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mining and corporate social responsibility: scotbar proprietary limited

David T. A. Wesley, Belinda Wade, and Sheila Puffer wrote this case solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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Allan Payne, the chief executive officer (CEO) of Scotbar Proprietary Limited (Scotbar) in Queensland, Australia, was becoming increasingly disillusioned by global mining practices. In the 10 years since it had acquired the Waterfall Quarry in Helidon, approximately 96 kilometres (60 miles) west of Brisbane, his company had come close to revolutionizing sandstone mining. However, he also knew that it would be more difficult in the short term to earn a financial return through sustainable mining. “We could just go after one product and it would be happy days,” he exclaimed.

Despite the challenges, Scotbar sought to achieve nearly 100 per cent resource utilization, a goal that was far more expensive and time consuming than those goals of traditional mining. Although the company planned to combine efficiencies, innovation, and investment to ultimately reach its objective, it did nothing to protect its innovations from competitors. In Payne’s mind, that was a good thing. In fact, he hopedthat competitors would copy Scotbar’s products and methods. Profit and loss were only part of the equation, and in a world of rapid resource depletion, global demand would far outpace production in the foreseeable future. Payne wanted mining companies to reduce their environmental impact globally, so he welcomed the idea of other mining companies replicating Scotbar’s methods. Whether they would actually do so was another question. Without strict regulations, Payne doubted whether mining companies would embrace costly new methods, even when they could potentially return a profit over the long term. “For me personally,” he said, “for my kids and my grandkids, what we do now with the planet matters. Unfortunately, unless there is a trend, you’re left dragging people kicking and screaming to achieve something that should be a common practice.”

Background

Alan Payne and Terry Smith founded Scotbar with a mission to redefine the way mining was practiced. Most sandstone quarries at the time specialized in singular product supply: some focused on exporting high-quality stone; others concentrated on supplying boulders for landscaping. When Payne toured sandstone quarries, he was struck by the amount of waste he saw. Most mines were utilizing 20 per cent or less of the extracted sandstone. As he observed,

The only thing consistent about sandstone is the fact that it is inconsistent. Fractures, faults, and soft material lead to mountains of material not suitable for export or material not even suitable in the local domestic market. In an effort to make a quick dollar, owners would identify a good seam, then pillage until it ran out, often creating as much as 90 per cent waste material. This then became an ongoing costly issue as they continued to try and seek out the high value material, having to shift, re-shift, and shift again.

In fact, it was the norm in all forms of mining that only a small portion of extracted minerals was suitable for production and sale (see Exhibit 1). Payne noted his concerns with this traditional practice:

We provided some services to a large local coal mine, and we realized that they were mining products that had good commercial value. For example, it is not uncommon for coal seams to be embedded into basalt and other hard rock materials that, if processed, could be used in other industries. What they would do is move the earth and other minerals, take their coal out and then go back and bury the non-targeted material. Then there’s another company down the road that gets a permit to open a totally new operation targeting the very material that the first company had just re-buried.

He wondered if that waste could be turned instead into useful products or utilized in some way: “I thought it would be pretty simple. There would be around five products that would pretty much utilize everything. So, the goal was to get as close to 100 per cent recovery as possible. How little did I realize just how difficult that would turn out to be!”

The quarry Scotbar acquired in 2007 was one of 4,200 quarries in Queensland, 200 of which specialized in sandstone. It also epitomized everything that was wrong with mining. While it had previously been known as the Waterfall Mine, the waterfalls here were long gone, as were many of the indigenous plants and animals. In fact, the mine was in such a state of disrepair that it had fallen to fifth tier status, the lowest level possible. Well-run mines were classified in tier one or two. At tier three, the mine owners had to appear before the district manager to explain why the mine was not meeting government standards. “Fourth tier, you’re in front of the Commissioner of Mines and the Inspector of Mines,” one regulator explained. “If you’re a five tier, you’re in loads of trouble. You’re sitting in court.”

When Payne acquired the mine, it was under state receivership. He immediately set out to restore its tier-one status by adhering to strict regulatory standards, restoring native plant and animal species, and eliminating nearly all waste. The company spent considerable effort reclaiming not only the sites it used, but also those of the previous owners. In one part of the quarry, the company spent AU$2 million[[1]](#footnote-1) reclaiming abandoned mines, filling holes, removing debris, and replanting native trees and shrubs. Another project involved building a water bypass to prevent rainwater from entering the mine, which could result in contaminated runoff.

Payne attributed much of his concern for efficient and environmentally responsible resource utilization to his upbringing on a family farm. “Good farmers leave trees standing for the cattle,” he recalled. “Other guys would flatten everything. Dad used to take old machinery and build new stuff, so as not to be wasteful.” However, after hiring people capable of assessing the quarry’s capacity and potential output, Payne discovered the hard reality that had prevented other companies from achieving high resource utilization. In fact, nowhere in the world was resource utilization anywhere near 100 per cent. “We started out with all the best intentions, but we were inexperienced,” he admitted. “The more we learned about the resource, the more we realized that we knew very little about it.” The unanticipated challenges of managing multiple products meant that the company’s extraction and production costs would be much higher than initially projected.

Disaster Strikes

Just as the company was beginning to get its footing, disaster struck. In 2011, a flash flood devastated the area, including nearby Toowoomba, Australia’s second-largest inland city, which had a population of approximately 115,000. Payne directed his employees to use company equipment to help rescue nearly 80 flood victims, for which he was later hailed as a local hero.[[2]](#footnote-2) In the aftermath of the flood, the government of Queensland asked to use Scotbar’s quarry as a temporary toxic waste dump. Payne believed it was his civic duty to help and agreed to the disposal of 100,000 tons of contaminated waste, under the assumption that the government would assist in remediation once the emergency was over. He was wrong. Instead, Scotbar was forced to invest in machinery upgrades, including bullet proof glass on its heavy earth-moving machinery, due to the risks posed by unexploded ordinance in the waste. Different government agencies argued among themselves over conflicting regulations for three years, further delaying remediation. “It was just stupid,” Payne exclaimed. “There was no coordination in the system for something like that. And there were no guidelines as to how to deal with a situation like this. We were still under a state of emergency, and these guys couldn’t get it [right].”

For more than three years, Scotbar was essentially shut down, as the Environmental Protection Authority (EPA), the mines department, and various other local, state, and federal government departments worked out an agreement. Although the government eventually reimbursed Scotbar $12 million for direct cleanup and remediation expenses, the company received no compensation for lost revenues. “We didn’t claim any, and accepted no compensation for three or four years, which was probably stupid on our part,” Payne admitted. “That was our bit for the community as far as compensation.”

Despite the hardship, the process of working out a remediation agreement helped Scotbar establish strong relationships with officials within multiple government departments, and these proved helpful as the company sought to introduce new products and establish export markets. These relationships also helped the company develop new ways to ensure regulatory compliance. For instance, instead of preparing individual reports, the company established a live document of its operations that covered the regulatory reporting requirements for multiple agencies. By 2017, the document had grown to nearly 400 pages. According to one regulator, the relationship produced a “free flow of information”: “If he’s not sure on something he can just give us a yell or send us an email and I have access to standards and everything else. If he needs anything then that’s the rapport; I can assist him to have the best possible outcome.”

Sand from Sandstone

When Scotbar finally received permission to resume operations in 2014, one of its first objectives was to return to its original goal: to develop cost-effective ways to turn sandstone into sand. Not only was sandstone-derived sand more environmentally sustainable than natural sand, but it would also be essential to the company’s mission of reaching 100 per cent resource utilization. As much as 60 per cent of the sandstone would normally be discarded as unsuitable for slabs, tiles, and other traditional sandstone products. Scotbar hoped to turn this waste into viable, high-quality construction sand.

As a key ingredient in concrete and other construction and landscaping products, sand represented a large and growing market. In 2016, global demand for sand reached nearly 14 billion tons, compared to 8 billion tons in 2004.[[3]](#footnote-3) At the same time, sand was becoming increasingly scarce.

Traditionally, sand was extracted in its natural form by dredging river and sea beds. As the world’s population grew, the demand for sand created serious environmental problems, particularly the loss of aquatic habitats. Awareness of the problem grew in 2012, when French documentary director Denis Delestrac released the film *Sand Wars*. “You can’t make cement out of desert sand because the grains won’t stick together,” noted British novelist Simon Ings in his review of the film:

You make cement with [alluvial] sand, and that is a finite resource. We are building so many dams that our rivers barely reach the sea, and so the sand we consume in construction is no longer being replenished. In fact, sand is now in such short supply that it is being smuggled around the world. The island of Singapore spreads, meter by meter, on foundations of smuggled sand. Moroccan hotels are rising in front of beaches annihilated to make them. In the Malay Archipelago, whole islands are being dredged away to build apartments that are then kept empty for investment.[[4]](#footnote-4)

In Australia, where much of the sand was exported for projects such as the Burj Khalifa skyscraper in Dubai, the EPA had begun to impose new regulations to limit the amount of river and sea-bed dredging. Some within the industry predicted that the practice would be banned outright within 10 years. Moreover, areas that could be dredged for sand were inconsistent in quality. Material that contained a large percentage of clays, silts, and organic materials resulted in shrinkage and cracking in concrete and related construction products. Cement producers often used additives that could counteract these impurities, but doing so was not as effective as using pure sand, and it added to the cost of the end product. Finally, the availability of sand fluctuated based on uncontrollable environmental events. For instance, a flood could contaminate natural sand with silt and other impurities, making it unusable without excessive energy, water, and additional processing costs to reduce the contamination.

Given these challenges, Scotbar knew that there would be a market for its sand, if it were priced competitively. Initial trials of sand from sandstone suggested it was ideal for construction applications. Scotbar’s sandstone quarry contained some of the oldest freshwater-derived deposits in the world, with highly valued colour, strength, and mineral characteristics (see Exhibit 2). The product was not only plentiful, it was far purer and more consistent than river sand, resulting in highly reliable and consistent concrete and other end products.[[5]](#footnote-5) When broken down into single quartz crystals, it was also highly plastic and shrank less than other forms of sandstone.

Large Australian mining companies with substantial market share in diverse quarry products had spent more than a decade and millions of research dollars trying to produce high-grade sand from sandstone. Nevertheless, none had been able to produce commercially viable high-grade sand products. In its initial research, Scotbar identified several hurdles that had prevented large multinational companies from producing sand, beginning with their continued use of traditional hard-rock crushing methods. “Trying to crush the material as you would in a hard-rock quarry destroyed the shape and integrity of the crystal and reduced its capabilities,” explained Scotbar’s sales manager, Greg Lennox.

Payne believed that the barriers were more psychological than technical. “With their corporate structures and the way they cost things, it is very difficult for them to get their head around it,” he explained. Every effort to crush sandstone into sand resulted in angular aggregates that could not be used in concrete.[[6]](#footnote-6) He knew that if Scotbar could reduce sandstone down to the level of single quartz crystals, this would result in irrefutable advantages. The key was to abandon traditional crushing methods and design a completely new process. Lennox recalled:

From August 2014, there had been a dramatic change. We invested a lot of money in research and development. We knew that there was a possibility of being able to turn sandstone back into sand, but in the early stages we didn’t actually know how we would achieve this. When we researched it, there was no real evidence or developed processes to support this proposal, so we trialed many things. We now have $2.6 million worth of experiences, because from every action we took, we learned something. Every action took us to the next step, a step that we hadn’t necessarily envisaged we would follow. We had some trials that never worked, but they weren’t failures. They were, as I said, steps to the next progression. But the dedication that has come from Alan, Terry, and the rest of the crew to get us to where we are now is second to none. There is a passion there that you can’t buy.

By December 2014, Scotbar had finalized a plan for processing the sandstone, and it set about constructing a trial plant (see Exhibit 3). Once it was completed, the trial plant was able to produce sand that was 97 per cent pure quartz crystal and 3 per cent mineral. Moreover, it contained no clays, silts, or organics. Unfortunately, these raw materials cost more to prepare than the end products could be sold for. At a time when customers remained focused on price, Scotbar’s production method was 50 per cent more costly than standard sand mining. Sand prices were expected to increase over the longer term, as the resource became scarcer and governments enacted stricter environmental regulations, including some that would force sand miners to complete costly remediation projects to return mining sites to their natural state. As such, the company expected its crushing costs to reach parity with the costs of traditional sand mining within eight years.[[7]](#footnote-7)

Early market testing raised questions about the willingness of customers to embrace this new, “manufactured” sand as a substitute for natural sand. “What we didn’t envisage was how difficult it would be to get people to share our vision and think outside the box,” noted Lennox:

Customers were price-driven, right from the start, so their first question was, “What’s your price?” My answer was, “What’s your real cost not only to purchase sand and to produce concrete, but also [for] ripping up slabs due to failures, the time and cost involved with dealing with the complaint, and the cost to your brand image?” They didn’t know.

What we have isn’t just a sand replacement. We have something that was going to offer people a lot of benefits. But there was apathy because we are a little minnow company operating in a multinational world—a lot of apathy because multinationals had tried to do what we have done in 18 months and failed.

Whenever Lennox was rejected, he implored the customer to call him if their existing products failed. The first such call came in October 2015 from a manager at a company he had met several months earlier:

The guy rings up and says, “You’ve got your opportunity, we’re sending up the trucks, have you got materials?” I said, “Yes, no worries.” This multinational company had been having massive issues with cracking, with a whole lot of staining of concrete that had to be ripped up and replaced. We had the material, but we had to meet their current buying price. We made a commercial decision to get the materials there and work out the costs later. Our material instantly resolved a lot of the issues. They ended up mixing our fine sand with someone else’s coarse sand, but our fine sand had so many benefits that it was masking the bad effects of the natural sand.

After [we made] some requested material grading adjustments, they began purchasing the material that we made for them and they have continued buying it. Although the benefits of using our material were very evident on our first visit, our client could now see the potential savings in ongoing repair costs, and his clients were experiencing significant benefits—far better finish, a dramatic reduction in cracking, [and] shorter time required before the boxing could be removed.

Our customer also increased his market share due to the quality improvement. The quantities of material they purchase from us have gone astronomical, to the point where now we can’t supply their total requirement, because our prototype plant is too small. The prototype plant is restricted to 750 tons production in a 10-hour day. To meet their demand, we need to produce about 3,000 tons per day. So even if we go to double shifts, seven days a week, we still can’t do it.

Although the trial plant was unable to produce the volumes needed to reach cost parity with natural sand, the company believed that, with sufficient scale, its production costs could be further reduced. Moreover, its customers had not immediately factored in other potential cost savings further down the supply chain.

Even at current prices, its existing customer began using the Scotbar product exclusively in premium cement products and, as a result, Scotbar had plans to increase its pilot plant output by at least 40 per cent immediately. Despite the construction industry’s sensitivity to cost, the cement companies found more of their contractors demanding this new mixed-design concrete after hearing that it resulted in fewer failures and lower support costs.

In the long term, Scotbar hoped to convince other potential customers that sandstone-derived sand was superior to river sand. However, because it was a new product, there was insufficient evidence to support the claim. Scotbar concentrated on the superior qualities of the material, such as purity and consistency, and encouraged other clients to try it rather than making conjectures about longer-term reliability.

The company also began working with local universities for resilience testing and product analyses that it could use to support its claims. This was also the first step to winning regulatory approval for major construction projects. Until it had this approval, Scotbar’s sand could only be classified as a “filler” and had to be blended with regular sand during production.

The next step was to build a mega plant that could produce large volumes of sand using the techniques learned from the prototype (see Exhibit 3).[[8]](#footnote-8) Payne sent his top engineers to various countries to study other wet processing methods, with the objective of creating the best sand plant possible. Ideally, the new plant would be fully automated and self-regulating, using various sensors and monitors. This would likely further reduce costs and provide a more sustainable business model.

One of the more promising technologies was owned by CDE Global (CDE), a Northern Ireland–based supplier of wet processing equipment. Founded in 1999, CDE had grown during a wave of expansion in South Asia and the Middle East to become the largest supplier of sand-washing equipment in the world. Although CDE had begun working with Australian sand quarries in 2013, to develop glass products, it would need to work closely with Scotbar to adapt its machinery to Helidon sandstone[[9]](#footnote-9) in a manner that complied with Australian environmental legislation. Despite a projected capital expenditure of $20 million, the mega plant was expected to reduce production costs significantly through a combination of additional process improvements and economies of scale.

Sandstone Tile

Another major product innovation was Scotbar’s unique line of sandstone tiles. Although sandstone tiles had long been available for construction, they were typically not used in walls because of their weight, except in higher-end buildings that had been specially engineered to support the tiles. The added construction cost meant that sandstone tile was not commercially viable for wall construction for the middle- to lower-cost housing market.

Scotbar believed that reducing the weight by as much as 75 per cent would make its engineered sandstone tile one of the more important innovations in the building industry, reducing end-product costs by as much as 90 per cent relative to traditional sandstone building products. “Our tile still retains the sandstone characteristics, esthetics, insulation, and sound, and yet is able to be installed on structural frameworks used in standard home construction,” Lennox noted. Moreover, traditional sandstone construction had to be undertaken by specialized stone masons, whereas the tiles could be installed by any qualified building contractor.

Scotbar’s sandstone tiles were constructed from 3-millimetre stone slices that were pasted onto a tile backing for support. They were then laminated, to increase strength and prevent cracking and breakage. This process allowed Scotbar to use weaker sandstone that would crumble under normal conditions. “Around 85 per cent of the world’s surface is covered in sandstone,” observed Payne. “But most of it crumbles and cannot be used for sandstone buildings because it wouldn’t be strong enough.”[[10]](#footnote-10) This process allowed Scotbar to utilize mined products that would normally be rejected.

Engineered sandstone had other benefits. For instance, faults in the stone would normally lead to cracks and other problems that would prevent its use in construction, but laminated tiles turned these faults into features, adding visible depth and structure to the end product. The added strength also extended the lifespan of the tiles relative to traditional sandstone, which cracked, chipped, or crumbled as it aged and was exposed to the elements.

Once installed, the sandstone tiles looked like traditional sandstone. “We took sandstone from the top 3 per cent of the construction market and made it available to probably 60 per cent of the market,” explained Payne. “It’s slightly more expensive than brick veneer, but you can get a sandstone finish.” He continued:

All of your structural requirements in the house design are adequate; there are no additional costs incurred in having a frame able to carry the substantial weight of a traditional sandstone tile. It’s the same as a rendered house or a brick veneer. That also allowed us—because we laminate that material—to use block which is beautiful in color, but that couldn’t otherwise be used because of breakage.

To produce this product locally would have required a large fixed-cost investment in manufacturing. Therefore, Scotbar chose to outsource production to a tile manufacturer in China. It shipped the raw sandstone from its Helidon quarry to China, where it was processed according to the company’s strict specifications before being shipped back to Australia in finished form.

Scotbar considered patenting the tile and the manufacturing process but was not sure if it was worth the cost and effort. Even if patents were granted, Scotbar reasoned that competitors would find a way to circumvent them. “It won’t take too long for a smart engineer to work out what we have done,” observed Lennox. “Changing just one component, one part of the process, or the design, even the size, will have a competitor on the market. And the risk is always there for the Chinese to copy it, even if we did have a patent.” Nevertheless, Lennox believed the risk to be manageable through Scotbar’s established relationship with the Chinese sandstone industry and its close collaboration with major Chinese factories.

Research and Development

Research and development (R & D) was a large component of Scotbar’s strategy. “It doesn’t matter how much money comes in the door, we still spend it,” Payne asserted. Although large mining companies also dedicated funds to R & D, their size made it difficult for them to quickly bring new products to market. Payne postulated that most large mining companies spent up to 5 per cent of their revenue on research, but when viable products or production techniques were developed, it took them 3–5 years to commercialize them.

Payne believed that Scotbar, as a small mining company less weighed down by bureaucracy, could react faster to product and market developments. That advantage provided little solace, however, as Payne was frustrated by the inability of his competitors to improve their environmental practices. “The frustrating part is the big companies are able to pursue innovations and have the available surplus funds, but it’s just so slow, even when they choose to do something.”

Although Scotbar’s employees were continually suggesting new product ideas, the company had limited funds and therefore had to prioritize projects. The profit on one new product was then used to fund the development of other products. As a result, all new product research was self-funded and did not require borrowing or outside investors. One exception was university partnerships. Scotbar occasionally partnered with local universities that had access to government grants and other research funding. In such cases, outside funding was administered through the university R & D labs, which in turn provided testing and advice to Scotbar.

One of Scotbar’s newest opportunities was the development of quartz flour material that could be used in cement manufacturing. From an environmental perspective, including quartz flour could reduce the amount of pollution created during cement production. “Cement manufacture is one of the biggest carbon emitters in the world,” explained Payne. “If we can utilize our flour, it would make an actual difference.”

However, quartz flour was a low-margin product compared to other sandstone products from the quarry. To earn a profit, Scotbar would need to sell a larger volume. The challenge was to convince enough customers to change their production methods and accept that the new product was as good, if not better than, the standard.

One hint that sandstone-derived materials might provide superior, longer-term performance came from a road construction project that had been completed several years earlier. The Australian government had decided to construct a new prison and hired several companies to provide materials for the new road. Two Scotbar engineers developed a sandstone-derived non-dusting road base. “We knew we had a good product,” asserted Payne, “because when they were building a prison out here, we laid it down and they couldn’t dig it up again, as it compacted so well and remained bound together.” He continued:

Instead of some idiots in ties running around trying to do stuff that resulted in nothing, we got some guys in that knew what they were doing. Our engineers started engineering road products and developing standards in the road base. The material the team developed enabled us to do a section of the main road, and it’s the only section between Toowoomba and Dalby that hasn’t failed. So, from that we knew we had something that was worth investing in.

Until we got out engineers on board, we were just guessing that the components that we had were right, and they then refined that and developed new products. Now, using the same core material, we have been able to engineer products that, when placed correctly, could double the life expectancy of the project.

Furthermore, traditional gravel road-base material normally had to be dug up after years of use before road crews could pave asphalt over it. Scotbar’s non-dusting road base could be easily paved over, and this resulted in incredible cost savings.

Although the company was convinced that its sandstone-derived road base was superior to other road building materials, it was unable to win state approval for the product because sandstone had been used for the road base in other parts of the country, and there had been multiple road failures. Other companies “cut corners,” Payne explained:

It doesn’t fail when it’s done correctly. You have to use equipment to get it in the right shape for it to perform. We’ve got probably 25 to 30 different types of clay on this site. Not all clays will make it—some of them will go slippery as hell when they’re wet, others shrink when they’re dry. If they shrink too much, then the road cracks and falls apart and is extremely dusty and unsafe. What we required was a specific type of clay that we would blend at specific rates. It’s like putting medicine together. You’ve got prescribed amounts of a whole lot of different products. When you blend that and you put the right amount of water in and it’s laid properly, you get those benefits.

In the end, the government issued a blanket ban on the use of sandstone in road construction, a ban that Scotbar was unable to get overturned, despite several approaches. Payne believed there would be problems even if he could convince officials, because the government would then be forced to grant permits to other sandstone producers. With more than 4,000 quarries in Queensland, it would be nearly impossible to ensure that other producers would not once again cut corners.

A Model for Sustainability?

To date, Scotbar had neither received nor applied for any patents for its machinery modifications or process improvements. Yet, even without a patent, Scotbar believed that the threat posed by its major competitors was minimal. Not only was the company in a better position to exploit its new sand-crushing technology, but its source material was also better suited to the new process.

It was critical to the success of the sustainability program that products be handled only as much as was necessary to access raw materials. High-quality slabs removed from the pit went straight to the sales pad, while the remaining sandstone was loaded onto trucks and sent to the sand plant to be processed into sand and other engineered products.

In some areas, the company tried not only to restore mined areas but also to improve them. For instance, Australia had historically engaged in clear-cut logging, where entire forests were cut down and then replanted with economically viable trees rather than the local species. This left much of the country with monoculture forests. Scotbar instead planted forests around its mining sites with indigenous tree species that had been logged out of the area more than 100 years earlier.

However, as a mining company, Scotbar’s ability to mitigate environmental damage was limited, and as the company grew, so did its environmental impact. The company was already consuming vast amounts of water and hundreds of litres of diesel fuel per hour.[[11]](#footnote-11) When the mega plant was completed, fuel and water consumption was projected to increase by an order of magnitude. The contradiction was not lost on Payne, who took a realistic view of resource consumption. If the world was going to continue to consume resources at an alarming rate, the focus had to be on minimizing rather than eliminating that impact. “I’m certainly not a tree hugger,” he asserted. “I don’t mean that in a disrespectful way. Most of the people who I call tree huggers are people with a genuine concern, but no knowledge of what they’re fighting for. So, their principle is right, but they just don’t get it.”

Payne acknowledged that reaching his goal of 100 per cent resource utilization would require producing some materials that would be less profitable. However, he believed that Scotbar’s strategy was about more than profit:

We don’t go and lie on the beach in the Bahamas. We’re married to our little dream and commitment of making a difference in doing what we’re doing. . . .

It’s not for money. Forget the fact that it’s hard; everything we do is ultimately for people. We should be doing things for our society, for people, for our environment. Yes, making money is a part of it, but that doesn’t sit above people, because people are what make up the world. [You could say], “Here is a $100 billion bonus, but there’s no-one else on the earth, [so] it isn’t good for you.” So, I just don’t get that, [when] they lose sight of humanity. It is all about a balance.

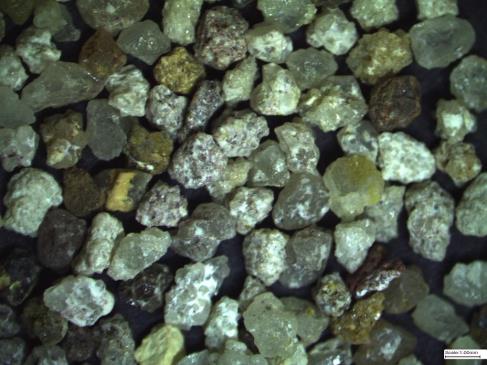
The authors gratefully acknowledge the generous support of the UQ UConn CIBER Sustainable Business Program in the development of this case.

**Exhibit 1: Waste Stockpile from previous mining operations at the Waterfall Mine**

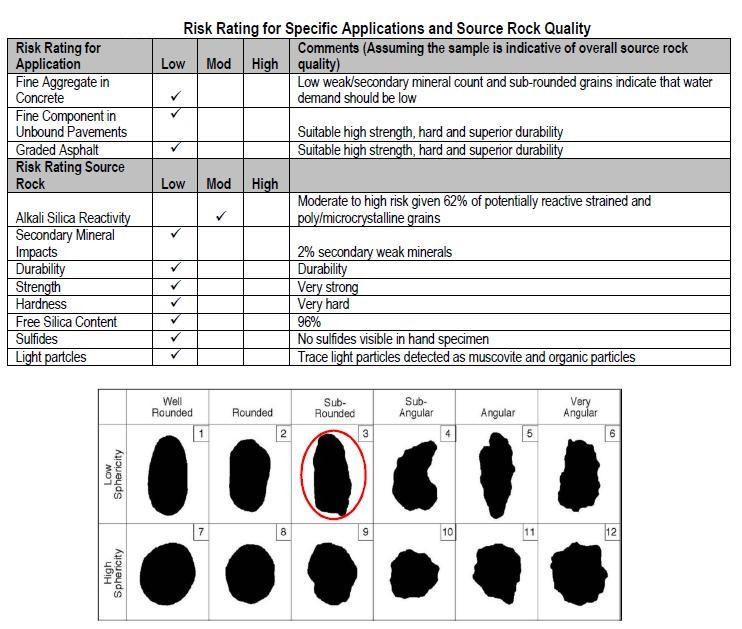
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Source: Company files.

**Exhibit 2: Comparison of colour, strength, mineral and other characteristics of Different Sand Forms**



**Conventional Alluvial Sand New-Process Sandstone Sand**



Source: Company files.

**Exhibit 3: Sand Plant Prototypes and Concept**

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| C:\Users\greg\AppData\Local\Microsoft\Windows\INetCache\Content.Word\IMG_1488.jpg | C:\Users\greg\AppData\Local\Microsoft\Windows\INetCache\Content.Word\IMG_1464.jpg |
| **Sandstone Sand-Wash Pilot Plant** | **Prototype Plant Designed by Scotbar** |
| C:\Users\greg\AppData\Local\Microsoft\Windows\INetCache\Content.Word\IMG_1463.jpg |  |
| **Prototype Plant Designed by Scotbar** | **CDE Global: Concept for Mega Plant Dewatering Plant** |

Source: Company files.

1. All financial data is in Australian dollars unless otherwise noted; AU$1.00 = US$0.76 as of April 24, 2018. [↑](#footnote-ref-1)
2. “Quarry Owner Recognised as Local Hero,” Quarry Magazine, February 1, 2012, accessed June 11, 2017, www.quarrymagazine.com/Article.aspx?id=2284&h=Quarry-owner-recognised-as-a-hero. [↑](#footnote-ref-2)
3. “An Improbable Global Shortage: Sand,” *The Economist*, March 30, 2017, accessed May 30, 2017, https://www.economist.com/news/finance-and-economics/21719797-thanks-booming-construction-activity-asia-sand-high-demand. [↑](#footnote-ref-3)
4. Simon Ings, “The Story of Climate Change Gets Star Treatment,” *New Scientist*, April 23, 2014, accessed May 17, 2017, https://www.newscientist.com/article/mg22229660-800-the-story-of-climate-change-gets-star-treatment/. [↑](#footnote-ref-4)
5. Finer particles (smaller than 75 microns) that were washed out of the sand to achieve compliance with the required grading for concrete manufacture were high in plastic properties, with very low shrinkage. Scotbar believed that, with continued research and development and when further processed, this fine material, could potentially be used in applications from beauty products to liner material for waste containment structures. [↑](#footnote-ref-5)
6. “Sharply angular materials (like manufactured sand or stone dust) are more prone to compaction than sub-angular particles. Sub-angular particles . . . will be relatively stable because they can nest together without rolling, and will resist compaction as the rounded edges have voids between them. Particles need some angularity to offer resistance to movement. Round particles (such as river or beach sand) create more voids and resist compaction, but . . . have more stability when moisture is added.” Source: “Riding Arena Footing Material Selection and Management,” Penn State Extension, accessed May 7, 2018, https://extension.psu.edu/riding-arena-footing-material-selection-and-management. [↑](#footnote-ref-6)
7. In the United States, bulk sand used in oil production increased in price from US$20 per ton in 2016 to $40 per ton in 2017. Source: Christopher M. Matthews and Erin Ailworth, “Latest Threat to U.S. Oil Drillers: The Rocketing Price of Sand,” *Wall Street Journal*, March 23, 2017, accessed June 8, 2017, https://www.wsj.com/articles/latest-threat-to-u-s-oil-drillers-the-rocketing-price-of-sand-1490266800. [↑](#footnote-ref-7)
8. The Scotbar quarry was estimated to have 100 million tons of sand reserve. [↑](#footnote-ref-8)
9. Helidon was a municipal district in Queensland, Australia renowned for its natural mineral water springs and high-quality sandstone. [↑](#footnote-ref-9)
10. “The Sandman,” *Master Builder Queensland* 54, no. 6 (June–July 2015): 54. [↑](#footnote-ref-10)
11. Scotbar maintained its own water recycling pools, which nearly eliminated all water waste and runoff. According to the company, the only water lost was through evaporation. [↑](#footnote-ref-11)