades and a few very high assays don't decide the answer. Click an element to **plot** the target against it (both scales logarithmic, at most 2 500 points drawn), and colour the points by lithology or by a mineral being logged or not. The Intervals tab's **metal equivalents** (NiEq, AuEq …) are among the elements, and one can be the target; their formulas and prices are written above “In short”. An equivalent always rises with the metals it is made of, whatever the rock — so those are marked in the list (**part of NiEq**, **includes Ni**, or **shares Cu** for two equivalents with a metal in common), left out of “In short”, and not used as pathfinders by Suggest….
- **The target and the logged alteration**, **mineralization** and **lithology** — for each mineral or rock: how many samples have it, the target's median with it and without it, the share of samples at or above the **high grade** (the Intervals tab's cut-off for the target, else its 90th percentile, or type one), and whether the target is higher, lower or neither. It says higher or lower only when both groups have 30 samples or more, the difference is more than chance (Mann–Whitney test, $p < 0.01$) and large enough to matter. Alteration also lists the median by strength; mineralization the rank correlation of the mineral's logged % with the target.
- **What each alteration looks like chemically** — pick an alteration mineral: each element in the samples logged with it against the samples without it, enriched at the top and depleted at the bottom.
- Results below detection count as half the detection limit; an over-limit result is replaced by the over-limit method's where there is one. Elements with fewer than 30 results, or mostly below detection, are left out and listed.

- **Save the tables (Excel)…** saves what is on the tab as a formatted workbook; **Save the sample table (CSV)…** saves a row for each sample — hole, depths, sample number, the rock, alteration and mineralization across it, and every element — for a spreadsheet or a geochemistry package.

3D & Section Viewer

- Every hole in the program folder (and the open hole) in its real position: from the collar's **GPS easting / northing** and **elevation** down the hole, following the surveys (between the surveys either side; the collar azimuth and dip if there are none yet). Holes without GPS coordinates are listed beside the view instead of being guessed.
- **Colour by** lithology (the strip-log colours), **alteration** (each alteration interval in the colour of its strongest mineral — the first listed, among equals — and thicker the stronger it is; the minerals' colours are the strip log's, listed beside the view; point at an interval for all its minerals with their styles and strengths), **assays** (pick the element; five grade classes from the program's own results, darkest highest — samples still waiting for results stay grey; **+ element…** beside it shows another element as well, up to four at once — say Ni, Cu and Zn: each is a strip of its own, side by side along every hole, in its own colours (the first yellow to dark red, then blue, green and purple, each light to dark) and with its own classes, all listed beside the view. Zoom in to tell the strips apart; point at one for its sample and value; “take away” at the foot of an element's list removes it. The Intervals tab's metal equivalents — NiEq, AuEq … — are at the foot of the element lists, worked out sample by sample at the prices in use; the legend writes the formula and the prices' date under its classes), or **intervals / composites** (each run in its own colour, “including” thicker, custom intervals in gold — as set up on the Intervals tab).
- **Structures** show as discs at their true dip and dip direction where oriented core gives one, or as a ◆ marker where only the angle to the core axis is known. The discs are light, so the colours along the hole show through, and the list beside the tick box makes them **small**, **medium** or **large**.
- Each **box beside the view** — Sections, Targets, Models, the drillhole database, the legend, Structures, Holes — **folds away** on a click on its heading and opens out again on another, so the ones you aren't using take a line each. What is folded is remembered on this computer.
- **Drag** to rotate, **right-drag** (or Shift-drag) to move, **scroll** to zoom. **Plan**, **Looking north**, **Looking east**, **3D** and **Fit** jump to those views. Hover over any point of a hole for its details — including its **depth down the hole**, its **vertical depth** below the collar (the surface there) and its elevation; **click** on a hole and a small box comes up beside it for that depth, without leaving the view: **Lithology** (the unit there, its depths, angle and description), **Alteration** (each mineral of the interval there with its colour, style and strength), **Structure** (what is logged there, or the nearest within 5 m) or **Assays** (the sample there and its results, the element the view is on first) — pick which with its four buttons; it starts on what you clicked (a lithology stretch, an alteration strip, a structure's mark, an assay). **Open in the log** opens that hole on that tab, at that row. `Esc`, the ✕ or a click elsewhere closes it.
- **Holes** ▾ (above the view) chooses which holes the 3D view shows. It opens a list over the view with a tick box for every hole — untick one to take it out of the view, tick it to bring it back — and **All on** and **All off** for the lot. With more than a dozen holes there is a search box: type part

of a hole number and the list shortens to the holes that have it, and All on / All off then act on those (type “21”, All off: every SUR-21 hole goes). Under the holes, **Proposed holes** switches all the targets and their planned holes on or off (the same as the Targets tick box), with a tick box for each one. The list stays open while you work, so the view changes as you tick; ✕, Esc or the button closes it, and the button shows how many are on when some are off (**Holes (7 of 10)** ▾). A click on a hole also offers **Hide hole** in its box. **Fit** takes in the holes shown. The choice is kept with the program. It is the 3D view's only: sections draw every hole that is on them, and planned holes and suggested targets still go by all the holes.

- **Grid** — squares on the horizontal at the highest collar. **Depth grid** — lines on the far walls of a box around the holes, a round number of metres apart (closer as you zoom in), labelled with the depth below the highest collar; the note at the bottom left gives their spacing and that collar's elevation. The bar at the bottom left is one grid square long, with its size (e.g. **50 m — grid squares 50 × 50 m**). Looking straight down (Plan) only the squares show.
- **Sections** (the box at the top right) — a vertical slice through the holes, drawn to scale for a PDF or a picture. A section is a **line** (its azimuth, through an easting / northing) and a **window** either side of it: every part of a hole inside the window is drawn on it, so several holes on the same line go on the same section. **New** fits one to all the holes; **Fit to holes…** fits it to the holes you tick — the line follows their drilling direction (along the collars if they're vertical), through their middle, with a window wide enough to take them all. For example, four holes drilled south, 100 m apart north–south and staggered 25 m east–west, get a north–south line looking west, with all four on it. **Draw on plan** lets you click the line's two ends on the plan instead.
- **Slices every … m** turns the section into a series of side-by-side slices that don't overlap (e.g. every 25 m: 5125E, 5150E, 5175E…). Each hole is drawn on the slice its path passes through; a hole that wanders from one slice into the next is cut where it crosses, and each part goes on its own slice — labelled with its depths (e.g. **TP-26-05 (62–148 m)**), with “rest on 5175E” in the list beside it. An interval split between slices is labelled on the slice with most of it, and “continues on …” on the others. ◀ ▶ step through the slices one by one (← → in the section view), and the **list between the arrows** jumps straight to any of them — each is listed by its name with how many holes are on it (e.g. **5150E — 3 holes**); slices with no hole in them are skipped. With slices, **Window ±** is each slice's **influence**: how far either side of its line a hole can be and still be drawn on it — never more than half the spacing, since each part of a hole goes on the slice it is closest to. Left blank it is half the spacing, and everything is on a slice; set smaller (slices every 50 m, window ± 15 m), what lies between the slices is left off.
- **Area** — for a program whose holes are spread far apart, when a section is only wanted for one group of them. **Draw area** lets you click two opposite corners of a rectangle on the plan (zoom in on the plan first to place it closely), then asks for the **sections across it** and makes them: the **direction** their lines run along, how far apart they are (**a section every … m** — it starts at the **spacing of the holes in the area**: the usual distance between neighbouring lines of holes across that direction, to the nearest 5 m, and it follows the direction if you change that, until you type a spacing of your own), and the **influence** either side of each — how far from a section a hole can be and still go on it, each hole (or part of one) going on the section it is closest to. It shows how many sections and holes that gives before you accept, and sets Line, Slices every and Window ±

for you; they can be changed afterwards. North–south and east–west sections sit on round coordinates (every 50 m: 5338050N, 5338100N…); others are spaced evenly either side of the middle of the area. Leave the spacing blank for a single section of the area. **Fit to holes…** with **Only these holes' area** ticked puts one around the holes you tick (10 m clear of them, more for a large group). Only the holes, and the parts of holes, inside the area go on the section: holes elsewhere along the line or in the other slices are left off, the slices cover only the area, and **Depth to** starts at the area's deepest hole. The area shows as a dashed rectangle on the ground in the 3D view (the slice's walls go only as far as it does), on the plan strip and on the key plan (with a box round it where it's too small to see among holes far apart), and the title block gives its size. **Redraw** draws it again; **All holes** takes it off. Each section keeps its own area — several areas, a section each.

- In the 3D view the section's slice shows as two dashed walls — an outline only: nothing is shaded and no hole is faded, so the holes are as clear as without a section. Tick **In the 3D view, fade what is off the slice** in the Sections box to have the section lightly shaded and the holes (and parts of holes) that are not on the slice shown faded, to see at a glance what is on it. **Section view** shows the drawing itself: the holes on the slice at true scale (1:1 000, 1:2 500…, the same on every slice), starting at the surface: **0 m at the top** (the highest collar on the section, its elevation given in the title block) with the depth below it down both sides — down to the deepest hole in the program, so every section shows the same depths — and the coordinates along the top and bottom, depth ticks down each hole, the end of hole, what's ticked under **Show** (below), structures at their **apparent dip** in the section (◆ where only the angle to the core axis is known) and the interval labels. Across the top is a **plan strip** of the holes at the same scale along the line, the slice between dashed lines; the section's frame runs to the bottom of the page, with the **legend** (including the holes on the slice and how far each is off the line) and the **title block** (line, looking direction, window, scale, with a key plan and scale bar) in a column beside it — or, on a roll **Sheet** (below), inside it, in the corners where they cover least of the holes. **Rest of each hole, faded** also draws the parts off the slice, dashed. Hover and click work as in the 3D view: a click on a hole brings up the same box, for the depth clicked.
- **Show** picks what a section draws — its own choice, whatever the 3D view is coloured by — and the PDF and PNGs are drawn the same way: **Lithology** coloured along each hole; **Alteration** as thin strips on the hole's right — one for each mineral of an interval (up to four, in the order listed, the first nearest the hole), each in its mineral's colour, with the minerals on the section in the legend; **Assays** as a **histogram** on the hole's left, a bar for each assay as long as its grade (full length at a round grade near the top 2.5 % of the program's results; a higher one has its value written by it), in the same grade colours as the 3D view, for the element picked beside it, with a **tick** at each end of each sample; **+ element…** beside it draws another element's bars as well — up to four elements, a histogram each, side by side out from the hole (the first nearest it), each in its own colours as in the 3D view (yellow to dark red, then blue, green, purple) and with its own classes and bar scale in the legend; with several the bars are shorter (5 mm for two elements, 4 mm for three or four), and a metal equivalent (NiEq, AuEq …) can be one of them, its formula and prices written in the legend; **Values** writes each assay's value across the hole past its bar, where there's room (the highest first) — with one element only: with several, another element's bars are where the values would go, so point at a bar in the section view for

its value; **Composites** (the Intervals tab's composites and custom intervals) in a strip on the hole's right with their grades (outside the alteration strips, when those are shown) — on the hole itself if lithology is off; and **Structures**. All but Alteration are ticked to start with.

- **Scale 1:** and **Depth to** are for a section that needs something different from the rest — say one hole is 1,000 m deep and the others 400 m. **Depth to** is the *program's* deepest hole to start with; *this section's* draws a section of 400 m holes down to 400 m, at a larger scale; *set…* takes a depth you type, and a hole going deeper is cut off at the bottom of the drawing with an arrow and "continues to EOH 1,000.0 m". **Scale 1:** left blank takes the largest standard scale that fits; a number sets it (a hole running off the side is marked the same way). Both are kept with the section, the same on all its slices.
- **Sheet** is the page a section is laid out on, for the PDF, the PNGs and the section view: **Letter** (11 × 8.5", landscape) to start with, **Tabloid** (17 × 11"), or a **24"**, **36"** or **42" roll** for a plotter. On Letter and Tabloid the legend, the title block and its key plan stand in a column on the right of the section's box, so they cover none of the drawing, which takes the rest of the sheet; on a roll they go inside the box, a little larger, in the corners where they cover least of the holes, and the roll is only as long as the drawing needs. On every sheet the scale is the largest that fits, while the labels, ticks and assay bars stay the same size on paper — so a crowded section spreads out (a section of 400 m holes goes from about 1:4 000 on letter to 1:1 000 on a 24" roll and 1:500 on a 42" roll). On a roll the sheet is as tall as the roll is wide and as long as the drawing needs, up to 200"; its length shows beside the choice. Each section keeps its own sheet; **Scale 1:** and **Depth to** work the same on every sheet. Zoom in on the section view to read a large sheet on screen.
- **Style** chooses between two drawings of the same section. **Technical** is everything described above. **Simplified** is a plain drawing for a news release, a slide or social media: the holes, with the Intervals tab's composites as bold coloured bands along them (the "including" ones wider) and each one's grade and length written beside it — e.g. "1.24 g/t Au over 15.00 m", with a line for each "incl." under it — under a title, with a scale bar, what each band is, and the note that the lengths are core lengths, not true widths. It leaves out the lithology, assay bars, structures, plan strip, grid and title block; models ticked "On sections" are still drawn. The best composites (grade × length) get the places nearest their bands when the holes are close together. Set the cut-offs on the Intervals tab; the section view, the PDF and the PNGs all follow the style, and a simplified section's files have "(simplified)" in their names, so you can save both. With Simplified the **Sheet** list also has two picture sizes — **Widescreen 16:9** and **Square 1:1** — whose PNGs are exactly that shape.
- **PDF…** saves every slice, a page each (on the section's sheet); **PNG…** saves the slice shown as a picture, and **All as PNG…** a picture of every slice into one folder. The sections are kept in the program folder's program file, shared by every hole.
- **Interpretation** (at the foot of the Sections box) — your own lines on a section: **Draw a line** for a contact, a fault or any other line, **Draw an outline** for a zone or a lens (closed back to its first point and lightly filled). The section view opens and waits: **click along the line**, point by point — a dashed line follows the pointer — and **double-click** (or Enter, or **Finish** in the bar above the drawing) to end it; Backspace or **Undo point** takes back the last point, Esc or **Cancel** gives it up. You can zoom and drag the drawing while you draw. Each one is then listed under Interpretation

with its **colour**, its **name** (Line 1, Outline 1 … until you type one: “Hanging wall”, “Zone A”), **line / outline**, and ✕ to delete it; to change its shape, delete it and draw it again. Its name is written beside it on the section and in the legend, and it is on the PDF, the pictures and the simplified drawing. The points are kept **in the ground** (east, north, elevation, on the plane of the slice they were drawn on), so a line stays where it is when the scale, sheet or depth change; with slices it is on the slice it was drawn on, and the box says how many are on the others. If the section's line, window or spacing is changed so that a line is on no slice any more, it is listed as such — to delete, or to keep until the section is put back. Pointing at a line gives its length (an outline: the distance round it and its area on the section); a click picks its row. **in 3D** draws every section's lines in the 3D view where they are in the ground — the same zone outlined on a series of slices shows its shape — and a click on one there goes to its section. **Save as DXF…** saves every line of the section, on all its slices, as **3D polylines** in the ground's coordinates, each on a layer named after it and in the nearest AutoCAD colour — for a CAD or modelling package, or to bring back under Models. They are your interpretation: nothing is worked out from them.

- **Targets & planned holes** (the box under Sections) — mark a point in the ground as a **target**, and a hole to reach it is proposed. **New target**, then click where it is. The 3D view is flat (no perspective), so one click can't give all three coordinates: a new target starts on the section shown (the middle of its slice) or, with no section, at the middle depth of the holes; each further click moves it *across* the view and keeps its distance from you — so turn the view, or use **Plan** (east and north), **Looking north** or **Looking east** (elevation), and click again. On the **section view** the click is the point itself, on the middle of that slice. **Done** or `Esc` ends it; **Move** starts it again, and the target's **E**, **N** and **Elevation** can also be typed. The box shows how far below the ground it is — the ground from an elevation layer of the Models box where there is one, else from the nearest collars.
- The **planned hole**: **Drill from — the best spot** gives the hole the direction of the holes around the target (the usual azimuth and the middle dip of the nearest six, at their collars — or the **Azimuth** and **Dip** you type) and puts the collar where that direction, followed back up from the target, comes out of the ground. **Drill from — a collar I set** takes a collar you give (its east and north, or **from a hole's collar** for the same pad) and works out the azimuth and dip that reach the target from there. **Allow for drift** uses how the nearby holes' surveys change down the hole (the middle value, in degrees per 100 m: “flattens 1.2°, turns 0.8° clockwise”): the planned hole is drawn bending the same way and set off so that it still passes through the target; untick it for a straight hole. **Past the target** is how far it is drilled beyond the target (25 m unless set), the **length** then taken up to the next 3 m rod. The box gives the **collar** (east, north, elevation), **azimuth**, **dip**, **length** and the depth down the hole at which the target is reached, with the nearest existing collar, and warns of a dip flatter than −40°, a hole longer than any in the program, or one passing within 10 m of an existing hole. **Nearby holes…** lists what the nearest holes have at their closest point to the target: how far and which way it is, the depth in that hole, the rock and alteration logged there, and the assay there with the highest within 15 m (the element the view's Element list is on).
- Targets are drawn in the 3D view as a ringed cross with a dashed planned hole from its collar (a small square) — the **Targets** tick box above the view hides them — and on technical sections, on the slice the target is in and wherever else the planned hole passes (a section's **Show ▸ Targets**;

a planned hole reaching past the drilled ground gets a slice of its own, listed as "+ 1 planned"). Click a target to bring it up in the box. **Start its log…** starts a new hole with what was planned already on its Hole info — collar easting, northing and elevation, azimuth, dip and planned length — for you to type the surveyed values over once it is drilled, and marks the target as **Drilled as** that hole (or pick the hole there yourself): the box then says how near the real hole passed to the target and at what depth, against the depth planned, and follows the hole's surveys as you enter them. **Drill plan…** saves all the planned holes as a formatted Excel sheet for the drillers and the field — collar, azimuth, dip, length, target, depth to target, notes, and the drift allowed for. **Colour** in the box sets the colour that target and its planned hole are drawn in, in the 3D view and on the sections; **Use for all** gives every target that colour, and the ones made from then on, and **Reset** goes back to the usual one. **Save CSV…** writes all the planned holes — HOLE-ID, collar, length, azimuth, dip, the target and the depth to it — and they are kept in the program folder's program file. They are proposals to check on the sections and in the field (access, pads, claim boundaries, the real ground surface), not drill-ready collars.

- **Suggest…** proposes targets from the results: **untested ground beside the better results**. Pick the **element**, the grade counted as **mineralized** (blank: the Intervals tab's cut-off for it, else its 90th percentile), the **step-out** (it starts at the usual distance between collars) and how many. The **trend** of the mineralization is worked out around each mineralized stretch — a plane fitted to the intercepts of the holes around it (within four steps), when three or more holes have them and they lie along a plane that the holes cut across; where that can't be done it is taken as square to the holes, and each suggestion says which — or set it yourself as a dip and dip direction, which is better whenever you know them. From each mineralized stretch of each hole it steps out along strike both ways, up dip and down dip (one step and two), drops every spot a hole already passes near (within 0.6 of the step), above the ground or already a target, and scores the rest from the samples around them — the nearer the more, with distances across the trend counting several times over. A sample's score is mostly its **grade**; with the data for it, also the **pathfinder elements** that rise with the element (the Geochemistry tab's rank correlations of 0.4 or more), and whether it is logged with an **alteration** or **mineralization** mineral that goes with higher grades in this program — each can be unticked. Each suggestion has a score from 0 to 100, its coordinates and depth, and **why**: which intercept it steps out from and which way, how far the nearest hole is, how many of the holes around carry the element, and the pathfinders and alteration around it. The ticked ones become targets, each with its planned hole, and keep their reasons. *They are worked out from the numbers alone* — they know nothing of structure, rock types, what limits the zone, or access, and with few holes or few results they mean little: places worth a look on the sections, not an interpretation.
- **Models** (the box under Targets) — surfaces and wireframes from **DXF** files: topography, overburden / bedrock, pit shells, vein or zone solids, block model limits… **Import…** takes one or several files (from Leapfrog, Surpac, Datamine, Vulcan, AutoCAD…; ASCII DXF, any version) in the **same coordinates as the holes** — UTM east, north and elevation, like the collars. Triangles and meshes (3DFACE, polyface and polygon meshes) are drawn as shaded surfaces, lines and polylines as lines, each **layer** in the DXF's own colour. Each model can be shown or hidden, made see-through (**Opacity**, 60 % to start with), recoloured or cut down to some of its layers (**All** / **None**, or a tick and a colour each); a model far from the holes is flagged, in case it's in other

coordinates. The holes are drawn over the models. **Fit** takes in everything shown — untick a large surface such as the topography to fit closer to the holes. With **On sections** ticked, each section shows where the models cross the middle of the slice, as lines in their colours (the topography and pit outline, a vein's outline…), listed in the legend, and in the PDF and PNGs too.

- **GeoTIFF and grid layers** — **Import…** also takes **GeoTIFF** files (.tif) and ESRI ASCII grids (.asc); they are listed in the Models box with the DXF models. A file of **elevations** (a DEM: one band of 16-bit, 32-bit or floating-point values) becomes a **surface**, just as a DXF topography is: shaded in the 3D view, with its colour, Opacity and On sections, and cut on each section as the **ground's profile**. A **picture** (an air photo, a geology map: colour, grey or palette) is drawn **on** a surface of the Models box — draped over the topography, following its shape — or **Flat, at an elevation** you give (about the level of the collars to start with); it picks an elevation layer by itself when one lies under most of it, and is laid flat otherwise (so a large map is not cut down to a small topography under one corner of it); **On** changes that. The plain white or black surround of a map or a grid, where it has nothing, is left clear so that what is under it shows; **Clear its surround** in its box turns that off. With On sections ticked, a picture shows in each section's **plan strip**, under the holes. The box says what each file is, its size and cell size and, for a large one, the detail it is drawn at: only the parts of the file needed are read (a smaller copy kept in the file is used when there is one), a surface at up to 400 cells and a picture at up to 4,096 pixels along its longer side. **Coordinates**: everything is drawn in the holes' UTM zone (from their Hole info). A GeoTIFF that says what it is in — latitude / longitude, another UTM zone, an MTM zone, Quebec Lambert or another Lambert or Transverse Mercator projection written out in it — is put into the holes' zone, and its line in the box says so; one that doesn't say, or a TIFF placed by a world file (.tfw) beside it, is taken to be in the holes' coordinates already. NAD27 is not shifted to NAD83 (the box warns). One band of values is taken as elevations unless it is 8-bit; **Use as** switches it between elevations and a grey picture. Not compressed, LZW, Deflate (Zip) and PackBits files are read, in strips or tiles, classic or BigTIFF; a picture compressed another way (JPEG) is read through Windows instead, and an elevation file that can't be read says how to save it again (in QGIS: Export ▸ Save As…, with LZW or Deflate). The files themselves are never changed.
- The DXF files stay where they are and are never changed: the program remembers where each one is (and how it's shown) in the program file, and reads it again when the 3D view is next opened — ↻ reads it again after the file has changed, **Locate…** finds it if it has moved, ✕ takes it out of the view. Even large files take only a few seconds (a 130 MB pit shell of 600,000 triangles about 2 s). Files kept inside the program folder are found again if the whole folder moves.
- **Drillhole database** — holes read from a database's own files (set up on the **Data Files** tab) are drawn here and on the sections with the program's holes: an **open ring** marks a database hole's collar, and the Holes box says how many there are. Clicking one shows its collar and what the checks found in it.

Box lengths

Box number, From and To. Each box starts where the previous one ended; boxes longer than the maximum box length are flagged.

Core photos — put the photos in a **Core photos** folder in the drill program folder (**Create folder** makes it; sub-folders are fine, or choose another folder with **Change folder…**). TotalGeo finds a hole's photos by the **hole number in the file or folder name** (written any way: TP-26-01, TP_26_1, tp2601) and matches them to boxes by the **box number(s) in the name**: TP-26-01_Box_012.jpg, TP-26-01 B12-14 wet.jpg, TP-26-01\Box 3 dry.jpg — or by depths: TP-26-01 12.5-17.0m.jpg. Each box with a photo gets a 📷 button; the viewer steps through the hole with ← →, and **Open full size** opens the original. The photos stay where they are — nothing is copied into the hole file.

RQD

Type the **first run** (From and To) and the remaining runs fill in at the run length down to the hole length. Enter **Recovered (m), Σ pieces > 10cm** for each run — the total length of the pieces over 10 cm — and **Recovery %** is worked out (the Hole info summary shows the length-weighted average). It can't be longer than the run. Change a depth and the runs after it that you haven't measured yet shift to follow. **Fill runs to end of hole** tops the list up (e.g. after entering the hole length later).

Measurements

Point readings down the hole: **magnetic susceptibility** (×10^{-3} SI) and **specific gravity** (g/cm^3), with an optional sample number and comment. A new row starts one step deeper than the last (the spacing of the last two), so you can type a reading, press `Enter` and carry on. Depths past the hole length and SG values outside 1.5–7 are flagged.

Data Files

Files in and files out, in two parts with a switch at the top: **Database files** reads a drillhole database you already have, and **Data export** writes the program's own holes out as files.

Database files — holes from a database export, used *without* becoming holes of the program: nothing is added to the Holes tab, the logs or the exports, so a program with no logged holes yet can show a whole project and work out its intervals.

- **Import database files…** takes CSV or Excel files — one per table (**collars**, **surveys**, **assays**, **lithology**) or one workbook with a sheet for each — and puts each file to its table and each column to its field by the headings (HOLE-ID, LOCATIONX / X / Easting, DISTANCE / Depth, Sample Number…), with an example of each to check. Only the collars are needed; the assays' element columns are found by their headings (Au, Cu_ppm, Ni (%)…, or in capitals: AU, CU_PPM), each with its unit — taken from the heading, or guessed from the element and its values: change any that are wrong. Tick **Dips are positive downwards** if the database writes a hole going down at 60° as 60.
- The tab then lists the **files** with how many rows each has, what the **checks** found, and **its holes**: collar, length, azimuth and dip, and how many surveys, samples and lithology intervals each has.
- **Where the database's holes are used.** In the **3D & Section Viewer** they are drawn with the program's holes (an open ring marks a database hole's collar), coloured by lithology or assays, and can go on a section; untick **Draw the database's holes in the 3D & Section Viewer** to leave them out. On the **Intervals** and **Geochemistry** tabs, choose **Program and database** or **Database only** under **Holes**: composites at a cut-off, custom and fixed-length intervals, metal equivalents,

true widths and the Excel and CSV tables are then worked out from the database's assays — **with no drill logs at all**, if you like. The QAQC and lab submission views are about the logs and never include the database.

- A hole also logged in the program (SUR-20-001 in the database is the same hole as SUR-20-01) is taken from its log; **Draw the database copy of the holes that are also logged** draws the database's version beside it in the viewer, named "… (database)".
- The database is **checked as the logs are**: samples or lithology overlapping, To not greater than From, depths past the hole length, gaps, duplicate sample numbers, surveys out of range or twice at the same depth — and for a database's own problems: rows of a hole that isn't in the collar file, a collar twice or far from the others, sample lengths that don't match To − From, results that aren't numbers, a survey dip pointing the other way, and sudden turns between survey readings (8° or more, at 10° per 30 m — a bad reading or a planned collar dip). **Checks…** lists them with the hole, table, line of the file (the headings are line 1) and depth, filtered by hole, table or errors / warnings, and **Save as CSV…** keeps the list. The intervals use the database's numbers as they are, problems included: fix what the checks find first.
- The files are only read, never changed: fix the problems in the database, then **Reload** reads the files again. **Files and columns…** changes the choice (a table can be set to none), **Remove the database** takes it out of the program. Where the files are and which column is which are kept in the program file; files inside the program folder are found again if the whole folder moves.

Data export — every hole in the program folder as CSV files, **laid out as the drillhole database's own files are** — the same column headings in the same order — so the rows can go under the database's for the resource estimate. Tick the files you want (the tab shows how many rows each will have, its columns, and anything that would leave blanks), then **Export…** and choose a folder. What is ticked, and the choices under Assays, are remembered for the program. If the open hole has unsaved changes, Export asks to save it first.

- **Collars** — HOLE-ID, LOCATIONX, LOCATIONY, LOCATIONZ, HOLE TOP, LENGTH, AZIMUTHfromSURVEY, DIPfromSURVEY. X/Y come from the GPS easting/northing, Z from Elevation, HOLE TOP is 0, azimuth/dip from the shallowest survey (or the collar azimuth/dip if the hole has no surveys yet).
- **Surveys** — HOLE-ID, DISTANCE, AZIMUTH, DIP.
- **Assays** — HOLE-ID, FROM, TO, AU, Len, Certif, Lab, Final SmpNumber: the database's eight columns. **AU** is the final gold result in ppm (g/t) — the main result, or, where that is over its limit, the over-limit result from its other column (e.g. gravimetric Au). Under **Columns** choose whether the file stops there or goes on with **every lab result column** (whatever the certificates analysed), after a **final column** for every other element measured in more than one column (e.g. Cu_final_ppm when the certificate also has ore-grade Cu in %). Grades are written as numbers: below-detection results as half the detection limit (or, your choice, as the negative detection limit or as the lab wrote them), and over-limit results (">10") as the limit. Only regular samples are listed, in depth order; samples without results yet have blank grades. **Unsampled gaps are left out** (of every file), and so are QAQC samples — they go in the QAQC files.
- **Lithology** — HOLE-ID, FROM, TO, ROCKCODE (the Litho code).

- **QAQC** — two files. **…_QAQC.csv** has the checks as the Samples & Assays tab's QAQC view shows them: each standard against its certified value, each blank against the detection limit and each duplicate against its original, with Pass / Warning / Fail (HOLE-ID, Sample, QC_Type, CRM_Code, Element, Unit, Result, Expected, SD, Detection_Limit, Original_Sample, Original_Result, Difference_%, Status, Certificate); it is left out while there is nothing to check. **…_QAQC_samples.csv** has every QC sample — blanks, standards and duplicates — with its lab results, laid out as Assays is, then QC_Kind (Standard, Blank or Duplicate), QC_Type (the material or duplicate type as logged), CRM_Code and Original SmpNumber; a duplicate has its original's depths, a blank or standard has none.
- **Alteration**, **Mineralization** and **Structure** — HOLE-ID, FROM, TO, then each selected mineral / structure with its details side by side (Alteration_1, Style_1, Strength_1, Alteration_2 … · Mineral_1, Style_1, Grain_Size_1, Percent_1 … · Structure_1, Angle_TCA_1 … — plus Beta_1, Dip_1, Dip_Dir_1 when the program has oriented core), and Description. Several values in one cell (e.g. two styles) are joined with "; ".
- **RQD and core recovery** — HOLE-ID, FROM, TO, Length, Recovered (Σ pieces > 10 cm), Recovery_pct, Oriented. **Measurements** — HOLE-ID, DEPTH, Mag_Sus (×10^{-3} SI), SG (g/cm^3), Sample, Comment.
- The files are plain text, as the database's are; one that holds an accent or other special character (a description, say) starts with the mark Excel needs to read it right.

Lists

The drop-down choices. Lithology is a table of lithology / litho code pairs, each with its **strip log colour** (worked out from the rock name until you pick one); the other lists are one entry per line. **The entries that come with the program are placeholders**: basic entries to start from. Every one of them can be changed, removed or added to, here or with “Add other…” in any drop-down as you log. Lists are saved with each hole and carried to the next one by **New hole**; with a program folder open they are the program’s, kept in its program file and shared by every hole in it.

List set (at the top) is for work on more than one client or project. A set is a named part of the entries: choosing it shows only that part, plus anything the log already uses, and **All entries** shows everything kept on this computer. Two sets come with the program, **Starter set A** and **Starter set B**: placeholders as well, to change or to copy into a set of your own. Nothing is ever deleted by switching: whatever drops out of view stays under All entries, and “Add other…” suggests entries from the other sets as you type.

- With a program folder open the choice is the program's: it applies to every hole in it, and its new holes start with it. New hole and Import Excel… keep the set you're on.
- With a set chosen, an entry you add on this tab (or with “Add other…”) joins that set; one you remove leaves that set only. With All entries chosen, removing an entry removes it from every set.
- **New set…** (at the bottom of the drop-down) makes a set for a client or project of your own, started from the entries showing, a copy of another set, or just the basics. Sets you make can be renamed or deleted (their entries stay under All entries); the two starter sets can’t, but their entries can be changed like any others.

- Sets and their changes are kept on this computer. A program folder carries its set: open it on another computer and the set is added there from the program's lists.

Checks

Every error and warning in the log. Click a line to jump straight to the row. When the same problem is on four rows or more of a table — a sample crossing a lithology contact, say — it is one line with the number of rows; click that line to list them, and again to fold them away. Errors start listed, since they have to be fixed.

What the checks look for

Errors — must be fixed before finalizing

- A Hole info box left empty (all but NTS sheet, Township, Claim no. and Comments)
- A From or To missing, or To not greater than From
- A depth past the hole length
- Overlapping intervals in any table
- A From that doesn't equal the previous To (lithology, samples, box lengths)
- A QAQC sample with depths, or an Unsampled gap with a sample number
- Missing or duplicate sample numbers or box numbers
- Angles outside 0–90°, percent outside 0–100, surveys outside their ranges
- An RQD run's Recovered longer than the run

Warnings — review, but allowed

- A sample longer than the maximum sample length, or crossing a lithology contact
- A sample whose type differs from its QAQC scheme position
- Sample numbers that skip
- A box longer than the maximum box length
- A mineral without its style / strength / grain size
- Gaps in the RQD runs
- Lithology not starting at 0 or not reaching the hole length
- A β without its angle TCA, or one that can't give a dip direction (no surveys or collar direction, or a near-vertical hole)

A **drillhole database** shown in the 3D view is checked the same way, plus for a database's own problems (rows of holes not in the collar file, sample lengths that don't match To − From, sudden turns in the surveys…): see **Drillhole database** under 3D view. Its checks are listed in its own Checks… window, not with the hole's.

Saving, backup and files

- **Save** (`Ctrl`+`S`) writes the hole to a **.json** file — this is your working copy. After the first save, Save writes straight to the same file; **Save as…** picks a new one. Keep hole files in your project folder.
- **Shared folders are protected.** Each save stamps the file with the time and your Windows user name (the Holes tab shows who saved each hole last). If someone else — or another copy of TotalGeo, or a OneDrive/SharePoint sync — saved the hole after you opened it, Save stops and asks: **save yours as a copy** (keeps both, so you can compare), **open theirs** (drops your changes), or **save yours over theirs**. Lab-result imports likewise merge with what is on disk, so two people importing certificates at the same time don't wipe out each other's.
- **Automatic backup** — the desktop program also writes a backup file after every change and reopens it the next time you start TotalGeo, so nothing is lost if it closes unexpectedly. It goes in an **Autosave** folder next to TotalGeo.exe (if that folder can't be written to, it uses your Windows AppData folder instead), in a file of its own for each person and computer — so on a shared program folder nobody gets someone else's work back, and a second TotalGeo window keeps its own backup too. The About tab shows the exact location. It is a safety net, not a replacement for saving.
- Closing with unsaved changes asks whether to save first.
- TotalGeo opens **filling the screen** (maximized) the first time. The **Restore down** button at the top right of the window makes it a smaller window you can move and size; after that it **opens the way you left it** — maximized or not, in the same place and at the same size.
- The tabs are in groups, with a thin line between them: the program's holes; the hole's log; results and views; core measurements; export, lists and checks; help. In a window too narrow for them all they go onto a second row rather than off the edge.
- **A moved program folder.** If the open hole's folder isn't there any more — the program folder was moved or renamed, or is on a drive that isn't connected — Save says so and offers **Save it somewhere else…** instead of failing (and, on the way to another hole, **Go on without saving them**). Changes brought back from the automatic backup for such a hole say so when TotalGeo starts. Open the program where it is now: TotalGeo finds the hole there by its file name, and if that file was saved again after the version the changes were made to, it shows both (lithology, samples, measurements…) and asks which to keep — **Open the program's** version, or keep the backup's changes open (Save still asks before writing over the file). Creating or opening another program offers to start fresh instead of saving them first.
- **Import Excel…** reads a hole from the DDH Log Template (title page, log, samples, box lengths, RQD, surveys and lists, plus a Measurements sheet if the workbook has one); sample numbers the template pre-filled but never used are skipped. Mineralization Percent comes in as the log shows it (a cell showing 2% is 2). Alteration Style / Strength (1) and (2) belong to the row, so they go on the minerals the row's description gives them to — the minerals written together whose words fit them: for biotite, hornblende and carbonate described "mod pervasive bt + hb + fracture/stringer carb", (1) goes on biotite and hornblende and (2) on carbonate. Where the

description doesn't say, (1) is the first mineral's and (2) the second's; where (2) describes a mineral the row doesn't list, it goes on none (the import notes list those rows).

- It also reads a **log saved by TotalGeo** — the Excel file of Finalize, Draft Excel or Export all logs (*hole*_log.xlsx, *hole*_log_DRAFT.xlsx): hole information, QAQC materials and certified values, lithology, alteration, structure and mineralization with each mineral's details, samples, box lengths, RQD, measurements, surveys and lists. Lab results beside the samples come back as their certificates, rebuilt from the Certif and Lab columns (with a program folder open, a certificate the program's lab results already have is used from there). Not in the file, so taken from the open hole as **New hole** does: the sampling settings and QAQC scheme. A log marked FINAL comes in **not finalized** — finalize it again once checked. Dip and dip direction are worked out again from β and the surveys.
- To bring in **many logs at once**, use **Import logs…** on the Holes tab.

Exporting and finalizing

- **Program files** (all holes at once) — see **Data export** on the Data Files tab: collars, surveys, assays, lithology, QAQC, alteration, mineralization, structure, RQD and measurements CSV files, laid out as the drillhole database's files are.
- **Export all logs…** (Holes tab) — every hole's PDF and / or Excel log in one go, into one folder: FINAL for finalized holes, DRAFT for the rest. **Finalize all holes…** beside it finalizes every hole that passes its checks (warnings confirmed first) and saves their FINAL logs the same way; holes with errors are listed with what to fix. Before saving, both open the same window as **Finalize…** on one hole — PDF and / or Excel, the PDF's sections and columns, and which lab results (elements) go on the Samples pages — and use those choices for every log. Finalize all keeps them with each hole it finalizes (Export all changes no hole), and the next Export all or Finalize all starts from them. To save already-finalized holes' logs again with other choices, use Export all logs: finalized holes still come out as FINAL.
- **Draft Excel** — a workbook of the log at any time, marked DRAFT. Unused sample rows are left out of the file but stay in the log.
- **Preview PDF** — shows the PDF log on screen. **Sections & columns…** chooses which tabs go in the PDF and which columns each table shows.
- The PDF's **Strip log** pages draw the hole to scale (choose 20, 25, 50 or 100 m per page, or the whole hole on one page), with the lithology descriptions, alteration, mineralization, structures, a grade bar chart, sample numbers and RQD side by side — untick any track under **Tracks**. A description, alteration, mineralization or structure that is longer than its interval is tall runs past it into the free space below (or above, near the foot of the page), with a thin line to its depth; on a crowded page the text gets a little smaller, and only when even that won't fit is it shortened (…), with a note on the page — choose fewer metres per page for all of it. The grade bar chart (the Assays track) is only drawn when you pick its element in **Grade**: it starts at **None**, and the element you pick is remembered with the hole (and, for Export all / Finalize all, with the program).

- The **Samples** pages can carry lab results: open **Columns** and tick them under **Lab results** — **Select all** ticks (or unticks) every element at once (the final columns, e.g. Au_final_ppm, are ticked to start with; results are shown as the lab wrote them, e.g. <0.005). When the results you pick don't fit across the page beside the samples (e.g. every element), the Samples pages list the samples with their descriptions first, then the results in **Lab results** tables of as many columns as fit across the page — each starting with Sample, Type, From and To, so nothing is cut off. Once a hole has lab results, its Samples pages also have a **Certificate** column with each sample's certificate number — two numbers, separated by "; ", when a sample was re-assayed on another certificate. Untick Certificate under Columns to leave it out.
- **Core photos** (off unless you tick it) adds the hole's box photos, two to a page, in box order.
- **Finalize…** — when the log is complete. It needs no errors, a hole number, a hole length, and lithology running continuously from 0 to the hole length. Warnings are listed for you to confirm. Then choose **Save as**: **PDF + Excel**, **PDF only** or **Excel only**, and the PDF's sections and columns.
- Finalizing removes the unused sample rows and marks the hole ✓ **Finalized**. Any later edit removes the mark — finalize again after changes.
- The **PDF** is landscape, each tab starts on its own page, and every page shows the hole number, project and page number. The **Excel** workbook has one sheet per tab with a Hole ID column, and one group of columns per mineral / structure (Alteration 1, Style 1, Strength 1, Alteration 2, …).

Licence

TotalGeo runs on a computer that has a **licence file** for it. A licence is for one computer and has a last day; who it is for and how long it is good for are on the About tab.

- **Getting one.** Each computer has its own **code** — four groups of four letters and digits — shown on the page TotalGeo opens with when it has no licence, and on the About tab. Send that code to the address on that page. You get back a small file whose name ends in .tglic: choose **Load a licence file…** and pick it, or put it in the folder TotalGeo is in. Nothing else is needed, and no internet connection.
- **One computer each.** A licence file works only on the computer whose code it was made for. A second computer needs its own file, and so does a computer after Windows is installed on it again (its code changes).
- **Before it runs out.** From 30 days before its last day, a line under the buttons at the top says how long is left. Load the new file when you have it; the old one needs no removing.
- **After it runs out.** TotalGeo keeps opening for 14 more days, with that line as a reminder. After that it opens with the licence page until a new file is loaded.
- **Your work stays yours.** A licence running out changes nothing in your program folders: the hole files, the program file, the lab results and every Excel and PDF log stay where they are, readable as before.

Tips

- **Can't finalize?** Open the Checks tab — click any line to go straight to the problem.
- **Another computer:** copy TotalGeo.exe — it is the whole program. Copy your hole files too; open the latest hole and use **New hole** to carry your lists and QAQC setup.
- **Typing stopped working** (clicks work, but nothing appears in the boxes)? Click another program's window, or press `Alt`+`Tab`, and come back to TotalGeo — the page gets the keyboard back when its window is brought to the front. No need to restart.
- **"Windows protected your PC"** on a new computer: click **More info → Run anyway** (the program isn't code-signed).
- **Problems or ideas:** see the About tab for contact details.