Mining Management System

SURPAC CMS PROCESSING

for Stope Reconciliation

MIN-GEN-20030212

Revision: B

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Table of Contents

1 PURPOSE

An Optec CMS (Cavity Monitoring System) survey produces a series of surveyed points outlining the actual shape of a void left by a stope, drive or some other opening.

The CMS is a useful tool to determine shapes of underground voids where conventional survey techniques would be considered unsafe.

Surpac software has a function which will create a 3dm (3 dimensional model, or wireframe) from the raw cms data.

Simply just using this function alone has several limitations:

1. Its inability to see through an object such as a ledge on the hangingwall or rockbolts and mesh inside the stope or hanging down from the brow. The resulting shadows require some interpretation to refine the model of the actual stope shape.
2. The data sets are very large, often tens times more than what would be required of a final model. Having several CMS survey data sets can often tax the speed at which some computer can process and display the data.

This procedure is based on using the Surpac Ring Design module to convert the CMS survey into a final model, and overcoming the above mentioned limitations.

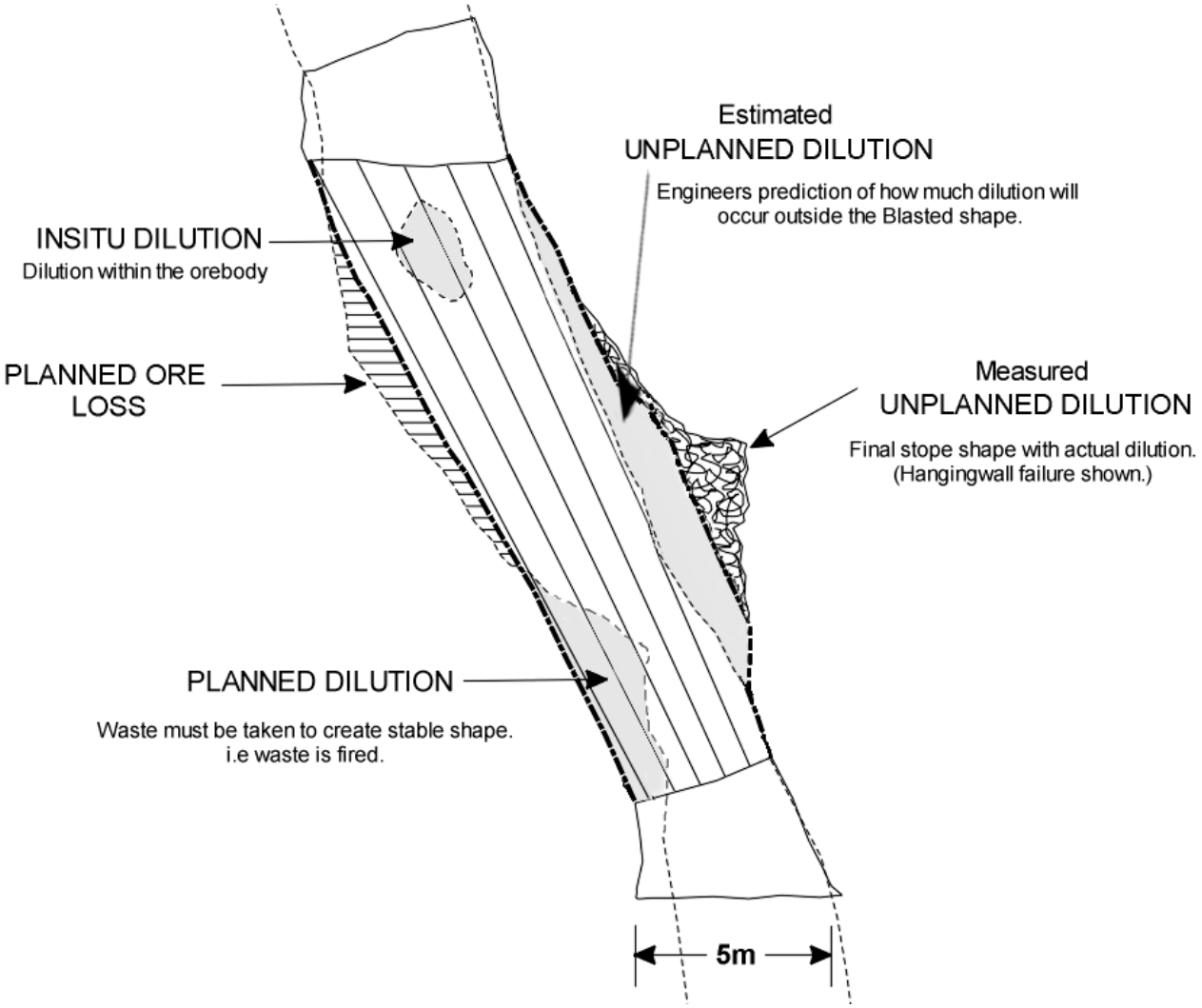
The model of an actual stope shape can then be compared with the design shape to determine the location and quantity of any overbreak or underbreak that may have occurred. It can also be used to generate reports on the block model grade of both the overbreak and underbreak, a valuable tool when reconciling planned and unplanned dilution.

2 SCOPE

This procedure outlines the naming conventions used when processing, the method used to simplify the amount of data to be processed, the creation of solid volumes for individual firings and the method used to reconcile tonnes and grade in each firing.

A certain degree of prior knowledge of Surpac is assumed at least to the point that the operator is familiar and comfortable with creating and designing production stope shapes and rings.

3 DEFINITIONS



4 PROCEDURE

4.1 Obtaining the raw CMS model

After conducting a CMS survey, the Surveyors will process their raw data to produce the CMS DTM (Digital Terrain Model) and string files.

Ideally a logical naming convention has been adopted for CMS file names. File names by such a convention could consist of three parts:

1. The stope name
   For example, n15_1s
2. The CMS number in that particular stope
   For example, _cms2
3. The date of the CMS survey
   For example, _20030204

Therefore, the second CMS survey conducted on the N15-1S stope on February 4, 2003 would have file names:

- n15_1s_cms2_20030204.dtm and
- n15_1s_cms2_20030204.str

In addition to this, an object numbering convention should be adopted to identify the number of the CMS survey which a particular model represents. The convention could start at object number 411 for the first survey conducted on a stope and increases sequentially with each successive CMS survey.

For example, the second CMS survey conducted on a stope would have an object number of 412

Note: Surpac does not perform some functions properly when the file path to the selected file contains blank spaces between words. It also sometimes shows a certain amount of inconsistency toward capital letters within words. Consequently, folder and file names should contain the under-score symbol (_) rather than blank spaces or multiple capitals.

4.2 Slicing the raw CMS data

A CMS survey is often made up of far too much detail to manipulate easily, and more than what is needed for reconciliation of stopes. A lot of the detail is wasted too as it is clustered in the drive behind, or below the area of interest.

This procedure uses the SSI Ring Design Module, and its main components are:
1. To cut slices out of the raw data at the ring sections.

2. Digitise a simplified shape around the slices which is saved to the Stope openings component of the ring section files.

> Note: Slight inconsistencies between operators may cause new slices to be slightly off the plane of the old slices. This is not critical as the raw slices are only to be used for digitising new slices exactly on the correct plane. It is advisable however for accuracy in processing the data to cut as close as possible to the ring sections.

4.3 Refining the Slices

Theoretically you should be able to clean up the CMS slices as they have been cut and renumber them to go straight in to the ring section files. Due to the existence of shadows and variations between pickups however, it is necessary to manually digitise the most probable true shape from the range of information available rather than rely on a single set of data. A certain amount of judgement may be required where there are known shadows that have not been picked up in any of the CMS passes, particularly at the ends of the stope.

The steps to follow are;

- Start ring design.
- Call in the ring sections in question. Change the layer to “Ring Design Stopes Layer”.
- Call in the CMS slice that you want. Drag it in to the correct layer and click on  or use ZP F2 to zoom to the plane.
- Use the digitiser (“dig” f2) to set the digitiser string at new string (For example 45 or 401).
- Click “Digitise a point at cursor location”  to make sure that points are exactly on the plane (ie. do not use “select points to digitise”).
- Click a series of points starting at the left shoulder of the drive and progressing clockwise to the right shoulder to create the most likely outline of the void at that ring.
- Close the segment by clicking  .
- Digitise a string (such as number 46, or 421) or around any measured fill.
- Delete the raw CMS strings.
- Save the section the same way you would normally in ring design.
- For sections further into the stope that have previous CMS outlines in them, you should be able to just adjust the existing segments, don’t bother trying to save them as new files, there should already be a solid created that shows their original shape.
- Once all the sections have the strings that you want and they look OK, you can delete the poo and other working files. They are easy enough to make again.

4.4 Assembling the interpreted solids.

Recall the above digitised strings, and create a 3dm by creating triangles between and inside the segments. Save.

4.5 Reconciliation

This will vary depending on the needs at the time but the most likely things that will be needed for comparison include;

- Asbuilt tonnes and grade
- Dilution (Design v's asbuilt) tonnes & grade.
- Planned v's actual dilution (Ore shape v's Design shape v's Asbuilt).
- H/W dilution
- F/W dilution
- Recovery and stope efficiency (Underbreak v's total ore v's designed ore)

In each case, the width of the overbreak and underbreak solids relative to block resolution will mean that tonnages are highly variable and inaccurate when block model reports are generated. Grade will however be as accurate as can be determined.

It is therefore recommended that an approximate grade be determined using block model reports and 3dm volume reports be used to determine tonnes. A certain amount of back-calculation can be done to act as a check but there will always be discrepancies in the overall numbers, generally less than the statistically acceptable margin for error in the original block model though.

5 REFERENCES

1	SGW standard MIN-GEN-2005 Mining Engineering & Survey Drafting

6 DOCUMENT REVISION HISTORY

Revision Events

Rev.	Author	Changes	Date
A	O Glockner	Initial Concept	12 February 2003
A	N Schunke	Draft	2 March 2003
B	O. Glockner	Dilution Definitions Sketch	31 July 2003