Dampier fact sheets

Introduction

The Dampier Archipelago consists of 42 islands and islets close to the western coast of Australia, about 1600 km north of Perth. They vary greatly in size, ranging in land area from 1 ha to 3290 ha. The largest island, Murujuga, was separated from the mainland only by tidal mud-flats and connected to it by a causeway built in 1964. Called Dampier Island until 1971, it was then renamed Burrup ‘Peninsula’ after a Roebourne bank clerk. Murujuga is maximal about 27 km long and up to 5 km wide, measuring about 117 km². The Archipelago was named after William Dampier, thought to be the first European captain to see it. Until 1868, most of it was occupied by the Yaburara, a sub-tribe of the Ngaluma, and frequented by the Ngaluma, Mardudhunera and other tribes of the region. In 1868, the Yaburara were subjected to almost complete genocide by the colonial government, in a series of horrific massacres occurring over about three months.

The Dampier Archipelago is regarded as containing the world’s largest concentration of rock art, comprising at least 600,000 petroglyphs, and very probably well in excess of one million motifs. It also features Australia’s largest corpus of stone arrangements, of which five types occur, numbering in the thousands. It is estimated that the rock art and megalithic structures occupy a total area of at least 8 km², and this is therefore the world’s largest art gallery, and

Figure 1. The central part of Murujuga (Burrup ‘Peninsula’) showing part of the industrial complex. Rock art and stone arrangements occurred throughout the area prior to the 1960s, but have now been destroyed in much of it.
Northwest Shelf LNG plant.

It is planned to locate the Pluto plant next to the existing explosive storage there. The petrochemical precinct of Dampier measures only a few square kilometres, yet the state government intends to cram numerous more plants into this area, in addition to the existing explosive storage there.

The explosive energy stored at Dampier

Existing installation at Northwest Shelf LNG facility at Dampier

4 LNG tanks, each of 65 000 m³, total 260 000 m³
2 Condensate tanks, each 72 000 m³, total 144 000 m³
2 Condensate tanks, each 90 000 m³, total 180,000 m³
1 Propane tank, 52 000 m³
1 Butane tank, 65 000 m³

The LNG is stored below its boiling temperature of -161º C, condensed 600 times. Therefore these 4 tanks have a capacity of 156 000 000 m³ of methane. One m³ of methane represents 37 080 BTUs (British Thermal Units) of energy, therefore these 4 tanks contain 5 784 480 000 000 BTUs when full.

One tonne of TNT yields 1 000 000 000 calories, or 3 968 321 BTUs. Therefore one Hiroshima-size atomic bomb, which is 15 kilotonnes of TNT, represents the energy of 59 524 815 000 BTUs. It follows that the LNG stored in the four existing LNG facility represents up to 97.2 atomic bombs of the size of the Hiroshima Little Boy bomb of 6 August 1945. Since there is also massive energy stored in the remaining 6 tanks, the minimum explosive energy held at the facility can be assumed to total at least the equivalent of 100 Hiroshima bombs, or the equivalent of 1 500 000 tonnes of TNT, at any given time.

Planned initial capacity of the Pluto facility

2 LNG tanks, each 160 000 m³, total 320 000 m³
2 to 3 Condensate tanks, total 120 000 m³

The 2 LNG tanks are planned to have a capacity of 192 000 000 m³ of methane, or 7 119 360 000 000 BTUs (Woodside 2006). This therefore corresponds to another 119.6 Hiroshima bombs, excluding the condensate, propane, butane, light oil and hydrogen tanks. Depending on how full the tanks are, it can be assumed that the minimum equivalent of 120 Hiroshima atomic bombs (1800 000 tonnes of TNT equivalent) will be stored there at any given time. It is planned to locate the Pluto plant next to the existing Northwest Shelf LNG plant.

Other volatile installations at Dampier

At the port of Dampier, next to the proposed site of the Pluto plant, 92 000 000 tonnes of ammonium nitrate is stored according to a newspaper report (The West Australian 2004). This chemical can explode spontaneously, particularly in hot and humid conditions (Toulouse disaster, 21 September 2001).

In 2005, the Burrup Fertiliser plant, 1 km east of the Port, commenced production. Its storage tanks also contain massive quantities of several volatile, toxic, flammable and explosive substances.

The size of the Dampier bomb

On this basis it can be reliably estimated that the combined energy stored in the Northwest Shelf, Pluto, the Port and Burrup Fertiliser facilities at any given time would be at least 40 000 000 tonnes of TNT equivalent, or 267 Hiroshima bombs (assuming Pluto is placed at Dampier). These plants are within a few hundred metres of each other, and if one of them exploded, the others would suffer the same fate.

Previous LNG disasters

Liquefied natural gas terminals present low-risk, high-consequence potential of major disaster. Thousands of people have died directly in LNG and natural gas explosions, tens of thousands have been injured or suffered gas poisoning. If there were a major mishap at Dampier, it is likely to kill 10 000 people immediately, through asphyxiation, explosion or fire. The most recent LNG disasters were the following:

Southern Ural Mountains, Russia, June 1989: 575 killed, over 700 injured.
Chongqing, south-western China, 23 December 2003: 234 workers killed, over 500 injured, 9000 residents poisoned, 40 000 evacuated.
Skikda, eastern Algeria, 19 January 2004: 27 workers killed, 72 injured (Halliburton had updated the plant in 1999).
Ghislenghien, Belgium, 30 July 2004: 23 killed, more than 120 injured.

The future disaster at Dampier

Assuming that (because of terrorist attack, earthquake, helicopter accident, lightning, faulty equipment, the act of a deranged employee or any other reason) a tank at Dampier has been damaged, the following scenario is to be expected.

The liquid LNG, which consists almost entirely of methane, has a specific gravity of 1.5 and will on exposure to air boil over, much as boiling water does, rapidly expanding in volume and fracturing steel structures in its way through its extreme cold. Being at this stage much heavier than air, non-inflammable and non-explosive, it will flood the plant and flow to any low-lying areas, including the nearby sea. At the periphery of the developing methane cloud, where adequate oxygen is available, a flame membrane will heat up the methane and explode other tanks as the cloud expands. The rapidly forming cloud will be white, because air moisture would condense to water vapour through the cold methane. It will expand up to 600 times the volume of the...
tanks and blanket the surrounding land for many kilometres, with an eventual volume of around 400 cubic hectares (e.g. covering an area of 200 km² or 16 km diameter 2 m deep). The rate and direction at which the methane diffuses depends primarily on the air temperature, air turbulence, and direction and strength of the wind. When the gas reaches its Lower Explosive Limit (mixed with air 5–14 % by volume), it is highly explosive, and ignition will occur at the periphery of the cloud almost as soon as the disaster occurs (e.g. from a flame tower, the initial explosion or any other potential source). The heat generated would be in the order of 2000–3000º C, first destroying the tensile strength of any steel (at 1200º C), then melting it (at 1600º C). As the methane cloud expands towards Dampier and Karratha, all living organisms, from humans to bacteria, will be first asphyxiated and frozen, then burnt. For many kilometres around the cloud, oxygen would be severely depleted as it is sucked into the firestorm, and where its level falls below 6 %, convulsions and death would occur in humans and other mammals. At levels of between 6–10 %, loss of consciousness would occur, and symptoms such as impaired respiration, permanent heart damage, nausea and vomiting would be still registered at 12.5 % (the normal oxygen content of air at sea level is 20.9 %). As the enormous quantities of methane burn, the population of Dampier and Karratha would probably perish even if not reached by the burning cloud, through oxygen depletion around the cloud. A methane cloud can travel for many kilometres, even hundreds of kilometres, especially unignited.

In addition to these immediate primary effects, other effects of such a disaster would include the complete destruction of all Burrup industry, including that of Hamersley Iron/Rio Tinto, the harbour, and all jetties and ships in the area. The immediate damages would be well in excess of $30 billion, but the long-term damage to the economy of Australia would be far greater. It would include the effects of a complete collapse of the LNG network of Western Australia, and the loss tax revenue, international sales and markets, labour redundancies across the state, losses to contractors and suppliers, and compensation claims from dozens of iron ore, salt and LNG customers throughout the world. The disaster would also cause the breakdown of the state’s electricity grid (as gas-powered generators would be shut down indefinitely), and the cost of disaster relief and long-term social security needs. Thus the total cost can be safely assumed to be in the order of 10000 human lives and hundreds of billions of dollars to the economy. The reason for this, the greatest industrial disaster in human history, is the insistence of the government to place all these volatile plants, which present ideal terrorist targets, in one single location, thus creating the ‘Dampier bomb’.

In addition to the devastation of the Dampier industrial complex and the state’s economy, a major explosion at Dampier could also cause a tsunami that would affect the west coast of the continent and southern coasts in the Indonesian archipelago.

The emissions of Dampier industry
Woodside’s Northwest Shelf facility, 2004/5
Nitrogen oxides: 12 000 000 kg
Benzenes: 1 200 000 kg
n-Hexane: 2 000 000 kg
Toluene: 2 200 000 kg
Total of organic compounds: 33 000 000 kg
Carbon monoxide: 2 500 000 kg
Carbon dioxide: undeclared, but believed to be between 8–12 000 000 000 kg per year.

Previously claimed emissions of NOx were: 1 300 000 kg in 1999, 6 800 000 kg in 2000, 5 800 000 kg in 2001, 11 000 000 kg in 2002, 12 000 000 kg in 2003 and 2004.

Of benzene, they were: 130 000 kg in 1999, 1 200 000 kg in 2000, 1 100 000 kg in 2001, 1 000 000 kg in 2002, 780 000 kg in 2003, 880 000 kg in 2004.

The production of the facility has steadily increased over these years, therefore the severe irregularities in some of these quantities need to be explained. In March 2003, Woodside admitted that it had lied about the NOx quantity, which explains the doubling in the 2002 report. The 1999
values are also entirely unrealistic and the benzene quantities remain probably false. The facility has been Australia’s largest air polluter for over 25 years (Australian National Pollutant Inventory 2006).

Other industry

The Hamersley Iron/Rio Tinto facility at Dampier reports emitting 7 000 000 kg of particulate matter (<10 μm), but only minor quantities of other pollution. There are no details yet available from Burrup Fertilisers, which commenced production recently. If the Pluto plant were established at Dampier, the crucial emissions of NOx and benzene would more than double relative to present levels.

The greatest concern for the preservation of the rock art of Dampier are the acidic emissions, most especially the oxides of nitrogen. They form nitric acid on contact with moisture, which then leaches the principal cations from the mineral accretion covering all rock surfaces, particularly iron and manganese. This results in the bleaching of this patina, which has taken many millennia to form and which is very sensitive to reduction of precipitation pH. The gradual but eventually complete destruction of the petroglyphs is rendered inevitable by this process. Deterioration of the mineral crust has been measured since the late 1960s, and has accelerated significantly since the late 1980s (Bednarik 2002). The Dampier emissions are recorded as light to medium, sometimes heavy rainfall on the local rain radar facility every day of the year, even if there are no clouds within a thousand kilometres. It is predicted that the rock art will begin to disappear during the present century, just as its makers did during the 19th century. The acidification of the natural environment also has other consequences, among them the destruction of the nearby coral reef and other components of the delicate environment.

Summary

There are numerous other concerns for the cultural precinct of Dampier, especially the ongoing physical destruction of rock art and stone arrangements, which began in 1963, has continued every year since then and remains ongoing. Major components of the monument have been destroyed as recently as May 2006, and the placing of the Pluto plant at Dampier will destroy most remaining rock art and stone arrangements between King and Withnell Bays. The continuing lack of a comprehensive management plan, the lack of any protection of the monument from uncontrolled
visitation, and the endemic lack of competence in heritage management in Western Australia are further concerns.

The government’s lack of concern over the extremely high level of carcinogenic emissions is likely to lead to major compensation claims in the long term. The government’s determination to add significantly to the already dangerously high concentration of toxic, volatile, flammable and explosive stockpiles at Dampier is particularly hard to understand. It indicates an inability to comprehend the severity of these planning mistakes. There are numerous alternative sites available for all future developments along the coast, and the need for such alternative industrial nodes is in any case inevitable. There is thus no need to prolong the destruction of the Dampier Cultural Precinct any further. Only one factor prevents the state government from discontinuing the destruction of the Dampier monument: its unwillingness to concede that its decision to allocate $185 million to infrastructure at Dampier was a mistake. Nearly all industrial proponents have now rejected Dampier as a viable site for their developments, including BHP Billiton, Methanex, Syntroleum and DME Japan, and no new ones are likely to be lured to Dampier. The Gallop plan for Dampier is a disaster in every possible sense.

Acknowledgment
I wish to acknowledge the help of Gary Gray, Corporate Affairs Director of Woodside Energy Ltd, in checking this document for factual accuracy of data referring to that company.

Robert G. Bednarik
Editor and Convener, International Federation of Rock Art Organisations (IFRAO)

REFERENCES


Legislative Council 2005. Questions on Notice, Tuesday, 16 August 2005, Hansard pp. 3917c-3918a/1, Legislative Council of Western Australia.


Please visit the Save the Dampier Rock Art site at http://mc2.vicnet.net.au/home/dampier/web/index.html and sign the Dampier Petition. Thank you!
The ‘Assistant Undertaker’ of Dampier rock art

Recently Professor Iain Davidson announced to the media that he had secured for his university department a three-year postgraduate scholarship to study the rock art of Dampier, to be funded by the rock art vandal Woodside Energy. An announcement in The Courier Mail on 4 October 2006 included the coy statement by Davidson that ‘Woodside already had done extensive auditing and study of the art’. The Professor need not have been so modest, The West Australian Weekend of 30 September had already reported a few days previously that he, Davidson, had been ‘employed by Woodside to oversee an audit of the rock art on their leases. He can’t comment on the report ... but he will say that Woodside came out well. And he says claims about the number of art pieces destroyed are misleading.’

The scholarship was widely dismissed as a public relations stunt to bolster the chances of Woodside’s Pluto development at Dampier being approved (e.g. on Message Stick, 5 October). However, Davidson defended this stunt and his own employment by Woodside with some well-chosen words. When asked by Conor Duffy, ABC, ‘Are you confident then that the heavy industry and rock art can co-exist?’, Davidson replied candidly: ‘No! I have no idea of that and nobody does, but all I can say is that they will co-exist. That’s to say, the heavy industry is there. I see no great will in government to remove a billion dollar plant. The rock art can’t go anywhere else, and so what we have to do is to get the best situation, the best outcome from that co-existence.’

Davidson claims to have investigated this issue, and he cannot see how the industry and the monument can co-exist, yet he expects them to co-exist. He offers no solution but the death knell for the rock art on the Pluto site at Holden Point, and the slow death from acidic emissions of the rest of the Dampier rock art. He does not even seem to realise that there are two Woodside plants to consider, and that nobody has demanded the removal of the existing Northwest Shelf plant. The new Pluto plant is easy to locate elsewhere, it has not had final approval yet. He is quite right, the rock art cannot go anywhere else, but he is wrong in suggesting that the Pluto plant needs to be in the same location as the rock art. There are dozens of alternative locations for it.

Davidson also stated in the same interview on 5 October: ‘We know of the damage to several hundred engravings, which were sanctioned by the state government at the time the Woodside plant was set up [in 1980], we cannot say that 20 % of the engravings — 20 % is 200 000 engravings — we cannot say that 20 % of the engravings have already been destroyed.’

For someone who claims to have done the relevant research his ignorance is breathtaking. It is generally known that 1760 decorated boulders removed by Woodside in 1980 languish in just one of the compounds of relocated rock art, and they represent only a tiny portion of the destruction. Most of the rock art in the way of industrial development has been bulldozed, as have all of the hundreds of ruined stone arrangements (such as the ones levelled in May 2006, see Figure 4, previous page). Since 1972, records have been kept of the rock art destroyed, by the Department of Indigenous Affairs of Western Australia. They show that between 1972 and 2003, the rock art of 119 sites was relocated, while that of 350 sites was destroyed, but 238 sites in the affected areas were preserved (Hansard 16 August 2005). The Department has also estimated that 3690 rock art sites existed on Burrup initially. In other words, 12.7 % of the Burrup rock art sites were recorded to have been destroyed 1972–2003. More were laid to waste since then, right up to the present time, and a very substantial slice of the Burrup rock art was levelled between 1962 and 1972. In addition, it must be remembered that these figures relate only to sites destroyed or relocated, and exclude partially destroyed sites such as Gum Tree and Skew Valleys, where many more thousands of petroglyphs were bulldozed. Thousands of others have been pitted over the years, because of the complete lack of any protection, and there has been much site vandalism by uncontrolled visitation. Of course the figures also exclude the rock art on Mistaken and East Intercourse Islands, which was eliminated entirely.

According to the most conservative and parsimonious estimate (National Trust of Australia), 900 rock art sites were destroyed on Burrup alone, out of 3690 thought to have existed there in 1962. This is 24.4 % of the total. An alternative way to calculate the quantity of rock art destroyed is to extrapolate from the known figures 1972–2003 to the full land area subjected to development. According to the Premier of Western Australia, Alan Carpenter MLA (his letter to me dated 9 October 2006), the ‘best current estimate is that some 42 % of the Burrup is designated for industry’. We know that 66.3 % of the rock art was destroyed in the area where proper records were kept, and if we make the reasonable assumption that a similar percentage has been or will be lost across the industrial estate, this would extrapolate to 1028 sites, or 27.9 % of the original total Burrup rock art. The difference of 3.5 % probably represents areas yet to be destroyed, most especially Woodside’s Holden Point site for the Pluto plant.

Professor Davidson only knows ‘of damage to several hundred engravings’ (0.1 % of the total?), which illustrates his ignorance. He also thinks that 20 % of the Burrup rock art is 200 000 petroglyphs. Again, his confusion is understandable, he is a newcomer to this topic. Nobody has claimed there are a million petroglyphs on the Burrup, but it has been said many times that there are a million in the entire archipelago, which includes forty-one other islands. Clearly, he either does not know much about this subject, or he acts as an apologist for the rock art vandals. My very conservative estimate of petroglyphs on the Burrup was 300 000, others’ figures are in the order of 500 000. Therefore 24.4 % is between 73 200 and 122 000, depending on...
Sims has recently reported from north-western Tasmania and other ages comprise many face- or mask-like motifs, zoo-morphs Thule ancestors of modern Inuit. The approximately 170 im-
attributed to the Dorset culture, which was replaced by the
Island, located near the village of Kangiqsujuaq, Hudson
Christians from a nearby Inuit community. The tiny Qajartalik
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would not have been able to convey the meaning of a word.
without the ability of making pictures of objects, people
tools, he made himself a name in 1989 with the theory that
in Australia for some time. A specialist in Spanish stone
emissions. This explains why Davidson refuses to rule out
the possibility that the rock art will not be able to co-exist
with the industry.
Davidson has been the most controversial archaeologist
in Australia for some time. A specialist in Spanish stone
tools, he made himself a name in 1989 with the theory that
figurative art must have preceded human language, because
without the ability of making pictures of objects, people
would not have been able to convey the meaning of a word.

Robert G. Bednarik
11 October 2006

A response to this paper has been invited from Professor I. Davidson. Unfortunately it was not available by the
time this issue of the AURA Newsletter went to press.

Petroglyphs destroyed by Christian zealots

The probably religiously motivated iconoclasm Peter Sims has recently reported from north-western Tasmania (RAR 23: 119) is apparently not the only such recent occu-
rence. Randy Boswell, of CanWest News Service, reported in August 2006 that the only major Arctic petroglyph site of Canada, Qajartalik, has been severely defaced by devout Christians from a nearby Inuit community. The tiny Qajartalik Island, located near the village of Kangiqsujuaq, Hudson Strait, consists of steatite. It features numerous petroglyphs attributed to the Dorset culture, which was replaced by the Thule ancestors of modern Inuit. The approximately 170 images comprise many face- or mask-like motifs, zoo-morphs and other figures.

Unfortunately the island has locally been named ‘Island of the Stone Devils’, probably a reference to the face mot-
tifs. Local residents consider the rock art to be pagan, and the island inhabited by evil spirits. Proposals to ensure the preservation of the rock art have been voiced for the past fifteen years, but action has been prevented by long-run-
negotiations between Nunavut, Quebec and the federal government over the ownership of the Hudson Strait islands. Now the site has been extensively defaced. The vandalism includes deep gouges and crosses over many of the face-
like motifs. This is reminiscent of the crosses placed on the circles of the Greens Creek petroglyph site in Tasmania, where a sect called the Brethrens is thought to be involved. It is a pattern often found in Christian iconoclasm, for instance in Karelia and Bolivia. The recent vandalism at Qajartalik follows a pattern of previous attacks by members of con-
servative Christians in Kangiqsujuaq and several other Inuit communities in northern Quebec.

Cultural Heritage and Indigenous Cultural and Intellectual Property Rights
A World Archaeological Congress Symposium

Venue: Burra, South Australia
Dates: 3–5 December 2006 Convenors: Claire Smith and Heather Burke, Department of Archaeology, Flinders University Program Chair: Tim Ormsby

This cross-disciplinary international conference will address the history of, and contemporary developments in, the intersections between cultural heritage and cultural and intellectual property rights in Indigenous customary and academic worlds. Key speakers include Julie Hollowell and
George Nicholas, Canada; Maui Solomon, New Zealand; and Sven Ouzman, South Africa. The conference will be held in the heritage town of Burra, South Australia, in the traditional country of the Ngadju people. Burra is a significant location for discussion of this topic, since it was the site where the Burra Charter (the Australia ICOMOS charter for places of cultural significance) was developed.

This conference will take an international perspective to examine in depth the cultural and intellectual property issues facing Indigenous, customary and academic communities, and examine critically the successes and failures of efforts to resolve such issues. Our ultimate aim is to inform protocol- and policy-making at individual community, national and international levels. The overall goal of this research is to provide foundational knowledge and data to assist scholars, Indigenous communities, and other stakeholders in developing more equitable and successful resolutions and policies regarding the cultural and intellectual property rights issues that are fast emerging. This conference is one facet of a global project being co-ordinated by George Nicholas, Julie Hollowell and Kelly Bannister, which has received seed funding from the Social Sciences and Humanities Research Council.

Dr Claire E. Smith and Dr Heather Bourke
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Australia


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**AURA Treasurer’s financial statement 2005/2006**

**ELFRIEDE BEDNARIK**

**Balance in hand on 30 June 2005:** $12,866.65

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**Total** $9364.58 **Total** $12,651.56

**Balance in hand on 30 June 2006:** $9579.67