INVESTIGATION INTO SOURCES OF WATER FOR PROPOSED TOURIST COMPLEX NEAR TEARS ROCK

CURRENT DEVELOPMENTS (DRAFT)

R. French
P.P. Wecker
A.D. Macqueen
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1.1 Background

Since the Harris, Kerr, Forster report (Ref. 1) of 1965 a water supply for a tourist industry at Ayers Rock has been the study of Stephanski who selected bore sites near Mt Olga, Ayers Rock and Mt Conner as well as 20 miles north of Curtin Springs homestead (Ref. 2).

In 1968 and 1969 bores were drilled by this Branch east of Ayers Rock, at the base of Ayers Rock and between Ayers Rock and Mt Olga. This investigation has been reported by Ride (Ref. 3).

The Harris, Kerr, Forster two volume report (Ref. 4) on tourism was followed by a brief investigation by this Branch in early 1970. The resultant report by French and Wood (Ref. 5) suggested that insufficient potable water was available within a 25 mile radius of the H.K.F. tourist complex site and that local water would have to be desalinated or potable supplies extracted from the Levi Range area 100 miles to the northeast.

In its preliminary study of costs (Ref. 6) the Commonwealth Department of Works assumed treatment for water from between Ayers Rock and Mt Olga (the H.K.F. site for the tourist complex) but no treatment for water from near Ayers Rock.

The "Ayers Rock Water Supply Investigation" by Australian Groundwater Consultants Pty Ltd (Ref. 7) was commissioned by the N.T. Administration "to study and evaluate available data and report on prospects of locating potable groundwater within 100 miles of Ayers Rock". The chief recommendation was, "To provide the full requirement for potable water, a further programme of investigation (should) be undertaken in the Mount Olga area".

A report by Kinnaird, Hill, De Rohan and Young is in preparation but its aim and content is not known to this office.

At present the Alice Springs office is preparing to carry out the A.G.C. recommendation by sending two percussion rigs to Ayers Rock and Mt Olga.
1.2 Objective

The objective of this report is to summarise some current attitudes which may affect the activities of this Branch in its search for water for a tourist complex to serve Ayers Rock.

1.3 Scope

This report tenders some comments on the A.G.C. report as the latest technical report produced, and reviews some current thinking on the role of a tourist complex in the area. As a result, an alternative site for a tourist complex is suggested and supported by hydrogeological opinions.

2. Comments on the Report by Australian Groundwater Consultants Pty Ltd

Within this section the numbering system is that of the consultants in their report "Ayers Rock Water Supply Investigation".

2.2 Topography

Britten Jones Creek does not normally flow. The 1:250 000 map shows the creek bed to extend 25 miles into the Northern Territory but an aerial inspection of the sandhill formation indicated that the effect of floodwaters extends at least twice this distance.

2.3 Climate and Rainfall

Groundwater levels in Central Australia generally do not respond to the intensities of the wet and dry seasons as they do in the north of the Northern Territory but to flood events if near a watercourse or source of recharge or otherwise to the trend of years to dryness or wetness. At first sight the consultants' adoption of the median annual rainfall of 5 inches appears no less conservative than the 10-percentile rainfall suggested by the Senior Engineer Groundwater in November 1971. Later in the report (pages 6, 15 etc), however, it is recommended that water be extracted close to exposed rock, that is, closer to the immediate source of water. In this case greater seasonal fluctuations of the water table can be expected and the 10-percentile rainfall becomes more realistic.
2.4 Vegetation

The vegetation at the bases of Mt Olga and Ayers Rock is strictly related to the runoff from these features. Figure 3 shows two major vegetation divisions and their dependence on runoff may be easily deduced from the major drainage divisions.

Ayers Rock dips steeply into the surrounding plain without a scree slope. Bloodwoods and other large trees extend only a short distance from the rock, presumably where the water table is highest. Around the Olgas, however, an extensive scree slope exists which slope is covered by mulga type trees and low vegetation. This is probably because the water table is too low for the roots of large trees to tap the capillary zone. Mulga and scrub do not seem to depend on a high water table to exist but all arid zone vegetation requires a high surface soil moisture content for seed germination.

The life span of existing vegetation and the degree of regeneration in the near vicinity of these two rock formations are seen to be dependent on both sub- and supersurface water supplies, hence, any significant alteration of these flow regimes is very likely to be reflected in the sudden or gradual death of vegetation.

2.5 Hydrology

The assertions of the third paragraph seem to be more definite than the (lack of) data allows.

2.6 General (Hydrology)

In the second paragraph the existence of a fault close to the southern face of Ayers Rock is hypothesised. Figure 3 shows some of the compression-tension lines discernible from the aerial photographs. One of these lines does in fact pass the southern face of the rock but this may not constitute a fault if the tightness of the line across the top of Ayers Rock is any indication. If faults do exist it may be better to avoid them as contained water may be more saline and could be extracted directly into a bore or by upconing.

On page 7 the statement "Discharge from individual wells and from the field is controlled to prevent large drawdowns, (or upconing of deeper saline waters)" assumes that water quality in this area will invariably decrease with depth.
The suggestion "Adequate monitoring of water quality is practised to maintain potability of the supply in the periods between recharges" does not preclude the possibility of the quantity of water available being reduced to zero in order to maintain quality standards. This is unacceptable, as a water supply for a tourist resort complex must be of acceptable quantity and quality at all times.

In the second last paragraph on page 7, the 100 feet of alluvium having the "greatest potential for supplies of potable water" when combined with the assumed specific yield of 8% (page 6) results in an eight feet equivalent water depth. If we assume no inflow into the aquifer(s) around Ayers Rock but that an annulus 6 mile long in circumference, 300 feet wide yields its full 8 feet of water then only 1750 acre feet is available. This is about 6 years supply at 250,000 gallons per day.

The technical and economic magnitude of completely encircling Ayers Rock with bores spaced close enough together to extract even 50% (page 12, last paragraph) of this water is psychedelic.

3.2.1. Adjacent to Ayers Rock

The intense gradient between AR13 and AR12 could also be explained by ineffect surveying or gross errors in water level measurements.

3.2.1. General

- Alluvium Adjacent to Runoff Areas.

To improve on the sentence "Nothing is known of the depth or nature of the alluvium close to the base of the Olgas complex or Mount Currie" in the last paragraph on page 13, Engineers French and Roberts inspected the gorge between Mt Olga and Wilpa on 30 January 1972. At the outlet of the gorge the erosional material of the Mt Currie Conglomerate is mainly pebbles and small boulders of black, extremely hard diabase. The depth of alluvium could not be gauged but the percussion driller, Mr. Yeatsman, indicated the penetration rates would be extremely low, especially for percussion rigs and trouble could be expected from crooked holes etc. He had also drilled a couple of holes close to the base of the Olgas so many years ago that records are not held in this office. No water was struck before the rig was pulled off somewhere between 100 and 200 feet because of hard drilling. The formation of short stream channels leading away from the base of these
features do not negate the probability of permeable alluvium of adequate depth". An inspection of Bubia Creek from the road around the Olgas indicated that solid rock forms the bed of this creek for much of its length. This impermeable bed rather than higher runoff is probably the cause of the comparatively long creek lengths. The "Ayers Rock" geological map (Ref 8) indicates that sufficient depth of permeable alluvium close to the Olgas (to prevent the dissolved solids content from building up) probably exists only to the south of that feature.

General remarks on the consultants' report

The basic fault seems to be that the commission to the consultants has not been carried out: "To study and evaluate available data and report on prospects of locating potable groundwater within 100 miles of Ayers Rock" (letter to the consultants from N.T. Administration Stores Section, 11 March 1971, reference S46/TE.117/70). The report of this office in May 1970 (Ref. 5) pointed to the existence of the likelihood of a source of water in Mereenie Sandstone less than 100 miles distant from Ayers Rock but this was not taken up by the consultants.

Because the consultants' commission only included preparing estimates for future investigation, the physical, financial, ecological and social problems with and costs of obtaining water from Ayers Rock and the Olgas has not been dealt with.

One plan drawn up by the Commonwealth Department of Works caters for a peak population of about 9000 persons at the H.K.P. site. A water supply producing in excess of 50 000 gallons per hour (1 million gallons per day) rather than 10 000 gallons per hour would be required. In the light of this demand and the physical system required to satisfy it, the type of solutions proposed by the consultants appears trivial.
3 SUMMARY OF SOME CURRENT ATTITUDES
TOWARDS A TOURIST COMPLEX FOR AYERS ROCK.

3.1 Management of Reserves

Employees and members of the N.T. Reserves Board have indicated
that the development of Katherine Gorge has led to problems of management.
The solution appears to keep concessionaires out of reserves or at least
away from the immediate environs of tourist attractions. This allows greater
control of tourists by fewer Board employees.

3.2 Provision of Health Services

The Department of Health is receiving many requests for the
provision of sisters, clinics and other health services in areas which need
them because of distance from Alice Springs but are unable to utilise them
fully because of low population concentrations. The health needs of the
pastoral, aboriginal and tourist populations might best be served if, instead
of spreading the personnel and resources of the Department of Health thinly
over the southern half of the Territory, these personnel and resources were
concentrated.

- A sizeable tourist complex near Tempe Downs homestead with an
all-weather airstrip would warrant the establishment of a large clinic or
small hospital and could serve the southwestern pastoral properties, the
resident and tourist populations of the complex, travelling tourists,
aboriginal populations especially at Areyonga and Docker River.

- A clinic and all-weather airstrip near Utopia Station would
serve the near northeastern pastoral properties and the large aboriginal
populations at present unserviced by Welfare Branch. Such facilities would
be more economically used if a tourist complex were established to serve the
Harts Range, Flinny River and Jervois mines areas, Aritunga, Ross River, etc.

- A third medical centre somewhere about Mt Wedge Station would
service the northwestern pastoral properties. Whether a tourist industry
can be developed sufficiently to provide a base population at the complex is
mainly dependent on Welfare Branch.
Springs area.

Tennant Creek already serves the northern section of the Alice Springs area.

While a tourist complex near Tempe Downs would almost certainly be economic as an independent unit (as, at present, one near Mt Wedge would not), an interdependent system of two towns and three tourist complexes at 100 air mile spacing might function well as a whole.

One class of tourist might be prepared to fly to Tempe Downs to spend five days seeing Ayers Rock, Kings Canyon, etc; fly via Hermannsburg to Mt Wedge for an experience of the Western Desert and aboriginal culture; thence to Utopia for a few days rock hunting and viewing 19th century mining installations; on via a water holiday at Hatches Creek to Tennant Creek.

2.3 Conservation

In Appendix A M.J. Webb indicates that tourism and conservation can and in fact should be compatible. By concentrating tourist accommodation and other facilities at a few localities in the Alice Springs area, places of natural beauty, scientific or anthropologic interest can suffer the minimum number of engineering disturbances from machinery, buildings etc.

2.4 Investment Optimisation

The development of many tourist facilities in the Alice Springs area are hampered by lack of water; Ayers Rock, Simpsons Gap, Standley Chasm and Glen Helen are but a few.

By locating the tourist complex for Ayers Rock where water is readily obtained, the "savings" in capital expenditure can be put into increasing the size or quality of facilities. Lower capital costs and the likelihood of higher returns are always more attractive to investors. Complexes near Tempe Downs or Utopia Station could be located on permeable sandstone aquifers (Marennie and Dulcie respectively) and should have no problems in obtaining large quantities of potable water. The location of a suitable water supply for a complex in the northwest is not so obvious.
NEW LOCATION FOR RESORT COMPLEX

4.1 Requirements

In the light of Section 1, the site for a re-located tourist resort must satisfy the following requirements:

a. A reasonably independent, potable water supply. This is preferable to a water supply of poor quality or limited supply because, apart from the initial savings on capital cost owing to a smaller equipment requirement and the absence of treatment plants, there are continuing savings derived from reduced maintenance and operational costs.

b. Ease of access to surrounding tourist attractions. While Ayers Rock and the Glass House are of prime importance, there are numerous other attractions south-west of Alice Springs which should also be considered. Hence a new location should provide a centre for these attractions, and provide access to all of them by both air and/or road. An all-weather airstrip is essential.

c. Location not in the immediate vicinity of a tourist attraction. While there are sound aesthetic and ecological bases for avoiding a location close to a valuable natural feature and tourist attraction, this requirement has the additional advantage of easier management. A resort located close to such a natural attraction would require a considerable degree of management and policing by rangers in order to maintain the environmental quality of the area.

d. Centre of population for pastoral and other community. The benefits of the resort complex for those other than the tourists wishing to stay there should be considered. Therefore, a location which could be of use in providing health services and supplies to the pastoral industry, any subsidiary tourist centres, and travelling tourists, is of increased value.

e. Aesthetics of immediate area. The surrounding countryside should be some attraction in itself.

f. More local considerations, such as comparative freedom from dust, wind protection, slope of the land for purposes of drainage, nature of soil for building purposes, possible provision of a golf course, and so on.
4.2 The "Mereenie Waters" Area

After due consideration of the above, the area shown in Fig. 4, named for the purposes of this report the "Mereenie Waters" area, is suggested as best fulfilling the requirements.

The area covers from Tempe Downs homestead in the northwest corner, to White Horse Gap in the southeast, with the Palmer River flowing through the centre. The area is mainly on Tempe Downs station, although the southeast corner is on Middleton Ponds.

Considering the requirements listed in 4.1, we have the following features:

a. There are excellent chances of a seasonally independent, potable water supply (See Section 5).

b. There is already road access to many tourist attractions in the region, such as Ayers Rock, Mt Conner, Kings Canyon, White Horse Gap, Hanbury Meteorite Craters, and the Areyonga Native Settlement. A good airstrip already exists in the suggested area.

c. The only tourist attraction which is very close is White Horse Gap.

d. The area is well located as a centre for Tempe Downs, Pallera Ranch, Angas Downs, Curtin Springs, Hanbury, and Areyonga. Furthermore, it is quite close to the most direct route to Ayers Rock from Alice Springs.

e. The local scenery of rocky skylines is much more aesthetic than the sand-hill country to the south.

f. The area would be relatively free of dust and wind problems owing to the ranges in the vicinity.

One area seems to deserve special consideration. It is between two rocky ridges, two miles south-east of the Tempe Downs homestead, and just north of the airstrip. The particular advantages of this site are:

1. The proximity of the water supply and airstrip (both approximately one mile away).
(ii) The nearest tourist attraction, White Horse Gap, is 10 miles away, which is far enough for management but close enough to provide a local attraction.

(iii) A good stand of river gum trees in part of the area would provide an ideal camping and caravan park, although this area would be subject to very minor flooding after heavy prolonged rain.

(iv) The slightly sloping land elsewhere would provide adequate drainage and allow the convenient erection of a water-storage tank.

(v) The hilly area on the western side of the Palmer River would provide an ideal golf-course.

4.3 Other Areas

Other areas could also be considered for the new resort location. Firstly, there is the whole area on Tempe Downs 30 miles further to the west towards Kings Canyon. Adequate supplies of water could be found here, but the area could not serve as a centre for tourists, since the road to Ayers Rock would be required to cross sandhills and Lake Amadeus and present considerable construction and maintenance difficulties.

The other possibilities considered are at the Mereenie Sandstone outcrops shown on the geological maps in the north of Curtin Springs and Mt Ebenezer stations, 56 and 100 miles respectively from Ayers Rock. These outcrops were, however, inspected on 10 February 1972 by Engineer Macqueen and Bore Inspector Wacker and considered inadequate for a large water supply. On the other hand, large water supplies can be obtained from the Quaternary gypsum outcrops in the north of Curtin Springs and Angas Downs stations, but the quality is very poor. Furthermore, all these areas would be quite unattractive for a resort complex.

5 HYDROGEOLOGICAL ASSESSMENT OF NEW LOCATION.

5.1 Within a radius of fifteen miles of Tempe Downs homestead there are considerable areas of outcropping Mereenie Sandstone which has been proved to be a reliable aquifer in the Alice Springs area.
5.2 The largest outcrop of Mereenie Sandstone occurs in a syncline approximately 10 miles southwest of the homestead, and constitutes the Levi Range. This area, however, is somewhat elevated from the surrounding country and the water table would probably be too low for the outcrop to be of great use. In addition, accessibility for drilling rigs would be a problem.

5.3 A much more promising site is on the syncline 3 miles southeast of the homestead near the Tempe Downs airstrip. This syncline is approximately 1½ miles across and the beds are dipping quite steeply. Furthermore, the Palmer River cuts across the syncline here, and there is a high possibility of considerable recharge which should maintain the quality of the water nearby. The main station road also crosses the syncline, so there is no problem with access for drilling rigs.

In 1968 this area was considered by the Water Resources Branch in connection with a proposal for an irrigation scheme. An investigation was carried out during which the fifteen 'Terowie' bores were drilled with varied success. The largest discharge obtained was 5000 gallons per hour while drilling.

This same area was visited on 11 February 1972 and it seems after studying the siting of the previous bores, that the limited success of the Terowie investigation was largely the result of insufficient geological knowledge and inadequate drilling equipment.

6 TENTATIVE INVESTIGATION PROGRAM

6.1 On 11 February 1972 four new sites, named MW1, MW2, MW3 and MW4, (to distinguish "Mereenie Waters" from "Terowie") were chosen and pegged at approximately 1000 feet intervals north of the axis of the syncline, working west towards the Palmer River. These should intersect the water table and Mereenie Sandstone at approximately 35 feet.

6.2 It is proposed that the investigation program of the area would commence by drilling at the above sites, and then probably continue by
drilling another four along the same line, further to the west, across the river. A discharges of the order of 10,000 gallons per hour is expected from each of these sites.

6.3 The estimated cost of the above program, including ten investigation and six production bores, is $100,000. This compares more than favourably with the $147,000 suggested by A.O.C. for investigations only at Ayers Rock and Mt Olga. The cost of a well field and reticulation could bring the total cost of a water supply for the H.E.P. site to about $1,000,000.
7 REFERENCES


4. Harris, Kerr, Forster and Company "Ayers Rock - Mt Olga National Park Development Plan"


6. Commonwealth of Australia, Department of Works, "Brief for first stage of camping facilities at proposed Ayers Rock - Mt Olga tourist village site". In conjunction with N.T. Reserves Board.


APPENDIX A

Extracts from "The Impact of Capital Extensive Industries on Arid Australia" by W.J. Webb, Department of Geography, University of Western Australia. pre-1970 16 pages.

In considering the impact and the development of capital intensive industries in low rainfall areas, we not only have to contend with remoteness but with the possibility that capital will be less effectively used under these conditions. Furthermore, development can proceed according to either economic or demographic criteria.

The position is further complicated by the fragility of the biological envelope in these semi-arid and arid zones. The biological shocks which the pastoral industry experiences from time to time are specific reactions to a high rainfall variability; the general absence of agriculture is evidence of low rainfall. The irreversibility of so many of the biological and edaphic processes under semi-arid and arid conditions is a major reason for imposing special types of control over investment and development in interior Australia.

Other indirect benefits which may flow from tourism involve the use of, and the demand for, local products and facilities. But this is not always so. In Western Australia, for example, the needs of tourists are catered for almost entirely from Perth and a significant proportion of the labour force in the dry areas is in transit. Consequently the impact is less than expected.

The most important direct impact is the construction and the upgrading of hotel, motel, and caravan and camping facilities in the major centres of attraction or at intermediate points. However, because tourism is a seasonal enterprise, these facilities tend to be located in areas where a base load demand for some or all of the facilities exists. For the time being the base load and tourist demands are largely complementary.

The distance between centres is so great that land travel is time consuming and costly. Consequently, a high proportion of tourists do not use hotel facilities but camp along the roadside or use caravan parks. The camping-out approach to tourism is also encouraged by so-called 'safari' tours, some of which combine road and air travel in order to reduce total travel time. The extreme example of this use of air and road lies in tours designed for overseas investors who are flown from one investment possibility to another with short road tours at each setdown; a 7-day tour of this kind may cost over $14,000.
The main physical limitation upon tourists at present is the lack of sealed roads. The consequent risk of wear and tear and of serious breakdowns, plus the low average speeds which result, reinforce, in the minds of potential tourists, the terrors of outback travel. The distance-time element has really to be experienced and unless one turns a holiday of two or three weeks into a marathon, journeys in excess of two thousand miles by road are very difficult for the average family.

Although not fully developed, the construction of accommodation at Ayers Rock is part of a trend which will inevitably involve many sub-centres and tourist routes connected to Alice Springs. Nothing comparable has occurred elsewhere in central Australia, but Alice Springs will probably set a pattern for the future based upon good accommodation and communications, a wide variety of scenery, contact with Aboriginal culture, and a hint of adventure rounded off by a topping of outback flavouring.

The development of tourism could be important for the conservation and development of arid Australia, especially the development of national parks and nature reserves. No other single factor could so forcefully affect governments, and although the creation of reserves and national parks is not yet one of the impacts of tourism, no plan for tourism or conservation which does not take the other into account is satisfactory.

The IOK Report on tourism (Harris et al., 1965), basing its findings upon American experience, unequivocally recommends that the entire tourist and travel industry of Australia should support those working toward the goal of more and better parks and reserves. Thus far, this has not occurred and the attitude of conservationists is not always favourable to tourism. The existing scale of tourist expenditure is probably not fully appreciated. In the Northern Territory, for example, tourists spent more than $4,000,000 in 1966-7 - a sum equal to half of the amount spent by the Territory administration.

The possibility of large tourist income from national parks and reserves in arid Australia has not been fully investigated, and the size of reserves in relation to our needs over the next twenty-five years is underestimated. What is also appalling is the extraordinary way in which we do nothing to preserve even the immediate environs of tourist attractions in dry Australia; in utter disregard of the fact that open space in Australia generally exists only because someone or some organisation has not yet found a way of exploiting it. So much of what is claimed in arid Australia is there only for this reason, and large areas are, or could be, changed to permanent or quasi-permanent ownership without regard to the needs of conservation and thus of good tourism.

The only reserves which are appropriate in scale and purpose to
the needs of arid Australia are the Tanami Desert Reserve and the Simpson Desert Reserve. Although there are reserves within the Alice Springs tourist region, they are so distributed as to indicate no cohesive plan and no conception of the real problems involved.

The transport revolution which follows the mining boom is more of a change of mode than of route. Nonetheless, traffic flows and tourists appear. At present the great central mass of Australia is crossed by only one effective route, the Darwin-Alice Springs-Goldfields line of communications. This may appear admirable, from the conservation standpoint. There is no doubt, however, that conservation and tourism should be regarded as symbiotic. The comparatively small impact of tourism at the present stage is largely the product of a lack of reserves and national parks and of a settled policy on their management, control, and investment. Too many people see the present open spaces as permanent features. They are not.

Much of the present leasehold land in the Northern Territory, Queensland, and Western Australia should be surveyed and much of it placed within a special category which could be called, for example, 'protected lands', by which is meant land open to use as at present but managed in such a way as to preserve amenity, flora and fauna, and scenery. The Alice Springs region should be the first to be thus investigated and developed. Many of the best conservationists are to found among the pastoral population. The possibility of relating conservation to pastoralism could be made a part of a development program for the region. The significance of this would become immediately apparent should an integrated land policy be drawn up for the Alice Springs region to serve the needs of pastoralism, tourism, and conservation.
APPENDIX B

Extracts from "Conservation And Recreation In Arid Australia"
by A.J. Costin, CSIRO Division of Plant Industry, Canberra and J.G. Mosley,
Australian Conservation Foundation, Canberra.

For some tourists, the condition of the soils and vegetation is
not an important consideration - in fact, the strong red colours of eroded,
arid country might heighten its appeal. The most important tourist qualities
of the Australian arid zone are probably its remoteness, vastness, and
spaciousness. With more than two million square miles of arid country, it
might be thought that there was no danger of these qualities being impaired.
However, since the tourist also seeks areas of spectacular scenery and easy
access, tourist interest is, in fact, concentrated on particular areas such
as the Centre and along roads. For example, visitors to Ayers Rock increased
from 4,312 in 1960 to 19,263 in 1966, an increase of well over 300 per cent
(Please, 1968). In such areas, tourist development is now proceeding rapidly,
and it is a matter of urgency that the essential qualities of the arid zone
are preserved through careful planning and control of tourist operations.
For instance, the facilities in Ayers Rock-St Olga National Park should have
been located well away from Ayers Rock itself; it is to be hoped that the
mistakes of the past will not be repeated in the developments now under
consideration. Sympathetic treatment is also necessary for historic sites,
especially those associated with early explorers such as Sturt, and Burke
and Wills, who have an important place in Australian history.

Major drainage and vegetation divisions

Ayers Rock & Mt Olga

Scale approximately 1:46,000

Figure 3