

# **New Hope Group**

## **Acland Cattle Grazing Trial**

Submission for Australian Business Award for Sustainability

March 2016



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## Introduction

The New Hope Group's New Acland coal mine is currently conducting its fourth year of scientific cattle grazing trials on rehabilitated mined land.

This industry leading work is conducted in partnership with independent agricultural consultants Outcross Agri-Services, the University of Southern Queensland's National Centre for Engineering in Agriculture (USQ), pasture specialists EcoRich Grazing and supported by expert veterinarian and statistician advice.

The Acland Cattle Grazing Trials project aims to determine the success of mined land rehabilitation on behalf of New Hope through its subsidiary Acland Pastoral Company, and to enable New Hope to refine and improve its land rehabilitation program.

The project has a unique approach that incorporates measurement of livestock, soil and pasture indicators. The focus is on productivity, viability and sustainability, along with established environmental indicators of safe, stable and non-polluting rehabilitated land.

USQ experts are investigating the soil chemistry and structure, while Outcross supervises the cattle grazing trials to monitor pasture and livestock productivity.

Results are available to any interested parties and the public in order to share learnings and to ensure New Hope's land rehabilitation practices can be adopted more widely across mining industries.

The land rehabilitation to grazing activities are carried out in conjunction with New Acland coal mine environmental protection and improvement works, which help to revegetate buffer zones along local waterways to create koala habitat and wildlife corridors.

The combination of these two activities results in a post-mining landscape that restores the land to as good as or better condition than pre-mining for grazing activities, and strengthens and protects the environmental values of undisturbed areas.

This submission for the Australian Business Awards Sustainability Award focusses on the long-term benefits of scientific research in the achievement of sustainable, economically productive and environmentally healthy landscapes.

These beneficial outcomes are achieved through informed, science-based rehabilitation techniques as an integral part of daily coal mining operations, and clearly demonstrate the compatibility of mining and agriculture practices.

## Section 1: Organisation

### New Hope Group

New Hope Group is an Australian owned and operated diversified energy company. New Hope is based in Ipswich, Queensland and was established in 1952.

One of Queensland's largest ASX listed corporations by market capitalisation (A\$1.2 billion), New Hope Invests in the broader Australian energy sector and has interests in coal, oil, port, exploration, and agriculture.

New Hope has a direct workforce of 550 and has created approximately 2,850 jobs for suppliers and contractors. New Hope supports the local communities in which it operates and employs local people for its work force – the company does not use a fly-in, fly-out workforce.

New Hope has coal projects in the Surat and Clarence Moreton Basins (New Acland, West Moreton – Jeebropilly- and Elimatta), in the Bowen Basin (Lenton, Yamala, Bee Creek, Churchyard Creek), and in the Maryborough Basin (Colton).

In addition, New Hope also has minerals projects in north-west Queensland (Courtenay, Yanko, Sherwood, and Monamarra).

New Hope owns about 17,000 ha of land in Queensland, and the company is committed to the progressive rehabilitation of disturbed land across its operations.

Rehabilitation is ongoing and progressively occurs right behind the mining activities. The aim of rehabilitation is to return land to sustainable and profitable beef cattle production as soon as possible.

New Hope's progressive rehabilitation techniques are relatively unique in the mining industry in Australia and are a significant point of difference with other mining operations.

Rehabilitating land immediately as mining progresses means that the footprint of the actual mining pit at New Acland has been no greater than approximately 170 ha at any one time.

An important issue for the local community, regulators and other key stakeholders is to have confidence in the ability of New Hope to restore disturbed lands to productive use after mining has been completed.

### New Acland Mine

This award submission focusses on land rehabilitation research and environmental conservation and protection activities conducted as part of New Hope's New Acland mine coal project.

The New Acland mine is located approximately 50km north-west of Toowoomba, near the township of Oakey, in the southeast Queensland's Darling Downs region.

The mine has a strong safety record and consistently achieves above industry average safety performance through consistent behavioural safety programs.



The mine produces around 5 million tonnes of thermal coal per annum using thin seam mining techniques. About 97 per cent of New Acland coal is exported, while around three per cent goes to domestic customers.

The mine provides direct jobs for around 280 locals and 160 contractors, and contributes to creation of an estimated additional 2,300 indirect jobs in service and support industries, and through the creation of wealth and demand in local communities.

New Acland mine contributes annually an estimated \$300 million to the southeast Queensland economy, and \$100 million to the Darling Downs economy.

The mine's low cost and competitive operation regimes enable it to remain profitable despite current challenging market conditions.

All water used in New Acland's mining operations is recycled wastewater purchased from the Toowoomba Regional Council's Wetalla treatment plant – the only borehole groundwater used on site is for human consumption.

New Hope will ramp down mining operations on currently approved mining leases at New Acland, from April 2017. The New Acland Coal Mine Revised Stage 3 Extension Project will, if approved, extend the mine's operating life to approximately 2029 with an annual output up to 7.5 million tonnes per annum.

The company's revised scope of the extension project, and consequential Environmental Impact Statement for New Acland Stage 3, was a result of New Hope management listening carefully to community and government concerns relating to a previous proposal.

The revised project has subsequently had a draft Environmental Authority issued by the Queensland Government and is currently progressing through the mining lease approvals process.

### [Acland Pastoral Company](#)

New Hope established the Acland Pastoral Company in 2006 as a farming, grazing and land management enterprise based at the New Acland mine.

The company is a significant local employer providing permanent jobs and seasonal contracting work, and also sources goods and services from local providers.

The Acland Pastoral Company is a commercial agri-business that manages approximately 10,000 ha of land, comprising a mixture of grazing lands, irrigated cropping lands, and lands that include regions with high biodiversity and environmental values.

Grazing lands comprise undisturbed areas as well as rehabilitated grazing lands that have been restored as part of ongoing post-mining operations.

The aim of land rehabilitation is to restore land to beef cattle production as soon as possible. Around 400 Ha of mined land has been fully rehabilitated to date, and cattle are routinely grazing on rehabilitated land at New Acland.

Acland Pastoral manages around 2,400 head of cattle on 4,000 hectares of land at the New Acland mine.

The area operated by APC is generally productive land although fertility and productive capacity are variable.

APC runs dry (non-lactating) cattle on its rehabilitated land which are being grown out to sell. The agricultural enterprise chosen for the project is growing out young cattle to feedlot entry weight. This is consistent with common commercial land use in surrounding areas where mining does not take place.



The economies of scale afforded by such a large cattle and cropping business mean that Acland Pastoral is able to devote resource to improving the environmental and ecological values of lands that are not suited to grazing or farming, as well as undertake detailed research programs such as the Acland Cattle Grazing Trials.

## Section 2: Method

### **About the Acland Cattle Grazing Project**

The Acland Cattle Grazing Project represents industry leading research that is helping determine the success of mined land rehabilitation practices on behalf of New Hope through its subsidiary APC.

The project's unique approach incorporates measurement of established environmental indicators of safe, stable and non-polluting rehabilitated mined land. In addition, the project measures the success of New Hope in achieving viable, sustainable livestock grazing operations on rehabilitated mined land.

The research assesses relevant indicators of soil and pasture capacity, and productivity. The project team has also undertaken direct measurement of livestock performance and economic returns and compared findings with the soil and pasture measurements.

As the trials progress, other important information will be collected including liver tissue sampling for measurement of potential contaminants.

The project design allows for measurement of livestock and pasture productivity within season and between years for a seven year period. The longevity of the project allows the results to be understood through varying seasonal conditions and over time.

In addition the extended time frame improves the reliability of results and confidence in conclusions to be drawn with regard to the sustainability of rehabilitated mined land.

### **Grazing Trials – Framework & procedures**



The Acland Cattle Grazing Trials project team comprises Outcross Pty Ltd – Livestock and Project Management (Tom Newsome, Ashlee Lance), EcoRich Grazing-Agronomy (Colin Paton), University of Southern Queensland – soils (Dr John McLean Bennet, Dr Alice Melland, Dr Jochen Eberhard), Veterinarian (Dr John Armstrong), with statistical analysis by USQ.

The project comprises Stage 1 (Pilot - 2011-2013) and Stage 2 (Year 2014-2018). The Pilot trial was completed by Outcross in 2011 and 2012. Following the Pilot, it was decided to identify the most proficient specialist team for each discipline and include them in the project team for Stage 2.

The project team intensively monitors three rehabilitated sites and one unmined Control site and collects data on commercially important Key Performance Indicators for soil structure and fertility, pasture productivity, and beef cattle production.

The performances of the rehabilitated sites are compared with industry benchmarks and commercial production data collected by the Acland Pastoral Company.

The performance of the rehabilitation is measured in terms of viability and sustainability.

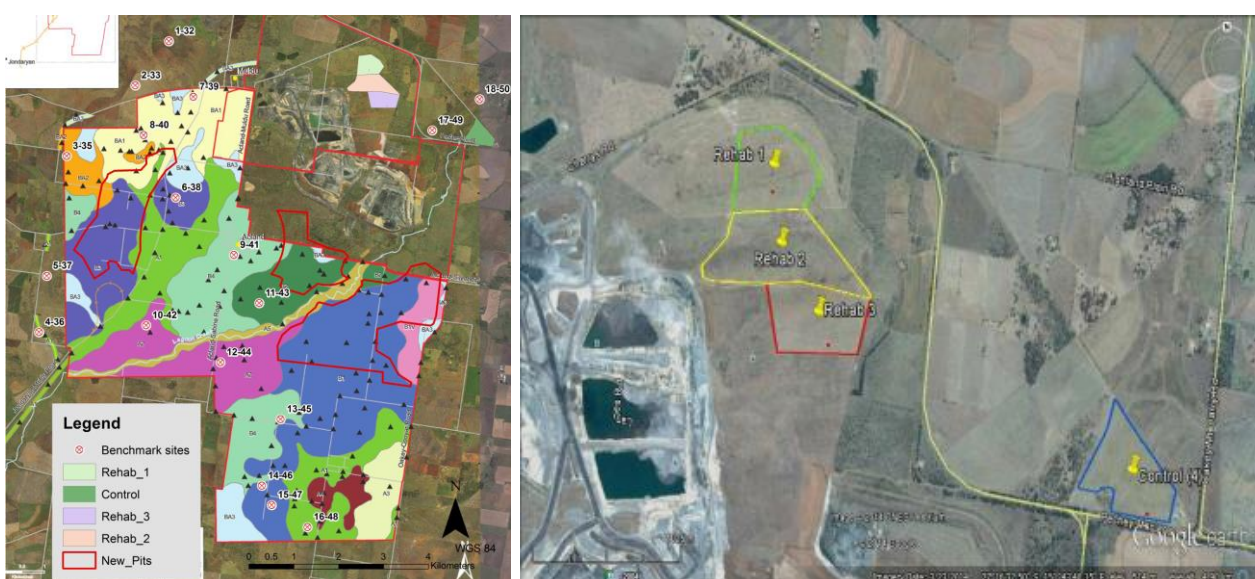
For an enterprise to be considered viable it must be shown to:

- Achieve commercial livestock performance similar to unmined land in the district,
- Provide a positive economic return, adding value to the business, measured by gross margin

### Selection of trial sites and benchmarks areas

Four sites are being monitored during the Cattle Grazing Trials Stage 2, including three mined sites rehabilitated in 2007, 2010 and 2012; respectively Rehab sites 1, 2, and 3.

The rehabilitated sites are being compared to an unmined site (Control site 4) that was sown down to improved pastures at the same time as Rehab 3, with a similar sub-tropical pasture mix, providing a direct comparison between sites.



Above: Project trial sites in relation New Acland mining operations.

Each rehabilitated site represents a different age of rehabilitation and pasture, enabling the measurement of productivity over time since rehabilitation. Pasture species sown include Rhodes grass, Gatton and Green panics, Bambatsi panic, Queensland bluegrass, and Purple pigeon grass. Legumes include Woolly pod vetch, Lucerne and some medics.

#### **Focus areas – soils**

The Control site's soil characteristics are compared with 18 benchmark sites surrounding the mine which represent the full range of land and soil classifications from the area. This has demonstrated that the Control site is representative of the area surrounding the mine.

In addition, the soils research is essential for assessing the productive capacity of soils post-mining when compared with benchmark sites.

Soil pit analyses were undertaken to characterise the soil profile and classify the soil type at 18 benchmark sites, the experimental control (3 pits) and rehabilitation sites (9 pits in total).

Soil chemical properties important for pasture production and sustainability were measured at the trial sites and Control site, and a further 18 unmined grazing sites throughout the mining lease were monitored.

Changes in soil moisture in response to rain in a mined and unmined soil profile were measured using sensors installed at multiple depths to one metre.

#### **Focus areas – pasture**

The pasture component of the Acland Cattle Grazing Trials is conducted by EcoRich Grazing and designed to measure the pasture quality and quantity in all sites.

Ten metre by ten metre areas were fenced to exclude grazing stock so pasture primary production and quality could be determined. Grazing exclosures were located in areas considered representative of each paddock.

These exclosures are used on all sites to enable pasture to grow in the absence of grazing each year of the trial. This enables measurement of dry matter yield as a key indicator of pasture production.

In addition green leaf samples are taken several times per year to measure nitrogen percentage, digestibility, metabolisable energy and protein content as an indicator of pasture quality and potential diet quality of grazing stock.

Stocking rates are determined by balancing the feed available (dry matter yield), with stock numbers for each grazing period. Pasture composition, or the dominant pasture species present, their density, the amount of green in pasture for grazing stock and the amount of organic ground cover are also determined.

#### **Focus areas – livestock**

Livestock production is measured by average daily weight gain (ADG) and total beef production per hectare while grazing each site within season (Spring, Summer, Autumn, Winter).

Stocking rates are determined by calculating the number of head





required to consume 10 – 15% of available pasture per grazing event, based on pasture yield measurements.

The project adopted a specific approach to selection of cattle. An equal number of 100 per cent Angus steers and heifers were used for the grazing trials. Cattle were selected on the basis that all cattle were of the same breed; were of a similar age and were sourced from one or two vendors.

The inclusion of the same age category steers (castrated male) and heifers (young female) has removed variation associated with age and included sex as an explanatory variable in the analysis.

This enables comparison of performance data between years and within seasons. Such a comparison is important in highlighting the variability in performance based on seasonal conditions.

Trial cattle were chosen based on mid-range weights and structural soundness, with lightest and heaviest animals being excluded. Prior to and during the trial all cattle received the same treatment protocols, with the exception of animals affected by infectious bovine kerato-conjunctivitis (pink eye), which were treated individually where required.

Animal health treatments are limited to vaccination for clostridial disease and bovis which are normal commercial practice. Additional commercial treatments such as the use of hormonal growth promotants, trace elements and urea based additives are excluded, as is any use of chemical or organic fertiliser. Therefore, the results achieved are able to be considered without the beneficial effects of many commonly used agricultural products that enhance the performance of livestock.

Additional data is collected as cattle continue through their pathway including feedlot performance and compliance to final specifications at slaughter. Additional data is collected, analysed and included in the results. This data includes gross margin, feedlot weight gain, slaughter metrics and liver tissue testing for analysis of potential contaminants. In addition, each animal is assessed under the Meat Standards Australia (MSA) grading system for beef eating quality.

Measurements taken in the cattle grazing trials are used as indicators of productivity, sustainability, viability, food safety and eating quality.

### **Key performance indicators**

The commercially important Key Performance Indicators for beef cattle production, as identified by the project team, to be measured in the grazing trial are:

- Average Daily Weight Gain (ADG) - commonly used in the beef industry to measure the performance of individual cattle and to compare the performance of pasture sites. ADG is a measure of production per animal and is calculated by dividing the weight gained on feed by the number of grazing days.
- Beef production - measured by kilograms of liveweight produced per hectare (kgBeef/ha) and is particularly useful for calculating the annual beef production from a site. This measurement combines ADG with stocking rate to measure total production per hectare of land grazed. Trial cattle are followed beyond the trial grazing period to assess performance at backgrounding, feedlot and abattoir. The heifer portion of the year 2 group will be kept as breeding stock and measured for fertility.
- Individual Gross Margin – each animal and site in the grazing trial is assessed for commercial viability through the calculation of a gross margin figure.
- Compliance to carcase specification – The end market for trial cattle to date has been slaughter. The cattle are assessed for suitability for this market based on compliance with the grid based Abattoir

system for grading carcasses. Each individual animal is graded based on fat depth at the P8 rump site, hot standard carcass weight and dentition, which determines the price received. Each carcass is then graded for eating quality factors through the industry owned MSA grading system for assessment of eating quality. Factors measured include ultimate pH, ossification, meat colour, pH temperature decline and rib fat depth.



## Section 3: Execution

The Acland Cattle Grazing Trials project began in 2011. APC engaged livestock management solutions provider Outcross Pty Ltd to assess the commercial productivity of rehabilitated mining land.

The project comprises Stage 1 (Pilot - 2011-2013) and Stage 2 (Years 2014-2018). The Pilot trial was completed by Outcross in 2011 and 2012.

A key objective of the Stage 1 Pilot trial was to learn from hands-on experience about the required elements for a rigorous long-term study proposed for Stage 2; in effect to determine success factors as well potential threats to reliability of trial data and conclusions.

The 77 ha Stage 1 Pilot trial site was rehabilitated in 2004. The size of the mob allocated to the Control site was adjusted compared to the mob allocated to the trial site to enable comparable stocking rates to be achieved.

Comparison of cattle ADG shows that the cattle in the trial paddock performed significantly better than those in the control paddock. The trial paddock cattle gained an average of 0.67 kg per day while the control cattle only gained an average of 0.06 kg per day.

While these results appeared very favourable, they actually provided valuable insights into the potential for results to be influenced by other factors.



As a result of the Stage 1 Pilot, Outcross recommended the following measures be incorporated into the Stage 2; Design to improve comparison between sites:

- Plant at the same time
- Use the same seed mix
- Undergo the same grazing management
- Consider slashing if there is a considerable difference in herbage mass or pasture quality at the start of the growing season
- Consider the benefits of a more rigorous approach to pasture and soil sampling that permits statistical comparison
- Consider use of remote sensed data to track changes in vegetative cover over the entire paddock area
- Be able to vary the length of the trial closely to ensure that both sites have adequate available feed if the seasonal conditions deteriorate.

Additional expertise be engaged to improve the rigour of the project with respect to the following:

- Identification of pasture and weed species
- Agronomy
- Soil science
- Animal physiology.

These recommendations were adopted by APC and formed part of the tendering process for the development of Stage 2. This resulted in more rigorous protocols and consequently greater confidence in the accuracy of data and the ability to make meaningful comparisons and draw robust conclusions.

## Collaboration

Based on the learnings from Stage 1, a key element of the Stage 2 Acland Cattle Grazing Trials is the broadening of expertise and the collaboration between parties with various relevant specialities.

It was recognised that a detailed understanding of soils was of fundamental importance to the success of the Stage 2 grazing trials.

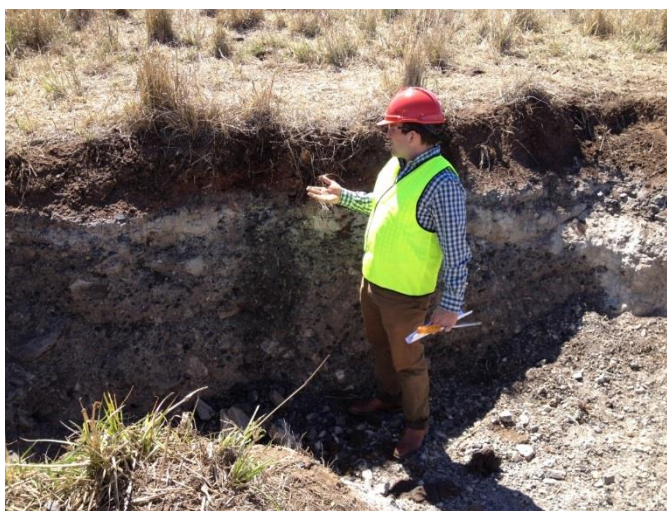
As a result Outcross sought the involvement of University of Southern Queensland; specifically the contributions of soil scientific expertise.

A natural extension of the boost to soils expertise on the project team is a similar requirement for understanding the capacity of the pasture. In this area Outcross sought support from pasture analysis experts EcoRich Grazing to provide agronomy services.

While Outcross provide livestock management services, the understanding and care of animal health was extended by involving livestock veterinarian Dr John Armstrong.

This recognition of the need for a collaborative multi-disciplinary approach has played a key role in the development of robust sampling and analysis techniques, resulting in reliable data collected over an extended period of time.

In turn, this reliable data set delivers conclusions and supports recommendations which can deliver consistent and sustainable long-term rehabilitation outcomes.



### Years 1 and 2 - Stage 2 grazing trials

The Acland Cattle Grazing Trials project has now completed the first two years of Stage 2, which involve rigorous protocols to ensure greater reliability of data.

Stage 2 will continue until 2018 and as cattle are slaughtered additional data will be collected, including gross margin, feedlot weight gain, slaughter metrics and liver tissue testing.

Grazing of the trial sites is conducted over four discrete grazing events across a 12 month period.

The year 2 (2014/15) grazing periods comprised:

- Spring Grazing – 22 days from 30th October – 21st November, 2014
- Summer Grazing – 34 days from 14th January to 17th February, 2015
- Autumn Grazing – 49 days from 14th April to 2nd June, 2015
- Winter grazing – 36 days from 14th July to 19th August, 2015.

The stock number varied between grazing periods, depending on the required stocking rates to achieve 10 per cent grazing utilisation.

Therefore 10 per cent of available feed was consumed during each grazing event. The total number of cattle per graze varied from 90 to 97 head of generally equal numbers by sex. These animals were selected from a broader group of 144 head.

All animals were weighed on a 2.5 hour dry (no water available) curfew period between the start of mustering and weighing.

Data collected on individual animals was recorded using the *BeefLink* software provided by Outcross. Weighing was completed on a full weight basis less curfew as described above.

### **Faecal Near Infrared Reflectance Spectroscopy (NIRS)**

Faecal NIRS is a process which estimates the quality of feed being consumed from faecal samples taken from animals. The use of NIRS better informs cattle performance data by showing the quality of what is actually consumed. This differs from the potential diet quality that is measured from the green leaf pasture samples collected in each site prior to grazing.

NIRS faecal samples are taken at the mid-point of each grazing period, to ensure samples are taken when feed was not limited.





## Section 4: Outcomes



The Stage 2 Acland Cattle Grazing Trials are delivering excellent, high quality data that is providing valuable information about the performance of the effectiveness of New Hope's land rehabilitation techniques.

As discussed, there are no additional inputs to the rehabilitation sites; they are simply sown with appropriate grazing pasture species, and only receive water in the form of rainfall. There are no fertilisers, feed supplements or salt licks.

Results to date show that in some cases the rehabilitated land trial sites are performing better than the Control site.

The benchmark soils work completed by the University of Southern Queensland verified the Control site as being representative of surrounding soils and within the benchmark range expected from 18 sites surrounding the mine.

Key indicators of soil fertility, stability and productivity were measured with USQ concluding that rehabilitated soils were comparable with control and benchmark soils in terms of their ability to support pastures for grazing.

The relative performance of pasture and livestock varies with seasonal conditions, time of year and age of rehabilitated pasture.

The direct pasture quality measurements and NIRS measurements were highly correlated to animal performance ranking for each site, suggesting that animal performance depends highly on diet quality.

In year 2, indicators of potential diet quality were superior for rehabilitated sites with nitrogen concentrations ranging from 42% to 258% higher and all NIRS measurements trending strongly toward the conclusion that the rehabilitated sites produced higher diet quality at the April, 2015 measurement.

The pasture production measurement showed that in 2015, quantity was definitely not limiting across sites and that rehabilitated sites were producing between 216% and 283% more dry matter than the control.

As a result, stocking rates, ADG and therefore total beef production was higher for the leading rehabilitated sites (Rehab 2, Rehab 3) when compared to the control.

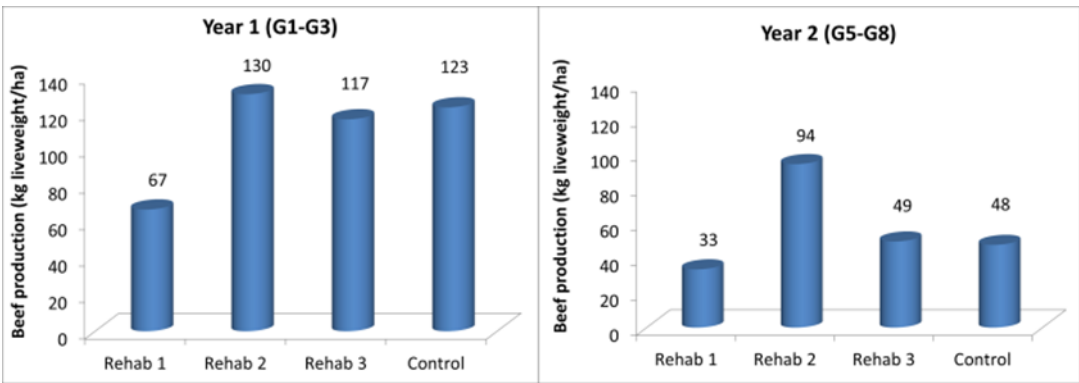
Results for ADG and total beef production indicate that cattle grazing rehabilitated pastures have performed better than those grazing unmined land when we consider that Rehab 2 has been the best performing site with the highest ADG in 3 of 4 grazing events and 90 per cent higher beef production than the Control site.

Rehab 3 is considered a direct comparison for the Control site as both sites were established in 2012 with the same preparation and pasture mix.

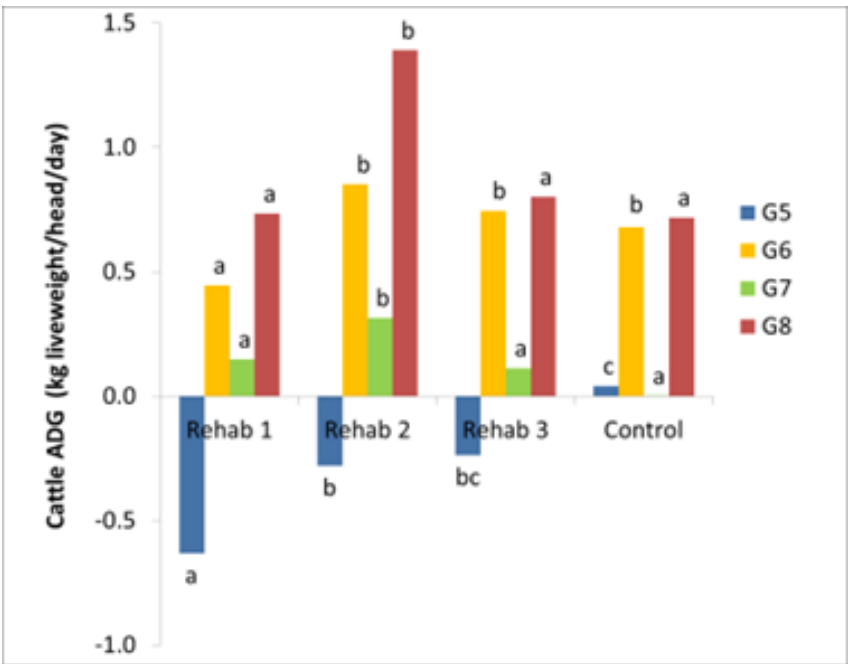
The results in year 2 indicate that Rehab 3 has performed better than the Control site, achieving a higher ADG in 3 of 4 grazing events and 4 per cent higher overall beef production for the year.

The effect of seasonality has been significant, with all sites having the highest ADG at least once during the nine grazings to date. Rehab 1 is the oldest rehab site and was generally the poorest performing in terms of ADG and total beef production.

However, Rehab 1 had the highest ADG during the Summer, 2016 grazing event. The NIRS results were consistent with the performance measurements, with better performing sites also having relatively high measurements for crude protein, digestibility, metabolisable energy and percent nitrogen.



Beef production, kg liveweight/ha for each year and site.



Average daily liveweight gain per head, kg/head/day (ADG) for grazing trial periods in year 2. Bars within a grazing period sharing the same letter are not significantly different ( $P < 0.05$ ).

## **Soil pit analysis**

Soil pit analyses involved excavating a section of the trial sites, control sites and benchmark sites. Soil pit analysis provides information about topsoil depth, interburden, structure and the ability of plants' root systems to access and exploit nutrients.

Assessments made during the Stage 2 reporting period showed that roots were extending into the interburden at all trial sites. While the interburden is considered structureless, observations suggest that it is being utilised to satisfy plant demands to some extent.

Observations found that plant roots are exploiting channels, rock fractures and fissures in the soil profile, which is likely associated with water and nutrient movement.

This information supports changes to rehabilitation operations where the interburden surface is ripped with machinery after spreading to partly remove compaction created by the landforming process, and to provide fractures and fissures that can be utilised by plant root systems.

## **Conclusion**

New Hope's progressive rehabilitation techniques are relatively unique in the mining industry in Australia and help to significantly reduce the disturbance associated with mining operations.

Preliminary results of the Acland Cattle Grazing Trials project confirm the success of New Hope's approach to land rehabilitation.

Results show that, on average, performance from cattle grazing the two youngest rehabilitated pastures was comparable or exceeded the performance of the control (unmined) site with an average gain of up to 0.63 kg/day in year two of the trial.

Mining industry rehabilitation activities have traditionally focussed only on an environmental outcome, and not a commercial outcome as well.

Grazing trials results to date show that New Hope's rehabilitation practices can restore mined land to a condition which support previous use and therefore can support viable and sustainable cattle production well past post mining operations and into the future.

## Section 5: Performance

The Acland Cattle Grazing Trials project is delivering valuable, accurate information about the the enviromental and economic performance of rehabilitated mining lands.

Results to date show:

- Animal performance depends highly on diet quality
- Potential diet quality was superior for rehabilitated sites in 5 of 8 grazing events to date
- Rehabilitated sites produced up to 283% more dry matter
- Similar or higher daily weight gain and beef production per hectare in two rehabilitated sites.
- 90 per cent higher beef production on rehab 2 trial site compared with the control site in 2015.

While traditional approaches to rehabilitation focus on environmental outcomes, the Acland Cattle Grazing Trials project outcomes are demonstrating that land rehabilitated by New Hope at the Acland coal mine can be restored to a state where the cattle performance matches, and in some cases exceeds that of similar unmined lands in the surrounding areas.

In particular, trial results to date have shown rehabilitated lands at NAC to be entirely suited for commercially successful and sustainable cattle grazing activities post mining activity.

The Acland Cattle Grazing Trials project will continue until 2018. As cattle involved in the trial reach the stage where they are sent for processing, further and additional data will be collected, including gross margin, feedlot weight gain, slaughter metrics and liver tissue testing.

This additional information will add to the extensive data already collected through the completed Stage 1 and years one and two of Stage 2.

### **Improving rehabilitation practices**

Already the data and results are being used to improve the way in which New Hope conducts rehabilitation.

Previously the interburden (the material that fills the majority of the mined area and forms the layer below the topsoil) is compacted as a result of the process of deposition and shaping the land profile.

As a result of information provided by the trials about root zone activity, and the ability of pasture species to send roots down into fissure and cracks in the interburden, New Hope rehabilitation processes now recognise that the interburden layer below the topsoil can also play an important role in supporting plant growth post mining activity.

As a consequence, prior to the deposition of topsoil, the surface of the interburden layer is now ripped with machinery to provide the rock fractures and fissures that can be exploited by plant root systems.

The ability to support deeper root systems in turn assists pasture plant species to be more tolerant of dry conditions, and to therefor provide better pasture performance in drier times.

In addition the detailed data gathered by the trials is assisting ACP to determine optimum grazing regimes for rehabilitated grazing lands, including rotation times and rest periods.

### **Sharing information**

Methodology and results from the Acland Cattle Grazing Trials project are made available to the public and any other interested party.

This is to ensure that the overall benefits to be gained from a more detailed understanding of the environmental and economic performance of rehabilitated lands in relation to grazing activities can be shared and adopted on a wider basis across the mining industry.

In addition, ACP is a significant member of the local farming community, and as such trial methods and results are also of great interest and made available to local community members and landholder neighbours surrounding the Acland coal mine.

#### **Complementing other land management activities**

Gathering accurate data about the performance of rehabilitated mining land is one part of a broader approach to integrated landscape management undertaken by ACP on behalf of New Hope.

Areas of land managed by ACP but not suited for grazing or cropping activities, are undisturbed or have extensive co-ordinated revegetation programs which protect and improve environmental values.

As an example, the 300m buffer zone along Lagoon Creek, established as part of the revised and approved EIS for the New Acland Stage 3 extension, is being progressively planted out with locally native trees and understory plant species, including forage trees for koalas.

These improved and protected areas contribute to a mosaic of landscape uses that provide a wide range of economic and amenity benefits for the local community, as well as protecting and enhancing the biodiversity and environmental values of the regional landscape.



## Section 6: Appendices

These can be separate attachments or inserted into a final PDF.

It has to be an unlocked PDF that can have individual text sections copied.

Suggested Appendices:

- Acland Cattle Grazing Trial 2015 Annual Report 071215.pdf
- New Hope Project Annual Report 2013 - 2010141.pdf
- 150417 Media Release APC Grazing trials set new industry benchmark.pdf

## Section 7: Links to supporting information

### Videos

#### [Acland Pastoral Company](#) [3:24]

This video provides an overview of New Hope Group subsidiary Acland Pastoral Company (APC), which was established in 2006 as a commercially viable agribusiness to manage lands owned by New Hope Group associated with its New Acland mining operation. APC established the grazing trials to gather accurate data on the success of New Hope's post-mining land rehabilitation activities.

#### [New Acland Land Rehabilitation](#) [1:10]

This video features a fascinating time lapse sequence showing how New Hope's progressive land rehabilitation activities transform the exhausted open cut mining area back into agricultural land. The results of New Acland Grazing Trials show that this land is returned to as at least good condition when compared with nearby undisturbed benchmark pastures sites.

#### [New Hope Group's approach to land rehabilitation](#) [1:00]

This video provide more detail about New Hope Group's approach to land rehabilitation and it forms part of everyday mining operations.

### **New Acland Continuation Project**

These videos document New Hope's environmental protection and improvement activities, which include revegetating waterway and boundary buffer zones with carefully selected local plants species. These trees and understory shrubs create wildlife corridors linking remnant bushland along Lagoon Creek, as well as providing koala habitat and food. Plant species selection planting techniques and follow-up management are developed by ecological engineering firm Veterra.

#### [Introduction and species selection](#) [2:30]

#### [Site Preparation](#) [0:48]

#### [Tree Planting](#) [1:45]

#### [Watering](#) [00:47]

#### [Weed management](#) [3:11]

#### [Acland Township Planting](#) [1:41]