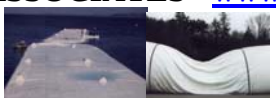
SPRAGG & ASSOCIATES - www.waterbag.com



SPRAGG BAG™
WATER TRANSPORT & STORAGE TECHNOLOGY FOR CLIMATE ADAPTATION

Submission to Garnaut Climate Review

March 2008

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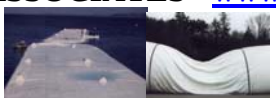
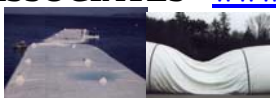


'Flexible water supplies for when and where you need them.'

1. Executive Summary

- The Spragg Bag™ waterbag is a new technology developed in the USA for towing large volumes of fresh water through the ocean in trains of connected fabric bags.
    - A patented zipper bag connection technology enables robust seaworthy operation for water shipments of large size and economic fuel efficiency.
    - Tests show each trip can transport up to one gigalitre of drinking water in sixty connected waterbags with each bag holding 17 megalitres.
- Waterbags will be a major contribution to Australia's adaptation to climate change.
    - They provide a flexible and modular technology to ensure water security for consumers in times of erratic or changing rainfall
    - Waterbags are a low energy method to secure urban water supply.
    - There are potential future waterbag uses for carbon sequestration and climate change mitigation
- Waterbags are a better value, faster and more greenhouse-friendly method for expanding urban water supply than desalination, dams and pipelines.
    - Waterbags have significantly lower capital and operating costs, greater ease of implementation, minimal environmental impacts, and much lower energy use than these other options.
- Waterbags will be a new commercial water supply industry that will
    - address drought contingency risks
    - create jobs, revenues and economic growth
    - be good for the environment.
- Wastewater treatment and transport for factories, storm water and sewerage outfalls is a potential major further application with strong environmental benefits
- Waterbags float in the ocean because fresh water floats on salt water.
    - This principle has numerous potential innovative applications relating to climate change adaptation and mitigation.
- Waterbag implementation in North Queensland and Papua New Guinea has previously been discussed with Professor Ross Garnaut, who expressed interest in further consideration of the technology.
- Waterbags present an excellent case study for the Garnaut Climate Review Issues Paper 4, *Research and Development: Low Emissions Energy Technologies*



2. Immediate Goals

- Spragg and Associates requests that the Garnaut Review conduct a technical and economic evaluation of the Spragg Waterbag proposal to assess our claims of

  (i) significant potential contribution to climate adaptation; and

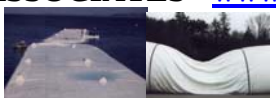
  (ii) significant economic and environmental superiority to other water technologies now under consideration.

- We request that the Garnaut Review recommend to Australian water authorities that they facilitate a national demonstration voyage and commercial implementation of the Spragg waterbag.
- Once political and financial arrangements are in place, we aim to conduct a demonstration voyage of the Spragg Bag™ water transport and storage technology by transporting six megalitres of drinking water through the ocean to all main Australian ports.

3. Long Term Goals

- To help secure Australia's urban water supplies and clean up the environment by establishing an economically sound and environmentally positive new industry for bulk fresh water transport and for the collection of factory, storm water and sewerage outfalls for processing and reuse.

Two connected Spragg Bags™ during demonstration voyage in Washington State, USA.
The waterbag in the foreground is being filled and the waterbag in the background has been filled.



4. Current Status

Spragg & Associates, under the leadership and overall direction of Mr Terry Spragg, based in California USA, has invested over US$4,000,000 to develop waterbag technology.

- Spragg & Associates has assembled a team of over 50 corporations, engineers, universities and individuals around the world who have contributed to the development of Spragg Bag™ waterbag technology.
- Negotiations are now advanced for demonstration voyages in locations in Australia, California and the Mediterranean.
- The Metropolitan Water District (MWD) of Southern California (the largest water agency in the world) has stated "...if our member agencies wish to pursue waterbag technology, Metropolitan is willing to serve as a regional facilitator."
- Several MWD water agencies are now investigating the option of demonstrating waterbag technology in California. The West Basin MWD and the Water Replenishment District of Southern California have formally supported proposals to introduce waterbag technology for California applications.
- Patents have been granted throughout the world, including in Australia, on various waterbag applications, such as the patented zipper connection sleeve coupling.

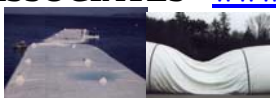
Ocean tests of Spragg Bag™ technology were performed in Washington State, USA, in 1990, 1991 and 1996

- These ocean tests proved the field viability of the patented Spragg Bag ™ zipper connection technology.
- A fifteen minute DVD showing television news media coverage of the 1996 demonstration voyage is enclosed with this presentation. A two minute DVD extract is publicly available at http://www.youtube.com/watch?v=4TEJp6UZaDI
- An Australian demonstration voyage can expect a similar level of media interest.

The Spragg Bag website www.waterbag.com contains further information and contacts.

5. Technical Studies

Spragg & Associates has funded research and development by engineers from the Massachusetts Institute of Technology, Harvey Mudd College, Ocean Spar Technology, CH2M-Hill and elsewhere for applications of waterbag technology. Studies completed on Spragg Bag™ waterbag technology include MIT Fabric and Zipper Strength Test Reports, CH2M-Hill Waterbag Progress Report Study Summary, and Metropolitan Water District of Southern California Waterbag Grant Award Documents.



Laboratory tests at Massachusetts Institute of Technology (MIT) and Harvey Mudd College have proven the patented zipper connection technology will withstand ocean stress, including in weather conditions worse than normally experienced in Australian waters. MIT engineers tested simulated waterbags zippered together in a US Navy test tank and found they could withstand 30 metre high waves.

Waterbag technology makes use of the natural properties of the materials involved to provide a highly robust result. 99% of the waterbag is below the surface of the ocean so the waterbags become part of the wave itself and take all the shapes of the waves. Tests established that the zipper is the most effective way to distribute stress evenly around the circumference of the entire waterbag. The newly developed polymer fabrics used for waterbags are strong, light, safe, flexible, economic and impermeable.

MIT and Harvey Mudd College tests established that the strength of the patented Spragg Bag ™ zipper connection system is sufficient to deliver up to a gigalitre of fresh water behind a single tugboat, using up to sixty waterbags joined together like railway freight wagons. At this large scale, each waterbag would hold 17 megalitres of water. Spragg & Associates envisages initial commercial operation at a much smaller scale than this, about 50-100 megalitres per trip with trains of five or six waterbags. This volume can be scaled up or down subject to supply and demand.

Studies have demonstrated that the Spragg Bag™ technology, because of its low capital and operating costs, and its modular flexibility, is the most economic way possible to transport fresh water through the sea.

"*New technologies are the only way to tackle climate change... Rapid economic growth and climate change mitigation cannot go together as long as we stick to current technologies… policy makers must focus on technological changes right now, rather than on economic measures to reduce carbon dioxide emissions into the atmosphere. These changes require upfront public R and D funding, especially for demonstration projects, plus a supportive regulatory environment.*"

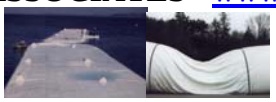
Jeffrey D. Sachs
Director of the Earth Institute
speaking at Delhi Sustainable Development Summit, February 2008

6. Issues

Australia has been identified by Spragg & Associates as among the best possible locations worldwide for implementation of waterbag technology.

Australia has strong comparative advantages

- abundant high quality drinking water supply from rivers in Northern Queensland, Northern NSW and Tasmania
- High level of urban water demand with capacity to pay through market systems



- Stable and competent water governance enabling negotiation between jurisdictions supplying and receiving water
- good port facilities suitable for dockside waterbag loading and offloading
- economically viable distance to major urban centres where additional water is needed
- Well developed government, commercial and technical counterparts suitable to work in partnership with Spragg & Associates

Possible future major spin-off industries include

- water supply to tourist resorts
- capture of factory, storm water and sewerage outfalls for treatment and reuse where needed
- high value agriculture and residential development in areas now constrained by irregular rainfall
- Use of waterbags as 'photobioreactors' for large scale production of algae to produce biodiesel and sequester carbon

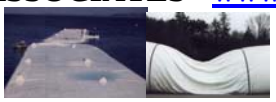
A commercial waterbag industry needs two things:

- public acceptance via a successful demonstration voyage,
- surplus water available for sale at the source additional to local needs and designated environmental flows.

Work can commence immediately to implement a demonstration voyage project once political and financing terms are agreed. Engineers and maritime experts from Spragg & Associates will implement the demonstration voyage in cooperation with Australian partners. Spragg & Associates can proceed with a public air inflation test and launch within months of approval. Estimated total cost for an Australian demonstration voyage is A$1.25 million.

Spragg & Associates' preferred business plan for its demonstration voyage is to obtain primary funding by selling sponsorship, marketing and broadcast rights, rather than government funds. Government seed funds could assist in mobilizing private capital and could be reimbursed from sponsorship generated funds. These funds could be generated from a range of firms (eg Coca-Cola, Harvey Norman, Thiess, Visy, Toll, Google, Virgin, Qantas, BHP-Billiton, Telstra, News Ltd, etc). Negotiations have not yet commenced with Australian commercial partners.

Spragg Bags™ will not compete against local water users. Only a small proportion of the surplus water which would otherwise flow into the sea will be used for waterbags. Waterbags will not operate during periods of low rainfall in supply areas.



7. Proposed Near Term Activities

Spragg & Associates will

(i) Provide information on the Spragg Bag™ technology to potential partners to answer questions and obtain support;

(ii) Consult with officials on the process for bulk transport of drinking water, considering commercial, technical, environmental and institutional factors;

(iii) Obtain political agreement and funding for a demonstration voyage from commercial partners;

(iv) On receipt of approval and funds, construct two new state-of-the-art fabric waterbags, each with capacity to hold three megalitres of drinking water, utilising the Spragg & Associates zipper connection system. This will take approximately four to six months.

(v) Air test the waterbags at agreed sites;

(vi) Fill the waterbags with fresh water at dockside;

(vii) Tow the waterbags through the ocean to agreed ports around Australia.

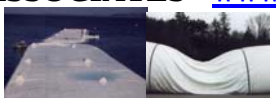
Australia's biggest suitable water sources are northern Tasmania and northern Queensland. The demonstration voyage can fill bags at any centre willing to provide six megalitres of water.

Media coverage of this demonstration voyage will encourage the Australian public, as well as political, business, and water leaders throughout Australia, to think about and discuss specific waterbag technology applications in their region. Media coverage will create nationwide publicity which will generate valuable national and international media exposure for the sponsors of the Australian demonstration voyage. 100% of funding for this demonstration voyage could be returned to initial investors (public and/or private) through sale of sponsorships and broadcast/media coverage rights. The general public will be encouraged to visit the waterbags in each port.

The demonstration voyage can also serve as a scientific education project regarding strategies for climate adaptation. Spragg and Associates is eager to cooperate with government and scientific institutions to provide public information about climate change.

Evaluation of specific locations will assess a strategy to implement a commercial waterbag system based on quantity and quality of available water and distance to destination markets. The system will be implemented in modular stages as reliability of the system is established. Size of waterbag trains can increase over time until delivery capacity meets commercial demand and available supply. Capital cost for the entire waterbag system will not be incurred up front, but will be spread out over time according to economic, environmental, and political needs.

The demonstration voyage will provide the framework to assess detailed costing and technical factors. For example, whether water treatment should occur at source or destination, pricing, ownership and volume, most effective sizes and routes, location of facilities, and systems for transferring water into the reticulation system. City water authorities are likely to wish to obtain untreated water and use their own facilities to treat



it themselves. The waterbags will remain the property and responsibility of Spragg & Associates at all times.

8. Project Benefits

The Spragg Bag™ waterbag technology will

- enable commercial sale of fresh water from places of abundance
- supply large volumes of competitively priced new water for municipal and industrial use in all coastal areas of Australia
- reduce need for water restrictions, enabling increased economic activity (eg tourism, housing, watering of urban parks, industrial use, high value agriculture) in destination centres.
- Improve efficiency and market orientation in the Australian water industry
- Provide an efficient wastewater management option in suitable locations
- Have potentially major contributions to CO2 emission reduction, climate adaptation and climate change mitigation

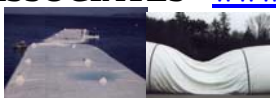
Extensive economic analysis of specific waterbag proposals has been commissioned by Spragg & Associates. An initial Australian desk study was prepared for indicative water supply over distances of 900km and 2150km. This analysis indicates that waterbag technology can supply commercially competitive water for municipal and industrial purposes to mainland Australian cities, and that waterbag technology has the potential to create a major new water transport industry for Australia.

Tasmania is ideally placed to take a global lead in the introduction of waterbag technology, in view of Australia's ongoing water shortages and the strong technical, physical and political capacity to introduce waterbag technology quickly. Experience with how to manage and sell bulk resources through the mining industry provides a platform for introduction of waterbags.

Waterbags will prove highly competitive and energy efficient against other technologies such as desalination, canals, pipelines, dams, ocean tankers and recycling, and will act as a useful addition to the overall Australian water supply system.

Waterbags will prove suited to a wide range of new and innovative uses. Ms Liz Penfold, Member of the South Australian Parliament for the seat of Flinders, has suggested other ideas that could make the water bag technology take off as a way to help clean up our environment and provide more water. For example, waterbags can be used to collect storm water, factory waste water, grey water and sewage for treatment, clean disposal and reuse. These approaches could provide new sources of water for a range of purposes from irrigation to human consumption. These sources would use water that is already available and causing environmental issues. Even the saline water from desalination plants, where these plants are still economic, could be collected in waterbags and towed out to sea for release in deeper more turbulent waters to dissipate. The Spragg and Associates patented zipper technology can be used for efficient and environmentally safe deep sea waste disposal.

Waterbags are an ideal strategy for climate adaptation in the water sector. They



- can be put in place quickly to meet peak demand and drought contingency
- are entirely modular and can be scaled up from a small initial operation
- can be relocated and used elsewhere
- can be made on demand without high up-front capital costs
- can act as their own off-shore reservoir at source or destination
- require much less energy than desalination per volume of water produced and delivered (so might be eligible for carbon offset financing)
- do not require large land purchases
- reduce the need for other expensive water supply solutions
- may in the future be powered by renewable wave, solar and wind energy

If water supplies at one source are less than the designated level earmarked for environmental flows, it is simply a matter of disconnecting the offshore portion of the water delivery system and moving it to a different water source location. The waterbags are easily moved to any offshore loading location.

Waterbag technology allows for an open-ended, perpetual agreement with multiple water sources, depending on water availability and transport price from any potential water sources.

Once proven on shorter routes, future supply could be assessed from other abundant water sources including New Zealand and Papua New Guinea, potentially with subsidies from carbon emission offset programs.

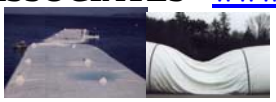
Waterbag technology will enable efficient arrangements for water trading between water systems. Waterbag transport systems, by their very nature, will help to remove institutional barriers in order to integrate the national water market and initiate water trades between States.

Waterbag transport systems will support full cost recovery for water in urban areas. Waterbag transported water could be introduced into various Australian urban water systems at a price close to or perhaps even equal to the current prices charged by existing water delivery agencies. By providing ‘new water’ into existing systems, waterbags can charge close to the marginal price paid by domestic users, while ‘old water’ from existing dams can be conserved and can fund local capital and maintenance costs.

Just as the electricity industry must maintain capacity for ‘peak demand’, and can charge high marginal costs, the water industry can use waterbags to meet peak water demand at market prices.

Waterbag transport systems are easily adaptable to all national standards for water accounting, reporting and metering, and will improve management of demand for water in urban areas.

The waterbag investment occurs when the water is needed, not years before, will deliver bulk water supplies quickly, and is fully portable. This economic flexibility and rapid response is not available from desalination plants, dams or land-based pipelines, whose sunk capital cost expenditures must be paid up front with interest regardless of fluctuation in demand and rainfall.



9. Environmental Benefits of the Proposal

Waterbag technology will have broad positive environmental impacts, strongly supporting Australia's adaptation to a likely warmer and drier climate.

Waterbags are ideally suited to accept only excess water, rather than placing pressure on existing environmental or agricultural needs. Waterbag transport systems are environmentally benign compared to the brine disposal problems of desalination plants or the land degradation caused by large pipelines, canals and dams. The energy cost of using waterbags to deliver water supplies is calculated at 3% of the total cost, made up only of towing costs. By comparison, energy cost is more than 40% of the operational costs of a desalination plant. A 25% increase in the cost of fuel will result in less than a 4.5% increase in the total cost of the water delivered using waterbag technology. Waterbags produce much less carbon emissions than alternative technologies. Over time, renewable power sources (wave, sun, wind, currents, tide) have potential to reduce waterbag energy costs even lower.

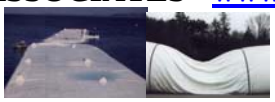
Because of the flexibility of waterbag technology, the system can be shut down and moved elsewhere if water levels at a selected waterbag loading source fall below designated environmental flows.

Wastewater treatment applications and climate adaptation and mitigation potential provide further environmental benefits.

An example of potential waste water treatment is in response to the problems identified by the Adelaide Coastal Waters Study. Technical reports have identified a loss of more than 5,000 hectares of seagrass mainly caused by poor water quality, especially high nutrient levels, in the near shore waters. These losses are due to discharge of treated wastewater from industry and metropolitan wastewater treatment plants. High levels of suspended solids in stormwater flows are also implicated. Waterbag transport and storage could make an innovative and cost-effective contribution to management of these liquid wastes.

An article by Dr Ian Edmonds, *NORTHERN RIVER WATER FOR AUSTRALIAN CITIES?*, published in the September 2007 edition of Water, the Journal of the Australian Water Association, discusses the feasibility of long distance waterbag transport. The article cites the Spragg Bag as a precedent and concludes:

> "The East Australian Current that flows 2000 km from the northern tropics to Sydney carries with it the outflow of the northern rivers. Enclosing only a small percentage of this river water in large membrane containers and allowing the filled containers to float with the current provides an almost free method of delivering drinking water to the major east coast cities. Preliminary cost estimates for the supply of 120 ML per day to the Gold Coast indicate **this method of water supply may be 30 times less expensive to implement than an equivalent supply by desalination plant and that the method may emit 60 times less greenhouse gas**. These figures suggest that the proposal would be much less expensive than a pipeline from the Burdekin River to Brisbane." (p.69, emphasis added)



10. Political Benefits of the Proposal

The political leaders in Australia who are first to publicly announce their support for the Spragg & Associates waterbag demonstration proposal will gain a reputation for creative and visionary political leadership.

This can be accomplished at no political or financial risk.

When the Spragg & Associates sponsorship marketing plan is implemented these Australian political leaders can point to the fact that they were the first political leaders that supported a demonstration of waterbag technology for Australia at **ZERO** financial risk to their taxpayers.

This technological and financial creativity demonstrated by Australian political leaders will receive wide spread media coverage throughout Australia and around the world.

11. Financial analysis of waterbag operating system

Spragg & Associates has completed a variety of waterbag transport system economic analyses based on various assumptions. Until a detailed analysis of proposed loading and off-loading locations in Australia is undertaken it will not be possible to present an in-depth economic projection for an Australian waterbag operating system.

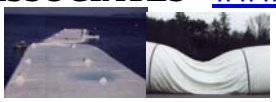
At the request of Mr Malcolm Turnbull MP, Spragg & Associates prepared financial estimates for Australian routes (attached). This analysis shows likely cost for waterbags is highly competitive against alternative technologies

Other analyses can be made available for potential partners to make estimates for Australian applications based on various assumptions such as distance traveled and volumes of water to be delivered.

These analyses indicate waterbags can be commercially competitive for municipal and industrial water supply. There are a number of possible water source solutions that are economically viable for selected areas of Australia.

12. Garnaut Review Implications: Waterbags as an Innovative Solution for Climate Adaptation

Our waterbag demonstration proposal documented here is an ideal case study for the Garnaut Review Issues Paper 4, Research and Development: Low Emissions Energy Technologies. The Issues Paper observes that new technologies will play a substantial role in both the mitigation of, and adaptation to, climate change, including new product lines, business practices and construction techniques, and that investment in a diversified innovation portfolio is a good way for governments to hedge against climate risk. A



waterbag demonstration is a very inexpensive part of a diversified portfolio, considering the potential payoff and the huge sums being invested in older water supply technologies.

The experience of waterbags in moving from demonstration to commercialization is a good example of how market failures in the innovation system make it difficult to generate optimal levels of investment in technological change, and how the incentives proposed by the Issues Paper could generate rapid technological progress. Waterbags present an entirely new large scale technology for water trading. Demonstration voyages have proved the viability of the technology, but commercialization has been slow.

This experience illustrates well the problems of "lock-in" whereby state governments want to invest billions of taxpayer dollars in 'proven' technologies such as desalination, but run the risk that the shift to a low carbon economy and significant rainfall events could make this investment obsolete.

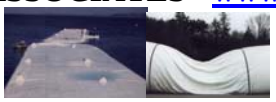
Droughts are cyclical, and rain can return for many years. Desalination plants, once built, continue to depreciate, and the capital costs continue to require payment whether or not the plant is in operation. In 1992 the City of Santa Barbara California spent $35 million to build a 3.2 MGD desalination plant. The plant ran for one month, the rains came and the reservoirs filled and the plant never operated again and later was sold for scrap. The flexibility offered by waterbag technology can avoid these technical and financial problems. A desalination plant costing $1.5 billion for Adelaide is highly risky when other options including water bags would cover drought situations at much less cost to the taxpayer who need other infrastructure and better health services much more.

In response to the question in Issues Paper IV, 'How can policy promote diversity without falling into the trap of needing to specify at a technical level what such diversity should include?' we endorse the options presented: immediate and delayed tax write-offs, accelerated tax deductions for depreciation, matched funding and niche market creation. These policies will optimize outcomes and support a market based approach to utility provision.

Waterbags are a large new technology with no incumbency advantage, but are well positioned to compete in a future low carbon economy if governments establish a sound regulatory and tax framework. There are major potential spillovers from our early-mover contribution which should be recognised in government policy. Our patents have protected our intellectual capital at the cost of implementation delay.

The Issues Paper suggests government funding for a 'niche market.' This could be used to subsidise initial transport of bulk water on a specific route, for example from Burnie to Adelaide or Port Lincoln, with the expectation that subsequent replication on other routes would attract commercial private sector and state government funding, and that work to address technical issues on an initial route would enable easier replication.

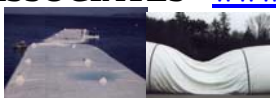
An emissions trading scheme would be significant in establishing a carbon-neutral level playing field for government policy towards new technologies in water supply. Our assessment is that the Spragg waterbag would become highly competitive under such a scheme, potentially displacing investment in high energy technologies such as reverse osmosis desalination.



Areas of uncertainty regarding emissions trading for water supply could include how to assess the overall benefits of a reliable and stable urban water supply, ie whether the expanded supply provided by waterbags should be compared against other methods of achieving the same level of supply or against a restrictive policy to reduce water use through quotas and water rationing. There are considerable social and economic benefits in allowing the water supply to increase to meet demand, including potential for real estate development in areas now constrained by lack of water, or at risk from future water shortages. Emission trading can help to create a functioning market for long distance water trading.

We consider that coordination failures in Australia are significant. Government role should focus on transparent policy consistency and equal financial treatment oriented towards clear goals such as safeguarding urban water supply and moving to a low carbon economy. Government can assist in reducing information asymmetries by allocating resources to technical appraisal and demonstration of innovative proposals.

Air Inflation test showing Spragg Bag^{TM} Zipper Connection



13. *Indicative Spragg Bag™ Water Supply Costs*

	Case 4 500 Megalitres per day	Case 3 200 Megalitres per day	Case 2 100 Megalitres per day	Case 1 40 Megalitres per day
	(A$ per megalitre)			
A. Total Cost (=B+C)				
Low estimate 900km route	$777	$814	$834	$950
High Estimate 900km route	$1,379	$1,458	$1,525	$1,750
Low Estimate 2150km route	$1,583	$1,590	$1,627	$1,699
High Estimate 2150km route	$1,950	$2,015	$2,097	$2,293
B. Transport Cost				
900km route Low estimate	$570	$603	$604	$660
900km route High estimate	$805	$822	$825	$866
2150km route Estimate	$1,376	$1,379	$1,397	$1,409
C. Non-Transport Cost				
Low estimate	$207	$211	$230	$290
High estimate	$574	$636	$700	$884

Notes

1. Prices are indicative estimates based on detailed economic and engineering analysis done in the USA and on limited information about site factors such as water purchase cost and linkage to reticulation systems at destination. The wide ranges given for non-transport costs indicate the need for site specific assessment and negotiation.

2. Further detail on these estimates is available from Spragg & Associates.

3. Transport cost approximate % breakdown:

water bag purchase	~20% for 900km, 15% for 2150km
operations & maintenance	~45% for 900km, 20% for 2150km
tug hire & fuel	~35% for 900km, 65% for 2150km

4. A shorter route, eg Clarence River to Brisbane (300km) would obtain correspondingly lower transport costs

5. Non-transport cost approximate % breakdown

water purchase	25-60%
loading/off-loading facilities	4-17%
loading/off-loading operations and maintenance	33-69%