Recovering water in the MBD
Productivity commission
LB 2 Collins St east Melbourne Vic 8003

Opportunities to improve water recovery in the Murray Darling Basin (MDB)

In recent decades most states of Australia have been subject to gradual temperature rise Climate change specialists consider this factor is somehow related to reduced rainfall that has brought on a decade of drought in S/E Australia. At the same time northern monsoons have maintained normal rainfall patterns, bringing on the perennial question by many in southern Australia- " Is it possible to tap into the huge volumes of northern river water that annually goes to sea, some say wasted." T Bowring & Assoc evaluated local and global options to move a fraction of northern water to four S/E Australian states and say, yes, introduction of water transfer infrastructure can make it happen. It is the opportunity to cover the future needs of cities, MDB irrigators, environmental flows and wetlands.

New water Benefits
Attached is an overview of our proposed multi state water transfer proposal to move a small percentage of northern water going to sea to meet needs of NSW and other states. While the water involved in this one off infrastructure project will not cover all needs it should demonstrate the future viability of transporting/trading northern water on a similar basis to gas and power. A preliminary business plan was developed on moving 4000 GL of northern water, 20% to urban dams, 40% to irrigators and 40% to environment flows. Returns to Fed government from investing in $8.8 Bn of canal/pipe infrastructure were-

- 17% pa from water sales delivered to cities, irrigators and environment alone.
- 27% pa from above water sales plus taxes and C offsets from industries developed
- $30 Bn GDP multiplier benefits to the economy as a result of infrastructure built.
- 7% pa emission -reductions, which puts us in range of our 5-20% targets by 2020.

While the main drivers of these returns come from supply of high value water to urban users, outputs of bio-fuels, power and offsets from soil carbon have significant impact.

Expand irrigation potential
As indicated in items 2(a-d) of our water overview proposal, details of our water transfer project still need more evaluation and various factors could lead to blow outs in capital expenditure. However, we consider the indicative high returns from infrastructure should enable us to cope with this eventuality.(see canal infrastructure returns.doc) One of our recommendations is when a global food crisis is looming, we should be expanding viable irrigation regions, not diminishing them via water buy backs. Probably the single main reason farmers are leaving the land is lack of rainfall or water. Banks are telling irrigation growers who have not had a crop for years they need to pay off their debt by selling their water rights. The trouble is if southern drying trends continue, this process of depleting irrigation regions of needed water will never stop. Water left over become increasingly expensive through lack of farm usage causing more growers to leave the region. At the same time business in towns will gravitate to the cities as gross revenue from farms fall

away. This eventually will lead to a gradual close down of towns which were once a hub of social and economic activity. .

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Regional Growth

The primary source of water in our proposal comes from combining the flows of Qld Burdekin and Herbert rivers. We propose to capture this water in an enlarged Burdekin dam and move long term storage water into fractured rock aquifers to reduce evaporation. As can be seen from route map options there are other opportunities for additional water from the Gulf of Carpenteria or major rivers going to sea along the Eastern coastline. In the long term recovery of this water by various means can open up inland towns based on mining /agriculture and new industries such as bio-fuel and renewable power production. These regional towns can take the pressure off capital city expansion. They will enable younger generations to get well paid jobs based on production of needed products, in non congested towns, where pollution is minimal, housing inexpensive and trees and gardens thrive with reliable water. The inland regions of Australia is where our current and future wealth is generated, it makes sense to improve their livability to maintain growth. Lack of water, power, communications, transport, medical, health and education services, have in the past discouraged families settling in regions supported by established towns. As indicated in section 8.0 of the water overview the future integration of proposed NBN with water infrastructure could assist in improving the attraction of towns west of divide.

Efficient water usage and salinity reduction

The movement of bulk water via canals and pipe to farms and towns is just the start of a process of a process of supplying new water to benefit MDB regions. Efficient usage of water in towns and farms will be important. We recommend low cost pipe making technology that can get water from subsidiary canal to farm.(see irrigation pipe) Pipe is preferred to membrane lined channels which have a tendency to pop up when water tables rise to critical levels. The selection of low water usage crop irrigation plant such as pivot irrigators or drippers etc is recommended. Technical and funding assistance should be given to growers to adapt to irrigation technology that suits their crops. Water going to wetlands should be pumped from canals instead of flowing overland by normal pathways.

Salinity is a problem in many open farming regions, mainly due to removal of trees that once kept ground water at acceptable levels. Depending on salinity levels there are many ways to reduce its impact such as digging runoff channels to rivers or evaporation basins. Probably the simplest proven system is usage of "mallee alleys" as seen in 4h)of water overview. WA wheat growers who see them as a cash crop that can be grown on land while reducing salinity. There are large opportunities to grow mallees to sequester carbon and produce biomass for low carbon steel production and/or bio-fuel needs. What is needed is applied development with local producers and farms to show advantages in an area through plantation, harvesting, processing developments (see overview item 4h).

Algal blooms are becoming a regular feature in MBD rivers as temperature rise and flows reduce. USA authorities have developed sterile fish to consume algal blooms in canals. We should be looking at the opportunity to breed suitable fish here, to eat our species of Cyanobacter algae which are said to be poisonous to stock and humans

Regional irrigation optimization
Substantial irrigation regions should be carefully evaluated to ensure non- productive growing areas or those will limited active farm usage are responsibly restructured (phased out). Irrigation control systems should be installed to maintain adequate channel or pipe reservoir water levels while ensuring quick and accurately metered supply of water to avoid wastage. Irrigation farms should be developed on a closed system basis to re-use excess water instead of returning nutrients and pesticides to rivers or streams.

Carbon farming
It is not well accepted yet but new pasture farming technologies, assisted by new water have potential to improve fertility and water retention while increasing soil carbon. New soil management techniques in Victoria (see item 7.0) have potential to rehabilitate soils that previously were seen to be unproductive. Funding needs to be directed to agricultural R&D to show the carbon and fertility potential of these developments over a range of soils, bio-nutrient and crop applications. When developed at a large scale, soil carbon sequestration from bi-annual irrigation of crops could offset major CO2 emissions from a range of Australian mining, industrial and agricultural activities (see overview item 4.c)

Barriers to transportation of Northern water.
As can be seen in preliminary estimates, costs of water to MBD irrigators from proposed infrastructure are already high and increases in capital expenditure could reduce healthy returns projected. Maintaining or bettering water margins will be important for success. Queensland have introduced caps on water that can be moved out of Burdekin & Herbert catchments. What we are planning for these rivers should suit a larger regional cap for a national interest project. Provided the recovery of this water going to sea does not have an adverse environment impact, we should be allowing its flow to go better use. Once benefits of a N to S water transfer project is established, with any concern on volumes involved the matter should be brought up either in Parliament or State COAG meetings.

Who should be in charge of water going into and within NSW inland regions
Over the last decade or two there have been examples of excess water diversions from flood plains and northern rivers that normally added to flow into the Darling. These were legally approved and condoned by government and implemented with hardly a murmur. Northern water going to and within the MDB is important for the environment and our future prosperity and unreasonable high diversions of flow should be monitored by a Federal authority. At this stage the MDBA have this role in all MDB regions. Whether their role should be expanded in rivers North of the basin to make decisions that can improve MDB flows is a decision the public should take. If accepted, their activities should be based on developing and administering uniform water plans based on NWI principles. When water availability is tight they should have the power to allow interstate water trading to develop enable water to go to the highest economic or public benefit.

Attached is an overview of methods costs & benefits from delivering new northern water.

T Bowring
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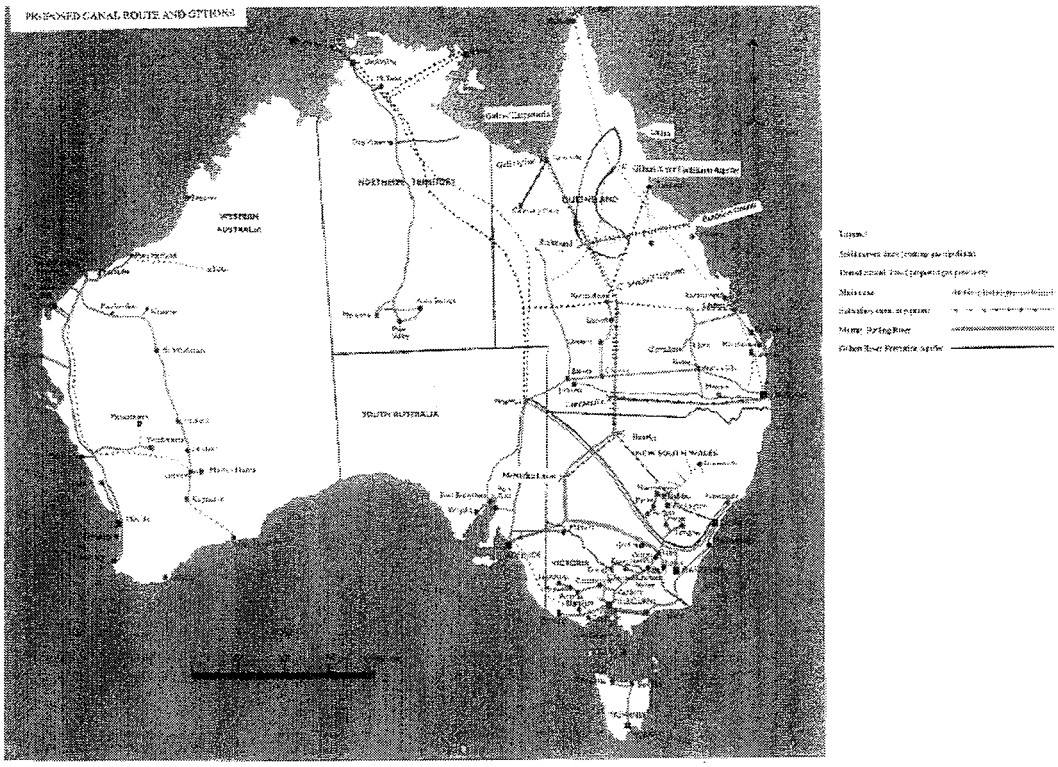
Multi State Water Transfer Project (Australia)
Updated: 13/10/09



1. Overview of Proposed infrastructure

Australia's southern states are facing water shortages at a time when world demand for food crops by 2050 will double. State governments are investing up to $13 bn on energy intensive desalination plant for coastal city needs but so far, little on inland infrastructure. Ql'd rivers which normally deliver water to southern regions from big rainfall events are drying in transit through arid land. To maintain & expand agriculture, mining and other industries dependent on water, we need to be looking now, at how to tap into the huge volumes of northern water going to sea and move it to areas of need at minimal loss/cost. CSIRO climate change modeling indicates rainfall in N/Qld is expected to be maintained at current high levels for 100 years while rainfall in southern regions gradually diminish. Australia has to think about, debate, and make decisions about its long term future. With a 60% population increase projected in next 35 yrs and demands from Asia the allocation and management of northern water will have a major impact on the quality of our future.

2. a) Australian water transfer opportunity:

It is estimated that on average, 173,000 Gigalitre(GL) pa of river water in N/E Qld and the Gulf of Carpentaria goes to sea each year. Part of this volume, which amounts to ~100 times southern city needs, could be better utilized by moving it to areas of need. Others have suggested southern irrigated agriculture should be moved to the north where all the water is. While the lower north has potential, few have made the move to the top end because of higher evapo-transpiration rates than rain delivers, poor infrastructure, depleted soils, high costs to fertilize, dry season fires, and current climatic unsuitability for crops such as wheat. We looked at infrastructure costs to move 4000 GL pa of water 1500 km south by pipe or canal. It soon became obvious that the cost of making pipe in cities and trucking it to site by road, at $32bn, was unlikely to be economic. To meet cost restraints canal construction was designed around using surface miners to excavate land and auto trim and line plant to lay concrete base. The canal is to move 4000 GL of water through W/Qld into the Darling at Bourke (or past Menindee to reduce river evaporation losses). This Bourke option, run over flat land with minimal river crossings, came out at about $5.6bn. From the main canal, subsidiary canals and pipe were designed to move water through major irrigation areas and/or to city dams in Qld, NSW, Vic and SA. The canal route, length and outlets should be determined by market need, and water delivery to farm or other users must be designed to minimize losses. To reduce high evaporative water storage losses in open dams we propose to run canal route near fractured rock recharge aquifers to part store water till needed, and average out seasonal flow variations. We are looking at a low cost osmosis process to treat some of the 65million GL of stored water in the GAB. Where pressure can be balanced with natural aquifer inputs, we see potential to treat brackish water to potable quality from multi point bore outlets and use it to top up canals going south. Power to run canal pump stations will initially come from gas engines or turbines using coal seam and basin gas widely available in Queensland. Gas pipeline is already in place on part of proposed canal routes and where it isn't, new pipe will be installed. We also see potential to use geothermal power or PV solar covers over canal to reduce climate change effects such as availability of water, and increased frequency of drought. Renewable power can reduce carbon charges for canal operations.

2. b) Water source statistics:

CSIRO estimates of rainfall trends indicate N/Qld will maintain current patterns for 90 years, while southern regions, starting in the west, dry out rapidly. Capturing water near the outlet of rivers such as the Mitchell, Burdekin/Herbert & Fitzroy could supply up to 40,000GL pa of base-load water for movement south. Our aim is to take no more than 1/3rd of river flow just before it goes to sea for canal supply. A good starting point for a major canal would be the Burdekin Dam which has stage two potential to hold 8500 GL of water. We also see the potential to merge Burdekin and Herbert rivers to run ~12,000 GL pa to sea at Clare. Flow from these rivers typically carries with it large volumes of silt from up-stream agriculture which infiltrate tributaries of the Barrier Reef Park. We see potential to partially reverse this adverse environmental impact by moving 1/3rd of this water into a canal system.

2. c) Preliminary cost estimates:

With a W/Qld main canal at $5.6bn and subsidiary at $3.2bn, it costs ~$8.8bn to evenly deliver 3750 GL of water to crops, environment flows & city dams in Qld, NSW Vic SA.

- We estimate if 3750 GL of water was sold only to irrigators and for environment flows at $250 /ML, returns on main & subsidiary canal capital would be ~10% pa
- If 3150 GL was sold to above groups at $250/ML and 600 GL was sold for city water at $1.80 KL (same as desalination costs) returns could go to ~25-30% pa
- If double the water, ie 7500 GL pa was put down the same routes, canal capex would rise by approx 55% and delivered water cost would reduce by approx 20%

These preliminary costs were based on USA canal construction data of material, labour equipment and energy usage with long term finance provided at 2.5% interest as in USA If finance rates rise to 7.5% canal costs will go up by 20% and delivered water costs will go up by 66%. We have preliminary EOI's from USA and local canal engineering groups as well as Boral (for concrete), Jemena (gas pipe line). These and other groups have contributed to our pre-estimates but we still need to further evaluate such factors as,--

: Route plans are spatially/geologically surveyed to ensure best fit with land and clientele.

: Ensuring canal routes can safely work around flood plains and major river crossings,

: Check availability of easily accessible sand and rock for on line concrete production,

: Potential of dams & aquifers to store large volumes of water and recover economically

: Complete trials on surface mining and trimming plant to confirm excavation potential

: Collection and conversion of crop wastes or tree biomass to produce bio-fuels & power.

: Validation of benefits of soil carbon and bio-fuels as carbon offsets within an ETS

2. d) Other canal route options and future opportunities.

A main canal ex the Burdekin dam going through regions such as Clermont, Emerald, Moree, and Dubbo and even down to the Murray on the Vic border could service more established farming areas and require less subsidiary canal & pipe to get water to coastal city dams. However a piped section to get over or around the ranges between Rolleston & Injune and multiple river crossings requiring inverted siphons or bridges on route would add considerable expense. The main advantage of this route, when needed, would be to provide water to rivers crossed that supply farms and eventually flow into the Darling. Capex estimates for this Central Queensland / NSW option are still under evaluation. Where possible canals should be sited near highways to enable long term logistic gains. We also recognize route sites need to be planned with grower and industry users of water

Solar power and canal liner membranes

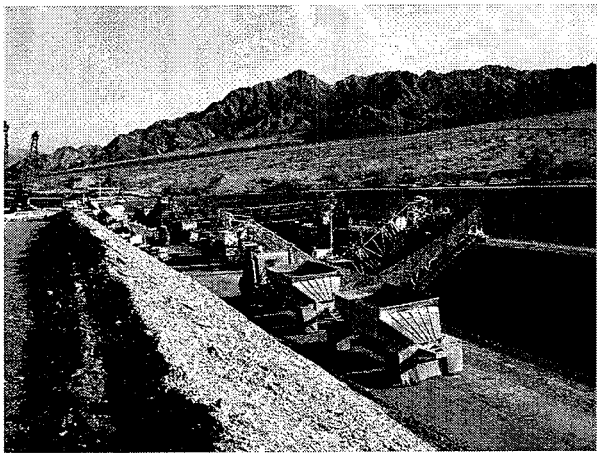
Studies of future opportunities indicate - 1) Use of thin film PV covers over canal or solar towers could generate power needs. Day solar power can be stored by holding water in elevated storage areas and metering it out at night. 2) Subsidiary canal lining costs can be reduced by using "50 yr life" membranes, to replace concrete where route water table allows. Options are under evaluation & could be introduced as route detail becomes clear.

3. USA canal experience:

For over 100 years the United States Bureau of Reclamation have been building concrete lined trapezoidal canals to recover seasonal river water (from melting snow) and moving it thru suitable land to make it profitable for agriculture and industry. Most USA canals have been financed by the Feds at 2.5% interest rates on the condition that "user-pay" water charges are to recoup capex & operating costs over 50 yrs. By opening this land canals have led to the development of W/USA cities such as Los Angeles, Tuscon, and Phoenix, plus associated industries, to which they still supply water. Canal construction costs are less than pipe for equivalent volumes and transmission loss from evaporation & seepage when run through the Arizona desert at 100Km/day, are repeatedly found to be rated at approx 4% per 1000 km of transit. Canals are easier to maintain than pipe which can have air supply problems during inspections, also, unlike pipe, they can be upgraded in volume flow as demand develops. In recent years demand for water in Western states has begun to exceed supply and authorities have begun saving seasonal water, excess to needs, by storing same in aquifers along canal routes. Water charges to growers are approx $60/Megalitre (ML) but can be as low as $30/ML when subsidized by hydro-power or higher city water charges when the water is servicing major cities. Use of centre pivots etc, to minimize water usage, can add ~$50/ML from Capital/ Power/ R&M costs. NB: The cost of building large US canals are well below estimates of local canal studies ie (the Kimberley canal).We consider USA constructors are our best source of expertise.

4. Market Opportunities:

With large demands coming out of N/Asia for agri commodities, bio- fuels and resources both agriculture & mining should continue to be industries of major focus. Below are economic and environmental benefits possible from making water available.



4. a) The Murray Darling River's needs for 1500 GL of environmental flows: Based on historical water buyback sales 100 % reliable water would cost $2800 /ML or $280 on a 10% return basis. With Government financed canals, delivery charges for environment flows, flood plains and wetlands @ $128 /ML would save about $265 million pa. This is a low cost option to buying out water rights whose volume will reduce as climatic drying takes hold. Water right buyouts, can lead to loss of towns, no longer supported by farms.

4. b) Supply coastal dams below suggested sell price desalinated water. i.e, $1.80/kl: Estimates indicate water delivered by canal/ pipe to city dams, could average $0.55/KL

4. c) $100bn pa grain and fuel sales from new water, to supply Asian markets:

The GRDC are projecting by 2020, grain output of 100 million TPA could come from value added areas of demand such as ethanol, starch, feed concentrate, meat substitutes etc. The main requirement to grow a quarter of this volume, is a temperate climate and reliable rainfall and/or irrigation water. If a North to South 7500 GL pa canal system as described above, was set up to irrigate 3.2 million ha of land with new irrigated wheat varieties yielding 9T/ha (6T in north -12T in south) it could produce 26 mill T of wheat. (ref- S Kearns GRDC). With variable growing costs of $2000/ha (inc'l $750 for water) and a grain price of $350/T, the crop could generate $9.1bn pa revenue and $3.0bn pa of grower margins. It is possible to concurrently recover 12T/ha of straw from above crop while retaining stubble. This could be converted to 12bn litre of ethanol & generate 7.5 million Mwh of base load power. Ethanol sold at 70c/L would generate $8.4bn revenue, (60% of our fuel demand) giving a $3.4bn margin. To meet larger demand, more canals sourcing water across the top end from Qld toWA would be required. While these plans are ambitious, as Asia urbanizes, grains and bio-fuels will become higher value export items. Taxes at 30c/Dollar and GDP multiplier effects will create large economy benefits. By rotationally growing other grains, legumes or camelina (a oil seed for bio diesel crop that double crops with wheat) we can potentially develop up to 150 million TPA of CO2 carbon offsets coming from soil carbon, energy and bio-fuels. These offsets will be useful in protecting mining and other industries from carbon charges. If cropping is expanded by using top-end water further west, we could offset close to all Australian CO2 emissions.

4. d) Ethanol and Bio-diesel

$12bn of Australia's 06/07 $17bn trade deficit was due to oil imports. We plan to introduce a proven ethanol from cellulosics technology via www.brienergy.com .This technology can produce ethanol & power from carbonaceous feed-stocks such as plastics, straws, MSW and gases. General Motors in USA have invested in similar technology via www.coskata.com and see ethanol as a major car fuel for the future. NSW has already mandated introduction of ethanol into fuels and by 2012, it will reduce costs to motorists by allowing purchase of a lower cost E10 fuel with lower carbon charges. Cars can be fitted in NSW with a $350 fuel conversion kit to use regular fuel or purchase E85 fuel at approx 2/3rds the current cost of regular fuel. (yesterday's cost, who knows tomorrow?) It was of interest to see Royal Dutch Shell Company in Jan 2010 set up a JV with large ethanol from cane producers in Brazil. Ethanol specialists believe N/Qld could duplicate the Brazil experience if we develop programs to ensure farm, plant & car needs are met.

Considerable selective breeding work is underway to adapt a local tree species Pongamia Pinnata for production of bio-diesel from annual harvest of its oil bearing seeds. Oil yields of 3-10 T/ha/yr are possible when plantation trees are grown at rate of 250 trees/ha This project www.pacificrenewableenergy.com.au also has potential for carbon off-sets.

4. e) Meat: $revenue traditionally triples the value of grain used to lot feed animals. As Asian populations urbanize, world bank projections are for a 80% increase in world meat demand by 2030. The methane ex cattle/sheep responsible for 18% of our GHG, we may need to live with, as meat is important to health. More feed-lotting of cattle held in sheds, cereal meat substitutes, plus poultry, pork & even kangaroos, can reduce methane output.

4.f) Dairy Farmers in recent droughts have found it less expensive to feed cows grain than on pasture grown using expensive irrigation water. Dairy farms could triple feed /Ha while halving water usage /litre of milk by using intensive farming systems to grow grain for feed. **(see7.0),** US grain fed cattle tend to yield 2 times more milk per cow than ours. Demand for dairy products and stock is already high and expanding in China particularly.

4. g) Wine& Fruit: Low water allocations in NSW, Vic & SA grape districts put $3bn PA of wine exports at risk. Many in this industry are now looking at how to tap into markets in Asia. Many vignerons desperate from prolonged drought are selling water rights at low prices.

4. h) Mallee Eucalypts to control salinity, sequester carbon & produce industry products:

Mallees are a fast growing local tree that survives in dry conditions of 125mm rainfall or can yield 10 dry T/ha/yr in 550mm regions. Growth will taper off, when not harvested at 4 YO maturity. They are widely grown to bio-sequester carbon and mallee alleys are useful in lowering water tables in dry-land cropping areas. By harvesting coppiced tree tops 1 in 4 yrs on plantations irrigated with 7500 GL water we could produce biomass for 20% of Qld and NSW base power needs, or 55% of our liquid fuel needs (via ethanol). By growing without harvesting they could sequester 13% of Australian carbon emissions. Other uses of harvested wood are to extract lignin via a solvent paper pulping process to be used for production of carbon fiber suitable for light weight car panels that are competitive with steel. Carbon Fiber can reduce car body weight by up to half (Nissan and Honda in Europe are planning to go this way in10 yrs). Pyrolysis systems can convert mallee wood into bio-char and bio-oils. The bio-char can be added to soils to improve fertility and the oils can be later refined into transport fuels. Char can be used now as a 33 % reductant substitute for coke in the production of steel from iron ore, 100% coke substitution is possible from stronger chars in regular furnaces or adapted to suit new steel plant such as the Rio HIsmelt plant. Steel makers are also looking at converting blast furnace gases into ethanol via a syngas fermentation process. Char can also be used to convert high temp CO2 emissions from industries such as steel, cement and shale oil into carbon monoxide and then to ethanol. The renewable feature of bio- char reduces carbon charges in above industry outputs.

5:)**New mining sites:**

W/Qld,-coal, uranium, shale oil, zinc, copper, rare earths **SA-** uranium, gold, copper **NT**- uranium, gold, phosphates, rare earths. **NSW**: coal. All need more water for viability

NEW DEVELOPMENTS

6:) Bush-fires need to be put out while still small. NASA in conjunction with USA forest services has devised systems to use multiple small unmanned air vehicles (UAV's) fitted with cameras to transmit fire images to base and quickly direct water bombers to pick up water from dams located near roads in fire prone regions. Water needed for these dams can be moved from open canals by tankers, off season. Bushfires are known to markedly reduce water output from catchments, while greatly increasing carbon emissions output.

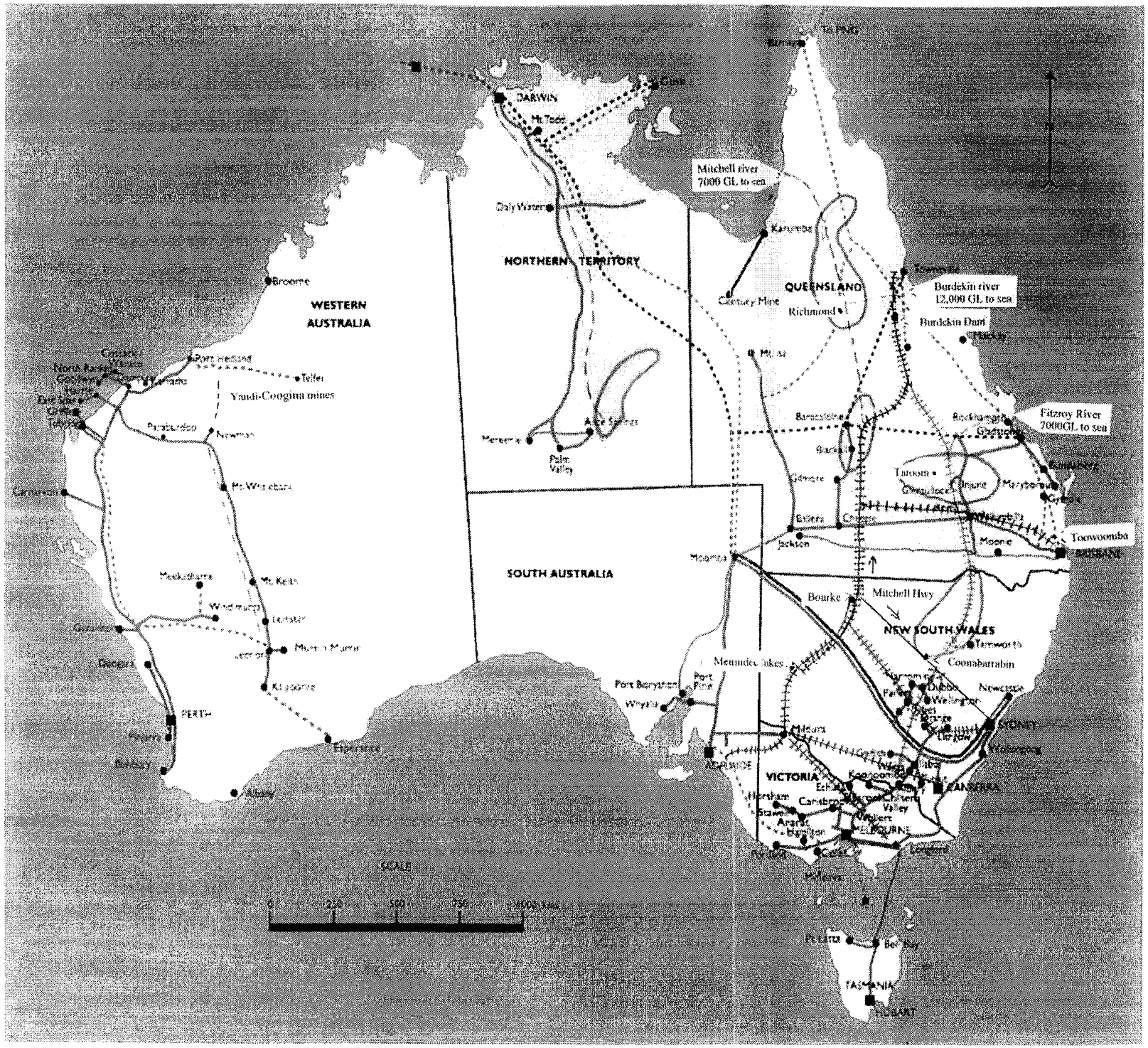
7.) Soil fertility& soil carbon offsets (CSIRO Research projects now underway to validate) Many broad acre farms south of tropic of Capricorn are swinging over to "no-till/organic fertilizer pasture farming techniques to grow grain and feed livestock on same land. Wheat when planted in cooler months out-strips growth of below foliage, shading it as a competitor. After a few seasons grain yields return to normal as a result of improved soil carbon, water retention & fertility. Vic growers are improving yield on duplex soils by using cultivation techniques that do not disturb top soil while adding gypsum & nutrients to loosen base clay. By combining similar techniques in rotation, with legumes, and precision farming we can rehabilitate soils to obtain high crop yields while sequestering soil carbon at rate of 20- 30 T CO2e/ha/pa when irrigated at least bi-annually. By adapting to new grow systems, and with adequate water, we can meet 2050 doubling of world food demand while generating carbon offsets that will cover approx 70% of Australia emissions. (NB recognition of soil carbon as a carbon offset is still waiting on International approval)

8.) National Broadband Network and Other Services Large Telco's have problem with the costs and returns of introducing fibre optic cable communications to scattered inland clientele. Canal infrastructure controlled by fiber could provide a trans-sectoral fiber backbone for inland communications, while aiding distribution of future renewable power from solar, wind & geothermal In the future FttH broadband will improve inland educational, medical and other services, normal, to those living on coast. Services such as NBN, adequate water and transport will be important to drive our future inland industries.

9.) QUICK SUMMARY: MULTI- STATE WATER TRANSFER PROJECT

Current N/Qld rainfall is expected to hold on for 100 yrs while southern rainfall reduces.
Bulk N to S water transfer by pipe is not economic, canal transfer projects are possible.
Water losses in US canals running in similar climate to Oz are low, approx 4% /1000 km
N/Qld river water going to sea, can meet the needs of cities, agriculture and environment.
17 rivers run to sea in Qld. Taking 1/3rd flow from one is unlikely to affect fish growth.
Storing northern water in permeable aquifers enables water storage with no evaporation.
Northern water into Darling river can supply multiple needs of Qld, NSW, SA and Vic.
A canal through central Qld and NSW, right down to the Murray, is another route option
Power to run canal pump stations can come from gas, wind, geothermal, solar or biomass.
Irrigation water buy backs will not keep up with climatic drying losses in S/E Australia.
Infrastructure for environmental flows etc, is more cost effective than water buy backs.
We can adapt USA canal technologies to minimize algal blooms by usage of sterile fish.
World food output to double by 2050, big opportunities for Oz farming if water available.
Bio-fuels, power & carbon offsets from crop biomass will be part of a low carbon world.
Main canal payback comes from urban water sales, city public, benefit from cheap food.
Agriculture can develop valuable carbon offsets from soil carbon, bio-fuels and power.
Availability of water in inland regions, can help to extinguish bush fires in early stages.
Proposed NBN infrastructure costs can be reduced by integrating with canal fiber optics.
Preliminary estimates indicate, 27%pa returns possible from a Public Private Partnership
to move 4000GL pa of water ,20% to cities, 40% to environment and 40% to agriculture,
To go to next stage, we are seeking funds for a feasibility study to build over 6 yrs.(see item 2c). We can provide reference back up data and answer questions in more detail

T Bowring (Director)
T Bowring and Associates Pty Ltd,
14 York Terrace, Bilgola Plateau, NSW, 2107, Australia.
Mob 0402 089 943 Ph 61 2 9918 9905 Fax 61 2 9918 4156 Email t.b.a@bigpond.com



Canal Route Options S/E Australia

LEGEND

Gas pipelines existing (solid colour)

Gas pipelines proposed (dotted colour)

Main canal W/Qld (dark blue dashes)

Main canal central Qld/NSW/dark and light blue dashes)

Subsidiary canal and pipe (mauve dashes)

Other canal options (broken light blue line)

Murray Darling rivers (dark green dashes)

Fractured rock recharge aquifers (orange Boundaries)

Government revenue streams from water sales, taxes from crops, introduction new industries, bio-fuels and carbon offsets.

Water/ new business data	Annual Revenue and profit pre-estimates				**Gov't returns**	ICN multiplier factors/$mill of new industry			
Total water available after losses =3750 GL Capex main & subsidiary canals $8.8 Bn	Sell price	Cost price	Water & /or Product revenue	Water &/or Product Margins	ex water sales, savings, taxes carbon offsets $mill pa	Value Added $1260m	Welfare $211m	Employed Persons $900 m	Tax revenue $317m
To Environment 1500GL Replace water buy backs	$128/ML	$125/ML	$192 mill	$5 mill	$260m savings	$11 Bn	$2bn	$8 bn	$3 Bn
To City Dams 700 GL to replace desalinated water	1800/ML	$600/ML	$1.25Bn	$840 mill	$840m margin $350m C offset				
To Irrigators 1550 GL	$250/ML	$185/ML	$387 mill	$101 mill	$101 m margin				
12T/Ha of wheat from crops irrigated at 2.5 ML / Ha yields 7.5 mill TPA	$350/T	$166/T	$2.2 Bn	$1.15 Bn	$345m taxes				
Straw yield @12T/ha Gives 7.5 mill T of straw @330L ethanol /T yields 2,475 ML of ethanol ex $1.9 bn of new plant	$700/KL	$420/KL	$1.74 Bn	$0.70 Bn	$210m taxes $129m C offset	$2.4bn	$0.4bn	$1.7bn	$0.6bn
Power from straw @ 660 Kwh/KL of Ethanol yields 1.63 mill Mwh pa ex $0.5Bn of new plant saves 2millT CO2 excoal	$80/Mwh	$48/Mwh	$0.13 Bn	$0.05 Bn $0..03 Bn	$16m taxes $32m C offset	$0.6 bn	$0.1 Bn	$0.4 Bn	$0.2bn
Soil carbon increase @ 30T CO2-e /ha/yr, offsets split 1:1 to gov't/industry	$20/T CO2e		$0.19 Bn	$0.19 bn	$190m C offset				
TOTALS			$6.63 Bn	$2.846 bn	$2.47 Bn	$14bn	$2.5bn	$10.1bn	$3.8bn

Notes related to approx cost benefits and emission reduction estimates, associated with Multi State Water Transfer Project

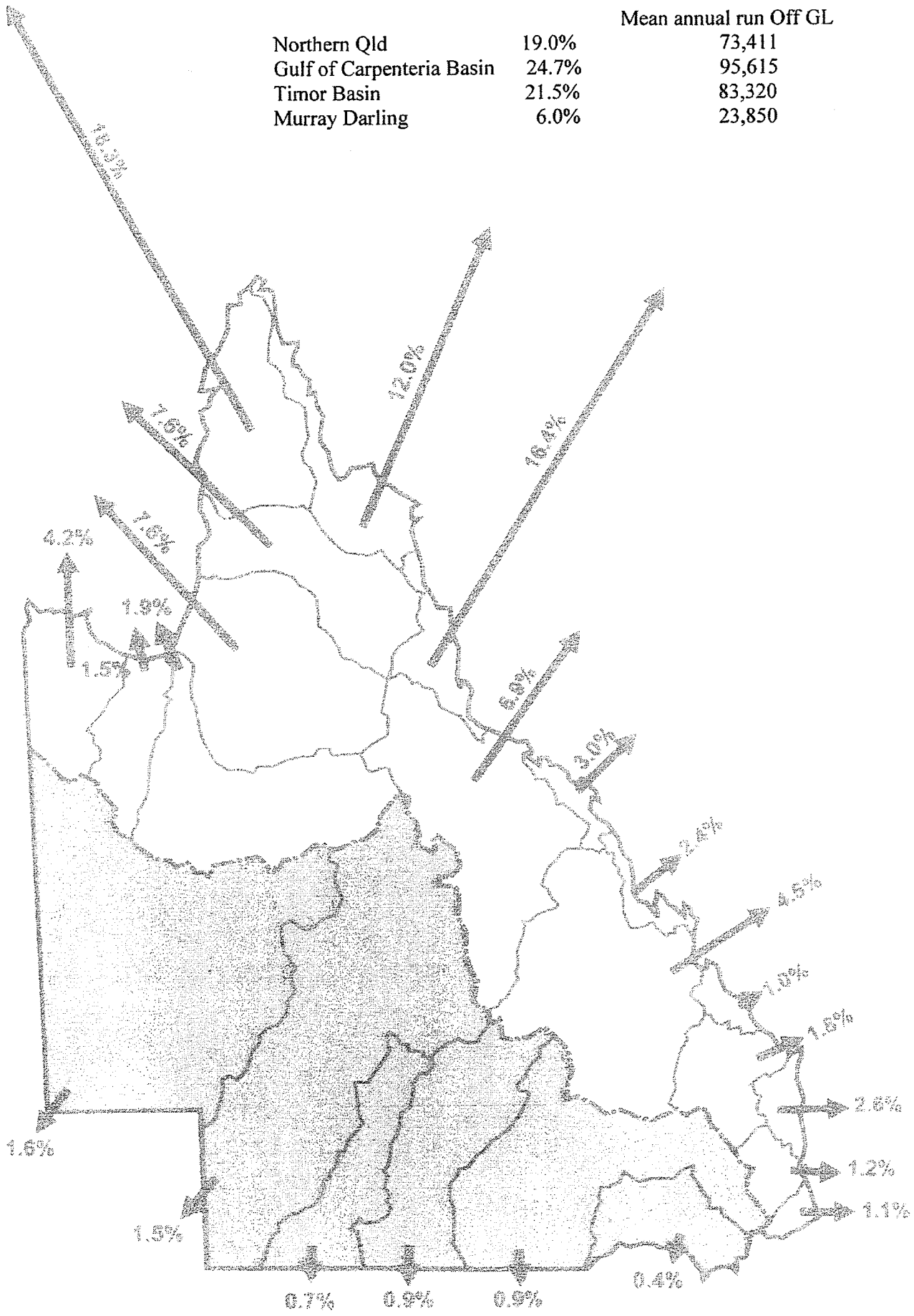
Water availability Canal capex	4000 GL minus 6% pa losses~3750GL water delivered **20%** to city dams, **40%** to irrigators, **40%** to environmental flows Main canal $5.6Bn & subsidiary canal $3.2bn delivering water to Qld, NSW, Vic and SA irrigation regions & coast cities. Could take 6 yrs to build, will have 50 yr plus life, water sourced from N/Qld regions with expected 90 yr rain reliability
Environmental flows	Water out of main canal is about one third of cost of a 10% return on water purchased from buy backs in last two years $260m savings come from reduced cost of water from infrastructure cf to continuing current water buy back process
City dams	New coastal city water comes from desalinated water which needs to be charged out at $1.80/KL to cover costs. Power to run desalination plant @ 7Kwh/KL gives carbon charge of 1.1T CO2 from a 50: 50 split of coal and renewable
Irrigators	Irrigated water charges based on average cost of delivering water from main canal plus charges involved in moving water via subsidiary canal to major irrigation areas in Qld, NSW, Vic and SA.
Wheat sales	We estimate as global food crisis impacts demand for grain from Asia will increase and so will price/T of wheat as dry - land farming struggles with diminished rainfall and climatic warming factors that will reduce yield
Straw to ethanol	Straw from wheat crop will be harvested, densified and delivered to ethanol plants at approx $25/T then converted to ethanol & power using syngas fermentation technology. Offsets come from reduced carbon charges on bio-fuel
Power from straw	Exportable power generated from cooling gas in boiler associated with syngas fermentation process . Carbon offsets come from renewable power credits
Soil carbon	Soil carbon dollars based on 30T CO2-e/Ha charged @$20T/tonne of CO2-e generated from no till irrigated grain crops. Carbon offsets split 50:50 between growers and gov't. Similar figures possible from other grains, legumes and cotton .
Gov't Returns from canal in a public-private JV & related industry	• Water returns $1.55bn pa from canal investment of $8.8 bn ~ 17% pa • Total returns pa from water sales, savings, industry taxes & carbon offsets less canal pumping C charges ~27% pa • GDP Multiplier benefits to economy (based on government recognized ICN factors) ~ $30 bn • Emissions reduction as a percentage of Australian total emissions ~ 7% (NB within range of Australia 2020 target)

LOW COST IRRIGATION PIPE TO REPLACE IRRIGATION CHANNELS

(pour soil based concrete over inflated pipe)

We know where all the water is. It is mainly in Northern Australia

		Mean annual run Off GL
Northern Qld	19.0%	73,411
Gulf of Carpenteria Basin	24.7%	95,615
Timor Basin	21.5%	83,320
Murray Darling	6.0%	23,850



Average Annual Discharge for Water Regions in Queensland