BAAL BONE COLLIERY
OPERATED BY THE WALLERAWANG COLLIERIES LIMITED

BAAL BONE COLLIERY
LW29-31 SMP Area

Subsidence Management Status Report No.12

for the period

8th August 2011 to 7th December 2011

and

End of Panel Report – Longwall 31

February 2012

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1 INTRODUCTION

This Subsidence Management Status Report fulfils the requirements of Condition 19 of the Baal Bone Subsidence Management Plan (SMP) Longwalls 29 to 31 Approval Conditions. This is the twelfth four monthly status report and covers the period 8 August 2011 to 7 December 2012.

This report also includes Longwall 31 End of Panel Report which fulfils the requirements of Condition 20 of the Baal Bone Subsidence Management Plan (Longwalls 29 to 31) Approval Conditions.

Extraction of Longwall 31 (LW31) commenced on 7 March 2011 and was completed on 3 September 2011.

Summaries of monitoring results for LW 31 are presented in this report. Subsidence surveys, photographic monitoring and visual inspections were conducted over the LW 31 surface area in accordance with the approved Subsidence Monitoring Programs with environmental monitoring conducted in accordance with the approved Environmental Monitoring Program.

2 PURPOSE AND SCOPE

The purpose of this document is to report the progress of mining, provide a summary of subsidence results, impacts, trends, analysis, the implemented management processes and consultation with relevant stakeholders to comply with the relevant approval Conditions 19 and 20 which state:

Condition 19

"Subsidence Management Status Report: *The Leaseholder must prepare and maintain a Subsidence Management Status Report which must include but not be limited to:*

a) the current face position of the longwall panel being extracted;
b) a summary of any subsidence management actions undertaken by the Leaseholder in the period subsequent to the last regular submission of the Status Report;
c) a summary of any comments, advice and feedback from consultation with stakeholders in relation to the implementation of this Approval (including the preparation, implementation and review of plans, programmes, reports or strategies required by this approval) undertaken or received in the period subsequent to the last regular submission of the Status Report and a summary of the Leaseholder's response to the comments, advice and feedback given by the stakeholders;
d) a summary of the observed and/or reported subsidence impacts, incidents, service difficulties, community complaints, and any other relevant information reported to the Leaseholder in the period subsequent to the last regular submission of the Status Report and a summary of the Leaseholder's response to these impacts, incidents, service difficulties and complaints;
e) a summary of subsidence development based on monitoring information compared with any defined triggers and/or the predicted subsidence to facilitate early detection of potential subsidence impacts;
f) a summary of the adequacy, quality and effectiveness of the implemented management processes based on the monitoring and consultation information summarized above; and
g) a statement regarding any additional and/or outstanding management actions to be undertaken or the need for early responses or emergency procedures to ensure adequate management of any potential subsidence impacts due to longwall mining

The Subsidence Management Status Report must be updated at least every 14 days to reflect any changes in the information required to be included in the Report. The Status Report must be regularly submitted to the Principal Subsidence Engineer every four (4) months from the date of this Approval. The Status Report (as updated from time) must be provided, upon request, to the

- *Mine Subsidence Board,*
- *Director of Environmental Sustainability*
- *Any other stakeholders"*

Condition 20

"Within 6 months of the completion of each longwall panel, an end of panel report must be prepared to the satisfaction of the Director Environmental Sustainability. The end of panel report must:

(a) include a summary of the subsidence and environmental monitoring results for the applicable longwall panel;

(b) include an analysis of these monitoring results against the relevant;

- *impact assessment criteria;*
- *monitoring results from previous panels; and*
- *predictions in the SMP.*

(c) identify any trends in the monitoring results over the life of the activity; and

(d) describe what actions were taken to ensure adequate management of any potential subsidence impacts due to longwall mining.

(e) *be provided to all relevant agencies."*

This document also provides the opportunity for relevant stakeholders to provide feedback as required under Condition 19.

3 SUBSIDENCE AND ENVIRONMENTAL MONITORING PROGRAMS AND MANAGEMENT PLANS

The approved Subsidence Monitoring Program, consisting of a combination of subsidence surveys, stress change and temperature monitoring has been developed, in consultation with and approved by the Principal Subsidence Engineer, for all panels. All required subsidence monitoring lines have been installed, subsidence surveys and surface inspections have been completed in accordance with the Subsidence Monitoring Program.

As required under the SMP Approval conditions, an Environmental Monitoring Program was also developed in consultation with and approved by the Director of Environmental Sustainability. Routine seasonal monitoring of flora and fauna, scientific monitoring of impacts on surface and groundwater regimes, rock features and escarpments have been undertaken in accordance with the Environmental Monitoring Program.

Monitoring, consisting of a combination of subsidence, stress cell and some temperature monitoring has also been conducted in accordance with the Wolgan Escarpment Management Plan.

4 SUMMARY OF SUBSIDENCE MANAGEMENT ACTIONS

Subsidence management actions undertaken throughout this reporting period are outlined below.

1. Continuation of weekly surface inspections.
2. Continuation of ongoing fauna and groundwater quality monitoring programs.
3. Routine monitoring of groundwater piezometer levels.
4. Continuation of stress cell monitoring adjacent to Wolgan Escarpment.
5. Subsidence surveys conducted on various lines.

5 CONSULTATION WITH STAKEHOLDERS

Consultation has been conducted with the following stakeholders during this reporting period

Correspondence from - Chris Rudens – Environmental Sustainability Branch, Department of Trade and Industry, Regional Infrastructure and Services and copy of correspondence to DTIRIS from Rebecca Pagan – Environment & Compliance Officer Forests NSW relating to general satisfaction with rehabilitation works to date and ongoing monitoring / inspections in relation to LW 30 subsidence crack remediation works following the inspection undertaken on 27 July 2011.

A Baal Bone Colliery Community Consultative Committee (CCC) meeting was held on 14 September 2011 to provide an update on environmental and rehabilitation items.

6 SUMMARY OF SUBSIDENCE IMPACTS

Mining operations for LW31 have been completed. Mining height was nominally 2.5m while seam thickness varies between 2.1m to 2.3m. Overburden ranges in thickness from 190m to 220m, this is shown in **Figure 1**. The full extraction void is 220m wide (which includes the 5m width of development drivage both sides of the longwall block). The progression of LW31 extraction is shown in **Figure 2**.

The only visible impacts associated with LW31 observed was some minor cracking, generally as predicted, parallel to the gate roads. Continued wet weather has resulted in the surface expression of the cracks increasing in size post mining to the stage where notification has been provided. This is further detailed in **Section 9**.

All required pre-mining, during-mining and post-mining subsidence surveys were completed in accordance with the Subsidence Monitoring Program. Survey results for subsidence, tilt and strain were generally below predicted levels. Some minor exceedances were noted and are detailed in **Section 5**.

No subsidence impacts were observed outside the nominated angle of draw on LW31.

Visual inspections and photographic monitoring of various surface features, including cliffs, roads, tracks and swamp vegetation were also completed, with no adverse or unpredicted impacts observed.

No subsidence impacts were noted generally in relation to flora and fauna.

Monitoring of groundwater bores for both levels and quality continued with no observable impact on groundwater due to mining noted during the reporting period. An internal review of groundwater quality monitoring results was conducted and further reviewing of results conducted by Aurecon as several elevated levels were noted. This is further detailed in **Section 9**.

7 SUBSIDENCE SURVEY SUMMARY, MONITORING AND ANALYSIS

A record of all completed subsidence surveys during the LW31 extraction period is shown in **Table 1**. Subsidence, tilt and strain results for the LW31 area were generally within the predicted range. A summary of subsidence, strain and tilt results are also detailed with comparison to the SMP predictions.

One minor exceedance of 38mm on E Line over LW30 has previously been reported. The survey conducted on 23 September noted that this exceedance had increased to a maximum of 126mm. The distance where this occurred is limited to a length of less than 50 metres. A further survey over F line at the start end of LW29 also noted an increase in horizontal movement. This maximum horizontal movement of 538mm was recorded on a relatively steep section of F Line and is not considered unusual.

Table 1 – Summary of Subsidence Survey Results

Line	Survey Date	SMP Prediction Subsidence (mm)	Measured Subsidence (mm)	SMP Prediction Strain (mm/m)	Measured Strain (mm/m)	SMP Prediction Tilt (mm/m)	Measured Tilt (mm/m)	SMP Prediction Horizontal Movement (mm)	Measured Horizontal Movement (mm)
E Line	10-03-2011	1400 – 1600	1638 (LW30)	9 – 21	14.2	32 – 52	27.1	400	216
E Line (LW 31)	12-07-2011		34		9.6		1.0		67
	14-07-2011		32		9.6		1.0		68
	21-07-2011		36		9.6		1.1		68
	26-07-2011		40		9.5		1.0		66
	28-07-2011		44		9.6		1.1		69
	02-08-2011		54		9.8		1.0		66
	05-08-2011		74		9.7		1.0		65
	08-08-2011		84		10.1		1.0		66
	10-08-2011		232		10.4		4.3		123
	12-08-2011		514		9.8		11.2		170
	17-08-2011		1245		9.5		37.5		
	19-08-2011		1340		11.9		42.4		234
	23-08-2011		1397		12.3		43.7		229
	25-08-2011		1415		12.3		43.7		244
	29-08-2011		1436		12.3		43.7		222
	23-09-2011	1400-1600	1726 (LW30 – previous survey 1638)		13.8		43.2		242

Line	Survey Date	SMP Prediction Subsidence (mm)	Measured Subsidence (mm)	SMP Prediction Strain (mm/m)	Measured Strain (mm/m)	SMP Prediction Tilt (mm/m)	Measured Tilt (mm/m)	SMP Prediction Horizontal Movement (mm)	Measured Horizontal Movement (mm)
F Line	21-01-2011	1400 – 1600	1418	9 – 21	12.0	32 – 52	26.1	400	333
	26-09-2011		1434		13.8		26.3		538 (LW29)
G Line	09-03-2011	1400 – 1600	50	9 - 21	2.3	32 – 52	0.9	400	61
	23-09-2011		58		2.5		0.9		44
H Line	21-01-2011	1300 – 1400	5	8 - 14	1.1	27 - 34	0.4	400	24
	06-04-2011		162		1.4		1.8		49
	08-04-2011		199		1.9		2.0		58
	12-04-2011		207		2.5		2.1		64
	15-04-2011		217		3.0		2.1		102
	29-04-2011		234		3.6		2.3		116
	12-05-2011		207		3.7		2.1		94
	26-05-2011		244		3.8		2.4		162
	23-09-2011		251		3.7		2.5		136

Line	Survey Date	SMP Prediction Subsidence (mm)	Measured Subsidence (mm)	SMP Prediction Strain (mm/m)	Measured Strain (mm/m)	SMP Prediction Tilt (mm/m)	Measured Tilt (mm/m)	SMP Prediction Horizontal Movement (mm)	Measured Horizontal Movement (mm)
I Line	21-01-2011	1300 - 1400	5	8 - 14	0.7	27 - 34	0.2		16
	06-04-2011		7		0.9		0.4		13
	08-04-2011		1		0.9		0.3		23
	12-04-2011		4		1.0		0.3		8
	15-04-2011		3		1.0		0.3		16
	29-04-2011		5		1.1		0,2		10
	12-05-2011		4		1.1		0.3		15
	26-05-2011		6		1.1		0.4		30
	23-09-2011		9		0.9		0.2		11

Line	Survey Date	SMP Prediction Subsidence (mm)	Measured Subsidence (mm)	SMP Prediction Strain (mm/m)	Measured Strain (mm/m)	SMP Prediction Tilt (mm/m)	Measured Tilt (mm/m)	SMP Prediction Horizontal Movement (mm)	Measured Horizontal Movement (mm)
J Line	12-07-2011	1300 - 1400	7		0.8		0.5		18
	14-07-2011		4		0.9		0.5		16
	21-07-2011		5		0.9		0.2		27
	26-07-2011		5		0.9		0.3		23
	28-07-2011		8		0.9		0.5		20
	02-08-2011		8		0.9		0.3		38
	05-08-2011		7		0.8		0.3		16
	08-08-2011		7		0.7		0.5		25
	10-08-2011		7		0.8		0.3		120
	12-08-2011		8		0.8		0.3		23
	17-8-2011		12		0.8		0.3		
	19-08-2011		9		0.7		0.4		32
	23-08-2011		8		0.7		0.2		40
	25-08-2011		12		0.9		0.3		17
	29-08-2011		13		0.7		0.3		34
	23-09-2011		15		0.7		0.3		23

Line	Survey Date	SMP Prediction Subsidence (mm)	Measured Subsidence (mm)	SMP Prediction Strain (mm/m)	Measured Strain (mm/m)	SMP Prediction Tilt (mm/m)	Measured Tilt (mm/m)	SMP Prediction Horizontal Movement (mm)	Measured Horizontal Movement (mm)
Northern Pinch Point Reflectors	04-04-2011		+6						12
	12-07-2011		+15						21
	14-07-2011		+14						16
	21-07-2011		+17						17
	26-07-2011		+14						25
	28-07-2011		+19						33
	02-08-2011		+14						43
	05-08-2011		+14						34
	08-08-2011		+17						38
	10-08-2011		+13						34
	12-08-2011		+12						36
	19-08-2011		+14						41
	23-08-2011		+13						39
	25-80-2011		+15						35
	29-08-2011		+14						35
	22-09-2011		+4						45

Line	Survey Date	SMP Prediction Subsidence (mm)	Measured Subsidence (mm)	SMP Prediction Strain (mm/m)	Measured Strain (mm/m)	SMP Prediction Tilt (mm/m)	Measured Tilt (mm/m)	SMP Prediction Horizontal Movement (mm)	Measured Horizontal Movement (mm)
Northern Pinch Point Prisms	14-07-2011		1						6
	21-07-2011		8						8
	26-07-2011		5						21
	28-07-2011		2						25
	02-08-2011		6						34
	05-08-2011		7						27
	08-08-2011		6						26
	10-08-2011		9						29
	12-08-2011		9						24
	19-08-2011		6						29
	23-08-2011		9						27
	25-08-2011		2						22
	29-08-2011		6						21
	22-09-2011		10						33

Line	Survey Date	SMP Prediction Subsidence (mm)	Measured Subsidence (mm)	SMP Prediction Strain (mm/m)	Measured Strain (mm/m)	SMP Prediction Tilt (mm/m)	Measured Tilt (mm/m)	SMP Prediction Horizontal Movement (mm)	Measured Horizontal Movement (mm)
Southern Pinch Point Reflectors	06-04-2011		14						10
	08-04-2011		14						9
	12-04-2011		14						8
	15-04-2011		17						9
	29-04-2011		14						7
	12-05-2011		12						10
	26-05-2011		15						10
	22-09-2011		14						10
Southern Pinch Point Prisms	06-04-2011		1						8
	08-04-2011		1						7
	12-04-2011		1						6
	15-04-2011		2						7
	29-04-2011		1						4
	12-05-2011		2						5
	26-05-2011		3						9
	22-09-2011		2						9

8 PHOTOGRAPHIC MONITORING AND VISUAL INSPECTION SUMMARY AND ANALYSIS

Dates of photographic monitoring and visual inspections are shown in **Table 2.** No impacts or changes have been noted in either photographic monitoring or visual inspections and these results have been detailed in the Subsidence Management Status Reports submitted previously.

Table 2 – Surface Inspection and Photographic Monitoring Dates for LW 31

Monitoring / Inspection	Monitoring / Inspection Description	Pre Mining Inspections / Monitoring	Mining Period Inspections / Monitoring	Post Mining Inspections / Monitoring
Surface Rock Features	Visual inspection	*12 May 2009*	*Weekly*	*19 January 2012*
Roads / tracks	Visual inspection Video	*16 July 2009* *16 July 2009*	*Weekly*	*19 January 2012* *To be completed*
Wolgan Escarpment	Oblique aerial photographic monitoring	*17 April 2009*	-	*To be completed*
Coxs River Swamp	Baseline Photographic monitoring	*From 6 June 2007 to 22 July 2011 at regular intervals*	*Seasonally*	*22 February 2012*

9 ENVIRONMENTAL MONITORING SUMMARY AND ANALYSIS

Wolgan Escarpment – Stress Cell Monitoring

Stress change monitoring instruments have been installed and commissioned in the vicinity of the two pinch points on LW31. Stress changes in the rock strata were monitored using a remote logger as Longwalls 29, 30 and 31 were progressively extracted. Stress cells are logged on a twice daily cycle and information downloaded periodically for analysis by SCT Operations.

Summary of Observations

The strain changes observed at BBO23 since 1 March 2011 are considered to provide a strong indication of stress changes at the northern pinch point.

The correlation between independent gauges (0.970 on 6 degrees of freedom) is consistent with a meaningful point measurement of the stress changes at the point of measurement.

BBO23 indicates that the major horizontal stress sub-parallel to the escarpment has dropped slightly to 0.68Mpa since the completion of LW31. The major horizontal stress is oriented at 41 degrees from horizontal dipping to the south at 330 degrees GN. The horizontal component of the major principal stress is steady in magnitude.

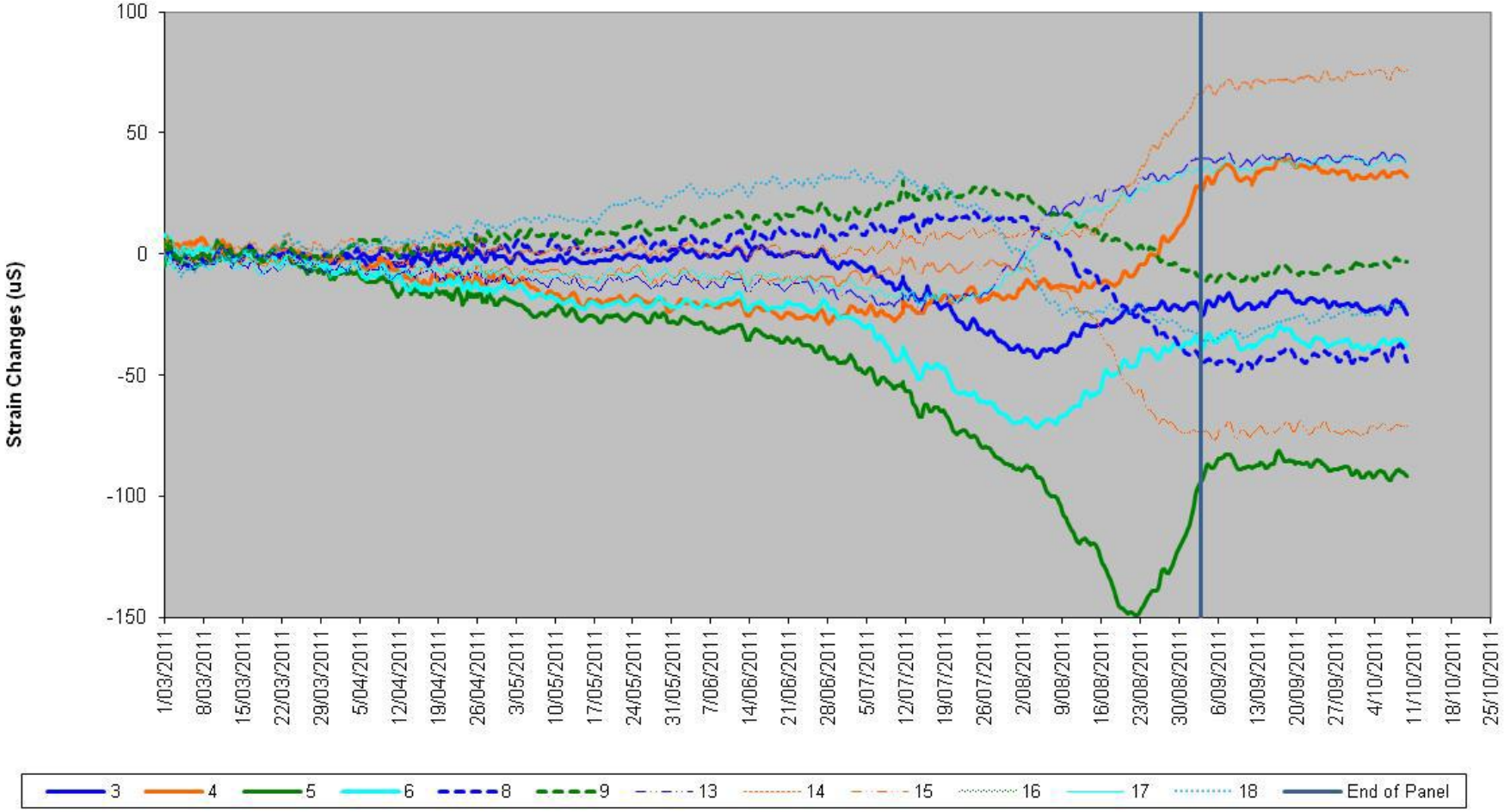
The orientation of the principal stress change remains approximately aligned with the in situ stress field measured prior to the start of the mine (330 degrees GN). Currently stress sis aligned at 340 degrees GN.

The high resolution prism monitoring indicates a reduction in compression along the line of the escarpment from about ch250m with a residual compression of about 13mm over about 320m equivalent to about 40uS. This compares with the 55uS residual indicated by the horizontal component of the major principal stress change measured by BBO23 at the point of maximum compression.

A residual compression strain of about 55uS indicated an increase in compressive stress along the escarpment of approximately 20% over the pre-mining stress levels.

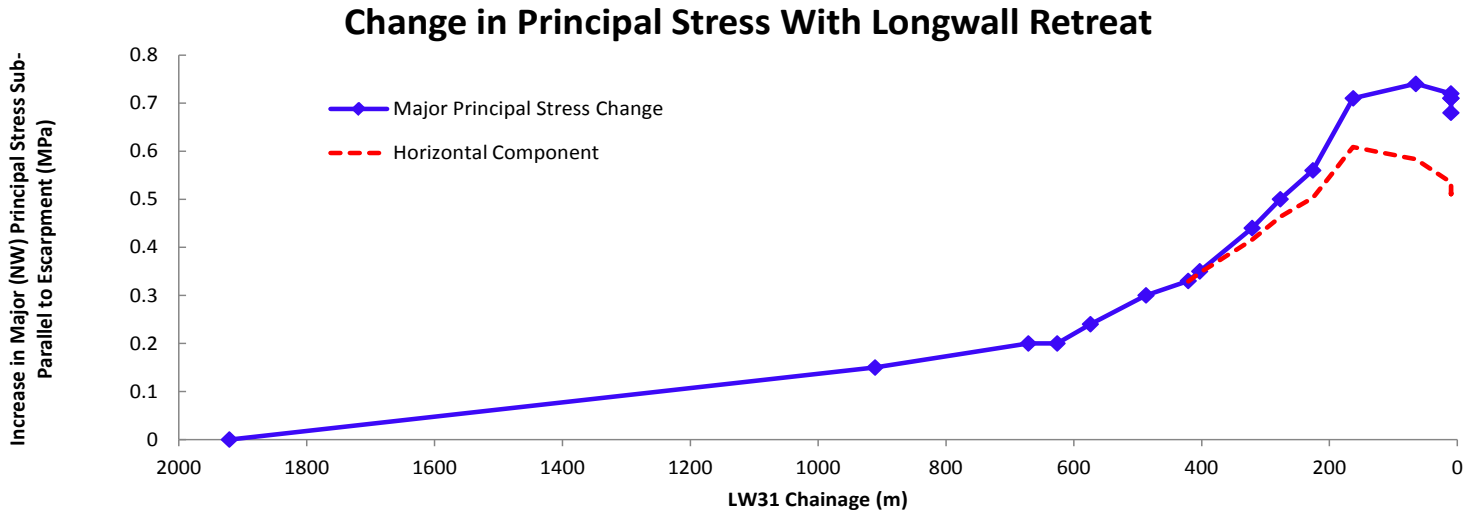
A series of Figures follows:
Figure 1 – BBO23 LW31 Strain Changes Since 1 March 2011
Figure 2 – Change in Principal Stress With Longwall Retreat and Time
Figure 3 – Prism Movements at Northern Pinch Point
Figure 4 – Prism Movements at Northern Pinch Point For Various Longwall Position

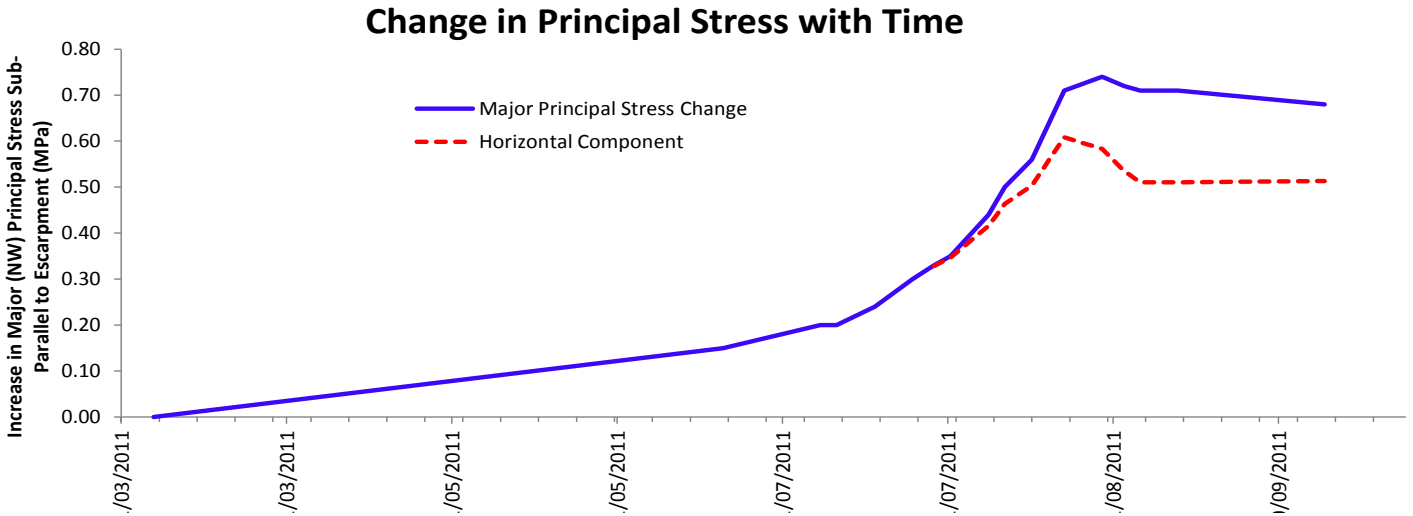
Figure 1 - BBO23 LW31 Strain Changes Since 1 March 2011



Source: 2011-10-9 Summary of Stress Changes at Baal Bone LW31 Northern Pinch Points – Ken Mills (SCT Operations)

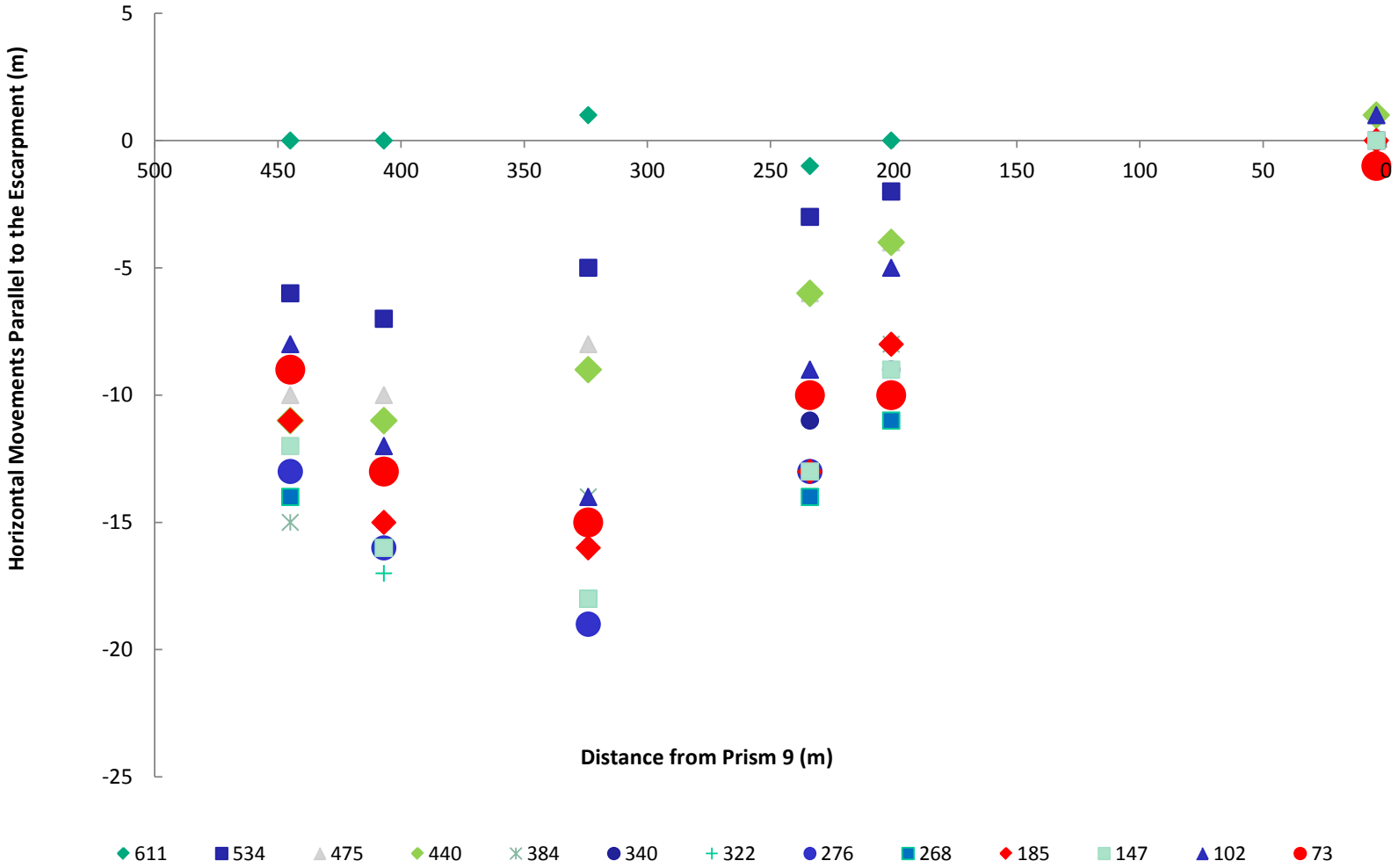
Figure 2 – Change in Principal Stress With Longwall Retreat and Time





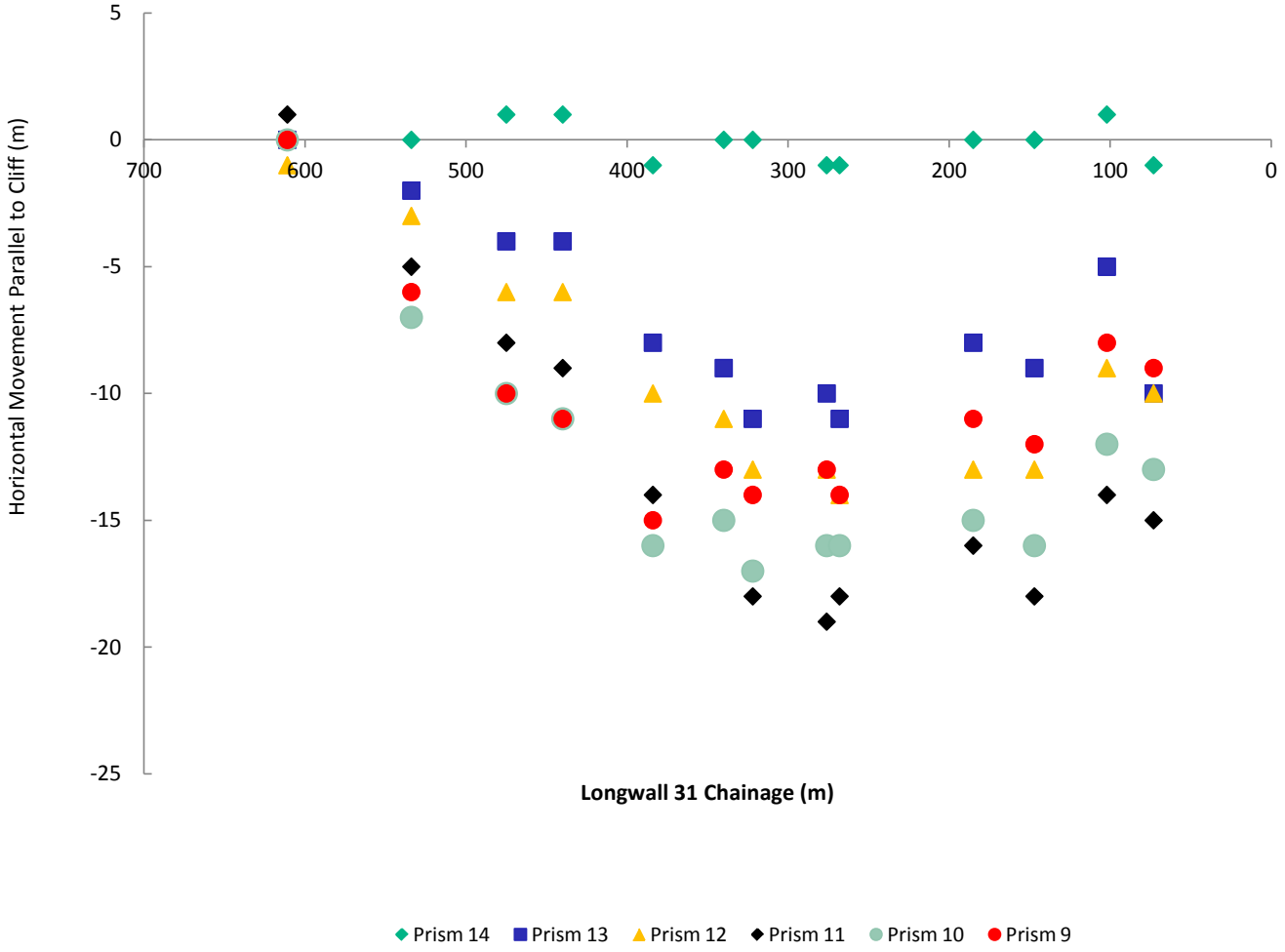
Source: 2011-10-9 Summary of Stress Changes at Baal Bone LW31 Northern Pinch Points – Ken Mills (SCT Operations)

Figure 3 – Prism Movements at Northern Pinch Point



Source: 2011-10-9 Summary of Stress Changes at Baal Bone LW31 Northern Pinch Points – Ken Mills (SCT Operations)

Figure 4 – Prism Movements at Northern Pinch Point For Various Longwall Positions



Source: 2011-10-9 Summary of Stress Changes at Baal Bone LW31 Northern Pinch Points – Ken Mills (SCT Operations)

Rock Features

To date there have been no adverse or unpredicted subsidence impacts on identified rock features in the vicinity of the SMP area.

Surface and Drainage Depressions

To date there has been one unpredicted subsidence impact observed on surface drainage depressions within the SMP area, in LW 30, details of which were included in previous Status and End of Panel Report**.** Apart from this incident some minor fractures, within predicted ranges and below TARP trigger values, as identified in the SMP Environmental Monitoring Program, have been identified.

Inspections of the area during or immediately following runoff producing rainfall events (i.e. 25mm / 24 hour period) have continued during longwall mining; there has been no observable change to pre-mining flow characteristics and/or stream morphology during this reporting period.

Inspections will continue now LW 31 is complete and any subsidence / upsidence impacts and/or required remediation on the stream will be reassessed at the end of the next reporting period.

The only visible impacts associated with LW31 observed was some minor cracking, generally as predicted, parallel to the gate roads.

Routine inspections of the surface above LW31 first identified initial cracking around the LW 31 start area on 6 May 2011. At that time the width of the crack was within the predicted range. In subsequent weekly inspections the crack stayed within the predicted range and as it is relatively flat in the vicinity of the crack it was determined not to require follow up inspections other than the end of panel walkover.

Continued wet weather has resulted in the surface expression of the cracks increasing in size post mining to the stage where notification has been provided. These were identified during the End of Panel walkover on 19 January 2012.

Notification has been provided, a remediation program developed and this will be implemented following appropriate studies and approvals.

A full surface inspection of the surface above LWs 29 -31 has been scheduled for late February / early March to confirm the location of any additional surface cracking.

Fire Trails and Tracks

To date there have been no subsidence impacts on any fire trails or tracks in the SMP area. Regular inspections are continuing.

Swamp

Seasonal photographic monitoring of the Coxs River Swamp has continued as scheduled.

Seasonal variations in swamp appearance are consistent with those observed during pre-mining assessments, particularly when antecedent ground moisture levels are taken into consideration. These observations are confirmed by the results of the seasonal flora and fauna monitoring programs.

Fauna

Four sites within and near the Baal Bone Colliery Longwall 29-31 SMP Area were surveyed for fauna by Biodiversity Monitoring Services during September 2011. Three of these sites have been surveyed since 2005.

Nine native mammal (plus two introduced), 41 birds, six reptiles and one amphibian species were located from within or near the SMP area. Calculations of diversity indices were undertaken and are provided in **Table 3.**

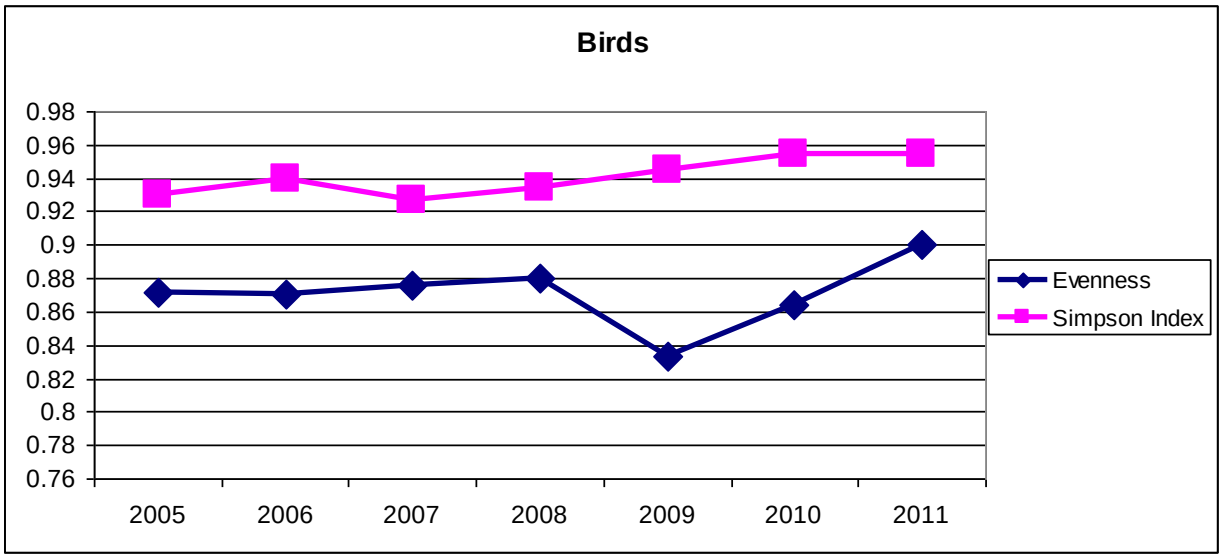
Table 3 - Biodiversity Indices for Fauna in Baal Bone SMP Area During Spring

Diversity Index	Birds 2007	Birds 2008	Birds 2009	Birds 2010	Birds 2011
Evenness	0.876	0.880	0.833	0.864	0.900
Simpson (1-D)	0.927	0.934	0.945	0.955	0.955
Total Numbers	145	209	549	433	575
Species Richness	35	34	51	50	41

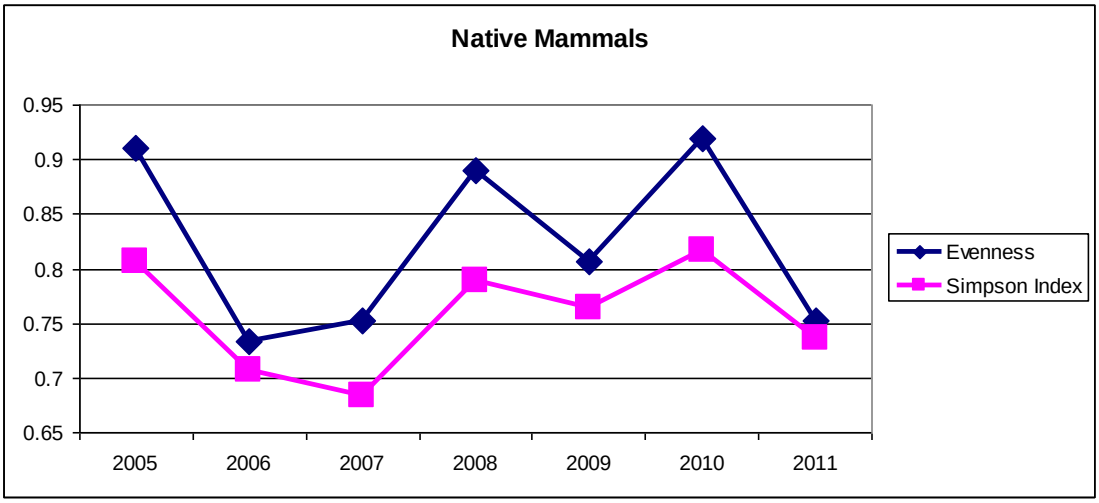
Diversity Index	Native Mammals 2007	Native Mammals 2008	Native Mammals 2009	Native Mammals 2010	Native Mammals 2011
Evenness	0.753	0.890	0.807	0.920	0.752
Simpson (1-D)	0.683	0.789	0.764	0.817	0.736
Total Numbers	41	17	69	48	93
Species Richness	7	7	9	7	9

Table 4 - Changes in Biodiversity Indices Between 2005 and 2011

a. Birds



b. Mammals


Native Mammals
0.95
0.9
0.85
0.8
0.75
0.7
0.65
2005
2006
2007
2008
2009
2010
2011
Evenness
Simpson Index

Statistical analysis (non-parametric Kruskal-Wallis One Way Analysis of Variance on Ranks) of these results shows no significant differences for the biodiversity indices over the years. However, over the years there has been a slight upward trend in most biodiversity indices. There is a falloff in native mammal diversity indices due to a relative high number of Eastern Grey Kangaroos. It is noted that the number of Brown Antechinuses was relatively higher than previous years, probably as a result of the wet year in 2010.

There are now sufficient numbers and diversities of the fauna groups monitored to be able to calculate a set of diversity indices that form part of the baseline monitoring database. In addition, these factors can now be tracked over a number of years (2005 to 2011) and seasons to provide useful monitoring data to assess any changes in biodiversity values in the LW29-31 SMP Area.

It is now possible to assess any differences in the biodiversity and habitat condition of those sites sampling an area that has been subject to underground mining and shows signs of subsidence activity. This comparison showed that there are no significant differences in the biodiversity and habitat complexity over the years.

Two threatened species were recorded within the area during the spring surveys. These were the Gang-gang Cockatoo and Scarlet Robin. In addition, many woodland dependant bird species were located. Although in small numbers, the trapping results gave larger densities of small ground mammals than in previous years.

It is concluded that, at present, there are no discernable impacts from underground mining of LW29-31 at Baal Bone Colliery upon the fauna on the surface.

Flora

Systematic vegetation monitoring quadrats were established within the SMP area in January 2007.

Prior to the establishment of monitoring sites the SMP area was the subject of a flora survey conducted over a 3 day period in October 2005.

No survey was conducted during this reporting period. Results of the autumn survey including species richness information over a four year period and general discussion of results is outlined below. The autumn 2011 survey took place on 25th March 2011.

Each seasonal survey involves recording of vegetation structure, dominant species, estimated cover and height for each stratum, full floristics, an estimated cover abundance for each species using the modified Braun-Blanquet scale (see below) and condition of common species using the condition scale. Observations of general condition of the surface environment, stream water flow and quality are also made where relevant.

<u>Modified Braun-Blanquet scale used in monitoring</u>
1 = cover less than 5% of site and rare
2 = cover less than 5% of site and uncommon
3 = cover of less than 5% and common
4 = cover of 5-20% of site
5 = cover of 20-50% of site
6 = cover of 50-75% of site
7 = cover of greater than 75%

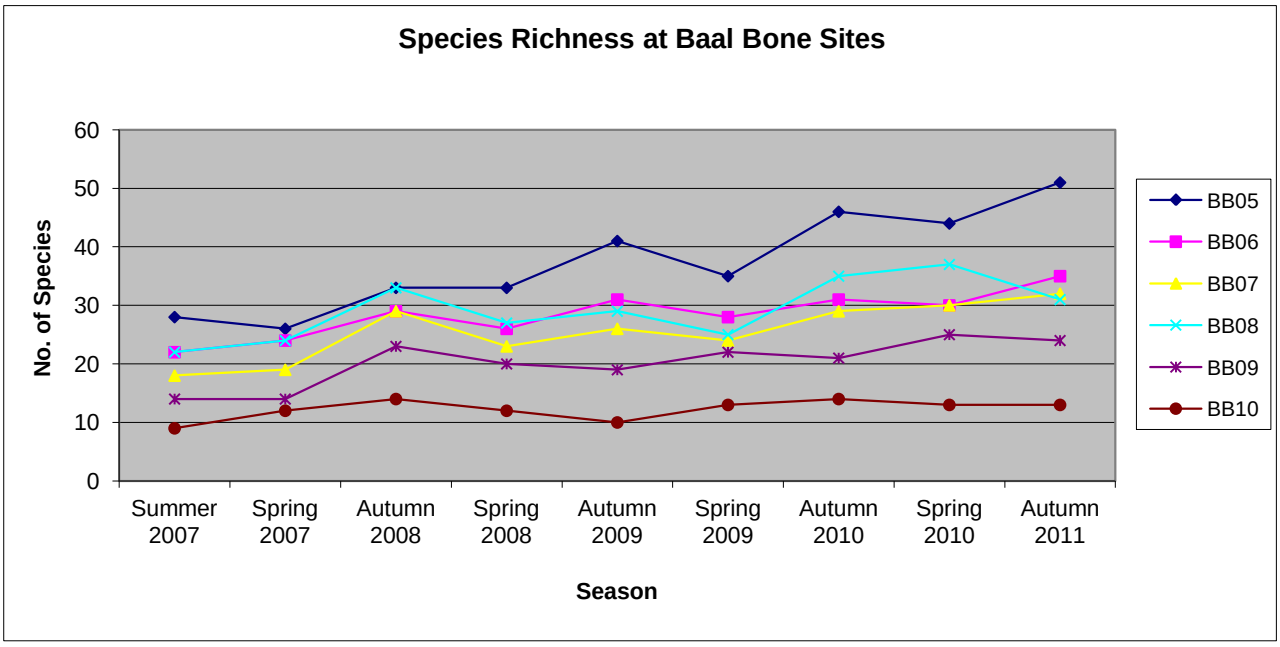
Results

Plant Species Diversity

Species diversity results show that levels of species diversity recorded in 2011 were at the higher end or above the previously recorded range at each site. Figure 7 shows species richness recorded across all sites during spring and autumn since the baseline data was obtained.

At the woodlands sites BB05, BB06 and BB07, species diversity in autumn 2011 was higher than at any other sampling over the monitoring period.

Table 5 - Species Richness at Baal Bone Vegetation Monitoring Sites



Weed Species

Exotic weeds were recorded at four sites in autumn 2011, with a total of three species, Dirty Dora (*Cyperus eragrostis*), Yorkshire Fog (*Holcus lanatus*) and Catsear (*Hypochaeris radicata*). The only weed at woodland sites was Catsear (*Hypochaeris radicata*).

Yorkshire Fog declined in abundance at the tow Long Swamp sites (BB09 & BB10). The decline from 2010 levels may be attributable to extended inundation within the Swamp favouring species adapted to wetter conditions.

Changes in Plant Species Distribution and Abundance

The following list shows new records of species at each site for autumn 2011:

BB05 Amyema pendulum
Boronia microphylla
Dichelachne parva
Eriochilus cucullatus
Todea barbara

BB06	Leucopogon lanceolatus
BB07	Eriochilus cucullatus
	Wahlenbergia luteola
	Xanthosia tridentata
BB08	Stylidium graminifolium
	Styphelia tubiflora
BB09	Deyeuxia brachyathera
BB10	Arthropodium minus
	Cyperus sp.
	Deyeuxia brachyathera

The majority of these were orchids, lilies and grasses which are difficult to detect when not flowering.

Discussion

The vegetation monitoring being undertaken is conducted in a manner which allows assessment against a number of indicators which may provide evidence of an effect of subsidence. These indicators are:

- a decline in diversity and abundance of plant species which typically are associated with wet, sheltered areas
- an increase in diversity and abundance of plant species which typically occur in forests or woodlands in locations initially supporting species characteristic of more sheltered communities
- an increase in diversity and abundance of exotic species or native species favoured by disturbance
- unusual variation in species diversity
- decline in condition of plant species known to be sensitive to changes in water availability.

Changes in these indicators may also result from prevailing climatic conditions and other disturbances independent of mining such as bushfires, logging operations, recreational activities and feral animals.

Gross species diversity records do not necessarily provide a clear indication of an effect of mining. Experience from other mines in the Lithgow area indicates that there is a seasonal response, with grasses, orchids and other ground layer plants being detected in spring, summer and autumn, but not winter.

Species richness at the all sites had higher levels recorded during autumn 2011 in comparison to those recorded in 2007 and 2008.

Abundance of Yorkshire Fog declined in autumn 2011. This was most probably due to prolonged inundation of Long Swamp.

The levels of species richness and weed growth are all consistent with a response to rainfall. There has been no evidence which would indicate an effect of subsidence on vegetation distribution and abundance at the monitoring sites.

Mine Water Make

Data continues to be collected from the mines dewatering bores, flow meters and data loggers regarding mines water discharges and underground water storage levels. Review of this data is continuing and the mine water model is currently being reviewed along with the post-closure mine water make model. At this stage this review is still in progress.

Groundwater

Aurecon monitors data loggers in the six piezometers on a regular basis to gather baseline data regarding groundwater level fluctuations in the vicinity of the Coxs River Swamp. Baseline data obtained prior to commencement of mining confirms a strong correlation between groundwater levels and prevailing climatic conditions, most particularly the relationship to rainfall.

Majority of the trends noted previously have continued for this current period. The flat and constant piezometric levels observed in bores 1, 5 and 6 have all remained flat, while the slow declining trend in bores 2, 3 and 4 has continued.

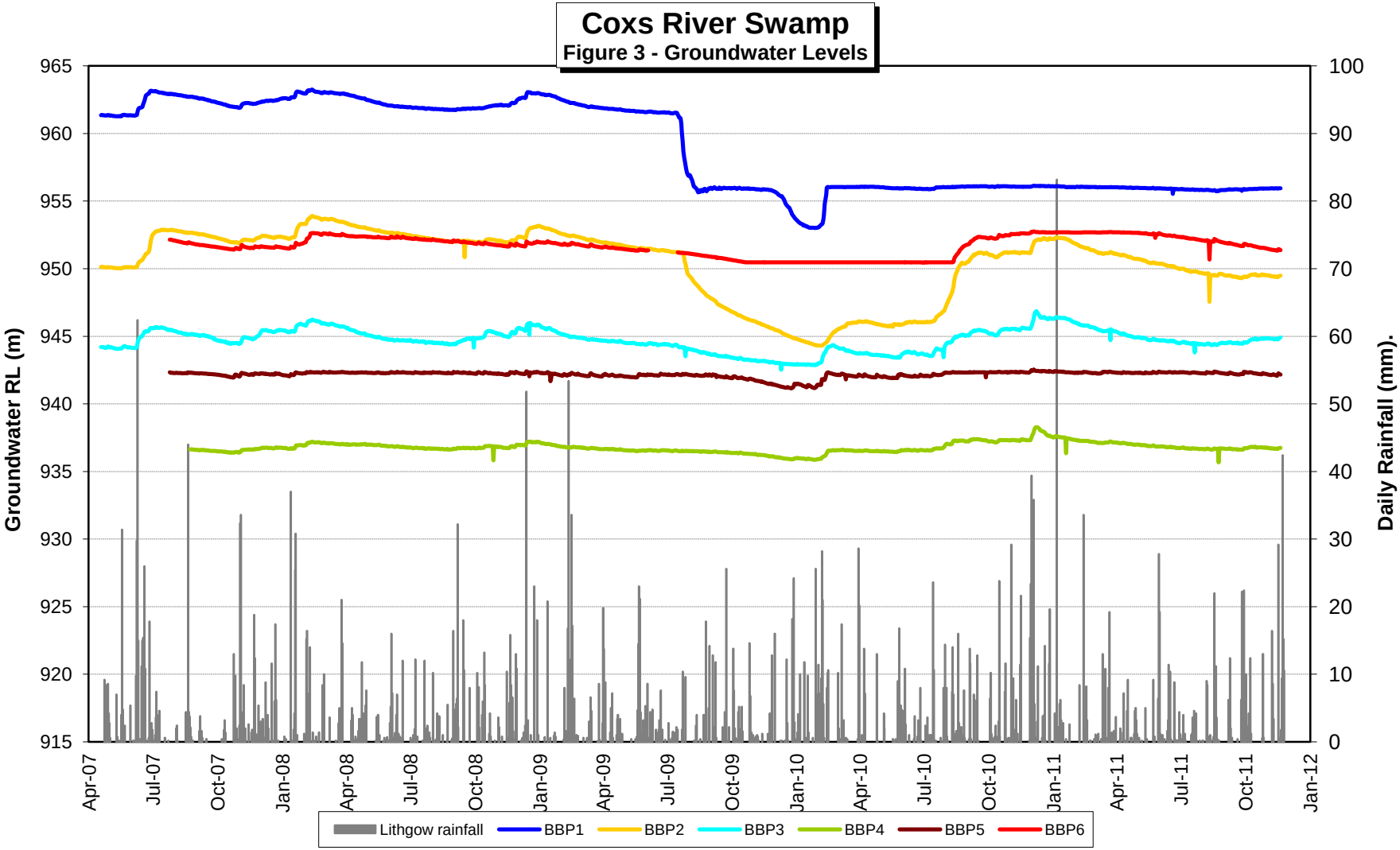
Rainfall observed over the reporting period has been higher than the long term average for September and November but not enough to reverse any of the declining trends observed.

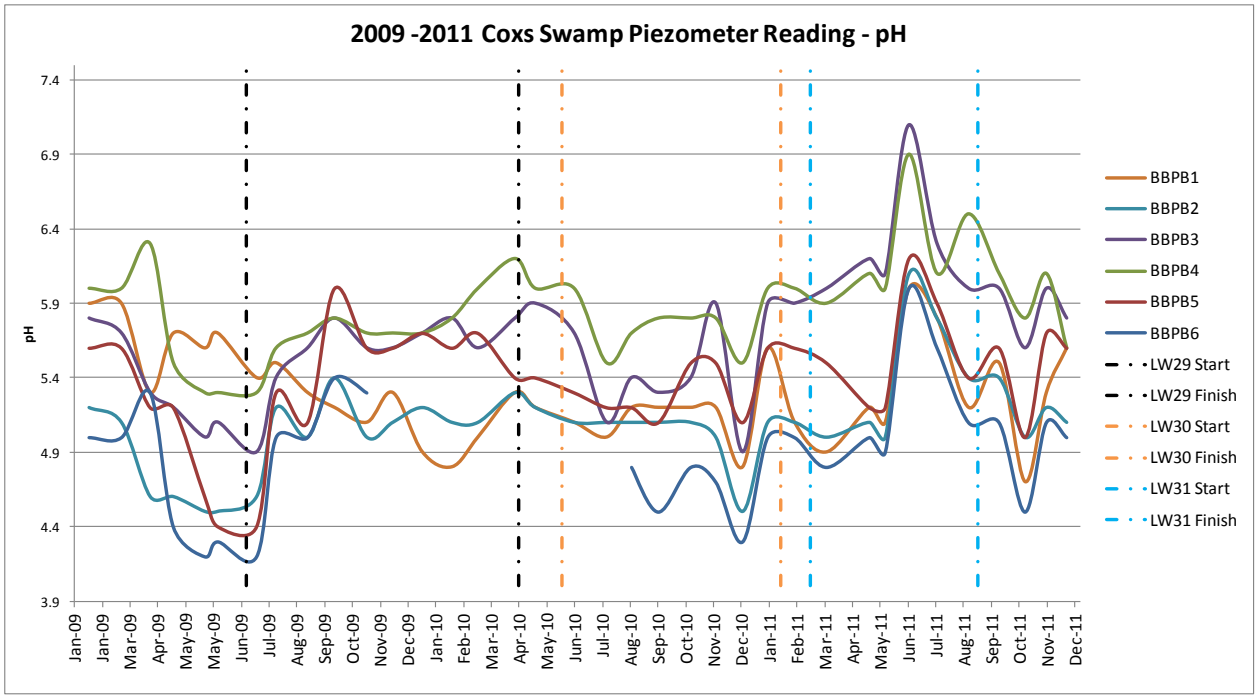
A north to south downstream water gradient is observed in the graph (highest level observed in BB1 and lowest in BB4), indicating that the creek/swamp flow has been maintained down through the swamp from the northern end.

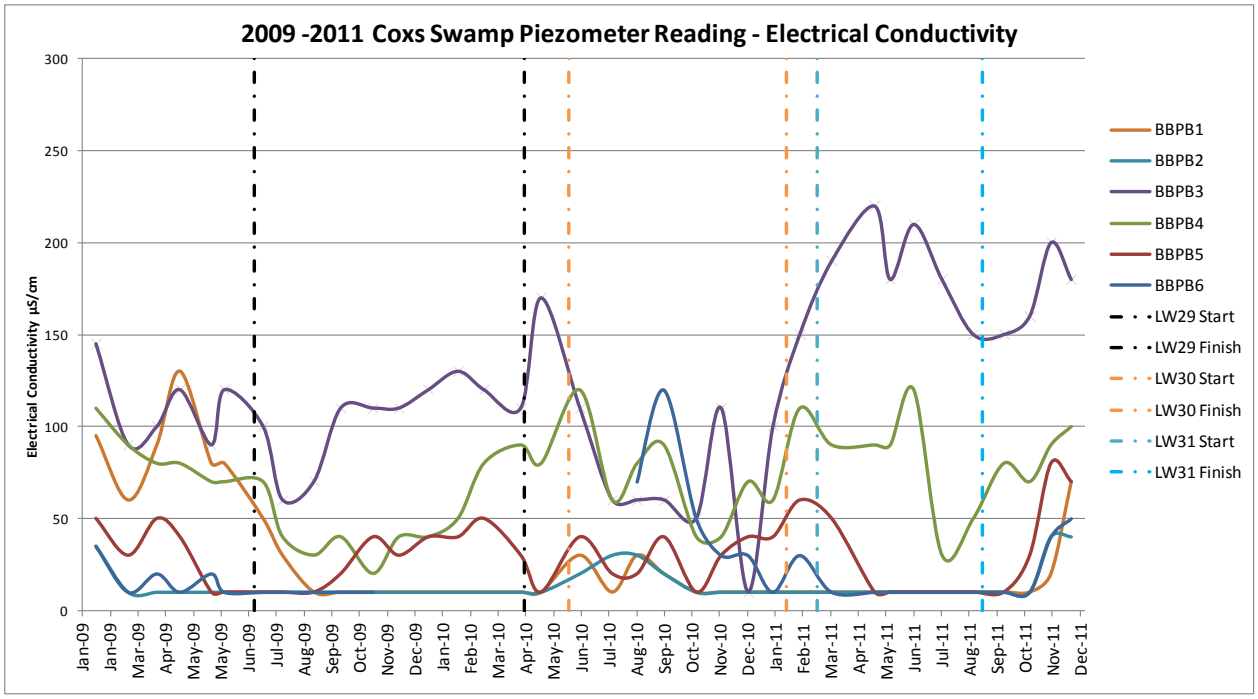
There is no observable impact on groundwater due to mining for the reporting period.

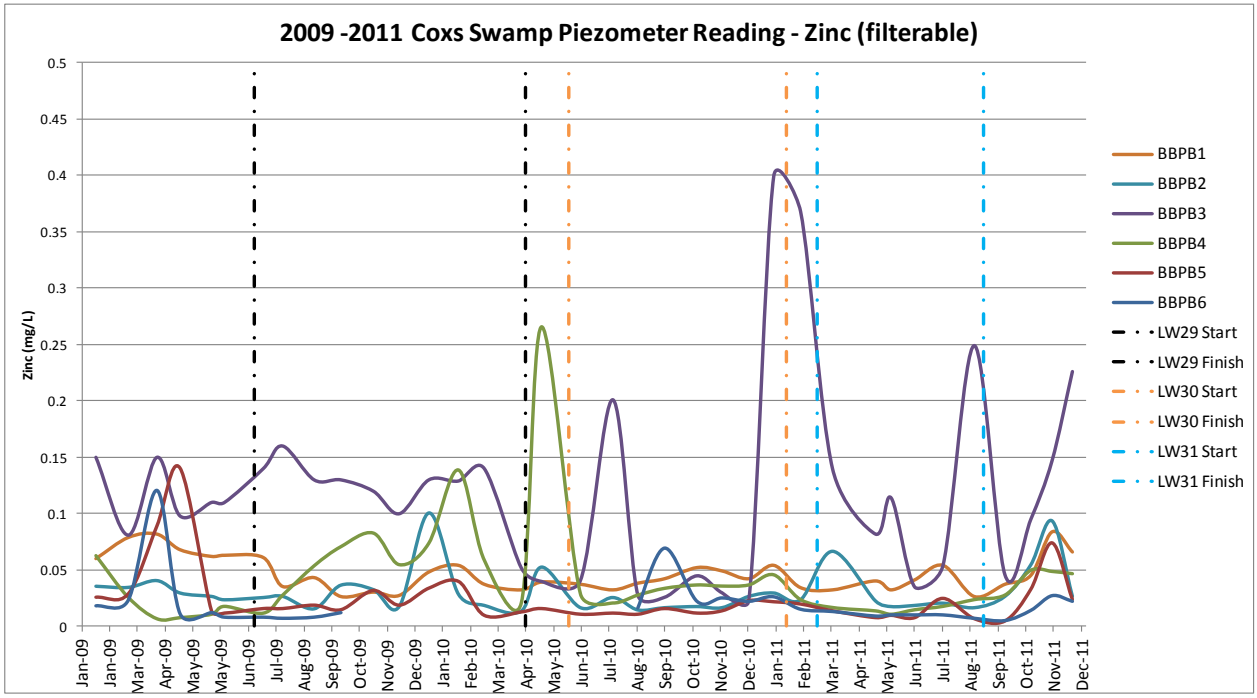
During a review of groundwater quality analysis a potential trigger of the TARP relating to groundwater quality was noted and subsequently reported and notification was provided on 21 February. The subject bore BBP3 is not located within the Cox's River Swamp. Two analytes zinc and iron were noted. Discussions have been held with Aurecon, who have been commissioned to review all groundwater quality data and provide a report.

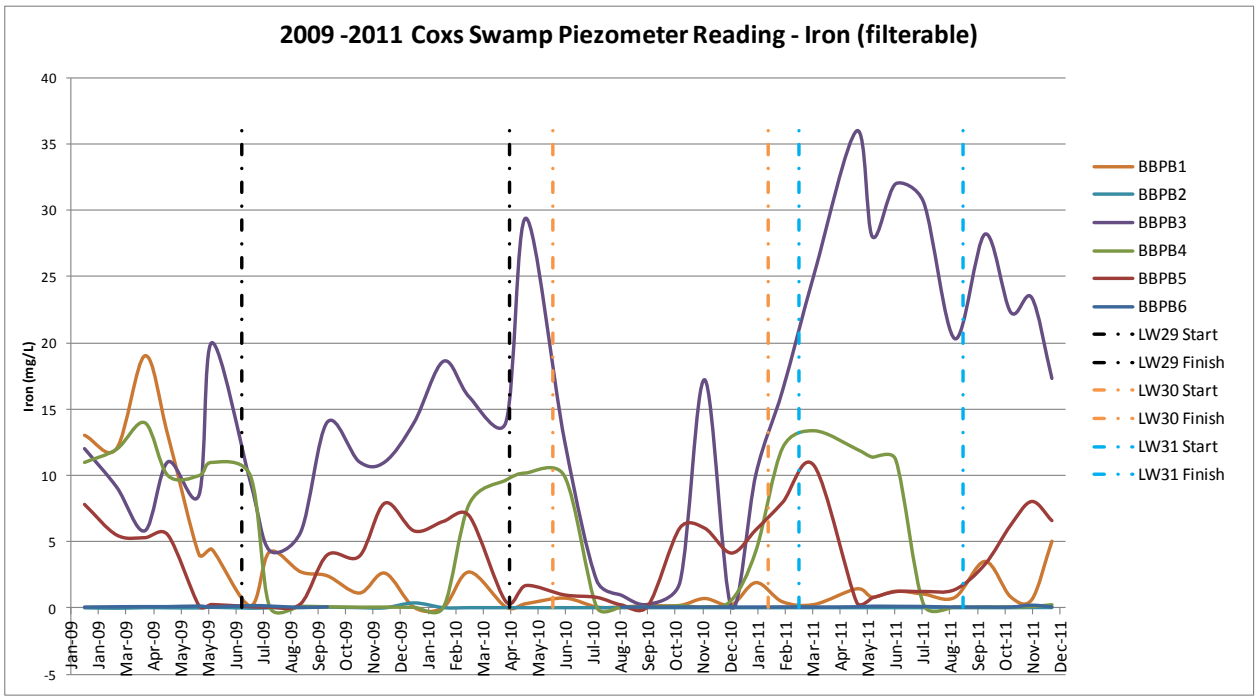
Figure 5 – Coxs River Swamp Groundwater Levels

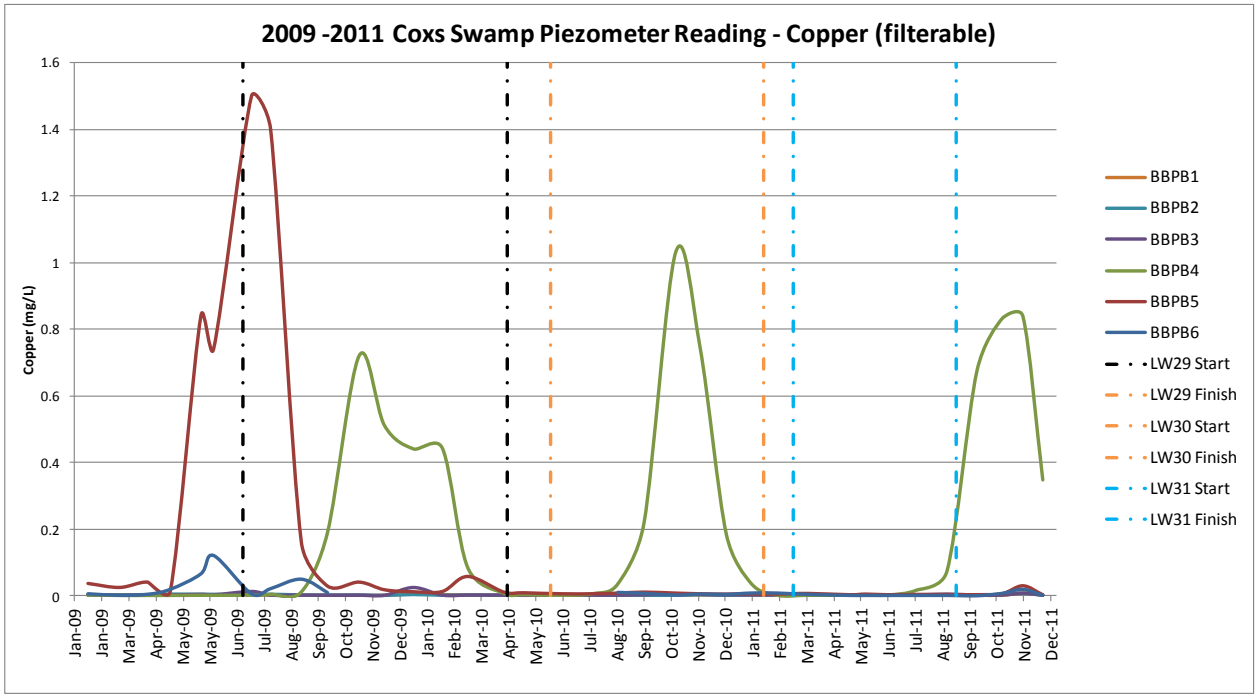



2009 -2011 Coxs Swamp Piezometer Reading - pH
pH
7.4
6.9
6.4
5.9
5.4
4.9
4.4
3.9
Jan-09 Jan-09 Mar-09 Apr-09 May-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09 Jan-10 Feb-10 Mar-10 Apr-10 May-10 Jun-10 Jul-10 Aug-10 Sep-10 Oct-10 Nov-10 Dec-10 Jan-11 Feb-11 Mar-11 Apr-11 May-11 Jun-11 Jul-11 Aug-11 Sep-11 Oct-11 Nov-11 Dec-11
BBPB1
BBPB2
BBPB3
BBPB4
BBPB5
BBPB6
LW29 Start
LW29 Finish
LW30 Start
LW30 Finish
LW31 Start
LW31 Finish


2009 -2011 Coxs Swamp Piezometer Reading - Electrical Conductivity
Electrical Conductivity µS/cm
300
250
200
150
100
50
0
Jan-09 Jan-09 Mar-09 Apr-09 May-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09 Jan-10 Feb-10 Mar-10 Apr-10 May-10 Jun-10 Jul-10 Aug-10 Sep-10 Oct-10 Nov-10 Dec-10 Jan-11 Feb-11 Mar-11 Apr-11 May-11 Jun-11 Jul-11 Aug-11 Sep-11 Oct-11 Nov-11 Dec-11
BBPB1
BBPB2
BBPB3
BBPB4
BBPB5
BBPB6
LW29 Start
LW29 Finish
LW30 Start
LW30 Finish
LW31 Start
LW31 Finish


2009 -2011 Coxs Swamp Piezometer Reading - Zinc (filterable)
Zinc (mg/L)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan-09 Jan-09 Mar-09 Apr-09 May-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09 Jan-10 Feb-10 Mar-10 Apr-10 May-10 Jun-10 Jul-10 Aug-10 Sep-10 Oct-10 Nov-10 Dec-10 Jan-11 Feb-11 Mar-11 Apr-11 May-11 Jun-11 Jul-11 Aug-11 Sep-11 Oct-11 Nov-11 Dec-11
BBPB1
BBPB2
BBPB3
BBPB4
BBPB5
BBPB6
LW29 Start
LW29 Finish
LW30 Start
LW30 Finish
LW31 Start
LW31 Finish


2009 -2011 Coxs Swamp Piezometer Reading - Iron (filterable)
Iron (mg/L)
40
35
30
25
20
15
10
5
0
-5
Jan-09 Jan-09 Mar-09 Apr-09 May-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09 Jan-10 Feb-10 Mar-10 Apr-10 May-10 Jun-10 Jul-10 Aug-10 Sep-10 Oct-10 Nov-10 Dec-10 Jan-11 Feb-11 Mar-11 Apr-11 May-11 Jun-11 Jul-11 Aug-11 Sep-11 Oct-11 Nov-11 Dec-11
BBPB1
BBPB2
BBPB3
BBPB4
BBPB5
BBPB6
LW29 Start
LW29 Finish
LW30 Start
LW30 Finish
LW31 Start
LW31 Finish



10 TRENDS IN MONITORING RESULTS

Anomalous groundwater behaviour in several monitoring bores as reported previously appears to have stabilised and is showing signs of normalising.

Pre, during and post Longwall 31 extraction, routine scientific and survey monitoring of impacts on rock features, escarpments, and surface and groundwater regimes continued, as did seasonal monitoring of flora and fauna. Though there have been two minor exceedances relating to subsidence and horizontal movement these have been located over LWs 29 and 30. Monitoring results over LW31 were generally within expected / predicted parameters, with the exception of the previously noted groundwater quality items, subject to review and report, and displayed no discernable trends.

11 ADEQUACY, QUALITY AND EFFECTIVENESS

The adequacy, quality and effectiveness of the implemented management response processes, based on compliance with approval conditions, are considered to be satisfactory to date. Notification, consultation and development of a remediation program with regard to the surface cracking are also considered to be appropriate and effective.

12 PROPOSED ADDITIONAL / OUTSTANDING MANAGEMENT ACTIONS

There are no current proposed or outstanding management actions to report apart from those noted relating to cracking remediation and finalisation of the review of groundwater quality data..

13 CONCLUSIONS

During the reporting period mining of LW31 was completed.

Routine scientific and survey monitoring of impacts on rock features, escarpments, and surface and groundwater regimes continued, as did seasonal monitoring of fauna.

Surface cracking in the vicinity of LW31 has been monitored and with increases due to recent weather, notification has been provided and a remediation program developed, which will be implemented once approvals are obtained.

Anomalous groundwater behaviour in several monitoring bores as reported previously appears to have stabilised and is showing signs of normalising.

An internal review of groundwater quality monitoring results was conducted notification of potential exceedances, due to several elevated levels in one bore, provided and further reviewing of results conducted by Aurecon with a report to be provided.

Two minor exceedances, relating to subsidence over LW30 and horizontal movement over LW29 were noted during recent subsidence surveys.

All other monitoring results are within expected / predicted parameters and displayed no discernable trends.

The following routine and scheduled seasonal monitoring is proposed.

- Regular visual inspections in general surface area with particular emphasis on the rehabilitated area.
- Groundwater monitoring to continue until the next Status report and then to be reviewed in consultation with the Environmental Branch DTIRIS.
- One further seasonal flora and fauna survey to be conducted with results reported in the next Status Report and then reviewed in consultation with the Environmental Branch DTIRIS.
- The following subsidence surveys, in accordance with the current Subsidence Monitoring Program, followed by a review in conjunction with the Principal Subsidence Engineer DTIRIS.
    - E Line (LW31 section) – 6 months post LW31 completion
    - Northern Pinch Point area – 6 months post LW31 completion
    - Wolgan Gap Trig – 6 months post LW31 completion.

Figure 6 - Subsidence Survey and Data Monitoring Locations (Source: *Baal Bone Colliery LW29-31 SMP Subsidence Monitoring Program*)

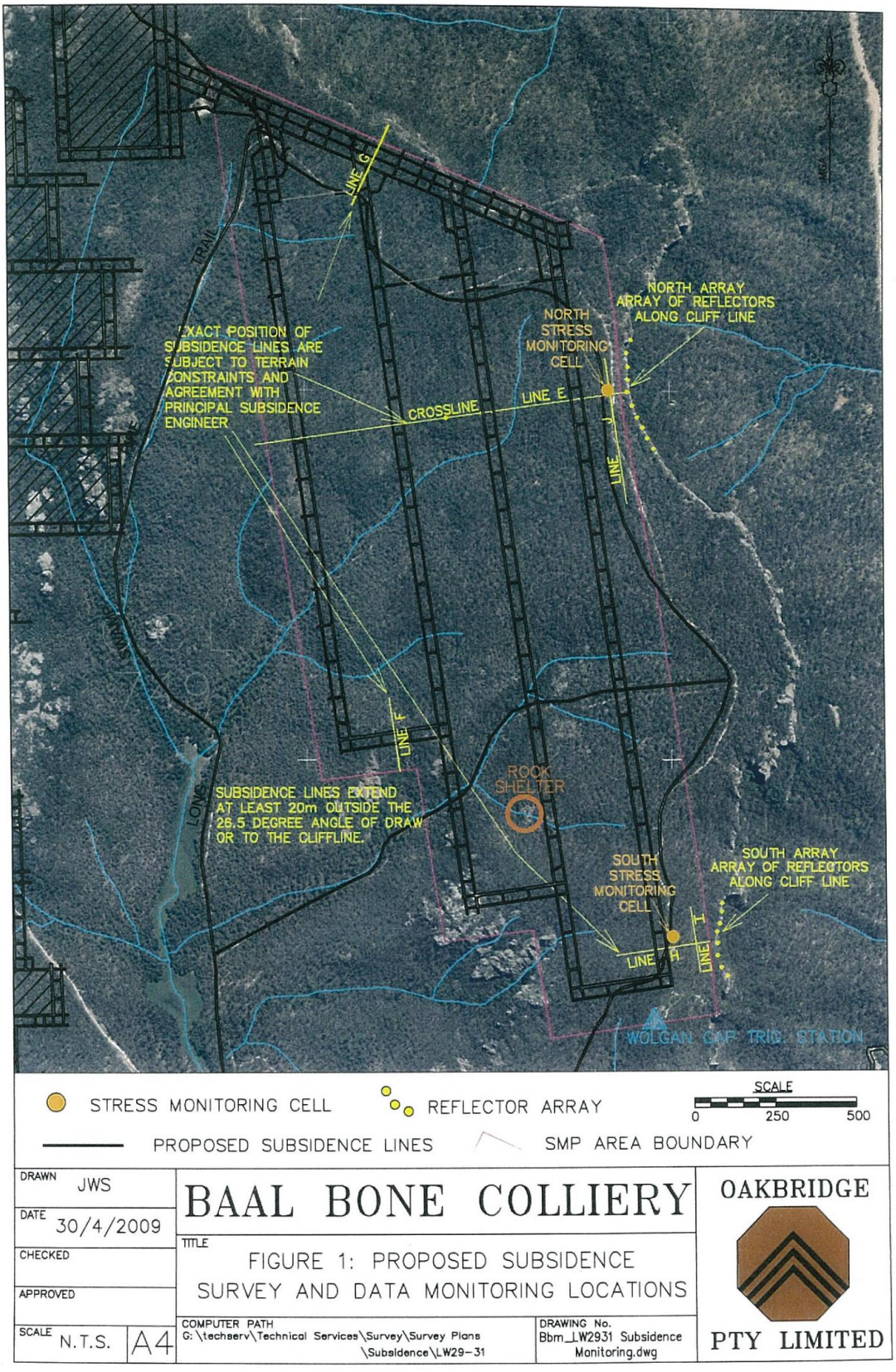


Figure 7 - Location of Groundwater Observation Bores and Geological Structures

aurecon

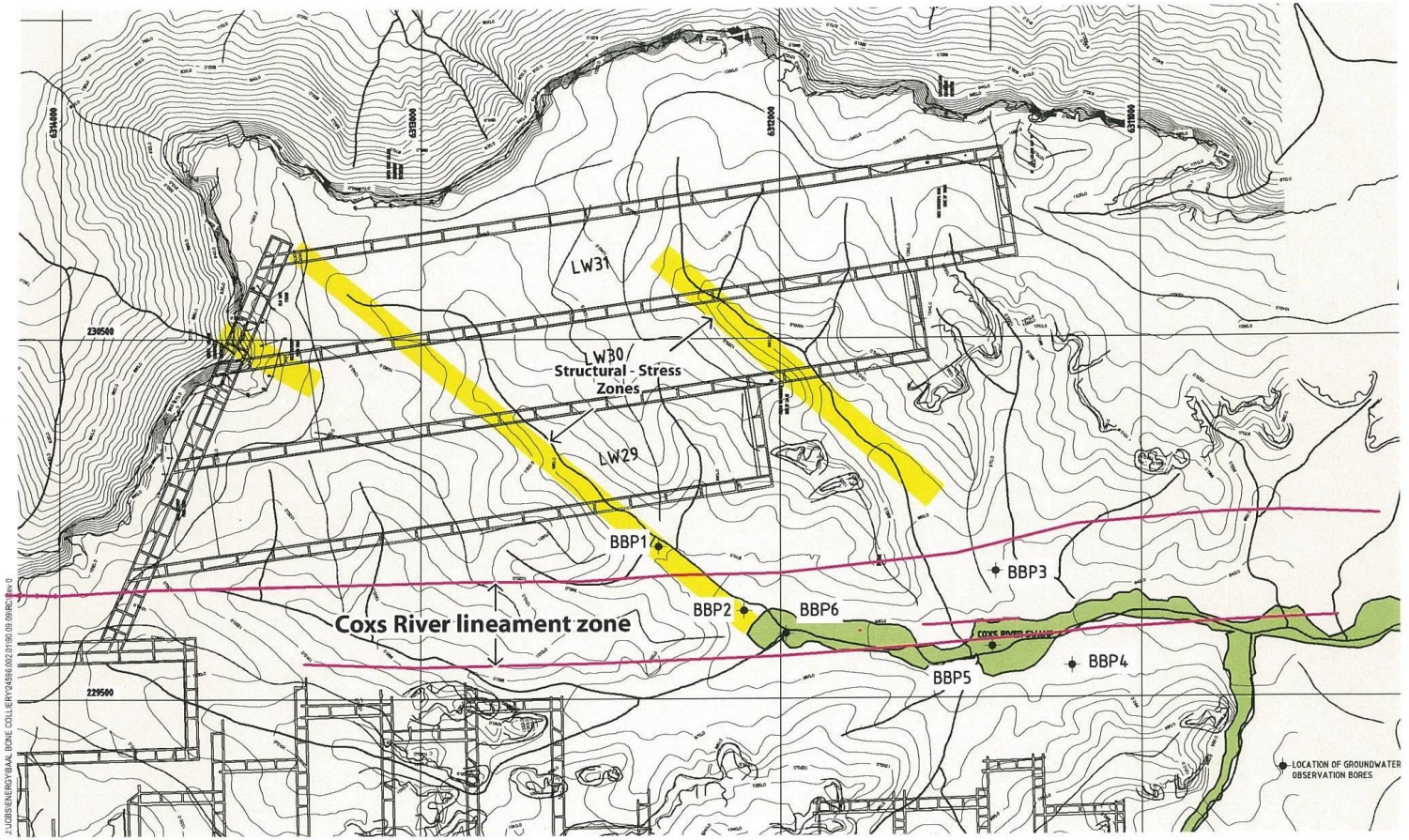


Figure 8 - Survey Monitoring and Stress Cell Location North Pinch Point Area

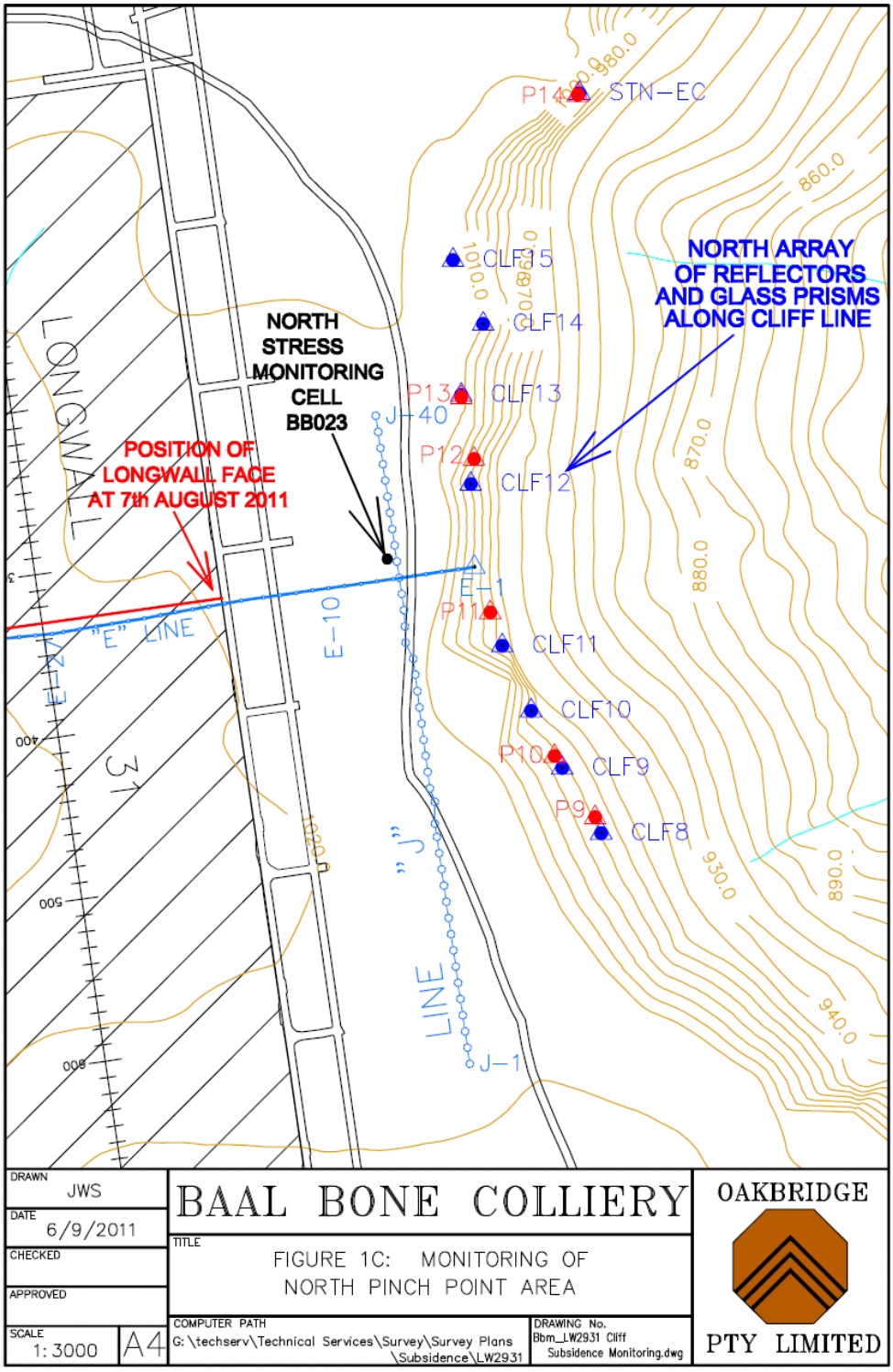


Figure 9 - Survey Monitoring and Stress Cell Location South Pinch Point Area

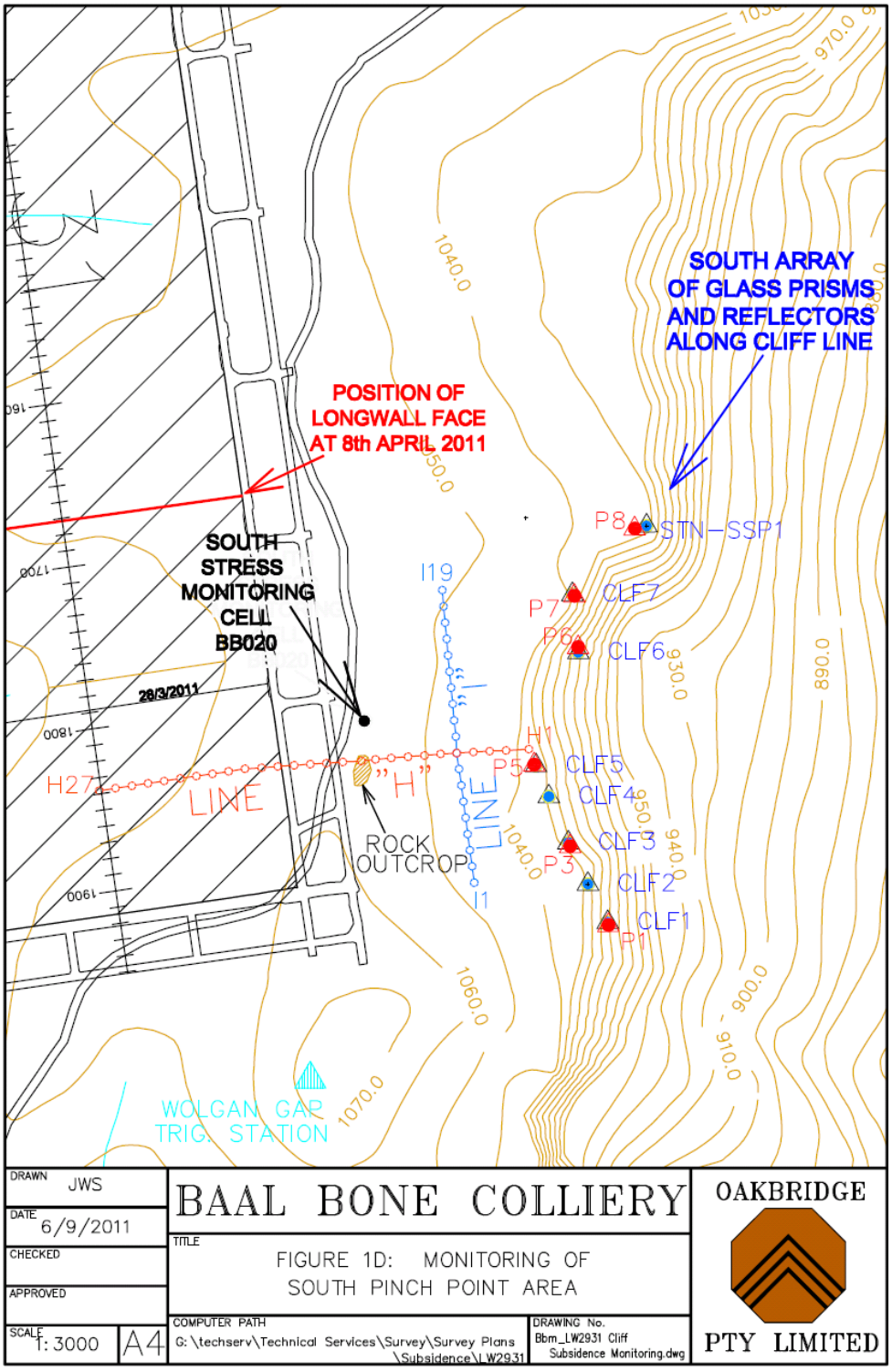


Figure 10 – Longwall Extraction Timing