

Introduction

This manual is to explain all functions and options in the Equalizer software. Normally the software is self-explaining but some functions might need some more guidance to be able to use it in the intended way.
The manual follows the different steps from data input till export.

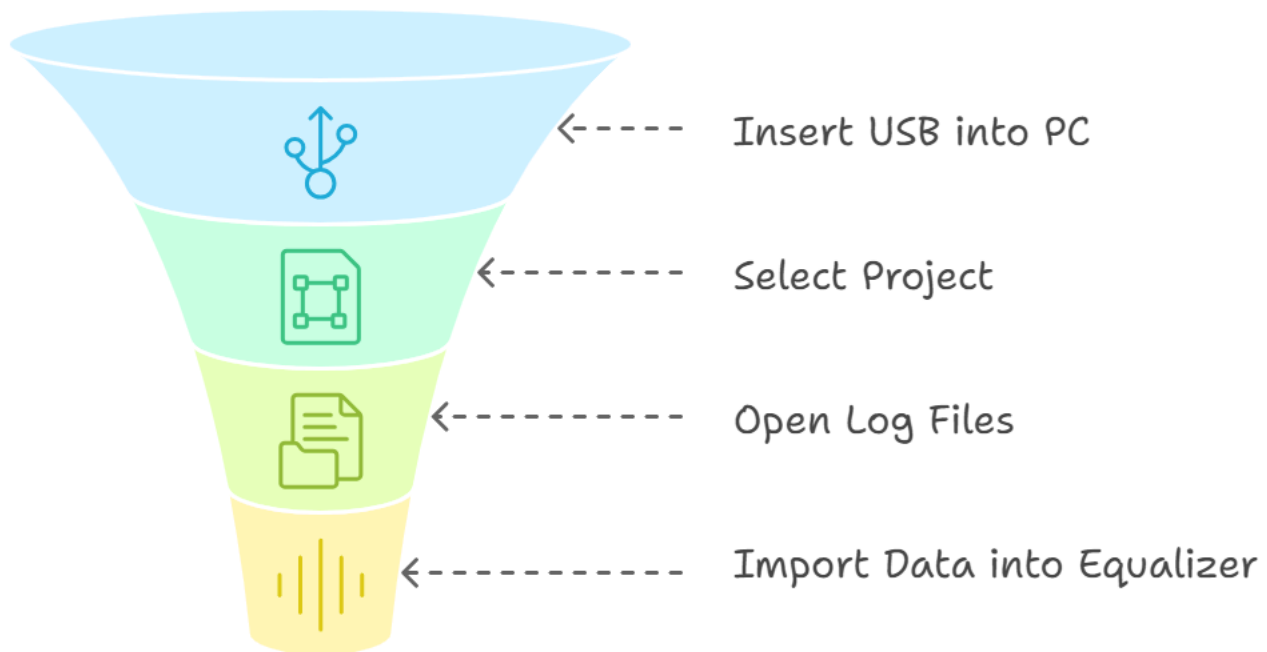
Read Data

You can read measurement data from different sources. Up to 700.000 points can be used in the calculation (max area 2.5x2.5km)

start a new project by opening the measurements. The file explorer starts and the user can select the file.

Data Import Process into Equalizer

USB Data Sync

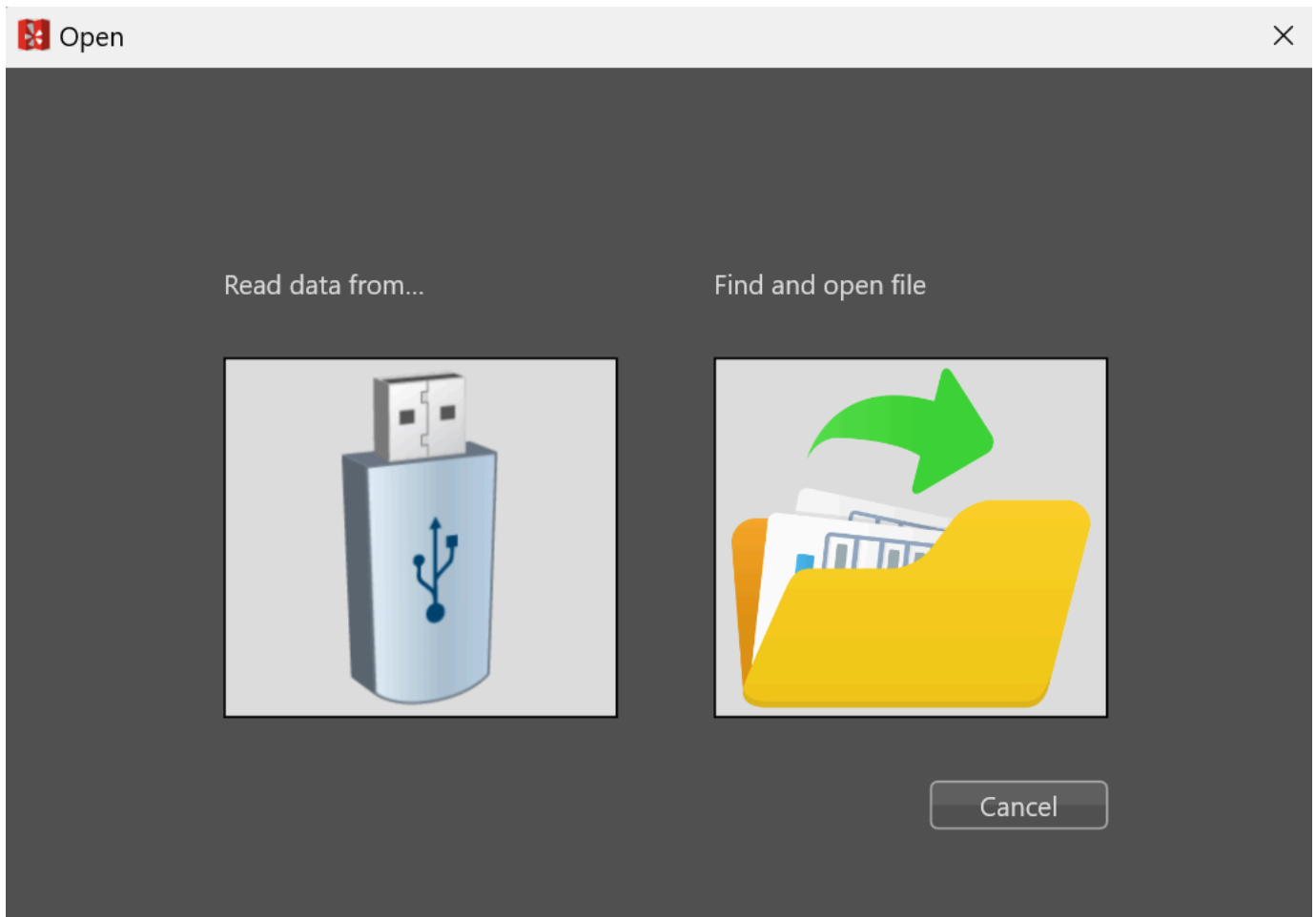


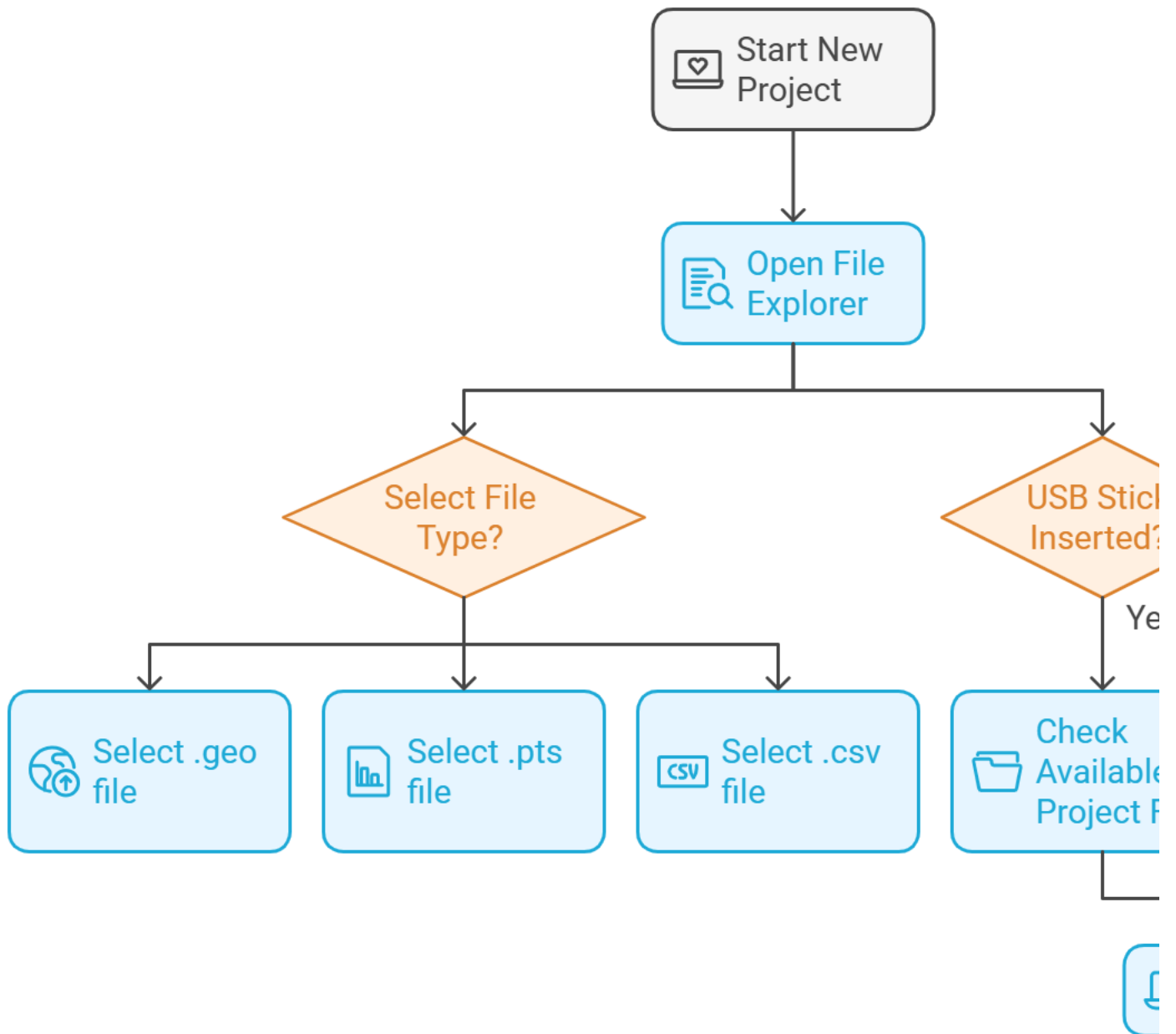
Data Ready for Processing

files that can be read:

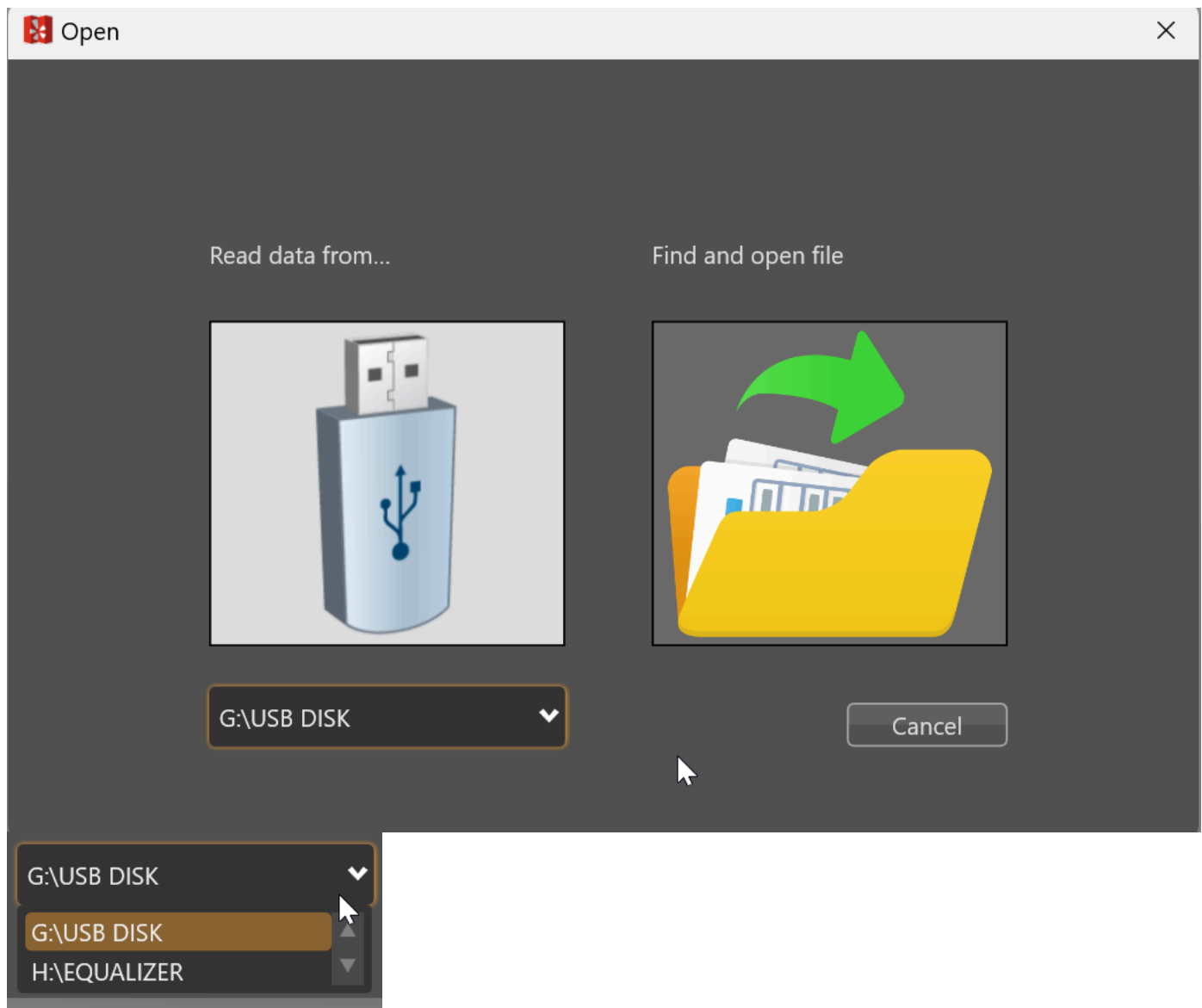
- *.geo files from iCON office
- *.pts files from MC1 surfacelogging
- *.csv files from Conx or from MC1.

if a USB stick is inserted, there is an option to check the available project files from MC1. This is only valid for USB sticks where the data is synced from MC1 to the USB.





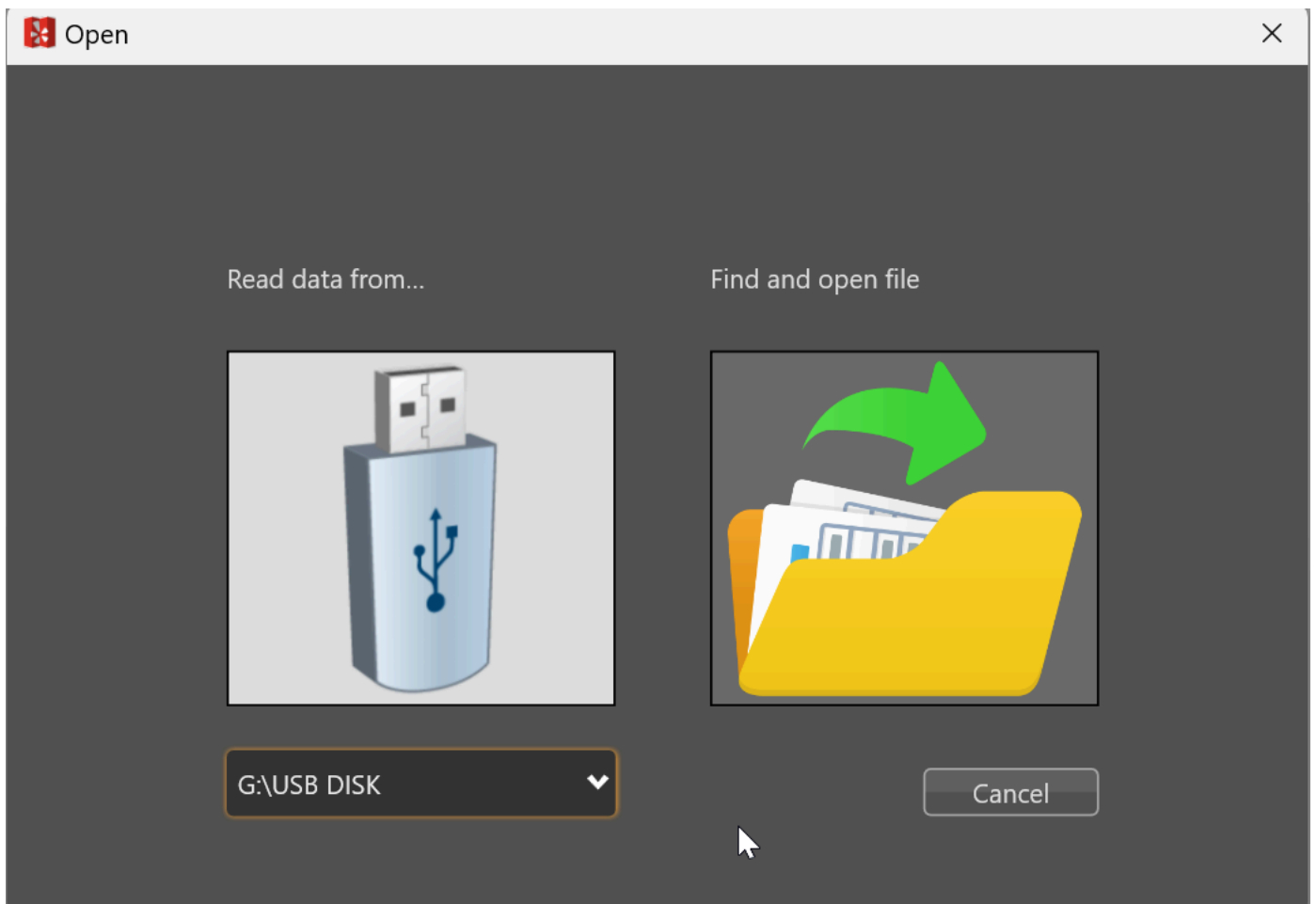
if more then 1 USB is inserted, the user can select the correct drive.



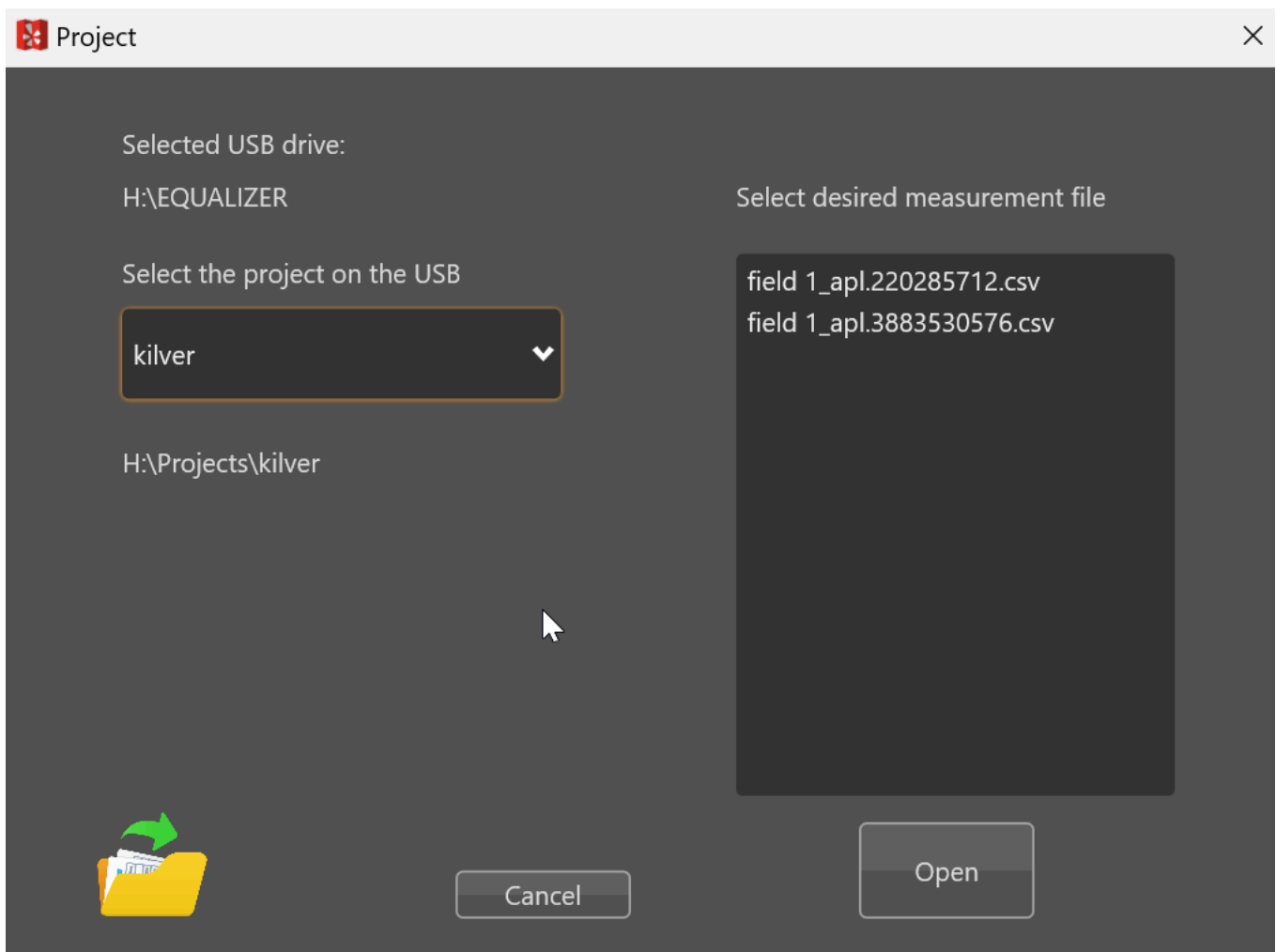
after selecting the right project on the left, the available pointlogs are visible on the right side. Double click on the filename or select the file and press open.

Read Data from MC1 USB

If the survey of the field is done using the MC1 software and auto points logging the generated data can be imported in Equalizer. Put a USB in the panel and sync all projects. After that insert the USB into the pc and select input points.



select the USB button and a screen pops-up showing all available projects



Select the project where the survey is made in and on the right part of the window the available log files will appear. It is recommended to use all the time a separate file for all different fields in order to keep the data nicely separated.

doubleclick on the correct field and the data will be opened in Equalizer. Ready to process.

If the data is stored into 2 different files, just repeat the last steps and select file nr 2. The data will be added to the already inserted data. Undo will not work for this data reading. If you make a mistake, use the reset option to clear the data.

Other formats

Use the browse option to select the correct data file.

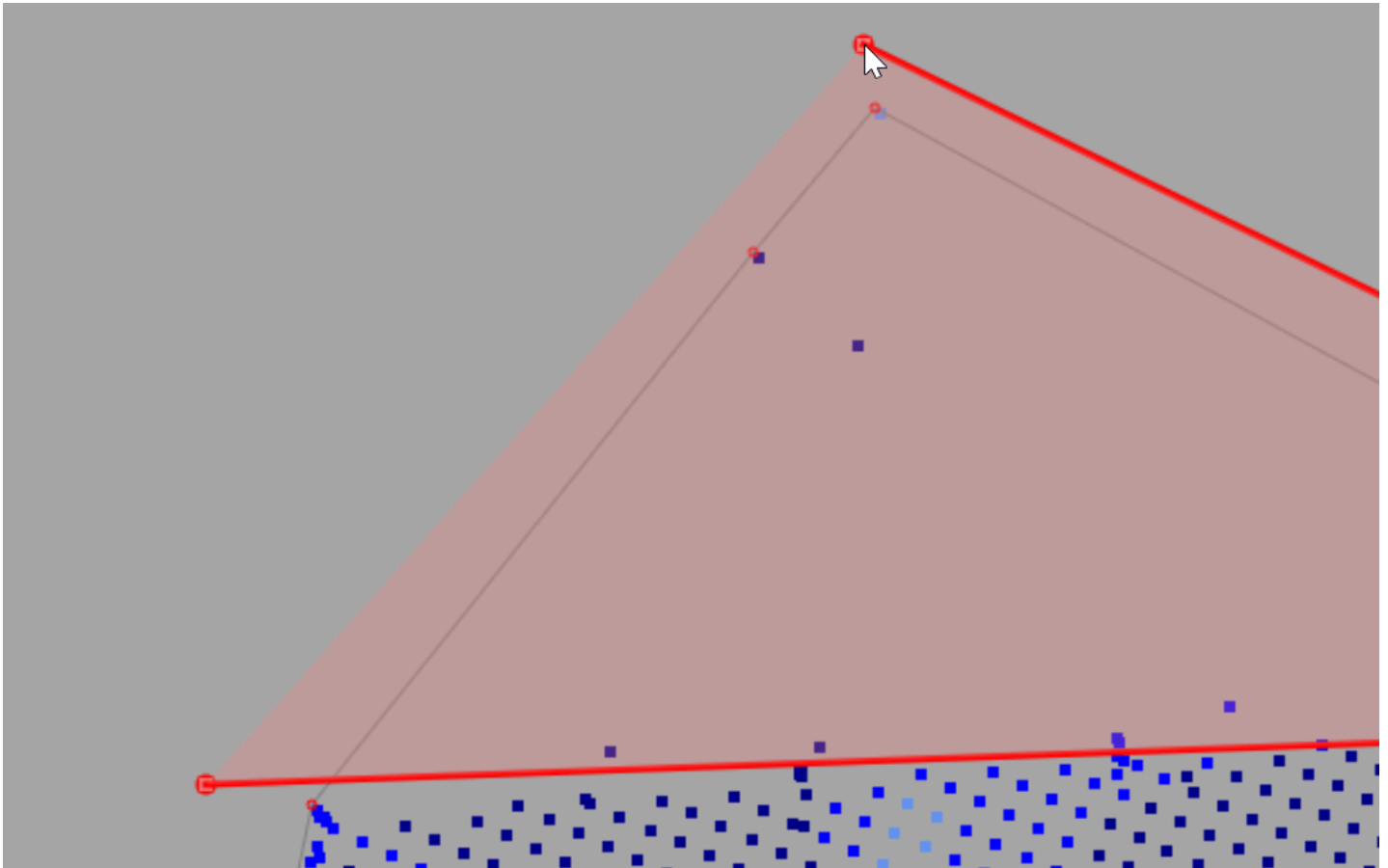
files that can be read:

- *.geo files from iCON office
- *.pts files from MC1 surfacelogging
- *.csv files from Conx or from MC1.

Be aware, only csv file directly from the panel can be used to import data. other *.csv files will not be read correctly and will generate error messages or even crash the software.

Edit data

Data read into the system can contain points that need to be cleared before using the data. This can be done with the deselect option. Start the function by clicking and draw a polygon around the points that need to be removed.



simply click on the first point again to remove the points inside the marked area. Using Undo if a mistake is done in the selection.

Use zoom and pan before starting the delete option to improve the drawing of the fence.

Devide into Surfaces

This step is an important step in the processing of the data and can only be undone by pressing reset and import the data again!

After the import of the data, the field is converted to complete 3d surface. The user first has to define the shape of the future surface:

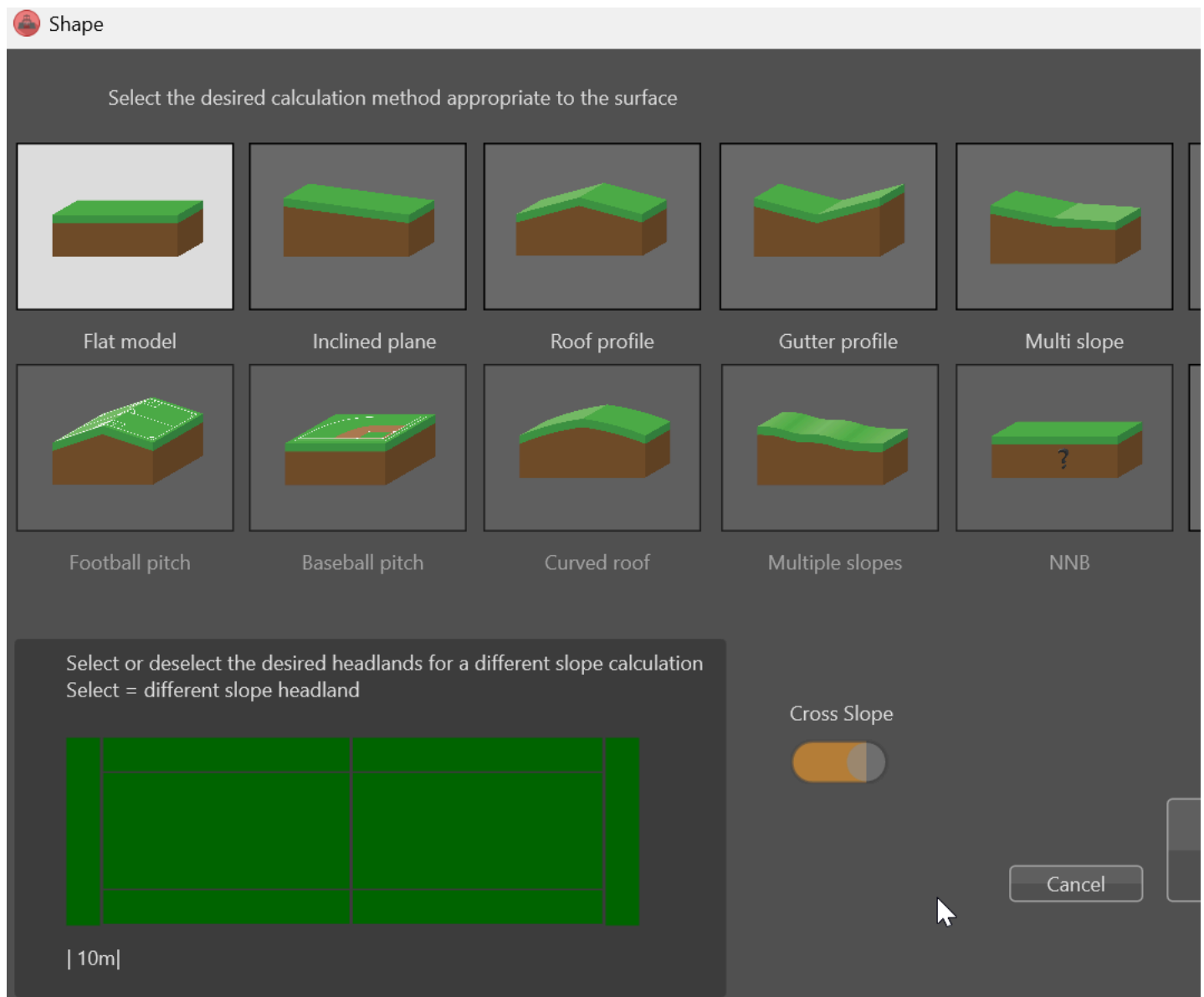
- Flat area
- Single slope
- Roof profile
- Gutter profile
- 2 slopes in the same direction
- Cone shape
- Free slope-> define 8 slopes in different directions to cover the terrain as you wish

Single slope, Roof, Gutter and 2 slopes do have an option to use dual slope. If selected, the best fitting crossslope is also calculated.

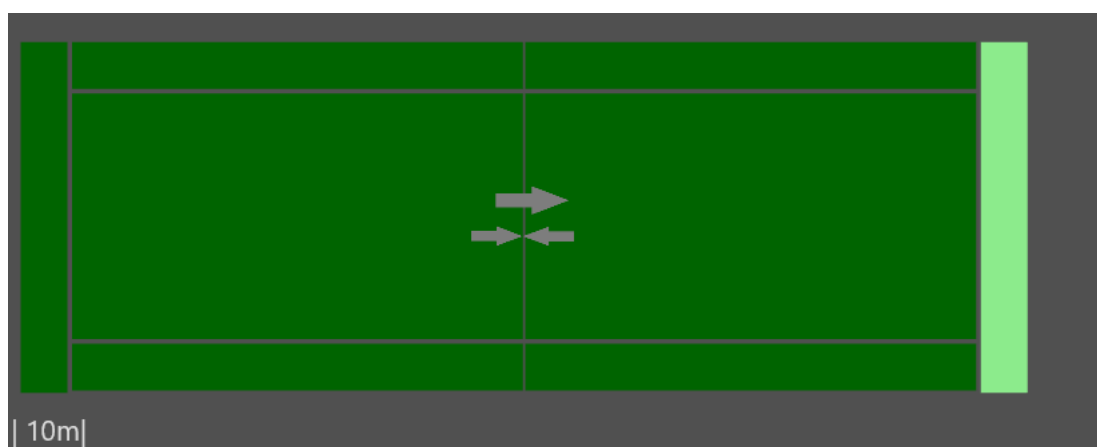
future models (not yet ready, but if you need them, contact info@lmsfactory.nl to get them prioritised)

- Football field

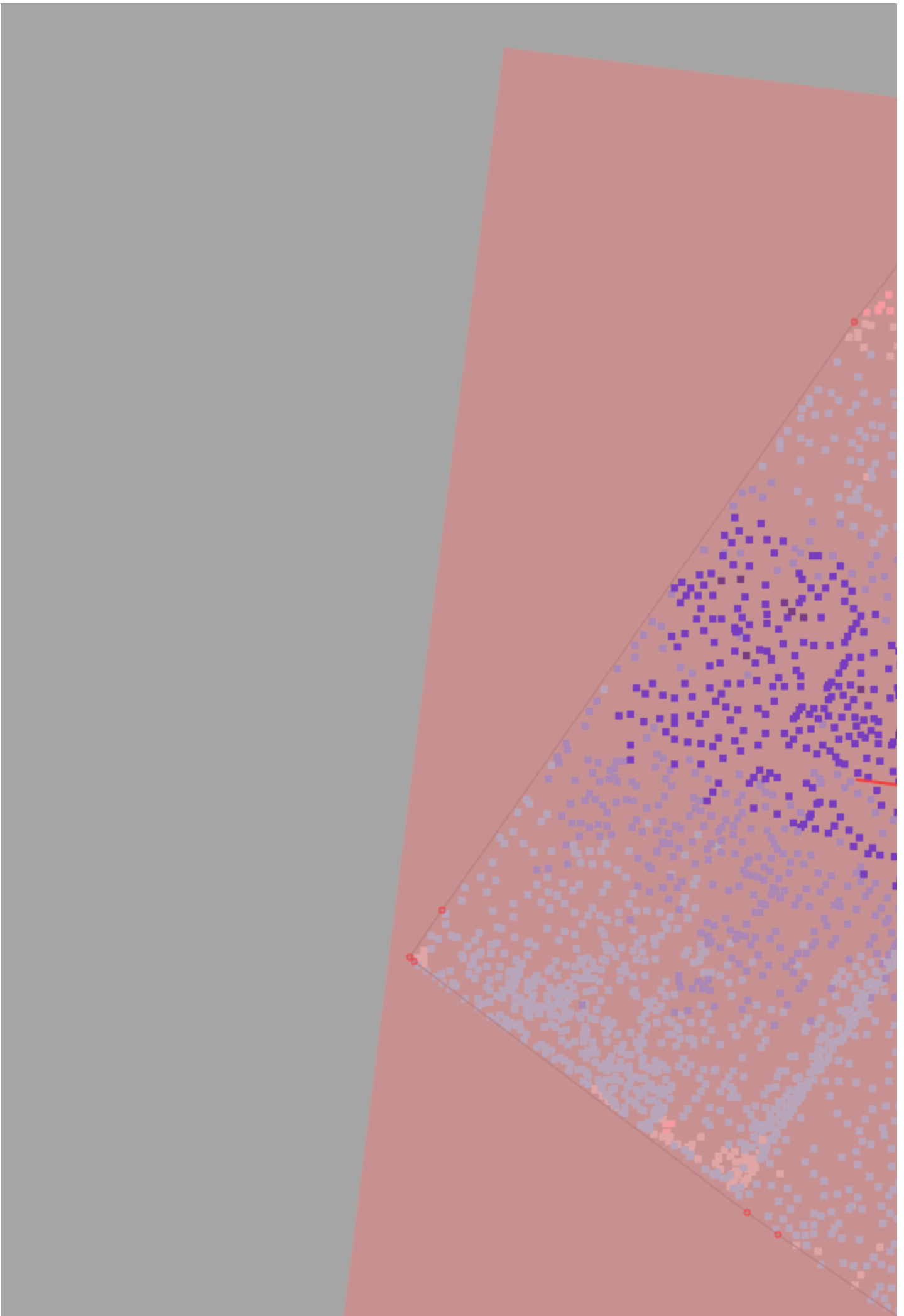
- Baseball field
- Curved roof
- multi slopes



besides this, there is also an option to mark the headlands. By highlighting one of the 4 headlands a 10m wide lane will be treated in a different way. For this part, a separate slope can be set. This can be handy to let water drain faster into a stream or canal. By simply turning it on or of the new created model will have the special slope or not.



After this selection, the correct direction of the slope has to be set. By moving the mouse over the area the red square box will rotate. By clicking with the leftmouse button, the direction is set and a result will be shown. If needed you can use the settings button to change settings before pressing the OK button. Remember that the direction of the slope is an important part of the process as this determines the direction the water will flow.





After pressing ok, the measured points are converted to a solid 3D shape. This calculation can take some time, depending on the size of the area, the number of measured points but also the number of processors the pc has. The result is shown on the screen where the right side of the screen is the direction of the arrow in the selection of the direction.

 Direction

Selected surface has the following specifications:

Length surface

369.02

(m)

Width plane

291.64

(m)

Direction of plane

36.07

deg

Selected calculationsettings

Minimum slope

0.24

%

Maximum slope

10.00

%

Minimum headland slope

3.89

%

Maximum depth (Topsoil...

0.20

(m)

Grow factor loose ground

0

%

Selected machine

Selected machine

Case with small Kilver

Cycle time:

360

sec

Volume blade:

5.00

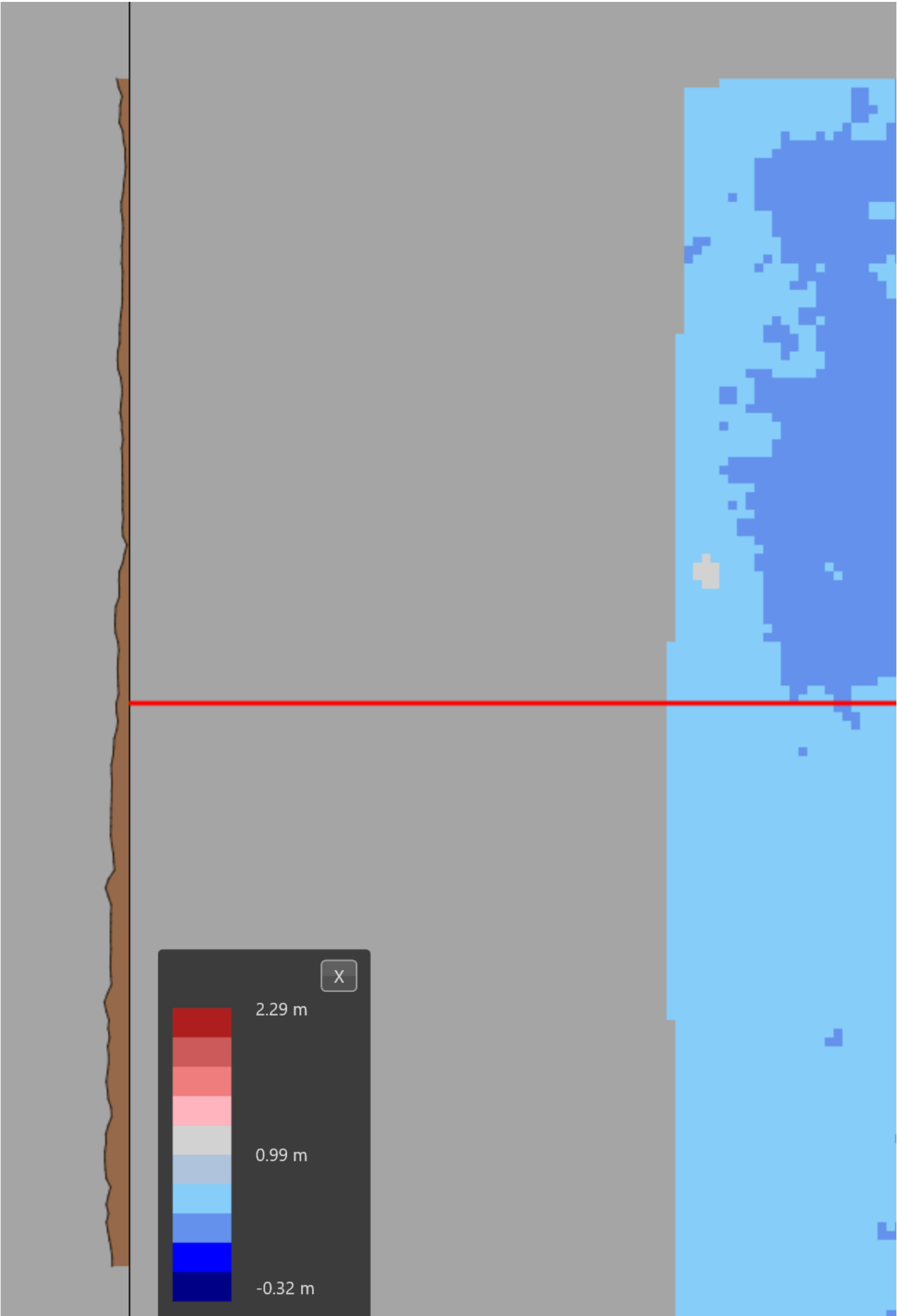
(m)3

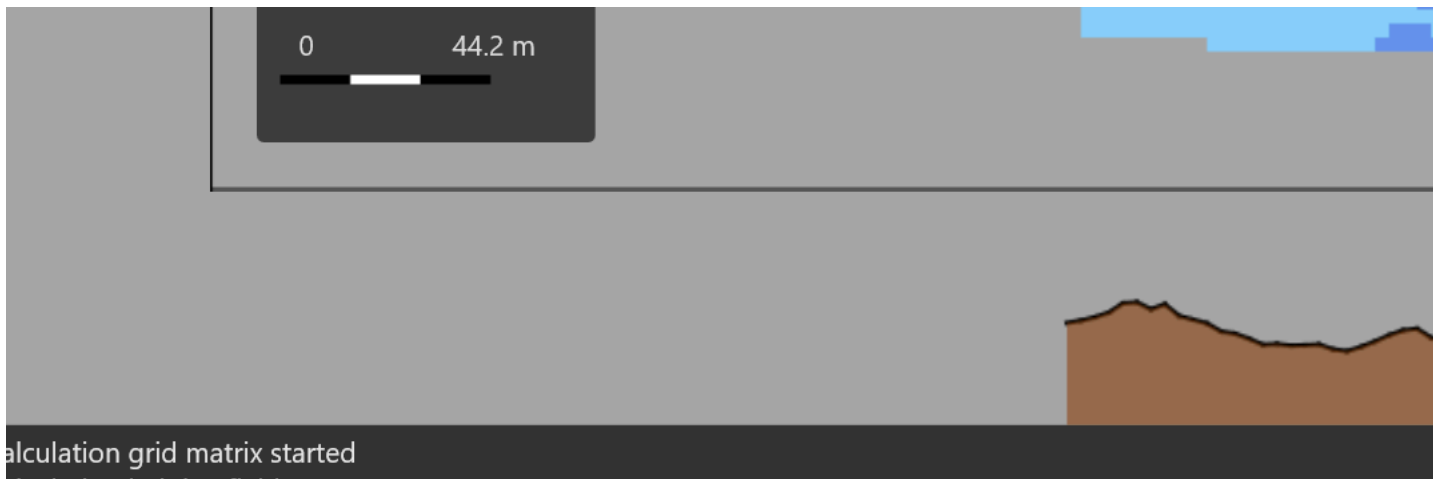
 Settings

Cancel

ok

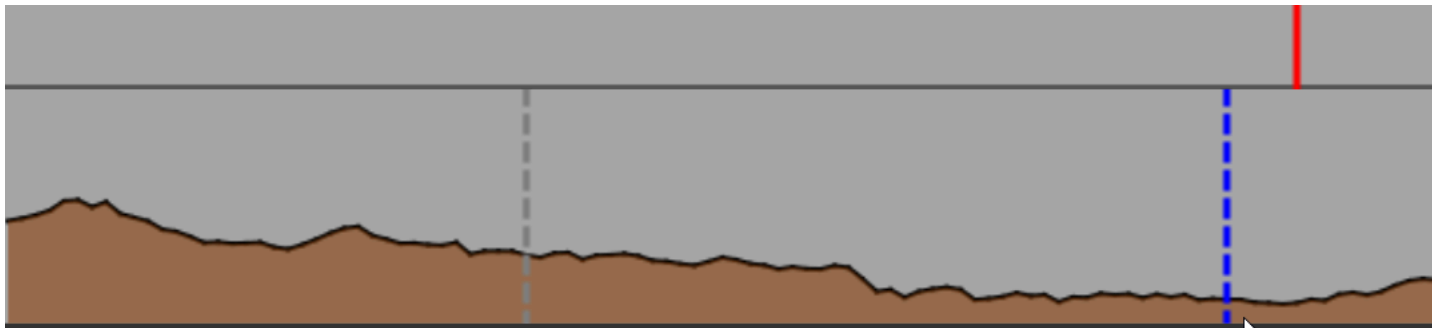
Below an example of the result from the calculations. Please note a red cross and a blue stripe. The red cross is the position of the long and cross slope shown on the bottom or right side of the screen. By clicking in the drawing the position changes and the long and crossslopes are updated.





The blue line in the longslope marks the position of the axis between the 2 planes. By clicking in the long slope, the position can be altered to the new desired position. If on the left and right of the blue line 2 gray lines are shown, that means that the position of the axis is not fixed yet. Equalizer will calculate the best option for the axis (with the least earthmoving) in the part between the 2 gray stripes. There is a setting available to turn this option off and to regulate the size of the search area (a larger search area can result in longer waiting time on slow pc's)

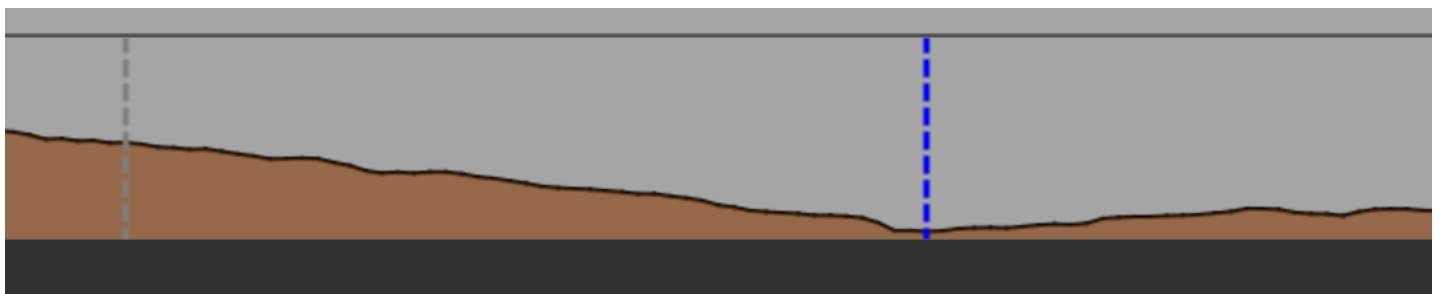
Model like flat and single slope do not have this option as there is not axis between to slopes. The Cone option also has a blue line for the cross slope but no gray lines for the optimisation.



By pressing calculate, the best fitting plane(s) will be calculated and presented

Calculate

When the calculation button is pressed, Equalizer tries to find the best matching slope (or slopes) When the dual slope, gutto or multislope is selected, the selection of the axis is important. (blue line) An option in the settings is to fix the position or to define a search area. When a search area is defined, the software tries to find the best matching slope and axis by moving the axis position between the 2 gray lines. The result with the lowest earthmoving is considered the best option. If a fixed position is chosen, the axis is not altered in position.



The size of the searcharea is influencing the time needed to calculate the best result.

When the calculation is done, the final results are displayed.

Calculate

Overview of...

Area to be treated	83980	(m)2
Cut	2849.1	(m)3
Cut area	40980	(m)2
Fill	2849.1	(m)3
Fill area	43000	(m)2
Maximum cut	-0.47	(m)
Maximum elevation	0.34	(m)
Area > max depth	1552	(m)2
Calculated slope	1.10	%
Second slope	0.49	%
Estimated time	56:58:51	UU:mm:ss
Cut L/R	15.5 / 34.5	% / %
Fill L/R	16.5 / 33.5	% / %

Ok



when the axis is a fixed position the calculated slope is maybe not the best result. Check the values in the result file.

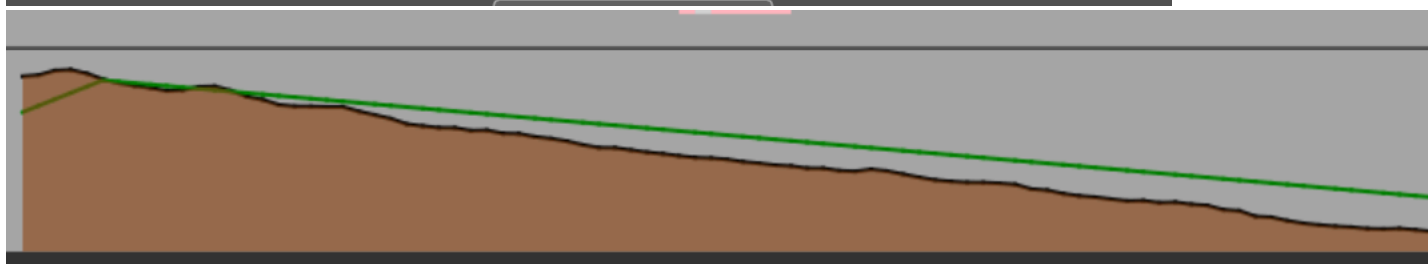
Cut L/R	15.5 / 34.5	% / %
Fill L/R	16.5 / 33.5	% / %



if they look like this, there is a balance between the cut and fill on the 2 slopes. This means not much dirt will be moved from plane to plane.

If the result looks like this

Cut L/R	4.3 / 45.7	% / %
Fill L/R	50.0 / 0.0	% / %

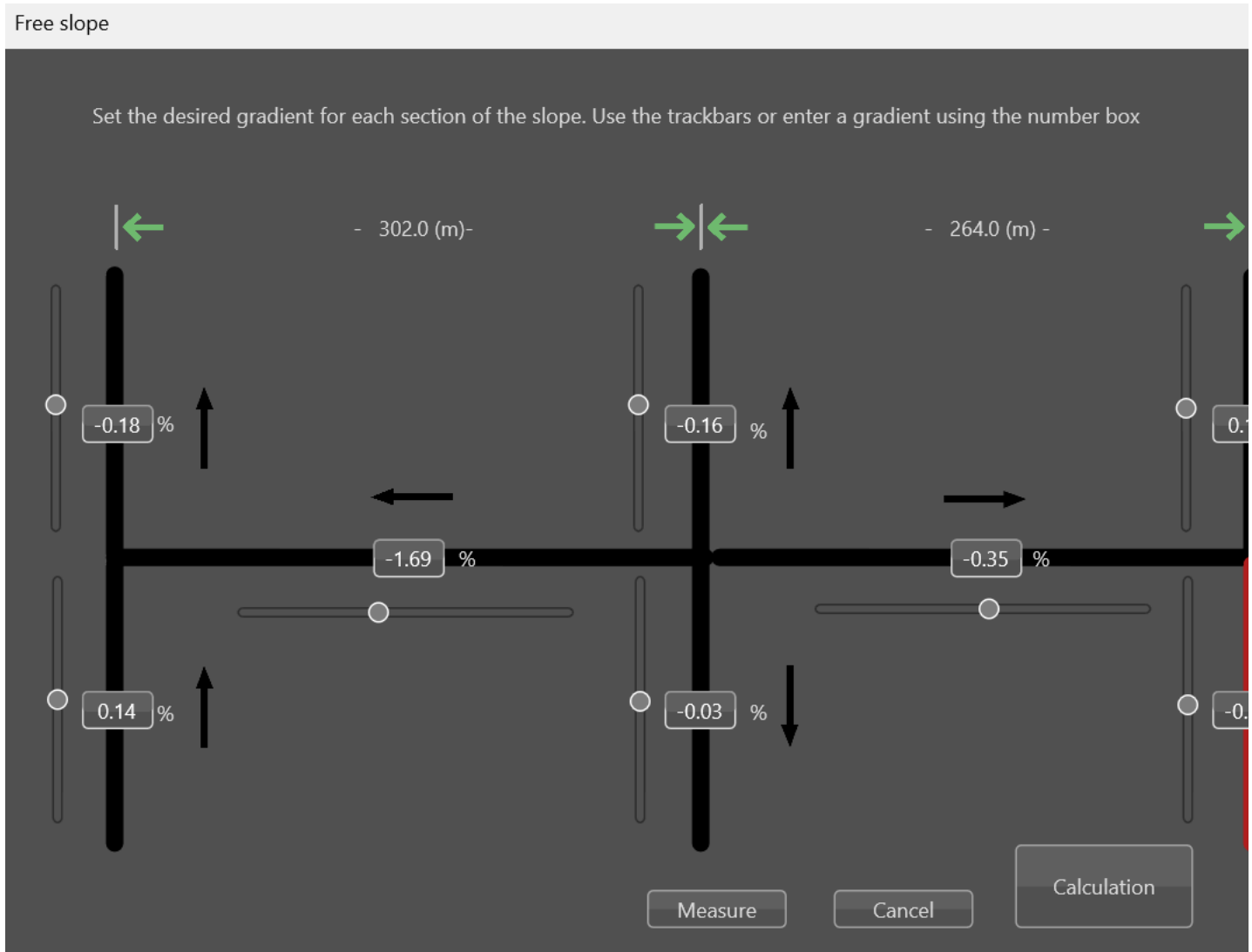
there will be extra transport between the 2 slopes resulting in extra work. In this case, try to move the tilting axis and recalculate.

The calculation can be repeated several times until the result is obtained that is needed.

If the final result is there, go to export to create the model for the machine.

Free slopes

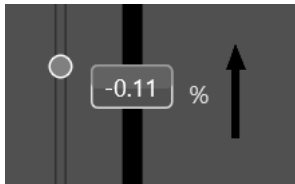
the free slope option offers the flexibility to create your own model based on 8 different slopes. The centre of the model is the basepoint from where the slopes are calculated. By pressing the calculate button, this screen appears.



as long slopes can generate large height differences when a slope is applied, the length between the 3 lines is displayed on top of the slope settings screen.

slopes can be applied by using the slider option or by editing the number field. max slope is 10%.

the area between two slopelines is interpolated creating a nice overflow from one slope to the other.



the arrow along the line indicates the direction the water is going (pointing downwards)

the measure button can be used to get a general idea of the current slopes of the existing field. If this can not be calculated, the slope will be zero and marked in red.

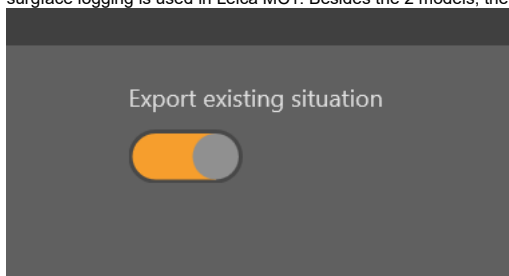
the undo button is used to undo the measure values.

Export

When the export button is pressed, the windows explorer pops up. The folder and the name of the file is already populated, based on the last input filename and position of that file.

When data is obtained from the Sync USB, the same project location will be used.

The landxml filename can be altered if needed. In the landxml 1 or 2 terrainmodels will be exported. The desgin and optional the exiting surface. The last one can be usefull when surgface logging is used in Leica MC1. Besides the 2 models, the perimeter, the sqaure and also the tilting axis are exported in the xml file.



In the settings there is one option that influences the export.

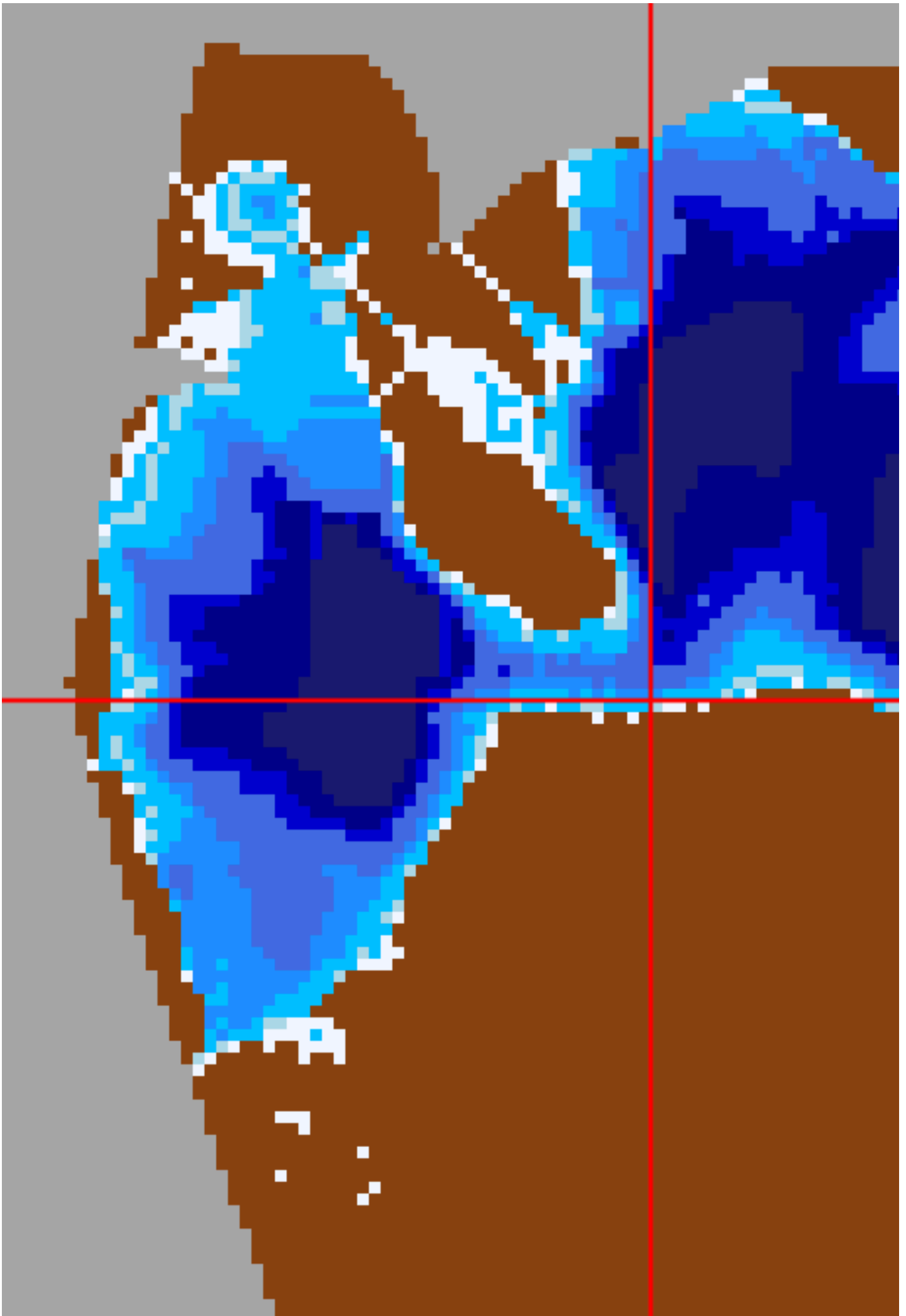


When cutting the soil, the volume increases. When filling the gaps, the compaction is not always the same resulting in more volume. That also often means that the deep holes that have been filled up start to searn over time, resulting in a shallow pit. In equalizer it is possible to compesate for this behaviour by filling gaps with an overheight. This setting is in %. If a gap of 10cm is filled with dirt and the compensation factor is 5%, the exported height on that position is 0,5cm higher.

The user can define pick his own compensation based on experience and soil type.

Rain simulator

The rainsimulator is a tool to check the surface to see if there can potentially accumulate water after a heavy rain.





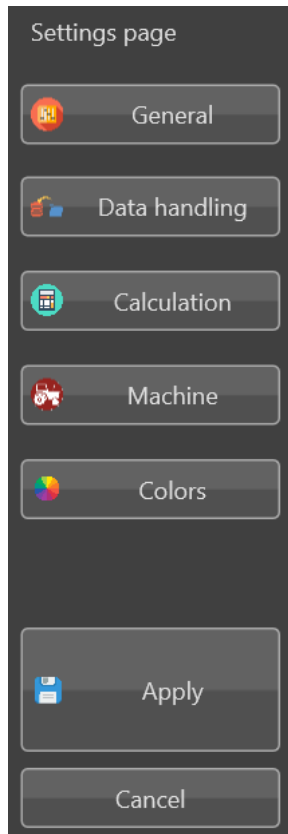
when the simulator is started an equal amount of rain is dropped on the field. The simulator then starts moving the "water" on every spot to the lowest neighbour. If the water can not go lower, it accumulates and shows a blue spot. If all of the field ends brown, no water remains after heavy rain.

The simulator is using the existing surface as model until the calculate button is used. From there it is using the new created surface as a reference level in order to check the new situation. If needed, you can switch in the legenda from design to survey and back and activate rain on the preferred situation.

Settings

Changes in a setting always needs to be confirmed by pressing the Apply button. With cancel all settings that are changed will be lost.

There are in total 5 pages with settings. With these buttons the user can switch between the different pages.

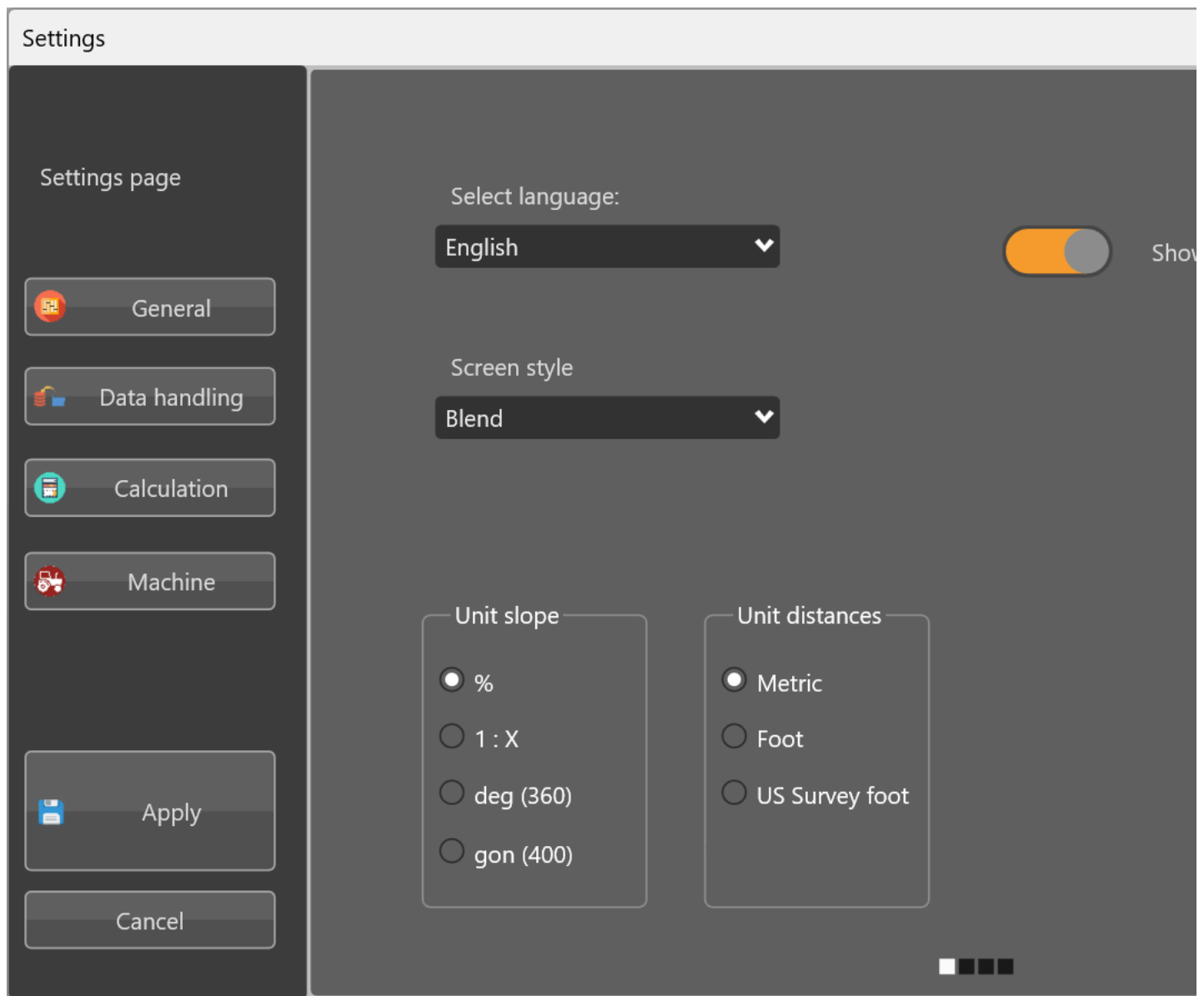


General settings

The general settings of the program are:

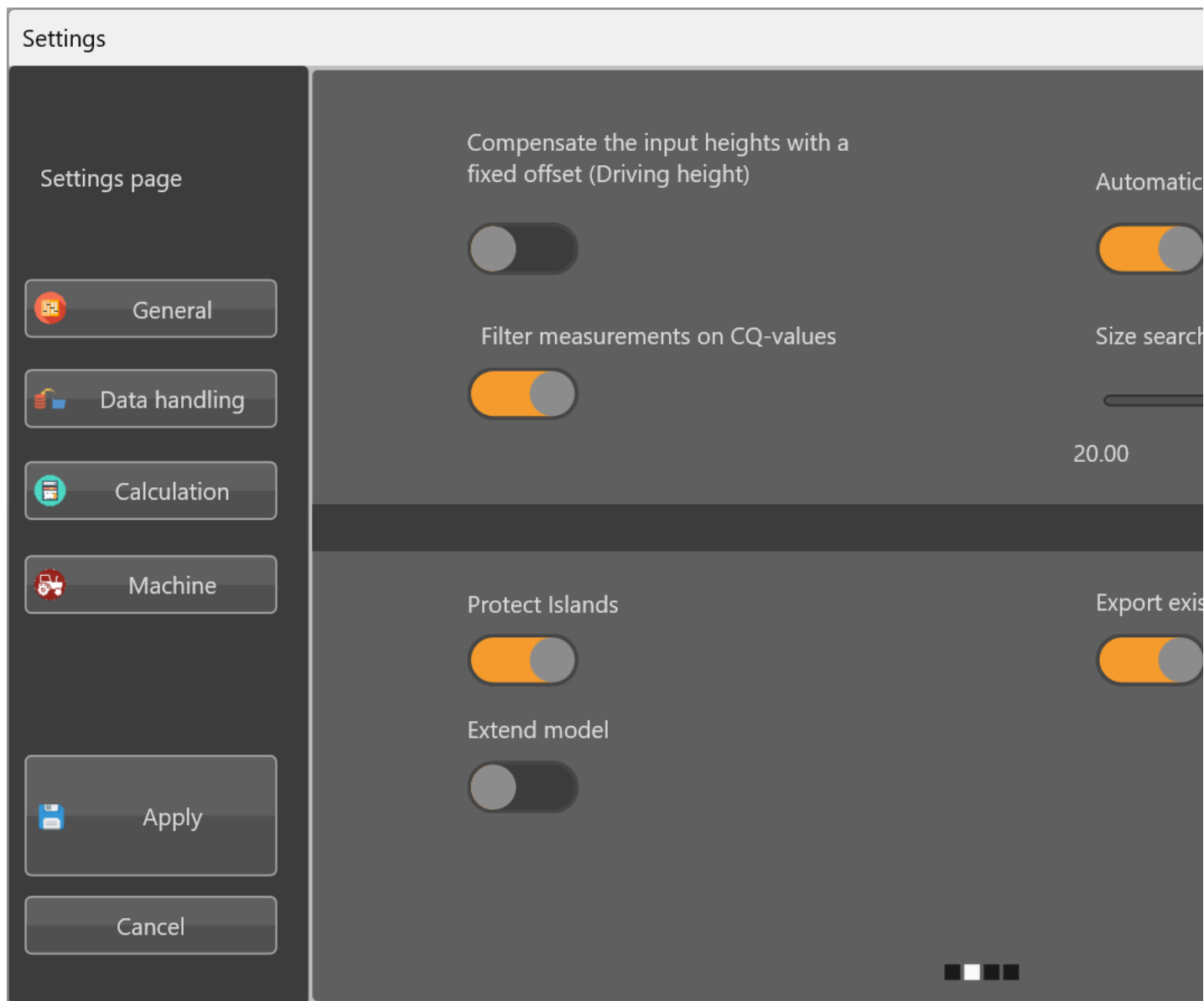
- Language
- Display appearance
- Units for dimensions and angles
- splashscreen sho at the start of the program yes/no
- License info

Changes in a setting always needs to be confirmed by pressing the Apply button. With cancel all settings that are changed will be lost.



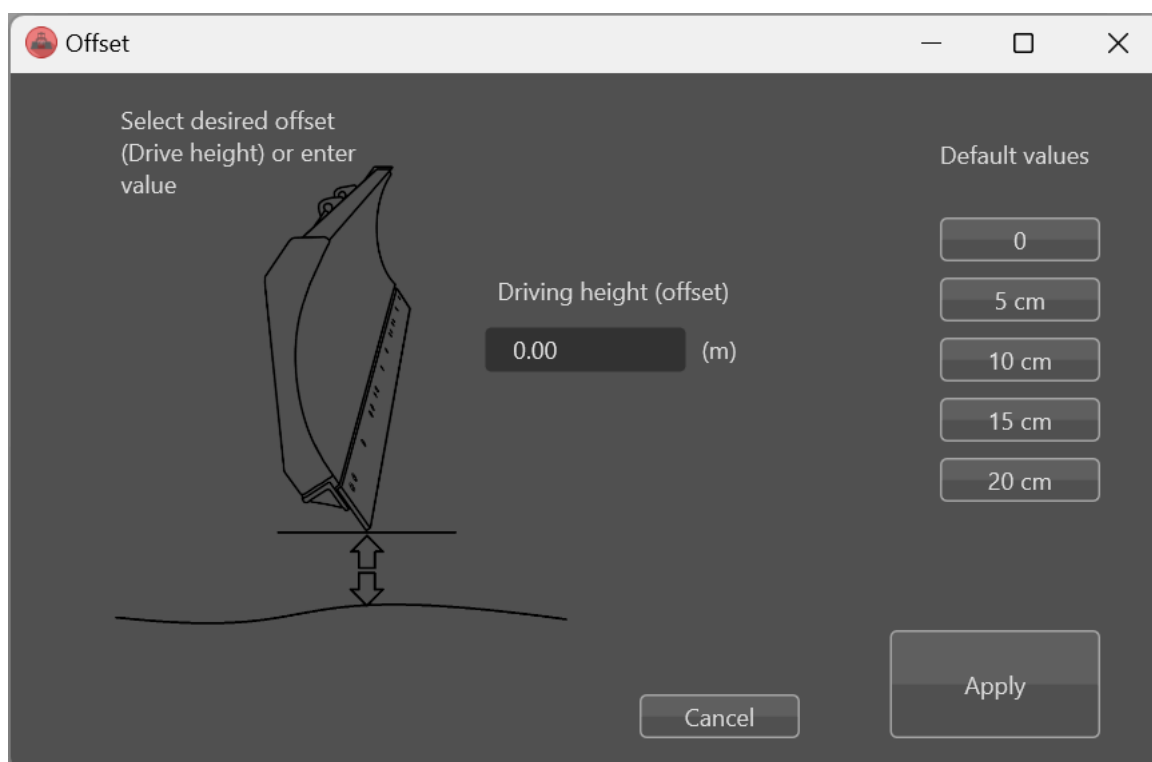
Data settings

Changes in a setting always needs to be confirmed by pressing the Apply button. With cancel all settings that are changed will be lost.



- **Compensate the input for driving heights**

When collecting data with the machine, the blade is normally lifted off the ground. With this setting on, the user gets the option to compensate the data for this driving height. The following window will appear when opening data files.



- Filter measurements on CQ-values

Data imported from a *.csv file from conx or the usb will contain all measured points. Including points that are not precise. When the filter is on, datapoints with a CQ values > 15cm will be removed from the import

- Automatic calculation optimal breakpoint location

For models with 2 slopes, this setting will define the searcharea for the tilt axis / breakpoint. When turned off, the defined breakpoint is fixed. Otherwise the size of the searcharea can be selected

- Protect islands

When enabled, the gridconversion takes into consideration gaps in the measurements and leaves parts within the circumference open. When deselected, the gaps are always filled.

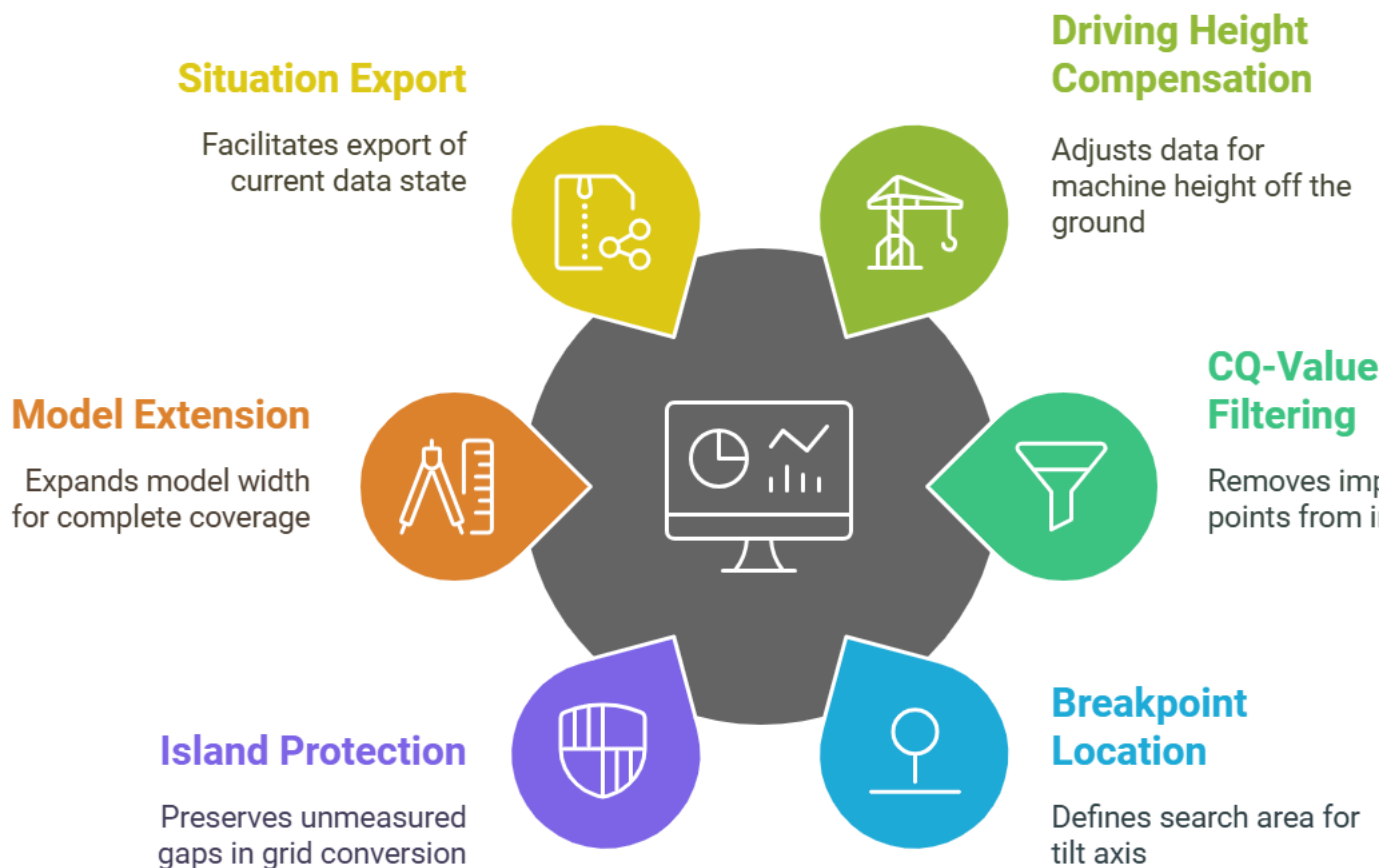
- Extend model

When activated, the resulting model will be 4 meters wider. This is in order to make a model that fits the whole area. When measuring with a big machine, often not all location on the edges can be measured. With the extension, the model is resized and when grading, you avoid driving off the model.

- Export existing situation

See export

Settings for Enhanced Data Processing



Calculation settings

Changes in a setting always needs to be confirmed by pressing the Apply button. With cancel all settings that are changed will be lost.

Settings

Settings page

 General

 Data handling

 Calculation

 Machine

 Apply

Cancel

Maximum depth (Topsoil protection)

Minimum slope

Maximum slope

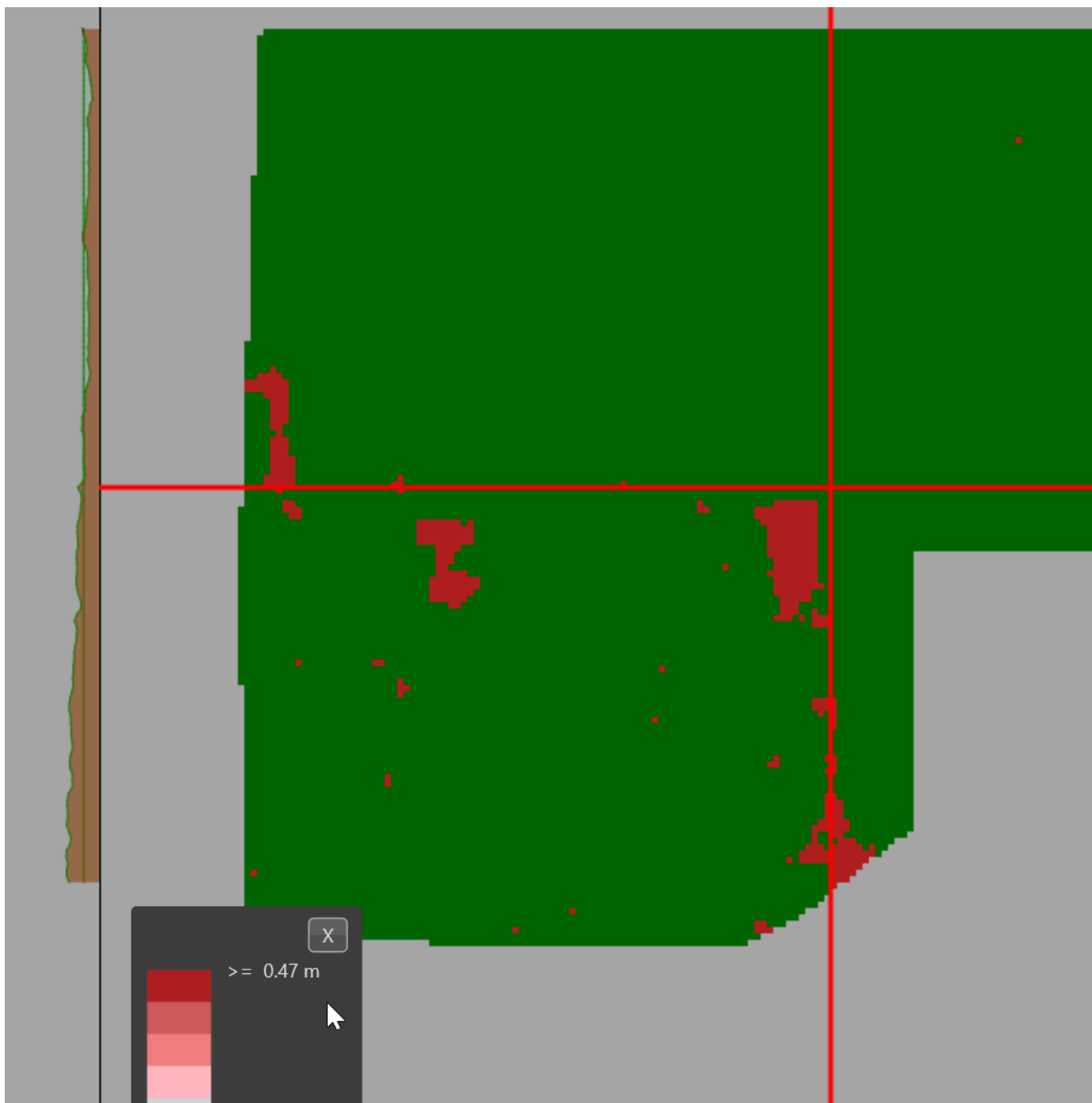
Minimum headland slope

Grow factor loose ground



- Maximum depth

This setting is a warning. If the maximal cut depth is extending the inserted maximum depth, the user gets a warning. Besides that, after the calculation it is possible to show the area's where the cut is greater then the maximum depth. (click on the legenda to swap between the 2 visualisations)



Red area's show the places where the topsoil is cut more then the setting for maximum depth

- Minimum slope

This is the minimal required slope the new situation should have to be sure the water is drained in the correct direction. The values is between 0 and + 10%.

- Maximum slope

The maximal slope the new model should fit in. This setting has to be > then the minimal slope and is maximal 100% (45 deg).

Equalizer is searching for the best matching slope in between these 2 slope settings. To avoid long calculation times best is to set the values for max slope not too high.

- Minimum headland slope

Headlands are the 10 meter defined area where a special slope can be applied.

- Grow factor loose ground

see export

Machine settings

In Equalizer up to 100 machines profiles can be stored. To be able to calculate an estimate of the time needed to do the work, some characteristics of a machine is needed.

- Name
- Volume of the blade
- Loading time
- Driving time

- Unloading time

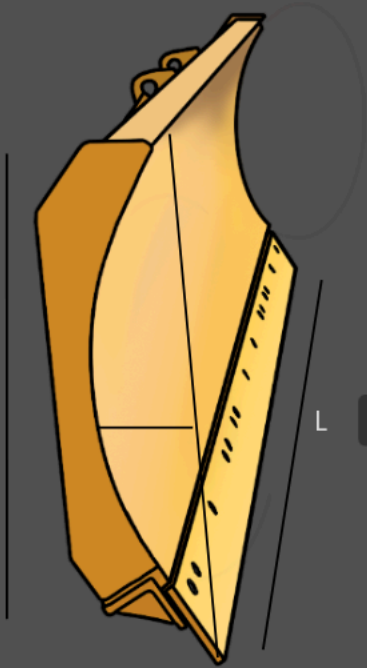
The time to load and unload combined with the time to drive up and down the loading area and to the unloading spot is the total haul time or cycle time.

If we know the volume of the blade and we know the cycletime we can calculate the M3/hour production. If we know the estimation of the total volume we have to move, the time needed can be estimated from these production figures. This is ofcourse a rough indication but can be usefull to have an idea of the amount of work to be done.

The time needed for the different activities can simply be measured with a watch. And ofcourse adjusted.

The volume of the blade can be entered if known. It is also possible to calculate it using the calculate volume option.

Calculate volume



H

0

L

0

C

0

H = the height of the blade

L = the width of the blade

C = the curvature of the blade,
measured from perpendicular to
curvature

Calculated content...

#

m3

Cancel

Apply

simply enter the dimensions of the blade in order to get an idea of the volume the blade can handle.

to switch between machines, select the correct machine and press apply to activate the selected machine.

file:///C:/lms/equalizer hd/help/Equalizer help.htm

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Settings

Settings page

General

Data handling

Calculation

Machine

Apply

Cancel

Select the correct machine:

this machine is currently selected:

Unique machine name Machinenr_4 + Toe

Description Case with small Kilver

Loading time 60 in sec.

Unloading time 60 in sec.

Drive time single 120 in sec.

Blade volume 5.00 (m)³ Calculat

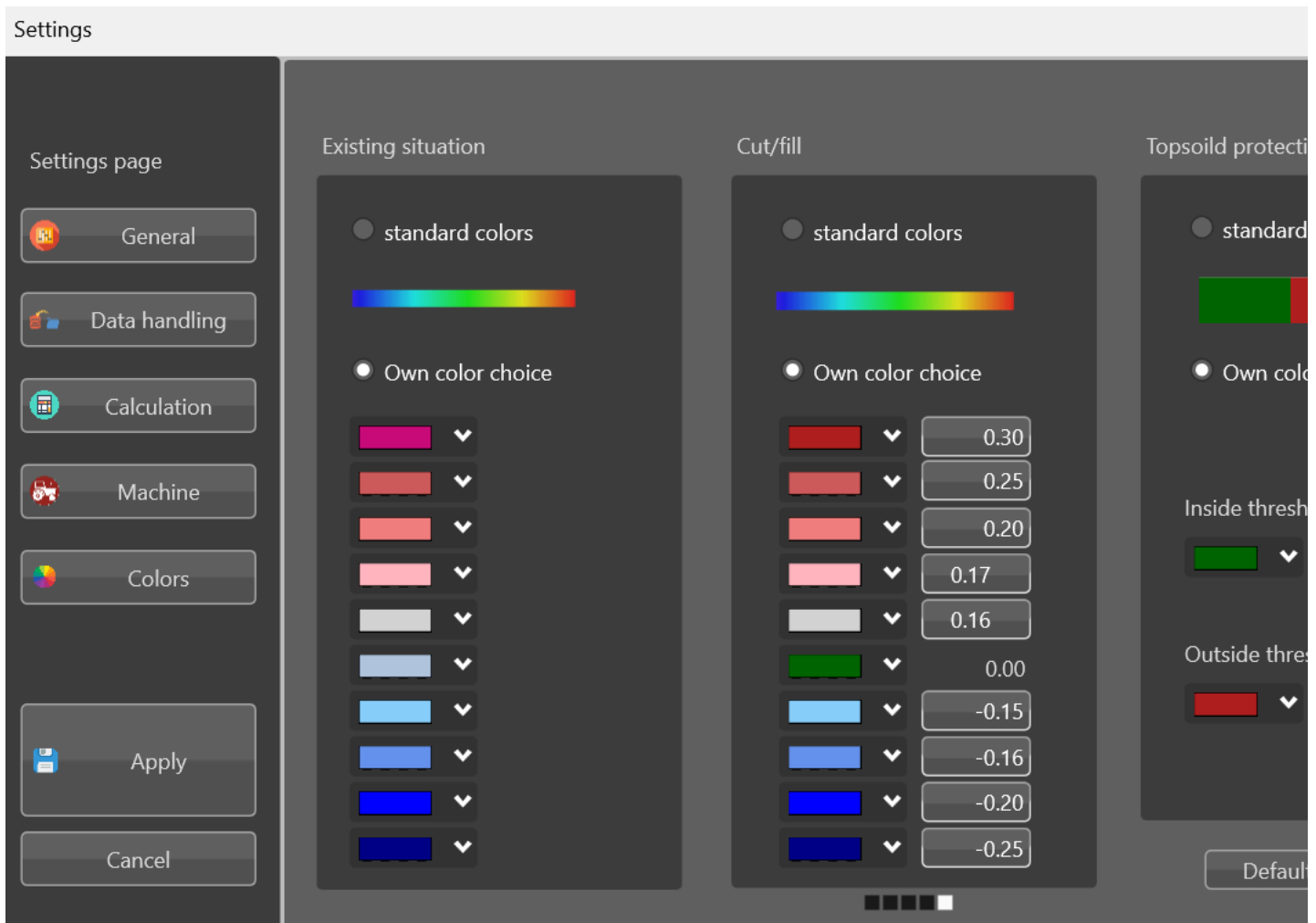
Total Cycle time 360 sec.

Changes in a setting always needs to be confirmed by pressing the Apply button. With cancel all settings that are changed will be lost.

Color settings

It is possible to pick your own color scheme for existing surveyed fields and for the cut/fill maps. For the cut/fill it is even possible to define your own intervals.

you can use the default color scale or own colors.



if you press default, all colors and intervals go to the factory settings

About

LMSfactory makes software for machine control systems. Equalizer is a dedicated software for scrapers, dozers, kilvers and skidsteers.

see also www.lmsfactory.nl