

Project Brief

Gemcom Skills Augmentation Course 2013

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1. Introduction

The Gemcom Skills Augmentation course is a project simulation designed to use what you have learned in the Surpac foundation course. The following document is a project brief containing the steps you should complete in this course.

2. Data provided

You have been provided with:

- A Cad file containing the topographic contours for the project area.
 - topo_contours_5.dwg
- A set of 4 Microsoft Excel spread sheets, containing the collar, survey, geology and assay data tables for importing into a Surpac database.
 - collar.xlsx
 - Survey.xlsx
 - geology.xlsx
 - assay.xls
- A Surpac string file representing the pit floor.
 - bas_1520.str

3. Steps for project completion

3.1. Topography surface creation

Use the file topo_contours_5.dwg to create a Surpac string file and DTM surface from this file. These should look as they do in figure 3.1.

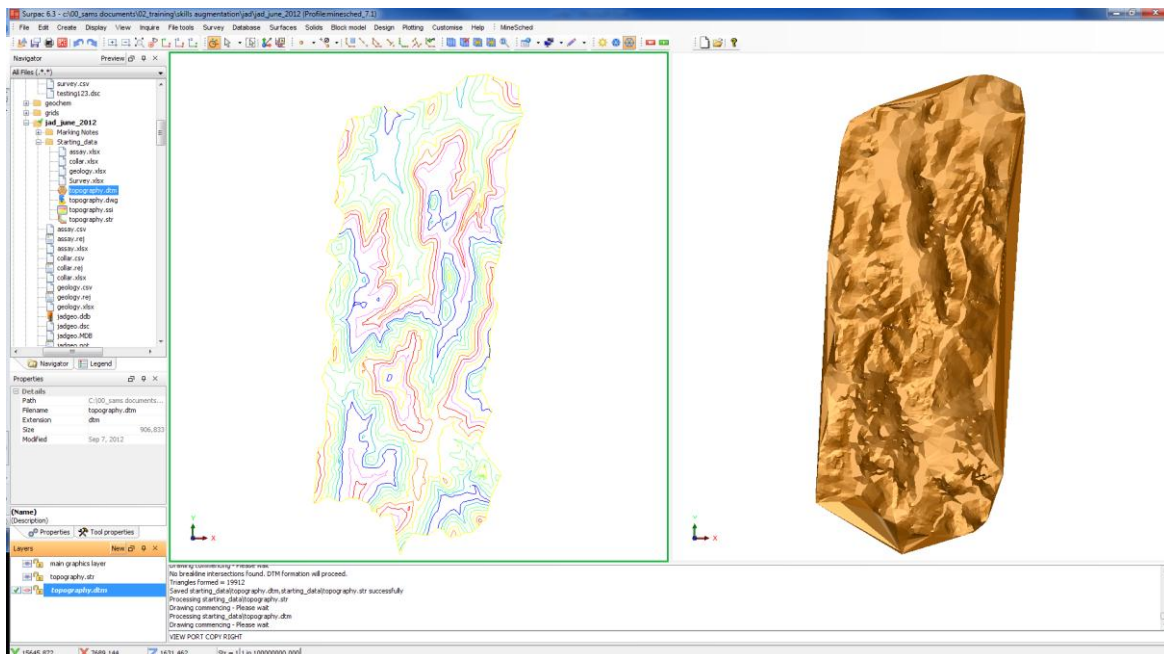


Figure 3.1 Left: topography string file. Right: Topography DTM file

3.2. Database creation

You must now create a database using text files (.txt or .csv) created from the .xlsx documents, imported into an empty Surpac database.

3.2.1. Data review and formatting

As with a typical project in industry, there are some errors in this dataset. As a part of data review and database validation, a consultant MUST check for errors in the database. These MAY include:

- Typing errors
- Sample overlaps
- Duplicate entries

3.2.2. Creation of an empty database

Before importing, a database structure must be created. Use what you have learned in the foundation course to create an empty access type database to import this data into. A table should be created for each of the spread sheets.

Note:

Surpac will also generate additional tables automatically: The “translation” table which will manage transference of data between fields and tables, and the “Styles” table which will store the database styles information discussed in chapter 3.2.4

3.2.3 Data importing

Once the database structure is set up and the .ddb and .mdb files have been created, the checked .csv files can be imported.

Importing can be performed table-by table, or collectively in a single run of the function. It does not matter which method is used.

Once the import is complete, error report files are created. These list how many entries (lines of the .csv file) have been imported, and how many have been rejected. It is usual to have the first line of the csv file rejected, as column titles are often left in the text files from the spread sheet. If you have not completed the steps in chapter 3.2.1 Data review and formatting, these entries in the database will not import and they will be listed in the error report file.

3.2.4 Display styles creation

In order to assist in the creation of their geological models, you should assign colours to the lithological codes, and numerical ranges in the database. This means that when they are displaying their drillholes, traces can be coloured by lithology (optionally with patterns), and numerical values (e.g. gold in the assay table) can be coloured.

You may create colours and/or patterns for the geology codes at will. For the assay table however, you should only create styles for the gold field, and use a cut-off value of 0.4. This cut-off will be used for solids creation.

3.3. Geological Modelling

Once a geological database has been created, it can be used to create a solid representing a gold orebody. This will constitute of three stages:

1. Digitizing of sections
2. Triangulating a solid
3. Validating a solid

3.3.1. Digitizing sections

Using sectioning tools the drillhole database should display vertical sections of the drillhole database, with lithologies and sample information displayed. This will allow you to use string digitizing functions to create closed strings/segments which represent cross sections of the gold orebody.

Choose a sensible cross-section orientation to create vertical cross sections for digitizing.

For this project, instead of creating lithological solids, you will create solids which represent “grade solids”. These are orebodies which are defined by their gold content alone. Use 0.4 as a cut-off to draw cross sections of a grade-solid. **Only use the gold assay values in the creation of the cross-sections.**

You should be able to use string digitizing tools in order to create a single, or multiple, closed string/segment for each of the sections which can be interpreted as being a part of the orebody. An example of this is shown in figure 3.2. Remember that the direction a closed string is digitized in is important.

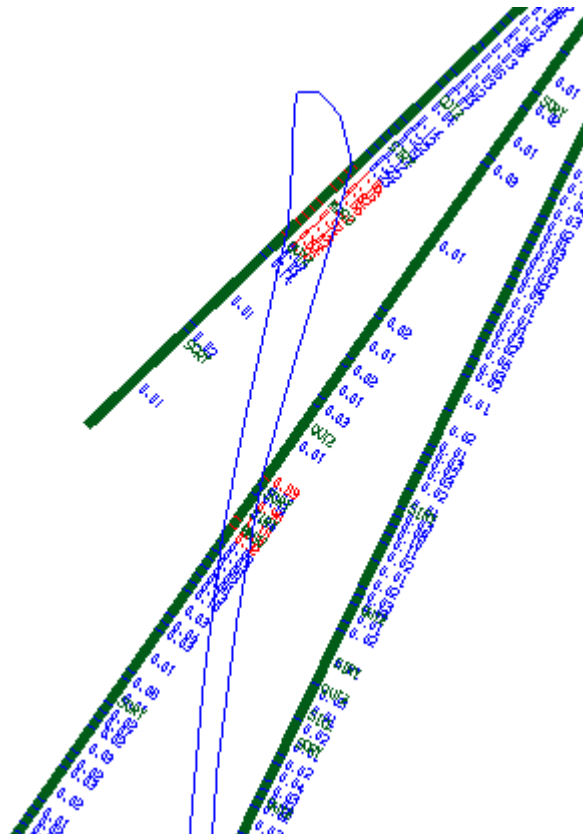


Figure 3.2 showing section triangulation along an anonymous cross section

Some cross sections will be relatively simple, whereas others may be complex. Though you are creating grade solids, these must make geological sense – that is, they must be a reasonable interpretation of the geology from the data presented.

Over-complicated strings will create solids which are harder to validate. Remember that the strings created must be suitable for creating a valid solid. You should make use of clean functions, and you may consider using other editing functions to create strings which will easily facilitate solids creation.

3.3.2. Triangulating a solid

You should make use of multiple triangulation functions in order to create your solid. This data should have at least three separate objects.

3.3.3. Validating a solid

The created solid **MUST** be validated. This will allow you to create a block model constraint. You **MUST** include a solid volume report in your submitted work.

3.4. Block Modelling

A block model must be created which covers the extents of your geological model; that is, it must contain both the gold orebody and the topography.

The block model will be used to carry out a basic estimation. First, constraints must be created. These should be:

- A constraint below topography
- A constraint within the gold orebody – due to the narrow geometry of the orebody this constraint **MUST** include blocks only partially inside the constraint. This will be accounted for by using partial percentages later.

3.4.1. Estimation

Due to time constraints, and the level of training you will have received by this point, the estimation will be using inverse distance. The parameters for this are:

- In order to run the estimation a composite string must be created. This should be a 1 m composite, with 75% minimum sample length to be included, compositing the gold field of the assay table.
- An attribute must also be created in which to place the estimated values. This should be a 'real' type attribute, with at least 2 decimal places and a background value of 0 or a negative number. Call this 'gold_id'.

- CONSTRAINT VALUES USED

Data Constraints

a. INSIDE CONSTRAINT .././BM/GOLD_OREBODY1

Model Constraints

a. INSIDE CONSTRAINT .././BM/GOLD_OREBODY1

- SEARCH PARAMETERS

ROTATION CONVENTION

Surpac ZXY LRL

ANGLES OF ROTATION

First Axis	*
Second Axis	0.00
Third Axis	0.00

ANISOTROPY FACTORS

Semi_major axis	1.00
Minor axis	1.20

OTHER INTERPOLATION PARAMETERS

Max search distance of major axis	*
Max vertical search distance	20.000
Maximum number of informing samples	15
Minimum number of informing samples	3

* You must decide on the angle of rotation for the first (major) axis, and the maximum search distance using variography. In a typical resource estimation, all of the above parameters would be decided using variography, however due to time constraints, in this project we will create a single variogram map to decide on these 2 parameters.

Load your composite string file into the variography window as a variogram map:

- View the d field for your gold composite
- Minimum value of 0 and a maximum of 10
- Plane dip and dip direction should be set to 0
- Set the number of variograms to 36
- Spread = 5
- Spread limit = 20
- Lag = 40
- Maximum distance = 200

You should select the best variogram created, which will define the direction of your major axis. You should also use this variogram to create a structure; which you can read your maximum search distance from.

Add these parameters to those listed above to run your estimation.

The block model can now be coloured by this attribute. Figure 3.3 shows this display with a colour range also shown.

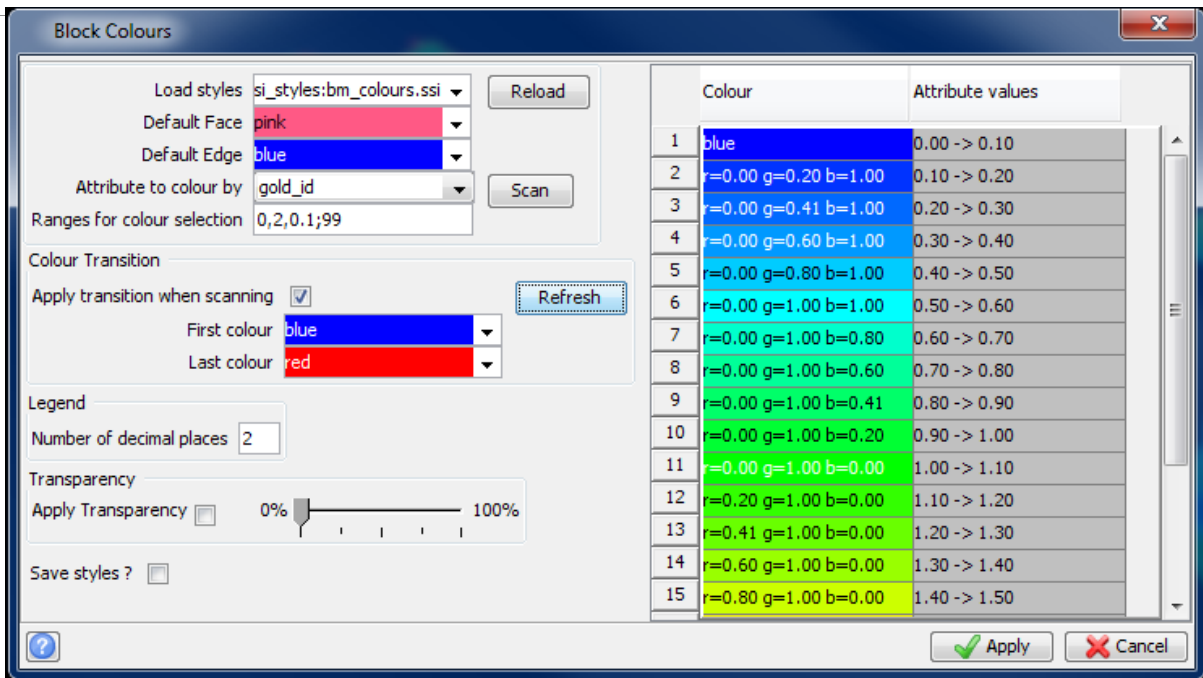


Figure 3.3 block model colour range specification

3.4.2. Block model reporting

3.4.2.1. Partial Percentages

As a constraint was used which included block only partially in the constraint, the current volume will be too high. This means that a partial percentage attribute should be set up and populated. The attribute should be real or float type, with 2 decimal places and a background value of 0. Use the partial percentage function to populate this attribute. This can then be used to weight the block model report. A partial percentage precision factor of 3 can be used.

3.4.2.2. Block Model report

A block model report should be created to report the estimated resources in the block model. The setup of a report of the example model is shown in figure 3.14. This was constrained within the gold orebody.

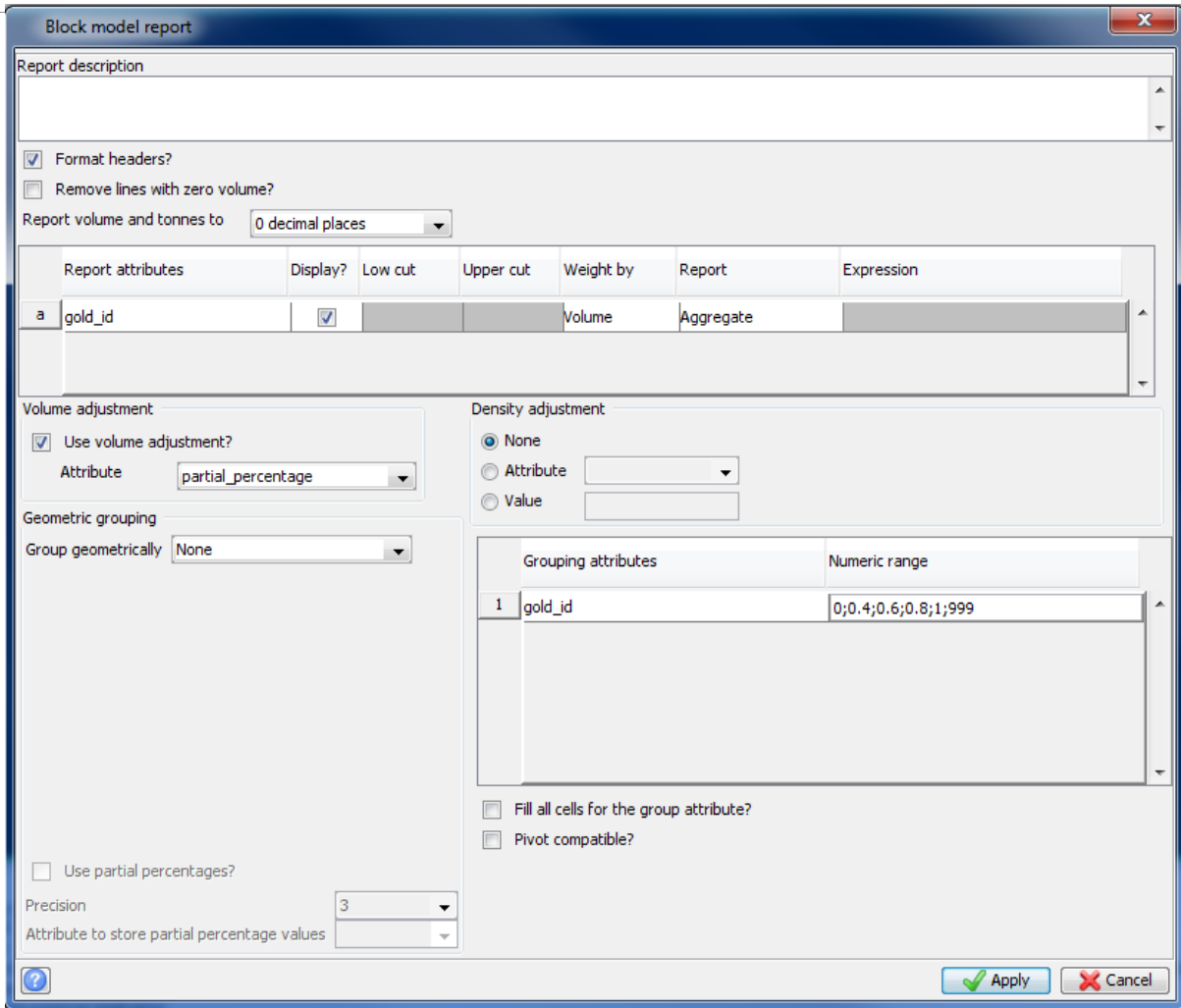


Figure 3.4 example block model report setup

3.5. Pit Design

A closed string has been provided which represents the pit-floor. This should be used as the start of a bottom-up pit design. This file is named `bas_1520.str` (as it is the pit floor at an elevation of 1520 m). You must create a pit design which meets the following parameters:

- The pit must have a design gradient of 70 degrees.
- Benches must be 10 m height.
 - This must also be true where benches are not continuous around the entire pit, i.e. when the pit design reaches the uneven surface, benches and berms should still be created until the pit design passes completely through the topography.
- Berms must be 5 m width and horizontal.
- There must be a single ramp which is continuous from the pit floor to the surface.
- The ramp must contain one switchback (180 degrees).
- The ramp must be 15 m width to allow 2-way traffic, and have a gradient of 1 in 10.

A surface should also be created from the pit design, and then clipped to the topography surface to show that the bench reached the surface, and that when the pit design reaches the uneven topography surface, benches and berms have been created until the pit design passes completely through the topography.

4. Data Presentation

You MUST submit the following files:

- Topography DTM (.str and .dtm files)
- Drillhole database (.ddb and .mdb files)
- Orebody solid (.str and .dtm files)
- Block model (.mdl file)
- Block model constraints files (.con files)
- Block model report (.not, .pdf, .csv or .html)
- An image of the variogram used to calculate the major axis direction and maximum search distance.
- Pit design (.str and .dtm files)
- Pit design clipped to topography (.str and .dtm files)

Note: Due to time constraints, it should not be required that students use the plotting functions in Surpac to show their resulting files. Screen grabs with grid displays, and captions describing the data and its view orientation may be accepted.

5. Report

Your university will provide you with the specifications of any requested report to accompany this project.