Appendix 5 A

Geology Report

Brandy Hill Expansion Project

Environmental Impact Statement

Hanson
HEIDELBERGCEMENT Group

Geology, drill Results and Resources

Brandy Hill
Quarry
NSW

Brandy Hill Site

Geology, and drilling report

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Purpose

The purpose of this report is to report on the drilling, interpret data and make conclusions from the geological logs to reinterpret the geology in order to maximise the resource on land owned by Hanson at its Brandy Hill quarry.

Previous Work

The site was investigated as part of the due diligence completed by Pioneer in 1999. This report was prepared by the author. It included one additional diamond hole in addition to two holes reported by Resource Planning (February 1983). Three additional holes were drilled in 2012 and a report describing these holes and recommendations for additional work was completed in March 2012.

Geology

Regional geology

From the Newcastle 1:250,000 geological map the site currently extracts the Patterson Volcanics described on the plan as acid lava and crystal tuff. It is overlain by the Seaham Glacial beds and underlain by the Mt Johnstone Formation comprising volcanic tuff and sandstones. The Nerong Volcanics outcrop to the north of the site. There is a fault called the Glenoak fault crossing the south east corner of the site. This fault appears to be a transform fault based on the Patterson Volcanics outcropping to the north east of the site outcrop. A portion of the plan is attached as Figure 1.

From the Newcastle 1:100,000 (1975) sheet the detail of these units is brought out including the transform fault detail. The orientation of the Glenoak fault is based around the outcrops of the Patterson Volcanics. A portion of the plan is attached as Figure 2 which includes the drill hole locations completed to date.

Site Geology

The rock has been previously been described as a rhyodacite[1] and comprises three colours; a cream which is a weathered profile, a red-brown layer which is fresher with the colour being due to the alteration of magnetite to haematite, and a grey colour is the fresh band which lies at the base of the sequence. An examination of the petrology indicates that this is more akin to an ignimbrite in nature

The drilling from this study confirms the presence of the Seaham Glacial Beds overlying the Patterson Volcanics.

The presence of mudstone was detected at the base of the ignimbrite in earlier reports. The number of holes, in this case two, was not sufficient to determine if the base of the ignimbrite is uniform. The report indicated field measurements that indicated a base dipping (or sloping) at 10 degrees to the south east.

The rock is described as a hard rock and the specific gravity has been tested at 2.6 for the sandstone and 2.67 for the ignimbrite.

Petrology.

A sample of the ignimbrite has been submitted in 2014 for a petrology analysis. This is attached as Appendix C.

Drilling

Previous drilling

Two diamond drill holes were completed by resource planning in 1983. In 1999 Hanson added an additional hole to the south east. Photographs of the 1999 core and graphic logs are attached as appendix D. An additional three holes were drilled and logged in 2102. Photographs of the 2012 core and graphic logs are attached as appendix E.

Drill Rationale 2014

[1] Brandy Hill Quarry. Detailed Geological Assessment and Testing Results by Resource Planning, February 1983.

Holes BH1401, BH1402, BH1403 and BH1407 were placed in the vicinity of the Glenoak fault. They were drilled to determine both the extent of the ignimbrite and influence of the fault. Holes BH1405 and 1406 were used to confirm the lateral and depth extent of the ignimbrite south east of the current ignimbrite outcrop. Hole BH1404 was drilled to confirm the basement of the Mt Johnstone Formation.

The borehole name, collar location, height datum, hole depth and angle are given in Table 1.

Table 1 Borehole collar information

BOREID	*X*	*Y*	*Z*	*FINALD*	*AZIMUTH*	*DIP*	*TYPE*
BH1	377116.9	6385887	69.2	70.5	0	-90	DH
BH2	376773.5	6385936	91.2	66.4	0	-90	DH
BH3	377003.8	6385708	46.4	66.4	0	-90	DH
BH401A	377397.1	6385796	37.94	60	0	-90	DH
BH401	377298	6385847	39.14	51	0	-90	DH
BH400	376667.8	6385668	72.13	100	0	-90	DH
BH1401	377467	6385110	30.64	75.15	0	-90	DH
BH1402	377445	6385345	41.59	75.3	0	-90	DH
BH1403	377250	6385303	30.34	123.2	0	-90	DH
BH1404	376295	6386194	148.32	80.6	0	-90	DH
BH1405	376384	6385562	45.67	111.77	0	-90	DH
BH1406	376633	6385412	37.19	111.35	0	-90	DH
BH1407	377590	6385578	30.59	111.35	0	-90	DH

Drill Results.

The drill hole locations are indicated on the attached borehole location and pit plan. Graphic logs are given in Appendix A and photos of the core are attached as Appendix B.

BH1401 showed 6 metres of sandstone, 9 metres of conglomerate with the balance being sandstone to a final depth of 75 metres or -44.5 metres AHD.

BH1402 showed 21 metres of sandstone, 3 metres of conglomerate with the balance being sandstone to a final depth of 75.3 metres or -33.71 metres AHD.

BH1403 showed 30 metres of sandstone, 14 metres of conglomerate an additional 4 metres of sandstone, 61 metres of ignimbrite with the balance being sandstone to a final depth of 123.2 metres or -92.9 metres AHD.

BH1404 showed 81 metres of sandstone, or 67.7metres AHD.

BH1405 showed 3 metres of sandstone, 7 metres of conglomerate 9 metres of ignimbrite with the balance being sandstone and mudstone to a final depth of 112 metres or -72.1 metres AHD.

BH1406 showed 5 metres of sandstone, 44 metres of conglomerate 46.5 metres of ignimbrite with the balance being sandstone and mudstone to a final depth of 123.2 metres or -74.2 metres AHD.

BH1407 showed 20 metres of sandstone, 16 metres of conglomerate 34 metres of ignimbrite with the balance being sandstone and mudstone to a final depth of 90 metres or -80.1 metres AHD.

Drill Result Conclusions

The total drilling program confirms the known regional sequence, from the base of Mt Johnstone sediments, comprising predominantly fine grained mudstone and sandstone to the Patterson volcanics and finally the Seaham Glacial Beds comprising sandstone mudstone and conglomerate.

The ignimbrites of the Patterson Volcanics are up to 60 metres thick but thin to the east and west. The basement of the unit dips at 8 degrees with a strike of 83 degrees and dip direction of 173 degrees. The drilling also indicated that these volcanics continue at depth past the mapped Glenoak fault and further to the east than previously known.

The location of the Glenoak fault and its orientation could not be confirmed by this drilling program. Hole BH1401 would need to have been drilled for another 71 metres to intersect the modelled basement of

the ignimbrite. Hole BH1402 would need to have been drilled for another 44 metres to intersect the modelled basement of the ignimbrite.

Geological model

Based on the drill results a geological model can be built from the data. In this area the logging indicates three sub units in the Seaham Glacial beds, an upper sandstone, conglomerate and lower sandstone. The Patterson Volcanics is considered one unit but has a weathering surface even at depth. The underlying beds are always mudstone in this area. The model extends to the south and east past the mapped Glenoak fault. The stratigraphy, clipped to the current surface is attached to the report as the cross section north west to south east.

Thus a layered model comprising these units can be devised. The layers were entered and modelled in Minex. The model produces a seam floor on a grid developed to accurately reflect the logging of all the holes. The roof of the units are derived from the floor of the upper unit, and thickness grids are calculated using grid arithmetic by taking the seam roof RL at each mesh point and subtracting the seam floor at that same grid point

The model produced was checked against the data and is considered to reflect the drill results consistently.

Model results

The model can be demonstrated in 2D by the use of cross sections. A north west to south east and two west to east sections are included here to demonstrate the model. The former shows the dip of the basement of the ignimbrite and the thickening of the upper sandstone and conglomerate units towards the south. The latter west to east sections show the same thickening of these units to the south as well as the thinning of the ignimbrite to the east and west.

Testing

No testing of this material has been completed to date. Results are given in Appendix E

PIT DESIGN AND RESERVES

A pit design based on the land owned by Hanson and based on the base of the ignimbrite is used for the reserve calculation. This is for a wider area than the known outcrop of the Patterson Volcanics. The resource calculation is based on the modelled layers as described above.

Total available resource

The total available resource has been calculated based on the topography surface to the base of the ignimbrite. The base of the reserves is based on the basement model. The basement contours are shown on the attached pit plan and solid models in figures 3,4 and 5. This plan shows the pit following the dip of the ignimbrite and this is also demonstrated in the north west to south east cross section.

The total volume to this basement in the pit area is 39.7 million bank cubic metres. The basement is shown on the ignimbrite basement cross section plan attached to this report. This figure is the indicated mineral resource under the 2012 Edition of the Australasian Code for the Reporting of Exploration Results, Mineral Resources and Ore Reserves ("JORC code") and is included for the purposes of compliance with the JORC code.

Application of scalping and other production factors

The indicated mineral resource does not consider production factors such as amended pit plans, poor quality material, production losses and overburden amounts.

The overburden has been modelled on the clay or deep weathering in the upper part of each drill hole. The depth varies over the site. The overburden volume based on the drill hole lithology depth is 2.021 million bank cubic metres.

The scalping losses have been calculated from the scalping analysis. In summary, for the ignimbrite layer identified, the weighted average for each hole has been calculated. The measured amount is close to 10% based on removal of the highly fractured ignimbrite.

The layers volume is then calculated from the program Minex 6.1.2. This takes the borehole database, the intervals identified as poor quality and creates seam floor models for each layer. In the model developed, the floor of one layer becomes the roof on the underlying layer. Again for this model the current surface is the upper limiting layer and this has been made the roof of the top seam layer.

The Minex 6.1.3 program then does arithmetic on the roof and floor layers to produce a thickness grid for each layer. From these thickness grids, the volume of each layer can be calculated

A conversion factor at each grid point in the model is used to calculate the expected tonnage:

> Tonnage = volume of layer x apparent particle density x (100 – scalp percentage)

From these inputs the program produces a production resource tonnage.

Thus the upper limit is defined by the topography, the lower limit by the floor model and the lateral extent by the property. The volume and tonnage will be derived from these limits.

Where appropriate, the earlier drilling has been incorporated into the current geological model.

Based on the interpretation of the geological data and the subsequent resource model, the calculated tonnage is given in table 1.

8.3 JORC Code

The resource is elevated from an indicated resource to a measured resource under the JORC code, as the drilling, petrology, conversion factor and scalp ratio for each layer are well defined. The amount of intervals measured and the consistent lithology over the site indicate that the calculated resource is economically viable over the site. Table 1 of the JORC code is attached as Appendix G.

As well as the physical knowledge of the body, the site is licenced to extract and is currently selling into to an established market. This is likely to continue. This site also has in place mining licence, planning

permission and a social licence to operate. This level of confidence is adopted as there is still some uncertainty as to the scalping ratio in the southern section, the subject of a mining and planning application, and pit design based on other restrictive environmental factors. When some historical data is eventually available from the extended pit and verifies the scalping ratios as calculated here, the resource can be elevated to a proven reserve.

Estimated extractable tonnage and confidence.

JORC classification	Type	Cubic metres (x'000)	Tonnes (x'000)	Reason for classification
Proven reserve	Overburden	4		The drill holes and interpreted basement for earlier work indicate a body of Ignimbrite dipping to the south east. A loss factor of 10% is used here as most material is sold.
	Sandstone B Grade Ignimbrite		83 88 **1,465**	
Sub total			**1,636**	
Measured resource	Overburden Sandstone Conglomerate Sandstone B Grade Ignimbrite	2016	 7,182 12,953 2,134 54,197	This is for the resource below RL 30, the current approved limit and the extension of the pit to the south.
SubTotal			**76,466**	

CONCLUSION

Based on the information obtained during the Drilling Program in2014, it is concluded that there are 78.1 million tonnes of ignimbrite, sandstone and conglomerate resource in the relevant resource areas. As extended by this drilling and testing program.

To develop a pit design the following assumptions have been made. The base of the deposit is modelled on the base of the ignimbrite intersected in the drill holes. The conversion factor is 2.6 and loss factor of 30% for the sandstone and conglomerate and 2.67 and 10% loss factor for the ignimbrite. The resource figure is for the difference between the current maximum pit and the new area. The pit is shown on the attached borehole cross section and pit plan.

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I have read and understood the requirements of the 2012 edition of the Australasian Code for reporting of Exploration results, Mineral Resources and Ore Reserves (JORC Code 2012 edition).

I am a competent person as defined by the JORC Code 2012 Edition, having five year's experience that is relevant to the style of mineralisation and type of deposit described in the report, and the activity for which I am accepting responsibility.

I am a member of the Australian Institute of Geoscientists.

The author is a full time employee of Hanson and has been employed in this position for a period of 30 years.

Peter Browne has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the Australasian Code for the Reporting of Exploration Results, Mineral Resources and Ore Reserves. Peter Browne consents to the inclusion in the report of the matters on his information in the form and the context in which it appears.

FIGURES AND PLANS

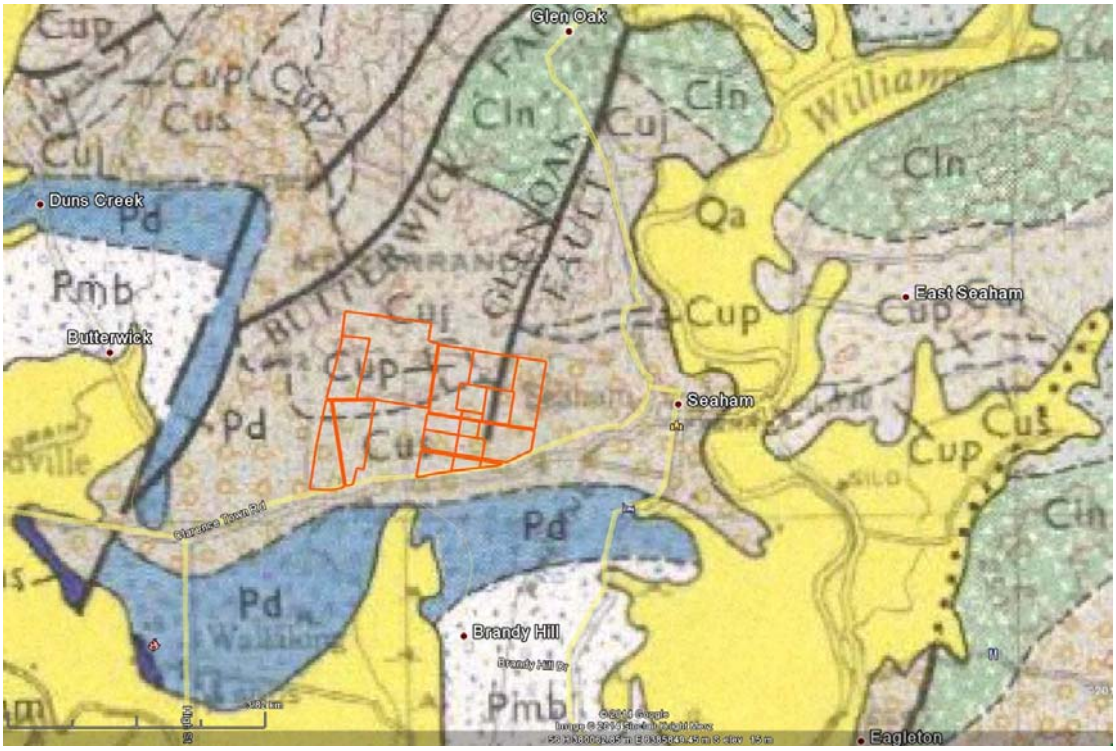

Figure 1 Extract from the 1:250,000 Newcastle Geological map. Cup is the ignimbrite. The Hanson properties are shown in orange outline

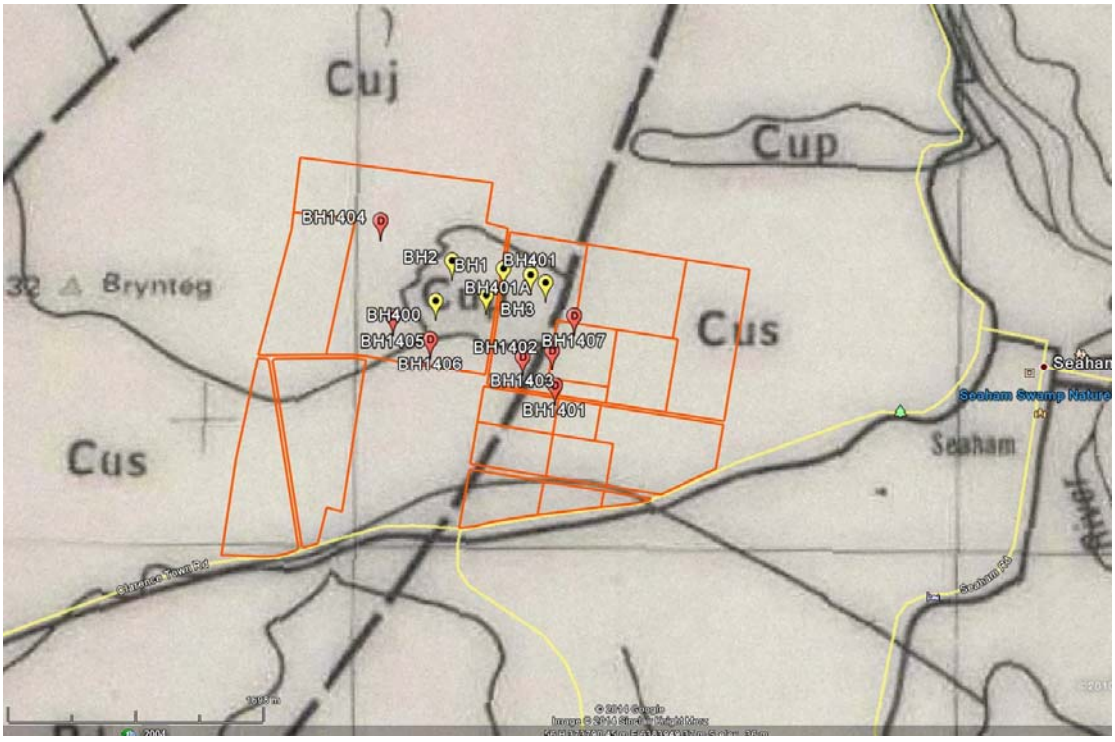

Figure 2 Extract from the 1:100,000 Newcastle Geological map. Cup is the ignimbrite. It shows the approximate location of the Glenoak fault and drill hole locations. The Hanson properties are shown in orange outline.

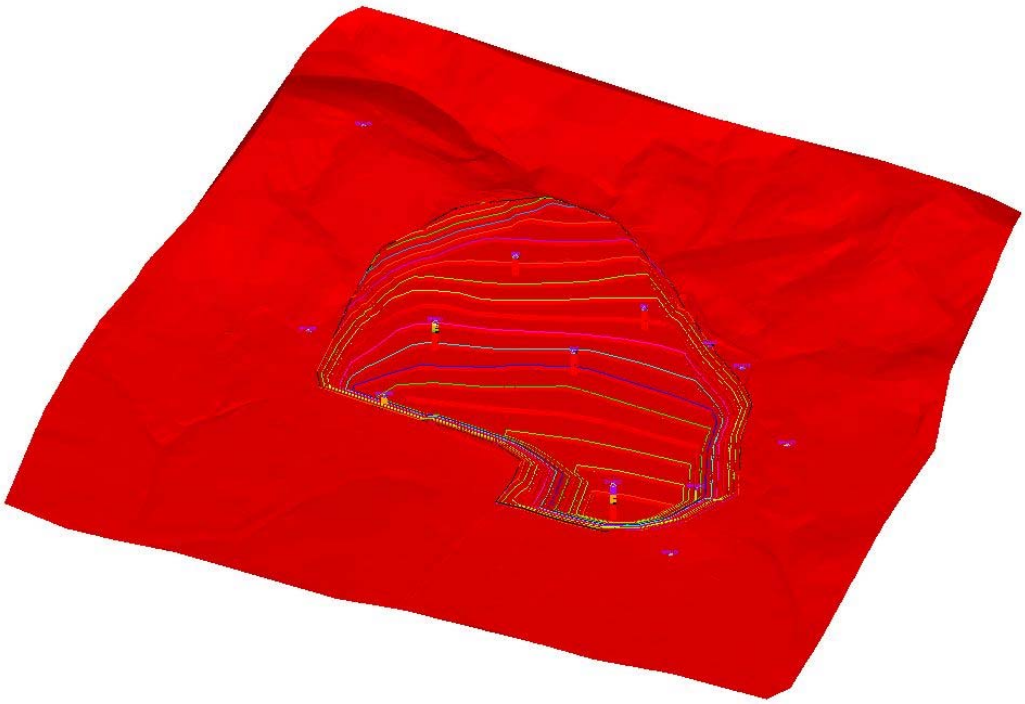

Figure 3 pit design looking to the north showing the pit following the ignimbrite basement.

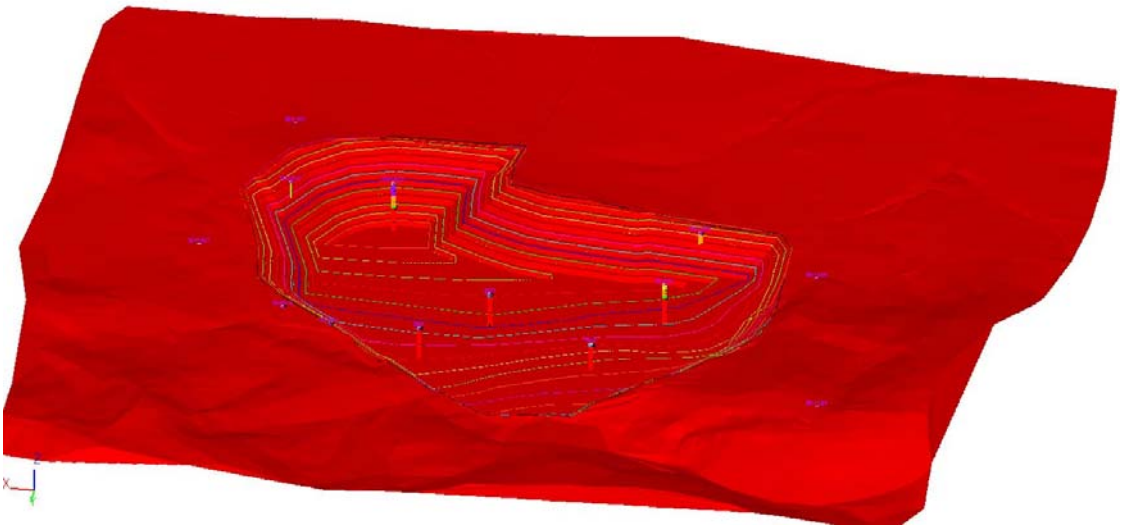

Figure 4 pit design looking to the south.

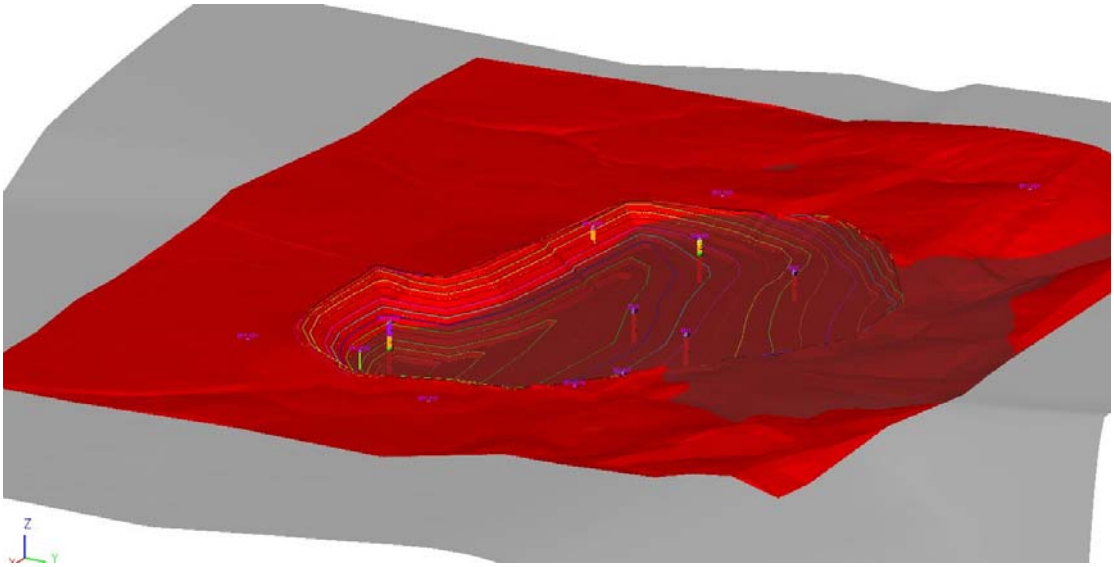

Figure 5 pit design with conglomerate base in grey.