LAND COURT OF QUEENSLAND

REGISTRY: Brisbane
NUMBER: EPA495-15
MRA496-15
MRA497-15

Applicant: **New Acland Coal Pty Ltd ACN 081 022 380**

AND

Respondents: **Frank Ashman & Ors**

AND

Statutory Party: **Chief Executive, Department of Environment and Heritage Protection**

AFFIDAVIT

I, **Andrew Michael Durick** of Australasian Groundwater & Environmental Consultants (**AGE**), of Level 2, 15 Mallon Street, Bowen Hills, in the State of Queensland, Principal Modeller and Director, state on oath:

1. I have prepared the following for these proceedings:

   (a) a joint expert report dated 16 February 2016 on groundwater conceptualisation, groundwater quality and groundwater modelling with Duncan Irvine on behalf of the Applicant, and Dr Matthew Currell and Dr Adrian Werner on behalf of Oakey Coal Action Alliance (**JER**)[1]; and

[1] Document ID: NAC.0033 (Exhibit 403).

Signed: .... Taken by: ....

Deponent — ~~C.dec/Justice of the Peace~~/Solicitor/~~Barrister~~

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(b) an individual expert report dated 23 February 2016 with Duncan Irvine on behalf of the Applicant[2].

2. In relation to the above reports, as between myself and Mr Irvine, I was responsible for the groundwater modelling aspects and Mr Irvine was responsible for the groundwater conceptualisation.

3. At the time of the JER, I had considered that:

(a) the conceptual model had assumed that the identified faults were complete barriers to flow; and

(b) the faults had not been modelled as conceptualised but instead had been modelled in some places with gaps along the fault alignments.

4. At paragraph 2.27 of the JER,[3] based on the above understanding, I agreed with Dr Werner that the faulting had not been modelled in accordance with the MODFLOW manual, and as a result, the behaviour of faults in the model was not as intended.

5. Dr Werner and I had agreed at paragraph 2.27 that, despite this error, this had resulted in a conservative assessment (relative to the application of faults as per the MODFLOW manual) of the potential drawdown extents in directions where there are gaps along the fault alignments.

6. As outlined in the part of the Applicant's response dated 11 March 2016 (**IESC Response 2016**)[4] to the IESC advice dated 10 December 2015[5] that was undertaken by AGE, I removed the HFB package representing the faults and have re-run the 18 model simulations that calibrated the model and regenerated the median drawdown results for the end of mining.

7. The above changes did not significantly alter the results of the modelling and accordingly, I did not consider that the faulting aspect was going to be a significant issue in these proceedings.

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[2] Document ID: NAC.0046 (Exhibit 418).

[3] Document ID: NAC.0033, p 11 (Exhibit 403).

[4] Document ID: OCA.0037 (Exhibit 721).

[5] Document ID: TMP.0009 (Exhibit 495).

8. Dr Werner did not deal with faults in any detail in his individual expert report dated 24 February 2016.[6] He did refer to it in his conclusions, however, given our agreement above that the perceived error in the modelling had resulted in a conservative estimate of the potential drawdown extents, and my conclusions as a result of removing the faults as outlined in paragraph 7 of this affidavit, I consider it was reasonable for me to form the opinion in paragraph 7.

9. Between 24 March 2016 and 31 March 2016, Mr Irvine gave oral evidence in these proceedings.

10. I was on leave when Mr Irvine gave his evidence and returned to Australia on Monday, 4 April 2016.

11. Upon my return, as part of my preparation for giving evidence in these proceedings, I commenced reviewing the court transcripts in this matter and, from my incomplete review to date, have noted the following:

    (a) during the cross-examination of Mr Irvine, faulting was given greater consideration than I had anticipated, given the agreement with Dr Werner referred to in paragraph 5 of this affidavit;

    (b) there was a very incomplete appreciation of the extent of collection and use in the modelling of the local data gathered by the Applicant;

    (c) Mr Holt QC cross examined Mr Irvine extensively on matters that I believe are groundwater modelling issues, and therefore more within my field of expertise rather than Mr Irvine's expertise; and

    (d) Mr Irvine, despite indicating to Mr Holt QC that he was not a groundwater modeller, at the insistence of Mr Holt QC, answered many questions within my field of expertise and from my review to date a number of matters need to be corrected for the benefit of the Court.

12. Because of the matters identified in paragraph 11(a) above, I considered that it was necessary to further investigate the faulting issues and the extent to which actual data informed the model. This caused me to contact Mr Brian Barnett from Jacobs (formerly

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[6] Document ID: OCA.0022 (Exhibit 436).

Signed: ....
Deponent

Taken by: ....
C.~~dec/Justice of the Peace~~/Solicitor/~~Barrister~~

SKM). Mr Barnett is the principal drafter of the Australian groundwater modelling guidelines[7].

13. I knew that Mr Barnett had been involved in the modelling from the early days of the model's development and had also prepared a report dated 8 August 2013 which, among other things, contained a commentary in relation to faulting issues. This report had been provided to Dr Werner and Dr Currell during the joint expert process and had also been referred to in the IESC Response 2016. A copy of this report is exhibited to this affidavit and marked "**AD1**".

14. During my telephone discussions with Mr Barnett on 6 April 2016 and 7 April 2016, Mr Barnett informed me that he would need to reconsider his archived files but his recollection was as follows:

    (a) some of the earlier model versions had included the faults as complete barriers to flow;

    (b) later model versions had then included in some places gaps along the fault alignments and this had been done intentionally and not in error as agreed with Dr Werner in the JER and as outlined in the IESC Response 2016; and

    (c) he would review his archived files in relation to these matters and the location of the faulting that had been conceptualised.

15. As a result of those discussions, Mr Barnett has agreed to provide me with further documentation from his archives in relation to the above matters.

16. Considering the attention the issue of faulting has been given during Mr Irvine's oral evidence in these proceedings, I consider that this new information will be important in relation to the location of the faulting and the treatment of the faulting in the model including the manner local data was or was not used in the model to advise on drawdown levels beyond the MLA during Mr Barnett's involvement in the modelling. Mr Barnett is hoping to provide this information to me early this week (commencing 11 April 2016) and I will be able to consider it by the end of this week.

17. After reviewing the material from Mr Barnett, if I consider that the position that I have taken as outlined in the JER needs to be changed, I will outline the reasons for the change in

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[7] Document ID: OCA.0036 (Exhibit 720).

position giving Dr Werner an opportunity to consider that reasoning prior to him giving evidence.

18. In relation to the matters outlined in paragraphs 11(c) and 11(d) of this affidavit, it is also going to take me some time to identify all of the references in the transcripts over the four days of Mr Irvine's evidence where Mr Irvine attempted to respond to Mr Holt's questions on modelling issues where I believe the position should be corrected for the benefit of the Court. I expect that I will be able to complete this exercise by 15 April 2016.

19. I also understand from discussions with Mr Irvine that His Honour asked Mr Irvine a number of questions including about the part of the IESC Response 2016 that was undertaken by AGE. I understand that His Honour requested Mr Irvine to prepare a document that outlines how the concerns of the IESC were specifically addressed in the IESC Response 2016 and whether there were any concerns that were not addressed in the IESC Response 2016. I consider that it would be useful for the Court if that document could be finalised with respect to both Mr Irvine's area of expertise and my area of expertise prior to me giving evidence and I expect that I will be able to complete this exercise by 15 April 2016.

All the facts and circumstances above deposed to are within my own knowledge, save such as are deposed to from information only, and my means of knowledge and sources of information, appear on the face of this Affidavit.

SWORN by **Andrew Michael Durick** on 11 April 2016 at Brisbane in the presence of:

....	....
Deponent	Solicitor

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Applicant: **New Acland Coal Pty Ltd ACN 081 022 380**

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CERTIFICATE OF EXHIBITS

Exhibits to the affidavit of **Andrew Michael Durick** sworn 11 April 2016.

Exhibit No.	Description	Date	Page No.
AD1.	SKM Groundwater Modelling Report - Calibration to Observed Drawdown Responses	8 August 2013	7 - 28

....
Deponent

....
Solicitor

L\318601620.2

"AD1"

New Acland Coal Mine

GROUNDWATER MODELLING REPORT – CALIBRATION TO OBSERVED DRAWDOWN RESPONSES

8 August 2013

SINCLAIR KNIGHT MERZ

New Acland Coal Mine

Document title:	New Acland Coal Mine - Groundwater Model Refinement
Version:	Version
Date:	8 August 2013
Prepared by:	Brian Barnett
Approved by:	John Barlow
File name:	C:\Users\BBarnett\Documents\Acland_mine\report\NAC_recalibration_June_26_2013.docx

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Contents

1. Background

This report details the refinement of SKMs numerical groundwater flow model for the New Acland mine to achieve greater accuracy in replicating currently observed effects on groundwater levels.

Recent groundwater monitoring reports (WSA, 2013) prepared by Waste Solutions Australia (WSA) have indicated that a discrepancy has arisen in recent months between observed groundwater levels in observation bores 81P and 82P to the east of the current Stage 2 New Acland mine workings and the groundwater modelling predictions prepared by WSA. The currently observed groundwater level reductions at these monitoring locations were not predicted by the WSA model. New Hope are concerned that this discrepancy may indicate that the WSA Stage 2 model impact predictions are unreliable and may undermine the integrity of the Stage 3 mine expansion impact predictions.

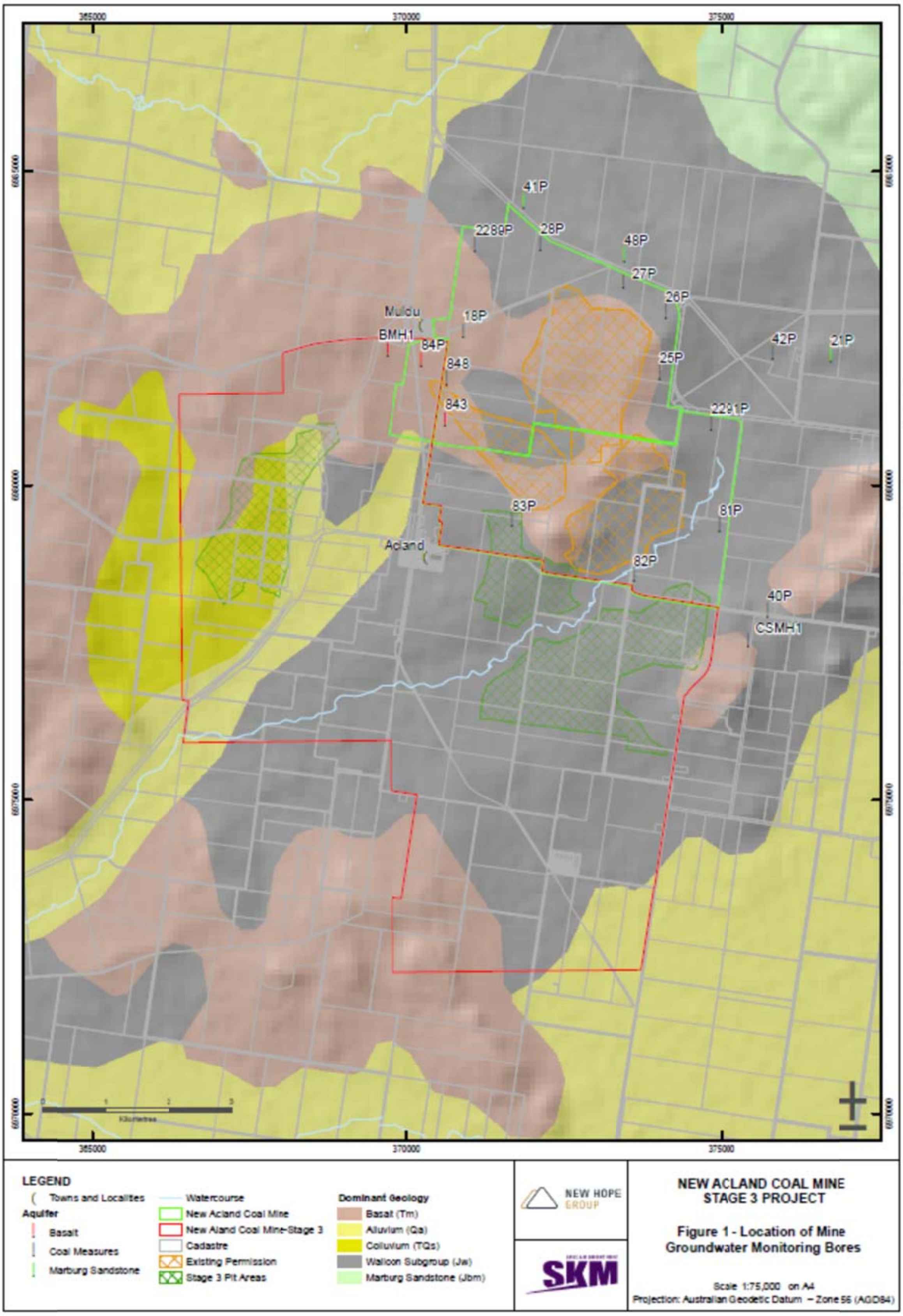
SKM are currently in the process of updating the original Stage 3 groundwater model to assist with groundwater impact assessments in support of the revised Stage 3 mine expansion plan. Clearly, it is important that this model is capable of replicating the key historic groundwater observations at the site, particularly the recently observed drawdown in 81P and 82P.

The location of observation bores and the mining pit are shown in **Figure 1.1**. Observation bores 81P and 82P are located immediately to the south and east of the mining pit.

The work described in this report is aimed at ensuring that the model currently being refined for the revised Stage 3 mine expansion impact assessment can demonstrate a faithful reproduction of recent drawdown and pit inflow measurements and provide confidence in the groundwater impact predictions for future phases of mining.

The existing SKM groundwater model was calibrated in steady state mode using information obtained prior to 2009. At this time mining had largely occurred at elevations above the water table. Therefore, no groundwater responses to mine dewatering (i.e. drawdown observed in nearby observation bore and measured inflows to the pit) were available for model calibration. Recent observations of groundwater responses to mining provide an opportunity to upgrade calibration to a transient calibration which will in turn improve the confidence with which predictions can be made.

Figure 1.1 Location of Mining Pit and Nearby Observation Bores



2. Objectives

The key objectives of the work undertaken and described in this report are:

- To upgrade the current Stage 3 numerical groundwater model so that it is able to replicate recently observed groundwater level responses (both observed drawdown and estimated pit inflows) in and around the New Acland Coal Mine,
- To allow New Hope to better understand the impact on groundwater levels around the current Stage 2 mining operation using the Stage 3 model.
- To help address comments from DEHP in relation to investigating observed groundwater level reductions at 81P and 82P.

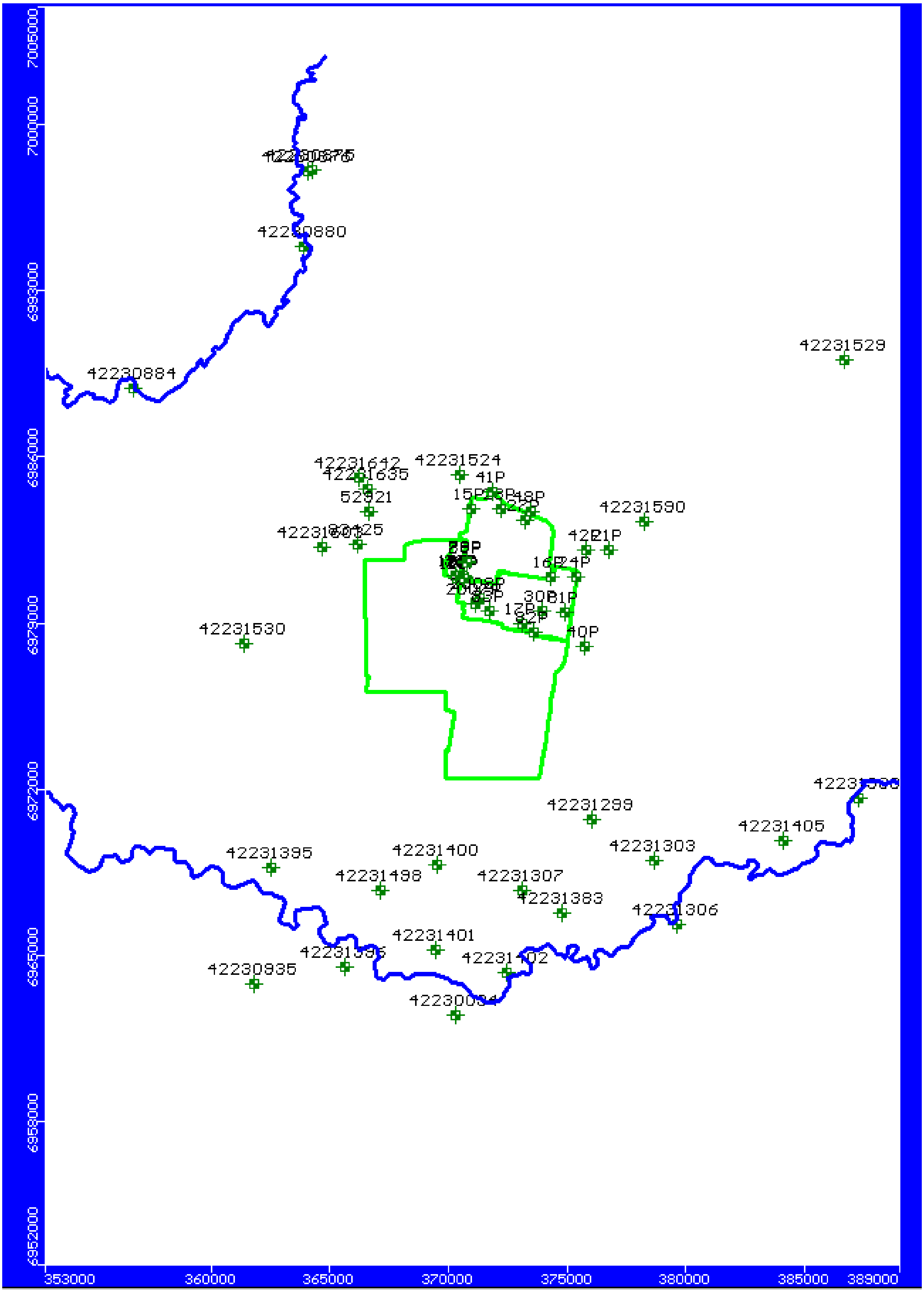
3. Procedure

In order to address NAC and potential community concerns it was necessary to carry out a transient model calibration exercise on the New Acland groundwater model aimed at demonstrating that the model is able to replicate the observed drawdown in observation bores and to replicate the inferred inflows to the pit (as detailed in the WSA report).

The following specific tasks undertaken were:

- Data collection. New Hope provided SKM with updated mining data including:
    - a) Pit floor elevation data for the current mine location and for the period 1 January 2011 to present,
    - b) Estimated inflows to the pit.
    - c) Pit outlines for the period since 1 Jan 2011 to present,
    - d) Pit floor elevations for the region of future mine expansion.
- A transient calibration model was formulated with the updated model configuration and data. The model covers the entire history of mining operations and continues through to the end of 2012. The model has a one month stress period and includes time varying drain boundary conditions to simulate historic mining operations. The model structure is described in detail in SKM, 2013. The calibration process is aimed at obtaining a set of model input parameters that, when run with the historic disturbances caused by mining operations, will produce estimates of groundwater behaviour that are comparable to the observed groundwater behaviour.
- Model input parameters (those describing the aquifer characteristics, recharge and connection to creeks) were initially manually revised to try to obtain an acceptable match between the model predictions and the pit inflows and the drawdowns measured in observation bores, the locations of which are shown in **Figure 3.1**.
- The PEST software package was used to optimise the calibration.

Figure 3.1 : Locations of observation bores.



4. Results

Updated data collected for this investigation includes recent observations of groundwater levels in observation bores located near the mining pit and estimated constraints on pit inflows. Both data sets are included in WSA, 2013. Examples of the latest bore hydrographs measured in observation wells near the pit are illustrated in **Figure 4.1** and measured rates of water extracted from the mine supplied by New Acland Coal are shown in **Figure 4.2** (WSA, 2013). Note that the estimates include groundwater inflows as well as rainfall on the pit and runoff from surrounding areas that accumulates in the pit. Groundwater inflows are therefore expected to be lower than the fluxes shown in **Figure 4.2**.

Figure 4.1 Groundwater head observations near the mining pit

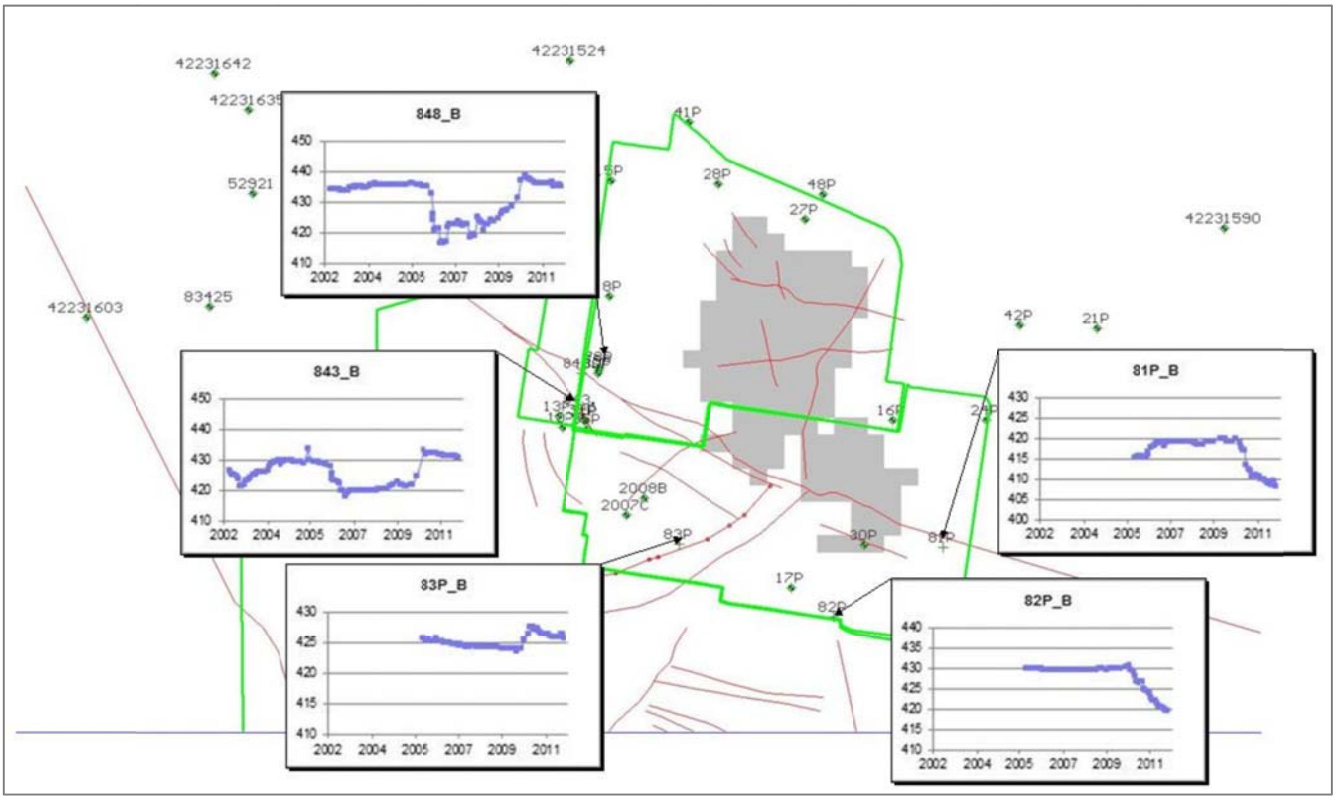
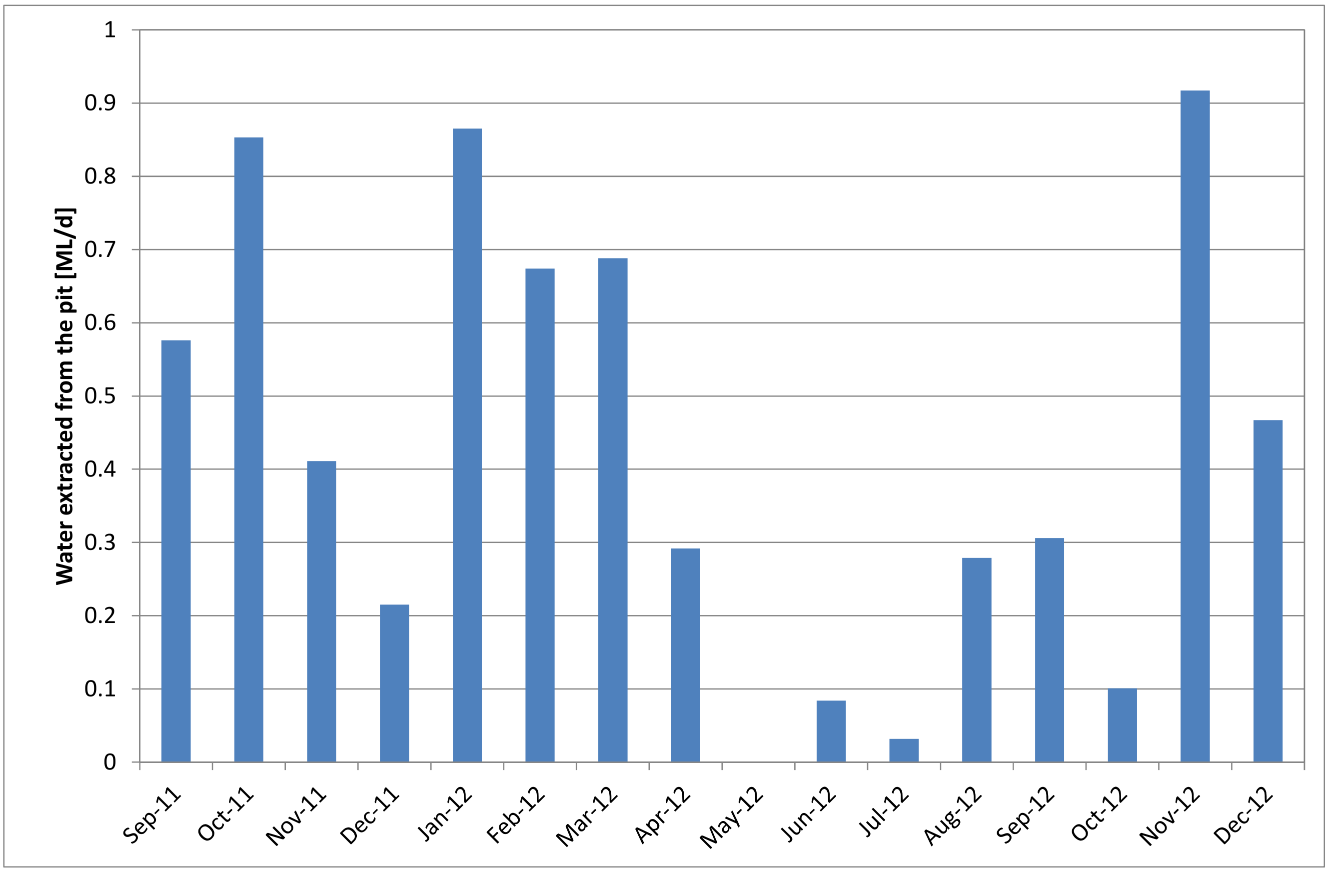


Figure 4.2 Measured rates of water extracted from the mining pit.

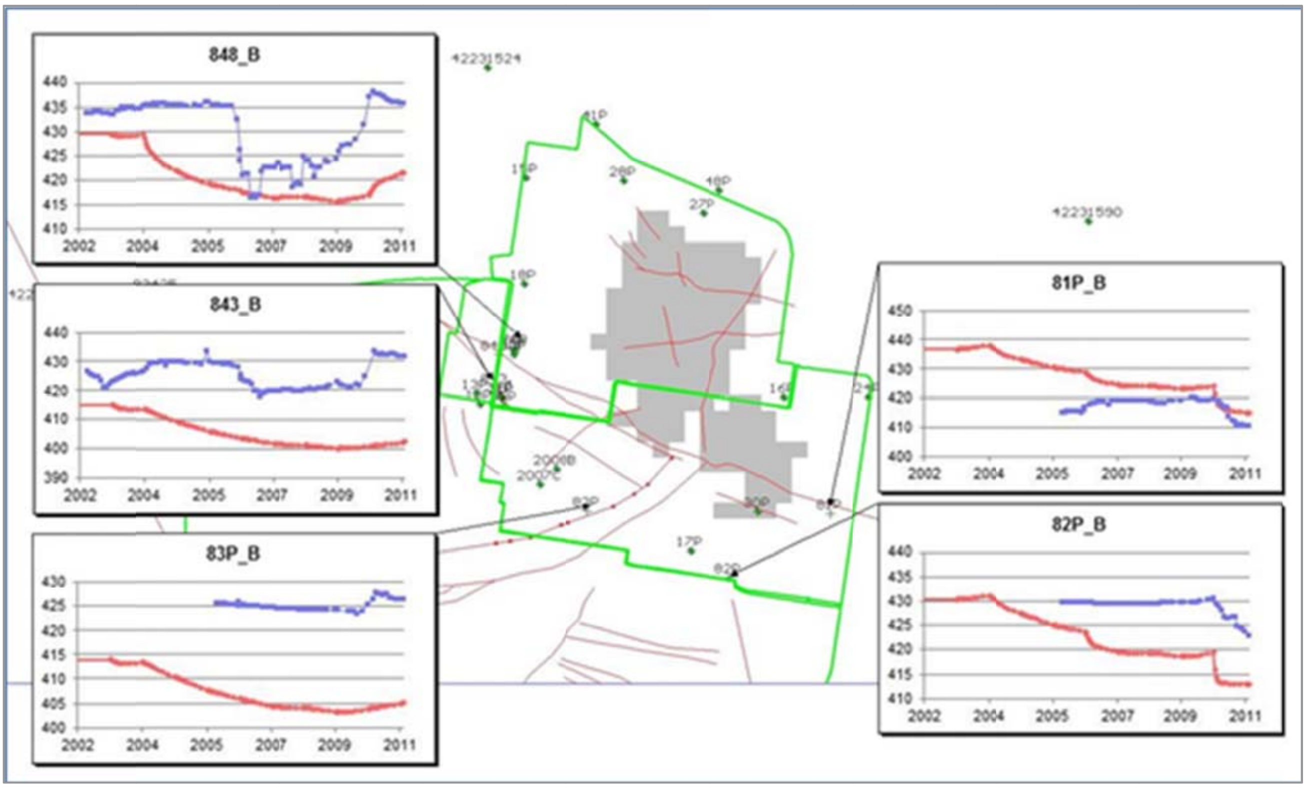


Initial runs of the revised model indicated that a minor response to the current mining operation was predicted and it was found that it was not necessary to implement additional explicit representation of local faulting. Instead, modifications to the regional hydrogeological model parameters controlling the formations' ability to transmit and store water were made in an effort to improve the model's ability to calculate groundwater heads and fluxes that match the observed groundwater responses. Manual trial and error calibration runs were followed by PEST automated calibration. The following constraints were placed on the calibration procedure:

1) Calibration was attempted without changing the hydrogeological zonation as defined by the interpreted distribution of the principal hydrogeological units present at the site,
2) Calibration was attained through refinement of the following model parameters and features:
   a) Hydraulic conductivity in the horizontal (kx, ky) and vertical (Kz) dimensions,
   b) Anisotropy between the principal components of horizontal hydraulic conductivity (i.e. the kx/ky ratio),
   c) Specific yield,
   d) Recharge,
   e) Hydraulic conductivity assigned to the Modflow Walls already present within the model to replicate the influence of faults,
   f) Conductance assigned to the Drain cells that define the flux of water into the mining pit.

The results of the re-calibration are illustrated by the hydrographs showing the model match to observed groundwater responses in the region of the pit presented in **Figure 4.3**. It should be noted that the focus of the calibration effort was to try to replicate temporal trends in the measured data after 2010. Decline in heads measured in bores P81 and P82 are clearly illustrated in the modelled result. Some of the other trends observed in the monitoring wells, particularly those measured prior to 2010, are more difficult to reproduce and more detailed descriptions of historic mining activities would be required to improve the calibration.

Figure 4.3 Calibration hydrographs



The calibration to observed heads can be quantified through estimation of the scaled RMS error for the goodness of fit (in this case 8%). The scatter plot and estimates of goodness of fit are shown in **Figure 4.4**. The model predicted inflows to the pit are presented in **Figure 4.5** and are consistent with the recorded rates at which water has been removed from the pit (by tanker) in recent months as shown in **Figure 4.2**. Note that the observed rate of water removal from the pit shown in **Figure 4.2** is not necessarily equal to the groundwater inflow to the pit. The figure includes rainfall and runoff accumulation in the pit as well as evaporation and leakage processes. The "measured" pit inflows therefore include significant uncertainty and its use in calibration should be viewed as an approximate target (i.e. a sanity check) only.

Figure 4.4 Calibration scatter plot showing a comparison in all observation bores

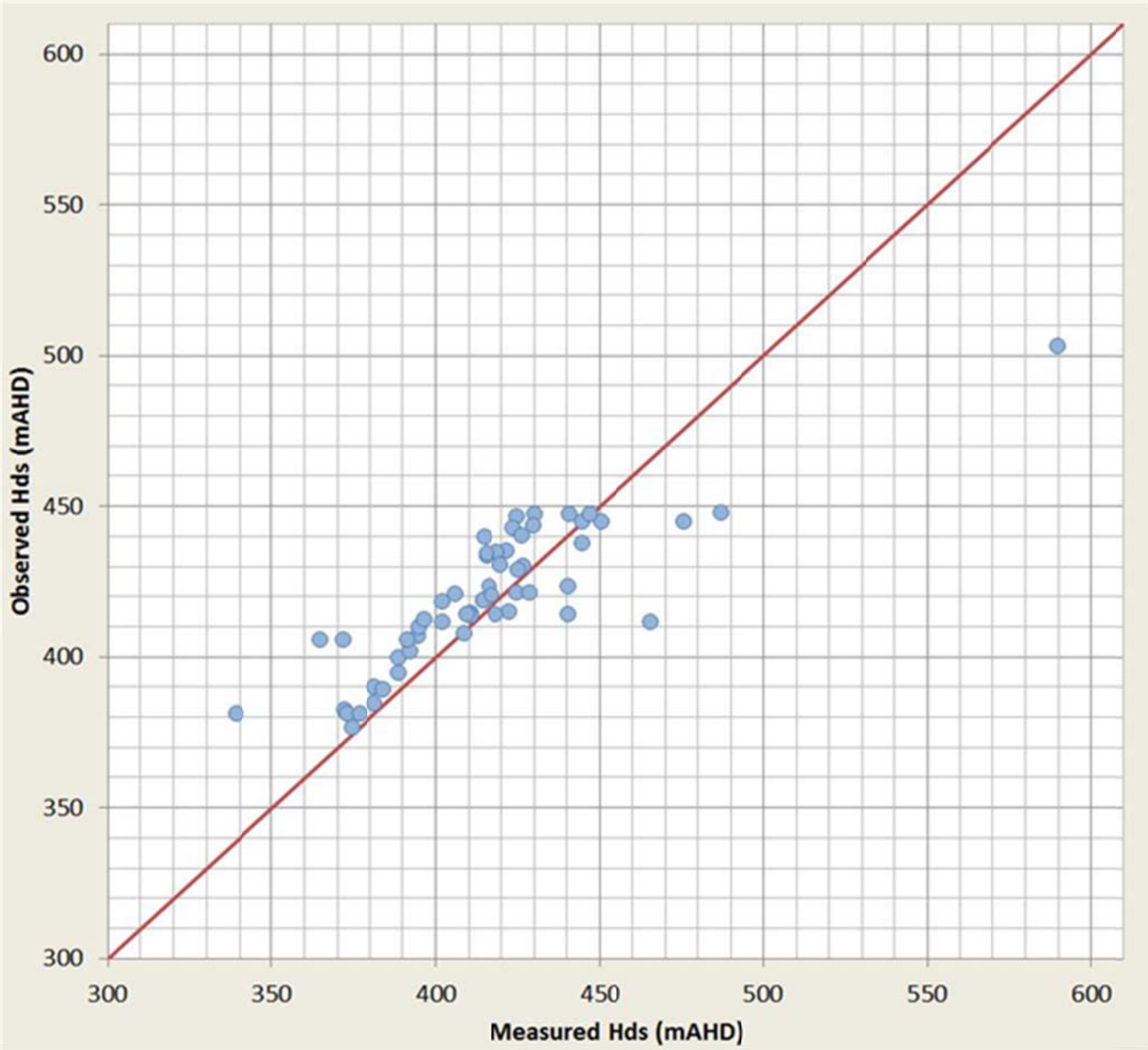
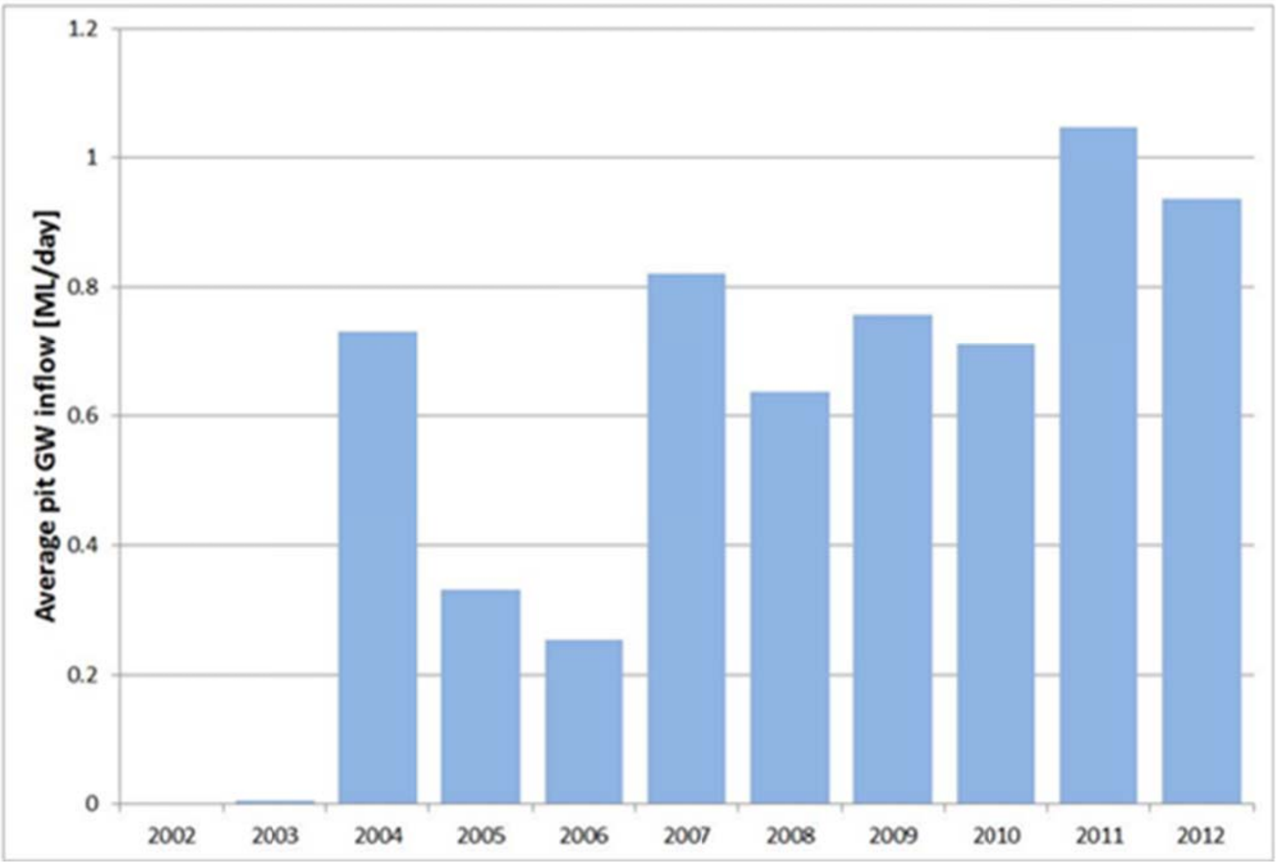


Figure 4.5 Model predicted groundwater inflow to the pit



5. Description of the calibrated model

5.1 Model Grid

The model covers an area of 1908 km^2 extending 36 km from east to west and 53 km from north to south. It is centred on the mine and has grid cells of 200 m by 200 m near the mine and 400 m by 400 m in outer areas.

The model consists of four layers with depth intervals that correspond to features of the geology in and around the mine such that the model layer structure does not always match the interpreted contacts between geological units. Rather the geological units are distinguished by the assignment of variable parameter values in both the vertical and horizontal planes. The model layers are described in **Table 1**. Note that the method of model construction results in individual layers that include a number of different hydrogeological units. The distribution of hydrogeological units in each model layer is shown in **Figure 5.1**. It can be seen that the distribution of hydrogeological units in Layer 1 and 2 are identical. The reason for including two layers here is that the base of layer 1 has been set as the base of the mining pit thus assisting with the implementation of mining operations in the past and future.

Table 1 Definition of model layers

Model Layer	Elevation range	Hydrogeological Units Present
1	Ground surface to base of pit	Walloon Coal Measures, Tertiary Basalts
2	Base of pit to base of the Basalts	Walloon Coal Measures, Tertiary Basalts, alluvium, Marburg Sandstone
3	45 m thickness	Lower part of the Walloon Coal Measures, alluvium, Marburg Sandstone
4	250 m thickness	Marburg Sandstone

5.2 Boundary Conditions

The model provides for exchange of water with surrounding aquifers through the inclusion of Constant Head Boundary Conditions assigned to its external boundaries. All the other lateral model boundaries are defined as no-flow boundaries through which water cannot enter or leave the groundwater model domain.

Faulting is known to have occurred from mapping of underground mines in the Acland area and has also been interpreted from bore data. Faulting is developed along two main trends, northeast-southwest and northwest-southeast. Folding has been interpreted from photogeological mapping, regional drilling and geological interpretation of the drilling results elsewhere in the Clarence-Moreton Basin. Model calibration highlighted the fact that there are significant head differences measured in neighbouring groundwater wells suggesting localised areas of low permeability and associated compartmental nature of the aquifers in the region of the mine.

In the model the MODFLOW HORIZONTAL FLOW BARRIER PACKAGE was implemented in order to represent the compartmental nature of the groundwater system. This package simulates thin, vertical low-permeability geologic features that impede the horizontal flow of groundwater. Faults are approximated as a series of horizontal-flow barriers (or “walls”) conceptually situated on the boundaries between pairs of adjacent cells in the finite-difference grid. Wall settings were adopted to represent the faulting present at the mine. The locations, alignment and permeability of the flow walls were derived from faults mapped by New Hope Mining at the site and during model calibration process. The walls were defined through Layer 1 to Layer 4. Figure 5.2 shows the location of the faulting (represented as green lines) assumed in the model.

Myall Creek is included as a Modflow Drain Boundary Condition which is a head dependent boundary condition that allows water to exit the model only. In other words it is modelled as a gaining creek and groundwater recharge resulting from the loss of water through the creek bed is not allowed for in the model. This representation is consistent with the fact that it is an ephemeral watercourse that is not a consistent source of groundwater recharge throughout the year. Oakey Creek has been represented in the model as a Modflow

River Boundary Condition that allows groundwater to enter or exit the model depending on the predicted groundwater levels and those specified as the river stage. In this case the river stage is assumed to be 5 m below the ground surface and the river bottom 6 m below ground surface (i.e. the water in the creek is 1 m deep).

Lagoon Creek is not included in the model as a boundary condition because this feature is conceptualised as being dis-connected from the local groundwater systems. Groundwater elevations in all aquifers lie significantly below stream bed elevations in the revised Project Area. Studies undertaken as part of Stage 2 EIS compared groundwater levels to stream bed levels in Lagoon Creek under average conditions and found that groundwater does not contribute to surface water flows.

Inflows to the mining pit are modelled as time varying Drain Boundary Conditions that drain the pit to the elevation of the pit floor. The locations of Drain Boundary Conditions in the calibration model are shown in **Figure 5.2**.

Figure 5.1 Hydrogeological units in model layers

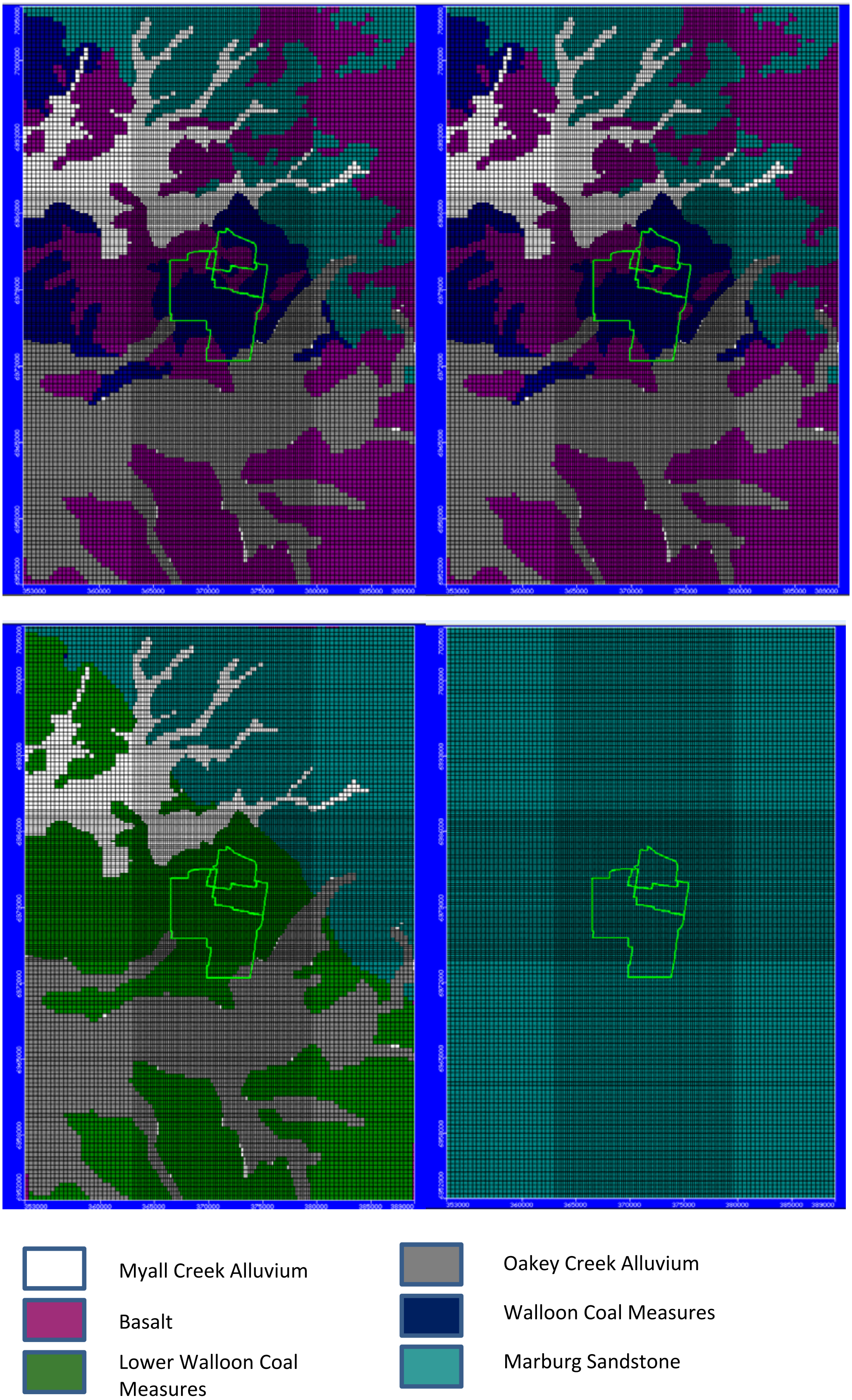
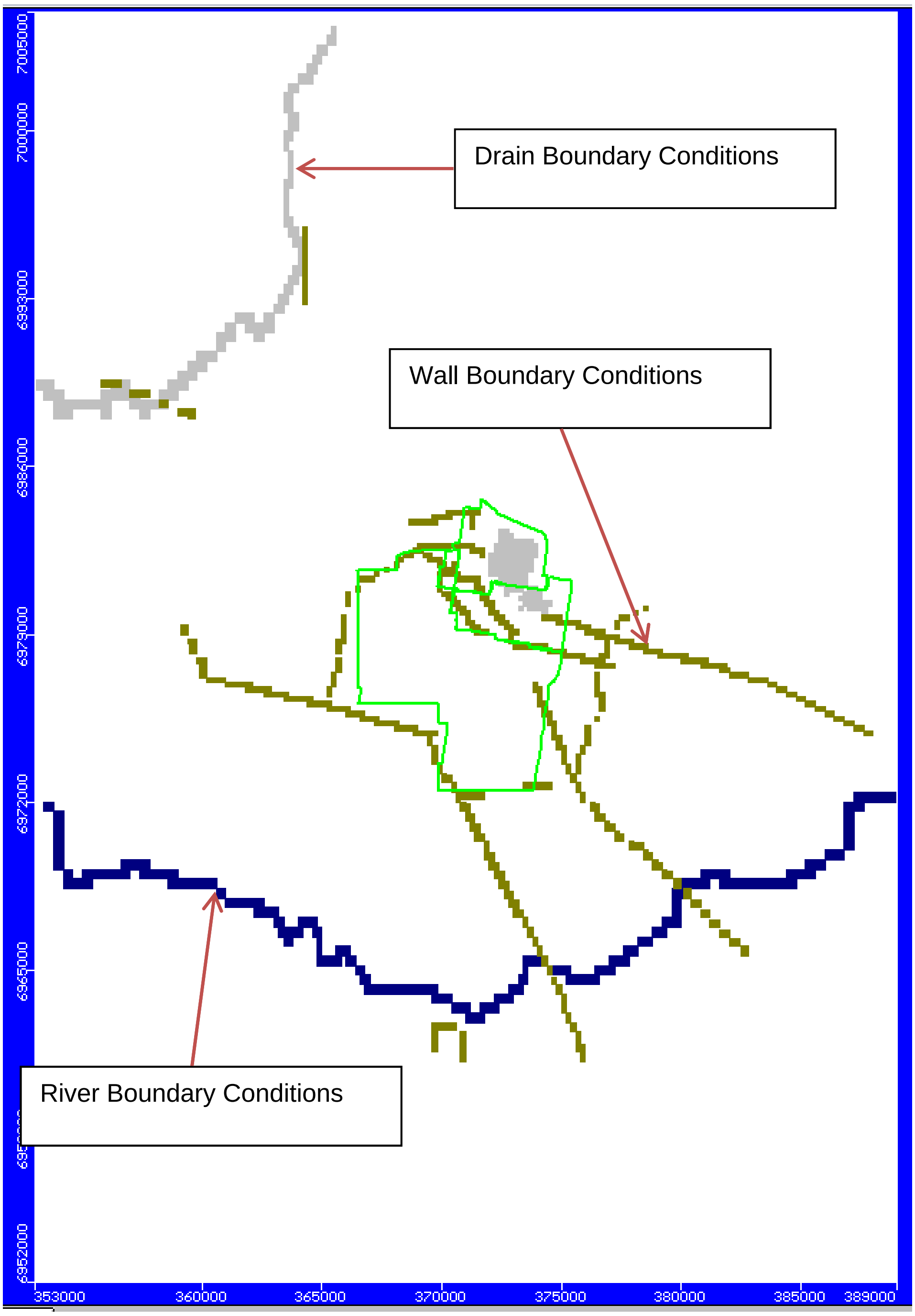


Figure 5.2 Model boundary conditions

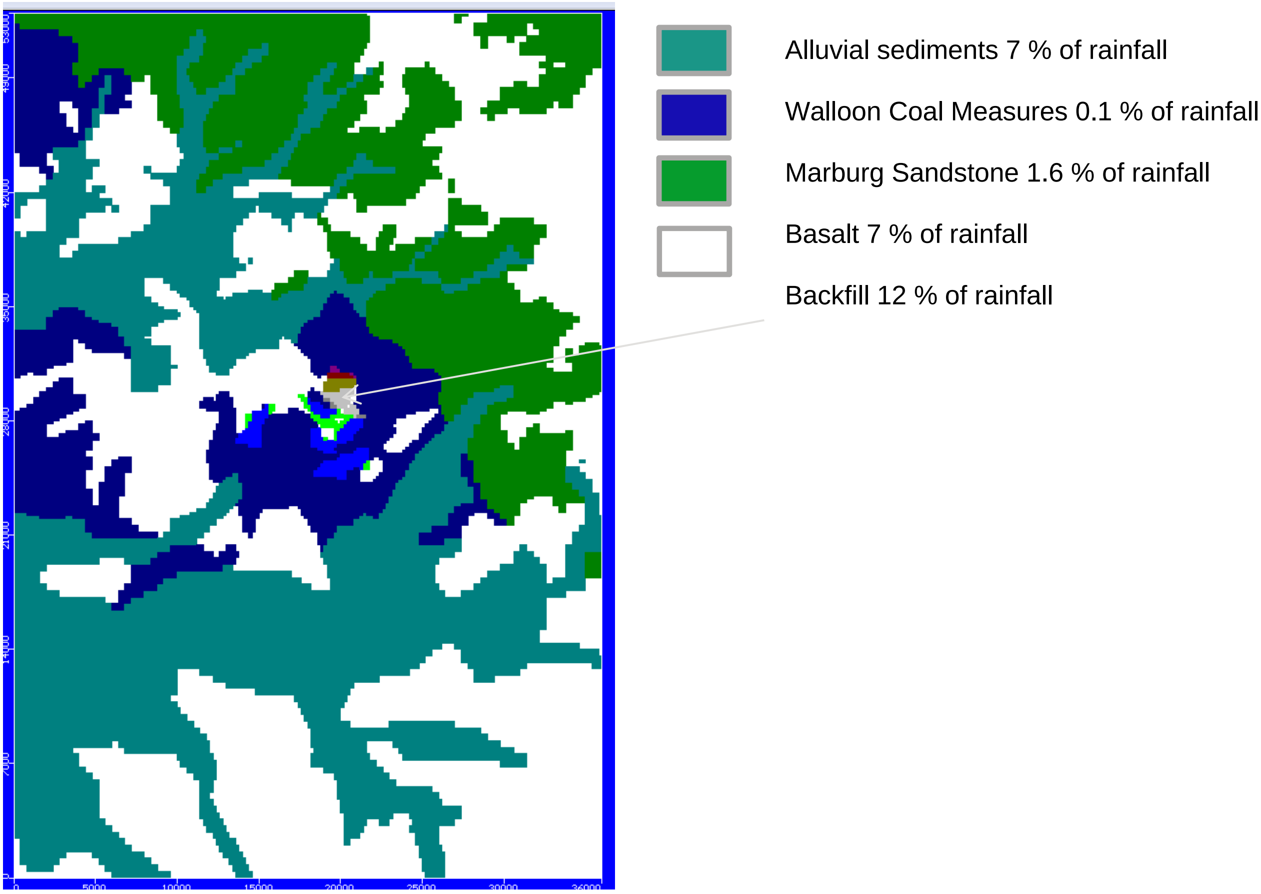


5.3 Recharge

A nominal level of rainfall recharge has been applied across the top surface of the model. Initial estimates of recharge were set at a fixed percentage of rainfall measured in gauges located within and near the model domain. The assumed distribution of recharge is shown in **Figure 5.3**. The figure shows that the model is subdivided into a number of recharge zones according to the permeability of the outcropping hydrogeological units. Zone 1 (coded as areas of white in **Figure 5.3**) represents the Tertiary Basalts. Zone 2 (shown in dark blue) represents the Walloon Coal Measures outcrop, Zone 3 is the Marburg Sandstone (shown in green in

Figure 5.3) and zone 4 (with various colours) is the pit backfill region. Each backfill colour represents five years of backfilling.

Figure 5.3 Recharge zonation



5.4 Aquifer Properties

Hydraulic conductivity and storage parameters included in the model as refined during the calibration procedure are presented in **Table 2**. Values of hydraulic conductivity are at the higher end of the range indicated by pumping tests (transmissivity between 7 and 40 m^2/d) carried out in the Walloon Coal Measures. Similarly the Marburg Sandstone hydraulic conductivity included in the model is higher than indicated by pumping tests. Parameter values included in the model provide a reasonable level of calibration and are consistent with observations from the mine and from the general recognition that the Marburg Sandstone is an important regional aquifer while the Walloon Coal Measures do not yield substantial quantities of water.

Calibration has resulted in extremely low values of vertical hydraulic conductivity in most hydrogeological units. This has been necessary to maintain strong vertical gradients and to maintain heads in that shallow model layers at levels close to those observed. When this parameter is increased the heads in the shallow model layers decline to level that are well below those observed in monitoring bores.

The hydrogeological parameters and recharge assigned to each layer are also listed in **Table 2**.

Table 2 Calibrated model parameters

Unit	Kx (m/d)	Kz (m/d)	Sy	Recharge (% of rainfall)
Marburg Formation	1	0.0003	0.0004	1.6
Basalt	3	0.004	0.007	7.0
Coal Measures	0.5	0.0003	0.002	0.1
Myall Creek Alluvium	10	0.1	0.01	7.0
Oakey Creek Alluvium	10	0.1	0.01	7.0
Lower Walloon Coal Measures	0.2	0.0001	0.0004	NA

6. Confidence Level Classification

The Australian Groundwater Modelling Guidelines (Barnett et al., 2012) define the Confidence Level Classification for groundwater models. The classification provides an indication as to the relative confidence with which a particular groundwater model can be used in predictive analyses. The classification relies on assessment against a number of criteria related to the available data from which the model has been conceptualised and calibrated, the method of calibration and calibration outcomes and the manner in which the predictive scenarios are formulated. The model described in this report has the characteristics that are typical of a Class 2 model which means that it is suitable for assessing mine dewatering problems and for estimating impacts in medium value aquifers and to medium value environmental assets. It is considered suitable for the on-going modelling objectives required for the Stage 3 EIS.

It was agreed with DNRM in February 2013 that a Class 2 Model would be acceptable to assess the impacts from Stage 3 operations.

The calibration work described in this report has been instrumental in upgrading the model Confidence Level Classification by incorporating a transient calibration in the model development and by calibrating to fluxes as well as heads measured in and around the mine.

7. Concluding Remarks

This investigation has resulted in a transient calibration to observed groundwater heads and fluxes in and around the mine pit. Calibration has been hampered by the non-homogeneous nature of the fractured rock aquifers present at the site. In particular calibration has been difficult because of the low vertical hydraulic conductivity present at the site causes apparent discontinuities and anomalies in the measured groundwater heads in the vicinity of the mining pit. These anomalies can be seen where there are clusters of bores at particular locations with substantially different behaviour observed in bores that are in close proximity to each other. These observations help to reinforce the general conclusion that the shallow aquifers present at the mine site (in particular the Walloon Coal Measures) are relatively impermeable and low yielding.

In the recalibration process the most important change required to trigger groundwater head responses at 81P and 82P was a substantial reduction in the specific yield (the capacity of the aquifer to store water) of all hydrogeological units represented within the groundwater model. The final specific yields for the units included in the model are extremely low and suggest that unconfined groundwater conditions are limited in their capacity to store water in the filling and draining of connected pore space.

The re-calibration of the model has been successfully completed without the need to implement preferential flow along discrete fractures or faults intersected by the mine. The calibration was attained by global changes in hydraulic conductivity and specific yield without the need to implement local scale anomalies. While faults and fractures in the rocks around the mine may be of hydrogeological importance, the fact that the model has been calibrated without explicit fracture representation and without including patches of anomalous conductivity or storage suggests that preferential flow along such structures is not necessary to explain observed groundwater behaviour. Experience to date suggests that most of the mapped faults do not necessarily represent preferred flow channels. The exclusion of these features in the model at this stage eliminates the need to decide where additional anomalies and faults may need to be activated in the model in the future as the pit migrates to the south.

We would recommend regular comparison of observed mine impacts with model predictions as the mine workings progress to demonstrate that the observed impacts are in line with predictions. Where observations deviate from predicted impacts model revision may be required and predictions of future impacts revised.

8. References

Barnett B, Townley LR, Post V, Evans RE, Hunt RJ, Peeters L, Richardson S, Werner AD, Knapton A and Boronkay A. *Australian Groundwater Modelling Guidelines*. Waterlines report #82, National Water Commission, Canberra

WSA, 2013. Stage 1 *Groundwater Investigation at 81P and 82P.* Consultancy report prepared by Waste Solutions Australia for New Acland Coal PTY Ltd. Draft C, 15 May, 2013.

SKM, 2013. New Acland Coal Mine - Stage 3 Environmental Impact Statement – Water Report. In preparation.