DEVELOPMENT OF BENEFICIAL USE SOLUTIONS FOR SURPLUS WATER FROM MARANDOO MINE: LESSONS LEARNED

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ABSTRACT

The Rio Tinto iron ore group[1] has developed a unique integrated surplus water management solution to enable the below water table expansion of the Marandoo iron ore mine. Dewatering surplus is managed through an integrated water management scheme that has become a key enabler for the development of Marandoo's below water table resources in an environmentally sensitive location. This solution seeks to maximise the inherent value of the water resource for positive economic, social and environmental outcomes.

The integrated water management scheme comprises:

- supply to the Marandoo mine operations and accommodation village;
- supply to Tom Price mine and town;
- a proposal to reinject into the aquifer accessed by the Southern Fortescue Borefield;
- the Hamersley Agriculture Project (HAP), consisting of an irrigated agriculture scheme using centre pivot irrigators on Rio Tinto's Hamersley Station to grow hay;
- a buffer dam to store irrigation water volumes unable to be utilised during winter; and
- environmental approval for limited discharge to a nearby creek in the event that all the surplus volumes cannot be appropriately managed under the other scheme components.

This paper provides an insight into the challenges faced through the planning, approval and operational phases of this unique beneficial use scheme, and reflects on lessons learned to inform future approaches to similar projects.

INTRODUCTION

Rio Tinto is the world's second largest iron ore producer and contributes approximately a quarter of the world's seaborne iron ore trade. Rio Tinto's most significant iron ore resource base is located in the Pilbara in Western Australia, with further operations in Canada and development projects in Guinea (west Africa) and India. Rio Tinto's Pilbara iron ore operations consist of a network of 14 mines, three shipping terminals and the largest privately owned heavy freight railway in Australia. Our annual capacity has grown to 237 million tonnes of iron ore, and we have committed to a growth strategy to achieve 360 million tonnes in 2015.

Rio Tinto's approach to managing its water resources in Western Australia is guided and informed by the Rio Tinto Iron Ore (WA) Water Strategy which recognises the need to carefully balance economic, social and environmental considerations to ensure ongoing success. Future access to ore bodies will require a focus on regional sustainability and the responsible management of water now and into the future. Our aim is to deliver more value from our business with less impact on the environment and the community.

The Marandoo mine is located approximately 45 km east of Tom Price, adjacent to Karijini National Park in the Pilbara region of Western Australia. The mine was commissioned in 1994 and produces Marra Mamba lump and fines products which are blended with other ore types at the ports to produce Rio Tinto's Pilbara Blend. In July 2010, Rio Tinto received approval from the Minister for Environment for its Marandoo Mine Phase 2 proposal, to extend the existing mine pit below the water table and extend the mine life to approximately 2030. The below water table phase of the mine has brought the management of water within this environment into focus.

Development of below water table iron ore deposits is increasing in the Pilbara as high-quality, above water table iron ore resources are depleted. Dewatering of below water table deposits can generate significant volumes of water, which is often surplus to the needs of the mine operation. Historically, management of surplus water produced by dewatering in the Pilbara has been regarded as the removal and disposal of water as a by-product, primarily through discharge to nearby water courses. However, continuous discharge has been increasingly seen by environmental regulators as inappropriate for ephemeral environments like the Pilbara, irrespective of water quality. Consequently, there is an increasing expectation that mining companies will demonstrate stewardship of water

[1] Hereafter referred to as Rio Tinto.

resources to secure environmental approvals and maintain the social licence to operate.

THE CHALLENGE

The technical challenge

The below water table component of the Marra Mamba Iron Formation at Marandoo is in hydraulic connection to a regionally extensive aquifer system, and is also overlain by up to 140m of saturated Tertiary sediments. Numerical hydrogeological modelling[2] indicates that peak dewatering volumes of approximately 100ML/day during the initial stages of dewatering, declining to 80ML/day towards the end of the mine life, are required to enable mining. Operational demand at the mine itself is estimated to range from 2.5ML/day to 7ML/day, which leaves an average volume of approximately 82ML/day over the mine life that is surplus to operational requirements. The water is of good quality, with a total dissolved solids concentration that meets the ANZECC Drinking Water Guidelines.

Under a traditional water management paradigm, surplus volumes would be discharged to a nearby creek system. However, given Marandoo's proximity to Karijini National Park, discharge of large volumes of good quality water was considered by both Rio Tinto and the regulators to be an inappropriate course of management.

Significant local demand for surplus water, or established large-scale infrastructure required to transport it to a demand centre, does not currently exist in the inland Pilbara. The isolation of many Pilbara mining operations means that the simple export of surplus water to existing demand centres (e.g. towns and ports) is often cost prohibitive, despite the escalating demand due to growth and expansion in the region. Yet the alternative is often limited to discharge of significant and unmanaged volumes to creeks for negligible social, economic or environmental benefit.

Unlike traditional demand-driven water supply schemes, below water table mining operations necessitate a supply-driven scheme, dictated by the need to dewater ahead of the mine plan. Abstraction rates are directly influenced by the rate of drawdown required to facilitate safe and effective operations in the pit.

This represents a paradigm shift for conceptual design. All components of a supply-driven scheme must be managed to eliminate constraint on the dewatering activities, whilst meeting critical demands such as mining and processing operations, and allowing built-in flexibility to accommodate variations in the dewatering rates during mine life and seasonal usage patterns.

[2] Based on the Feasibility Study mine plan and hydrogeological model.

The need for security of demand from the water user becomes as important as security of supply for standard demand driven systems. Thus, the commercial challenge exists to legally protect the mining operation if demand is interrupted; in the absence of demand the mine operations face the need for emergency discharge which may present a risk of breaching environmental licences. Concurrently, users of the surplus water will be looking to protect their operations in the event of supply interruptions at the mine (e.g. operational emergency, power failure, water quality issues etc).

The regulatory challenge

Given the limitations on continuous discharge of water to the environment due to its location, the key regulatory challenge for the Marandoo Mine Phase 2 project arose around the acceptability of the surplus water management solution. The use of some of this surplus water for irrigated agriculture emerged as one of the preferred options for beneficial use.

The use of mine dewatering surplus to grow crops is, in Western Australia, a new concept, and the initial response across regulatory and enabling agencies of government ranged from hesitation to strong support. The difference in response derived from the uniqueness of the project, its inability to neatly fit within traditional mining project development and approval portfolio responsibilities, and the initial lack of clear policy frameworks to deal with such developments.

Some state government agencies with an interest in the State's economic development welcomed the proposal as an opportunity for economic diversification and regional development in the Pilbara. Over time, this approach has focussed in on seeking to prove up concepts that may be applied more broadly across the region and recognising the need to better facilitate projects through the complex regulatory process.

Views also varied across agencies with environmental regulatory responsibilities; some saw beneficial use as an alternative to discharge as a positive step, particularly given that water is in high demand in other parts of the State and discharge to the environment could be percieved as wasteful. Others took a more cautionary approach, focussing on potential weed and nutrient management issues, and the acceptability of certain crops in the Pilbara environment.

Management of such schemes under the existing legislative framework was also a source of uncertainty. The main legislative instrument for water resources management, the *Rights in Water and Irrigation Act 1914* (WA), is almost 100 years old and was developed primarily to regulate water resources for the purposes of irrigation.

Water management from below water table mining was never envisaged under this Act. The project also raised some general questions as to whether the use of surplus water for beneficial purposes was possible under the *Mining Act 1978* (WA) and other relevant mining tenure.

Neither the *Rights in Water and Irrigation Act* or the *Mining Act* contains any express limitations. However, the uniqueness of the project was sufficient to cause a level of initial uncertainty as to whether the surplus water from the mining operation could be used off-lease for beneficial use purposes. Often legislative and policy change lag behind the need for it, and it is noted that some limited recognition of the use of mine dewatering surplus for beneficial uses was provided in the Department of Water's *Pilbara water in Mining Guidelines* (2009).

Importantly in 2012, the Department of Water and the Department of Mines and Petroleum have sought to clarify how surplus water can be used through the development and planned release of a *Use of mine dewatering surplus* policy[3].

The Marandoo integrated water management scheme cuts across a number of traditional portfolio boundaries, linking mining to other regulatory portfolios such as agriculture, water services and health (eg drinking water quality). This challenged traditional approvals pathways and lead to greater complexity. Indeed, a separate Part IV *Environmental Protection Act* assessment by the Environmental Protection Authority and Ministerial approval were required for the HAP project.

Additional approvals also included those not normally undertaken by mining companies. Drinking water source protection plans, works approvals under the *Water Agencies (Powers) Act 1984* (WA) and the the need for a Pastoral Diversification Permit to run pivot irrigation on Hamersley Station are just some of the approvals required that would not normally be contemplated in a standard mine proposal.

This also lead to uncertainty around the required sequence of approvals, and in some instances required some regulators to challenge their traditional approaches to assessing approvals for mining projects.

Other drivers

A number of other drivers also supported the business case for the surplus water management system for Marandoo Mine Phase 2, namely:

- Water scarcity is a prominent issue for the Australian public, and even more so in a drying climate. Beneficial use solutions enable water to flow to its highest value use, a key principle underpinning the *Intergovernmental Agreement on a National Water Initiative (2004).*

- Rio Tinto is aware of the opportunities for economic diversification and regional development to support a stronger, more sustainable Pilbara. This is consistent with both Rio Tinto's commitment to sustainable development that is underpinned by our statement of business practice *The Way We Work* and with the *Rio Tinto Iron Ore (WA) Water Strategy*.

- The Water Strategy commits us to (amongst other things) minimise adverse impacts on the environment and to seek to inform our business decisions through identifying the true value of water. This requires us to consider the wider social, environmental and economic costs and benefits of water management options.

THE SOLUTION

Investigation of Water Management Options

Numerous water management options were considered during order of magnitude and prefeasibility phases of the project through a range of workshops involving expertise both internal and external to Rio Tinto. Options were selected for either elimination or investigation through sustainable development, risk, and options assessment tools and processes. Key criteria for the success or failure of any option included technical and financial feasibility, acceptability to stakeholders, regulator approvability, and potential triple bottom line benefits, including benefits to other Rio Tinto businesses and assets.

It was identified early in the project that there was potential to meet the water demands of Tom Price town and Rio Tinto's Tom Price mine operations, utilising the existing supply pipeline that runs between Tom Price and the Southern Fortescue Borefield. The Southern Fortescue Borefield is located in the east of Hamersley Station near the boundary with Karijini National Park and has supplied Tom Price at a rate of up to 18ML/day for over 40 years. It has consequently been drawndown by up to 40m from the original water levels. As an environmental benefit, opportunity also exists to replenish this water resource by reinjection back into the aquifer accessed by the existing borefield and utilising some of the existing borefield infrastructure.

Supply to the Marandoo mine operations, Tom Price town and mine, and reinjection to the Southern Fortescue aquifer would utilise approximately 30% of the dewatering volume produced by the development of Marandoo Mine Phase 2. However, additional management

[3] At the time of writing, it is noted that this policy is yet to be released.

solutions were still required that would utilise the majority of the remaining surplus volume and provide greater flexibility in water volume management to accommodate potential fluctuations in supply.

Some of the more creative solutions proposed included ground freezing to limit water inflow, enhanced evaporation using misting fans, recreational water parks, breweries, aquaculture, water-bottling and solar-thermal powerstations. Such options were deemed to be either prohibitively capital-intensive, unapprovable, or simply didn't use enough water on an ongoing basis.

The options analysis quickly led us to irrigated agriculture. Rio Tinto leases six pastoral stations in the Pilbara, five of which are directly operated by Rio Tinto. The Marandoo mine is located approximately 2km from the eastern boundary of Rio Tinto's Hamersley Station, with a range of soil-landscape systems present that analysis indicated could support irrigated agriculture.

Consequently, the Hamersley Agriculture Project (HAP) was proposed, comprising an irrigated agriculture solution at a scale sufficient to accommodate the majority of the remaining surplus volume, taking the following into consideration:

- Appropriate selection of crop types is critical to the success of the irrigated agriculture system for the purposes of water management. As the irrigation system is primarily a water management system to enable mining, it is imperative that the crop has a high water uptake yet is sufficiently flexible to be able to cope with changes in irrigation regimes based on dewatering volumes.

- There must be a market for the crop. For example, development of a market garden for local food production would rapidly flood West Australian fresh fruit and vegetable markets, and significantly undermine our social licence to operate the irrigation scheme. Priority was placed on working with a crop for which there is a large scale local demand; in this case hay.

- The crop must be approvable within the unique nature of the Pilbara environment. The pastoral lease is located adjacent to Karijini National Park and there was concern expressed by environmental regulators over appropriate weed and nutrient management at the irrigation scheme.

The suitability of preferred grass species (Rhodes Grass, or *Chloris gayana)* was determined through an irrigation trial at the Wooramel agriculture project, located approximately 100km south of Carnarvon. The trial was co-funded by Rio Tinto and the Department of Food and Agriculture WA, and was managed by the agronomy and fertigation consulting team utilised for development of the HAP scheme. The focus of the trial was to establish the agricultural management systems, namely: nutrient management, balances, monitoring and audits; cropping regimes and crop quality; and telemetry control systems. The performance of Rhodes Grass on irrigation pivots at Kilto Station in the Kimberley region of Western Australia was also observed, indicating a low weed risk for Rhodes Grass by the lack of self-propagation off-pivot or outside of irrigation areas.

Integrated solution and scheme components

The Marandoo Mine Phase 2 project developed an integrated surplus water management scheme comprising delivery of surplus water to the following components:

- Up to 7ML/day supplied to the Marandoo mine operations and accommodation village;

- Up to 18ML/day supplied to Tom Price mine and town via a t-junction installed into the existing Southern Fortescue Borefield to Tom Price pipeline;

- A proposal to reinject up to 12ML/day into the aquifer accessed by the Southern Fortescue Borefield[4];

- The Hamersley Agriculture Project (HAP), consisting of an irrigated agriculture scheme using centre pivot irrigators on Rio Tinto's Hamersley Station to grow hay. The HAP scheme covers 850Ha and can accommodate surplus water from the Marandoo Phase 2 operations of 40ML/day during winter months and up to 120ML/day[5] during summer to produce up to 30,000 tonnes per year of hay from Rhodes Grass (*Chloris gayana*);

- A 3GL buffer dam to store volumes unable to be irrigated during winter due to lower evapotranspiration rates – to be used for irrigation during the summer months when evapotranspiration rates are approximately three-times higher; and

- The environmental approval includes a licence to discharge to a nearby creek, in the event that all the surplus volumes cannot be

[4] At the time or writing, the reinjection system is yet to be installed, and the final reinjection rate and operating philosophy for the reinjection system is currently being investigated. It is considered that reinjection of approximately 60% of the current abstraction rate of 14 ML/day is achievable over the long term (an average of 8 ML/day, or 10-12 ML/day for 8 months followed by 4 months of resting).

[5] Due to higher evapotranspiration rates during the summer months, the capacity of the irrigation scheme is greater than the volume of water available for irrigation.

appropriately managed under the other scheme components.

The discharge footprint is limited by a condition on the licence to a 20km surface expression in the creek bed. This limits the volume of water that can be discharged at any one time, based on the hydrology of the creek system. Rio Tinto has developed a monitoring program to ensure this condition is met in the event of surplus water discharge. However, incorporating the buffer dam into the HAP project almost eliminates the need for creek discharge under normal operating conditions.

The operating philosophy for the integrated water management system seeks to treat the dewatering volumes in a similar way to traditional energy demand; Tom Price town and mine demand acts as a "base load", while the HAP enables the flexibility to respond to peaks and troughs in supply volumes inherent in life-of-mine dewatering profiles by adjusting the number of irrigation pivots and managing seasonal usage patterns across irrigated areas.

Engagement with regulators and other government agencies

Concurrent to our efforts to secure the necessary approvals for the project, Rio Tinto also engaged proactively with relevant regulators and government agencies recognising the immediate and future need for greater clarity in some regulatory arrangements. We also sought to engage early with those agencies not normally associated with water approvals for mining projects, who had identified the availability of surplus water as a potential opportunity for regional development and economic diversification projects. This engagement strategy was consistent with our Water Strategy which ranks engagement as one of its key elements.

<u>BENEFITS</u>

The integrated surplus water management scheme is first and foremost an enabler of below water table mining at the Marandoo mine, by finding a beneficial use for surplus water and avoiding discharge to the environment. The multiple beneficial uses to which the surplus water is then put seek to maximise the value of the water resource, generating benefits across the triple bottom line in the following ways:

- Replacement of supply to Tom Price town and mine with good quality water from dewatering activities enables abstraction from the Southern Fortescue Borefield to cease.

- In addition to natural recovery at the Southern Fortescue Borefield, reinjection enables the aquifer to be artificially replenished, replacing what has been depleted through 40 years of constant use;

- The HAP scheme helps increase regional fodder production, supporting our pastoral operations as well as other pastoral properties in the region through a more sustainable provision for drought proofing their operations. It also demonstrates the potential for economic diversity and regional development in a region that is heavily reliant on mining.

Rio Tinto's pastoral stations have historically sourced hay from the south of Western Australia. Transport costs are often greater than the cost of the hay itself and the majority of pastoral operations in the Pilbara (Rio Tinto and non-Rio Tinto) significantly limit the import of hay simply because costs are prohibitive. A portion of the hay generated by the HAP scheme can be used on Rio Tinto's own stations without the weed management challenges associated with importing hay as uncontrolled grasses cut from the south of Western Australia.

Hay is one of the quickest options to reach full take-up of water, allows for considerable flexibility in management of dewatering volumes in accordance with the mine plan, as well as provides the earliest cash-flow returns to the pastoral operations.

Irrigated agriculture integrated with Rio Tinto's Pilbara mining operations also presents the following benefits:

- Increases the viability of Rio Tinto's pastoral stations, which in-turn support tenure and land access for future mining projects.

- Avoids the need to import feed from other regions, reducing the costs and environmental impacts of long haul transport of fodder, including a reduction of greenhouse gas emissions from this transport.

- Reduces grazing pressure on sensitive rangelands areas, improving the biodiversity and overall health of these areas without impacting cattle production on pastoral properties. The availability of higher quality fodder also results in a better quality beast.

- Maximises the pastoral production required to maintain a pastoral lease, maintains a scale sufficient to support a viable pastoral industry in the region.

- Increases the ability to drought-proof pastoral operations in the Pilbara and increase their financial viability by suppling hay and irrigation water to stations.

- Provides potential commercial opportunities for traditional owners through provision of contracting services, transport, local employment and training. This also assists in diversifying the economic and social base of the region by providing non-mining employment opportunities and adding social diversity to regional towns.

LESSONS LEARNED

The integrated surplus water management scheme for the Marandoo Mine Phase 2 operations is the first of its kind in the Pilbara Region, where dewatering volumes from below water table mining are beneficially used to supply mine operations, town demand, large scale irrigated agriculture, and provide potential for promoting aquifer recovery through reinjection. The integration of these uses within a single supply driven system is unique and provides insights into improved water management for future below water table mining operations in the Pilbara.

Awareness of water-related business risk and opportunity

Integrating beneficial uses of surplus water with management of mine operations requires increased awareness of water-related business risks, opportunities and priorities, and preparedness on the part of senior management to consider a broad range of options available to facilitate project development.

Whilst Rio Tinto has owned and operated pastoral leases as strategic tenure for more than 20 years in the Pilbara Region, the Marandoo Mine Phase 2 development is the first project to propose a direct integration with pastoral operations, with hay production an agricultural bi-product of the mining operation.

The proposed activities that deviate from our core business of mining iron ore were the focus of some initial internal caution. However, the business case for development of a large scale beneficial water use scheme was strong in the absence of other feasible and approvable surplus water management options. Successful development of the HAP scheme underpins the dewatering and development of the Marandoo Mine Phase 2 project and once the feasibility of the integrated surplus water scheme was fully considered, the proposal was given the full support of senior management.

Strategic water management as a core function

Resources dedicated to a focus on strategic water issues enable innovative, forward-looking solutions to be developed that may not always be possible when distracted by immediate operational priorities.

Rio Tinto employs a dedicated Water Strategy team to ensure ongoing identification and integration of strategic water management risk and opportunity into the business planning process. It also develops and recommends the business case for strategic water management at a project, sub-regional and regional level, and integrates the water strategy drivers into Rio Tinto's Pilbara expansion projects at the grass roots. This enables water related risks (including social and environmental risks) to the business plan to be strategically managed, and water related opportunities to be more readily identified and investigated.

Going forward, a high level governance structure has been supported and approved by the business. It includes senior management from across the business and seeks to focus on water strategy implementation. The governance structure will drive strategy implementation, more clearly define accountabilities, enhance integrated decision making and drive behavioural change in our water management across the business.

Organisational and operating model - integrated accountabilities

Water must be integrated into the day to day management and planning of the operation. It is critical that the management structure incorporates and communicates clear accountabilities to address all risks.

Historically, Rio Tinto's Pilbara operations comprise a number of divisions that manage and operate a defined set of assets. Each division has clear accountabilities, battery limits, and financial structures. In the case of the Marandoo mine, Pilbara Mines (operations) operate the mine, Pilbara Services and Integrated Planning (utilities) manage the water pipeline and power infrastructure, and Organisational Resources (pastoral) manage the pastoral stations. However, in the case of an integrated water management scheme for Marandoo Mine Phase 2, these divisions are required to function in a fully integrated manner. While each division has its clearly defined remit, there must be end-to-end communication and accountability for issues that impact the whole system.

A working example used in operational readiness planning of how issues might manifest and be resolved was the possible circumstance where a tanker truck that refuels the generators that power the pivot irrigators breaks down. Under a traditional operating scenario, where the mine is not linked to the pastoral division, it would not be the mine's immediate responsibility to assist the pastoral operation with a mechanic and a workshop to fix the truck. However, as the pastoral operation is now integral to the dewatering success of the mine operation, it is not only in their best interests to fix the truck, but it is also a necessary extension of the mine operations to ensure that water management via irrigation continues unimpeded, all the while keeping the utilities division informed of any interim changes to water management volumes and priorities.

In the same way the HAP scheme must also operate with the philosophy that it is, in essence, a mine surplus water management system. The same levels of auditable reliability and safety are required as for any other component of the mining operation. The irrigation equipment, pumps, pipes, power supplies, controllers and communication systems all need to be designed and operated to mine specfications to ensure end-to-end integrity across the water management system, from the dewatering bores right through to the sprinklers on the pivots.

For Rio Tinto, the integration of water utilities functions was less of a challenge. Rio Tinto is also an established licensed water service provider under the *Water Services Licensing Act 1995* (WA), providing water and wastewater services to the towns of Dampier, Tom Price and Paraburdoo. From this position, the provision of drinking water to Tom Price town with surplus water generated from dewatering at Marandoo mine provided no significant organisational challenges, as our Utilities Division is well resourced and experienced at managing obligations under our water services licence.

Internal Control – the benefits of controlling supply and demand

Designing and delivering a project where all of the water use components (demand centres) are kept in-house optimises the ability to react and respond to changes in water supply volumes.

Retaining each component of the Marandoo integrated surplus water management scheme within assets owned and operated by Rio Tinto allowed the concept to be progressed relatively quickly. The constraints of third-party schedule alignment and security of supply issues, and the contractual complexities that this might bring, did not need to be considered. Rio Tinto is able to provide the mining operation with an in-house security of demand by controlling the scheduling and the area under irrigation to ensure the irrigation scheme is responsive to water supply rather than maximising crop yield. This is contrary to the operation of a typical agricultural scheme where irrigation is scheduled to optimise moisture delivered to the root zone.

Developments that contemplate collaboration with third party users of surplus mine dewater, whether for agricultural or other uses, need to consider any security of supply issues associated with a supply driven dewatering system. The development of operating models should be based on water users as surplus water managers. Commercial arrangements may need to recognise and address the need to be flexible and responsive to supply changes.

Proactive engagement

Early proactive engagement on innovative water projects enables a better understanding in government and the wider community of opportunities and limitations facing the proponent, and can inform positive policy change.

The Marandoo Mine Phase 2 project is not the first below water table development to be undertaken by Rio Tinto. However, it is the first example in the iron ore group where creation of a demand for beneficial use of surplus water has been proactively pursued as a critical element of the project development. The development of Marandoo Mine Phase 2 was a key trigger in recognising the growing importance of below water table developments in our own operations, and as an emerging trend for the mining industry in the region.

The need to develop the integrated surplus water management scheme brought into focus a need for proactive regulator and broader government engagement on the challenges of developing beneficial use solutions.

The objectives of this engagement have been to:

- Provide government with a better understanding of the issues faced by proponents, including: the opportunities and limitations of developing beneficial use schemes that are driven by below water table mining; and the technical and approvals challenges. This includes an awareness of the capacity of existing regulatory arrangements to appropriately and proportionately manage such project approvals.

- Encourage regulators and agencies to adopt a joined-up approach to working with proponents. This seeks to recognise the cross-cutting nature of these projects and the multiplicity of interests involved.

In this regard, Rio Tinto welcomes the impending release of the whole-of-government *Use of mine dewatering surplus policy*. It is understood to address all of the above issues and to indicate an appreciation of the complexities and the limitations of supply driven beneficial use schemes associated with below water table mining.

We also welcome the recent clarification from both the Department of Mines and Petroleum and the Department of Water, based on State Solicitors Office advice, that "... the *Mining Act* itself does not inhibit the uses for the surplus water derived from dewatering". This includes uses such as providing water to a third party for use under a water services licence or on a pastoral lease, provided they have the appropriate licences or agreements under the appropriate legislation (Department of Water 2012).

Engagement should not be limited to government agencies and regulators. Wider stakeholder engagement with non-government stakeholders on these solutions is also of great importance. Through development of the integrated scheme, and the HAP project, Rio Tinto endeavoured to:

- Recognise the cultural significance of the groundwater and surface water resources held by the traditional owners of the country on which Rio Tinto's projects are located.

- Work with traditional owner groups to develop ancillary beneficial use opportunties by providing access to surplus water and land. Opportunities for water-bottling using groundwater resources in and around Hamersley Station and Rio Tinto exploration leases were the focus of significant investigation activities during 2011[6].

- Engage early with traditional owners and third party organisations to explore business opportunities for using a portion of the pivot system for generation of native seed.

One of our key learnings from the Marandoo integrated surplus water management scheme and other similar projects is the need for long-lead times to work with Traditional Owners to identify and investigate business opportunities arising from future surplus water operations.

CONCLUSION

Rio Tinto's development of the integrated surplus water management scheme to enable the below water table expansion of the Marandoo iron ore mine has highlighted a number of key lessons for future beneficial use schemes:

- Integrating beneficial uses of surplus water with mine operations requires increased awareness of water-related business risks, opportunities and priorities, and preparedness to consider a broad range of options available to facilitate project development.

- Resources dedicated to strategic water issues facilitate the development of innovative, forward-looking solutions.

- Water must be integrated into the day to day management and planning of the operation, with clear accountabilities to address all risks.

- Retaining control of demand centres optimises the ability to react and respond to changes in water supply volumes.

- Early proactive engagement on innovative water projects enables a better understanding in government and the wider community of opportunities and limitations facing the proponent, and can inform positive policy change.

Through strategic water management, Rio Tinto is committed to identify, develop and communicate a clear pathway for the long-term stewardship of the water resources it manages that facilitates development of future deposits. It gives full consideration to the interrelationships between the social, environmental and economic values of water.

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[6] In this instance, an appropriate water-bottling source could not identified on tenure held by Rio Tinto that would suit the specific water quality profile required for a bottled water product. The traditional owner group subsequently secured a bottling source with another mining company on nearby land.