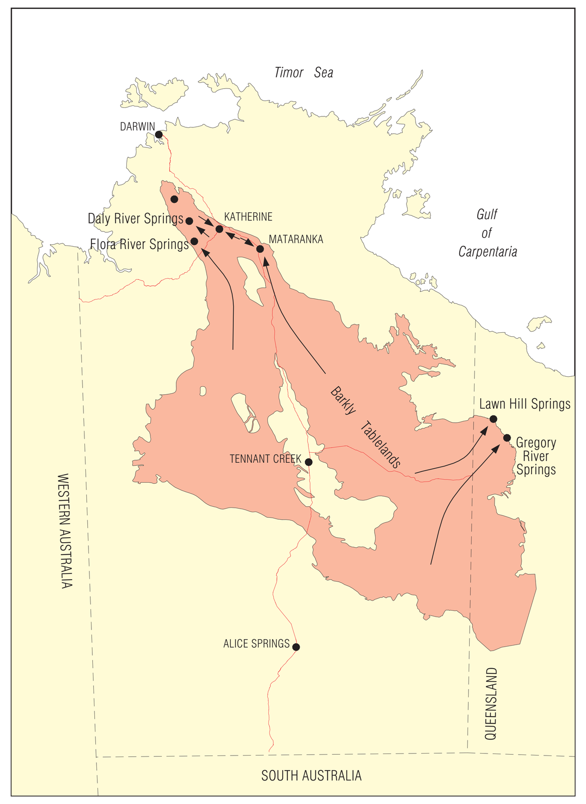
# SPRINGS OF THE MATARANKA AREA

The Mataranka area is notable for its many springs.
This map shows the location of the main springs and other groundwater discharge features.
It explains why the springs are there and describes some of their characteristics.

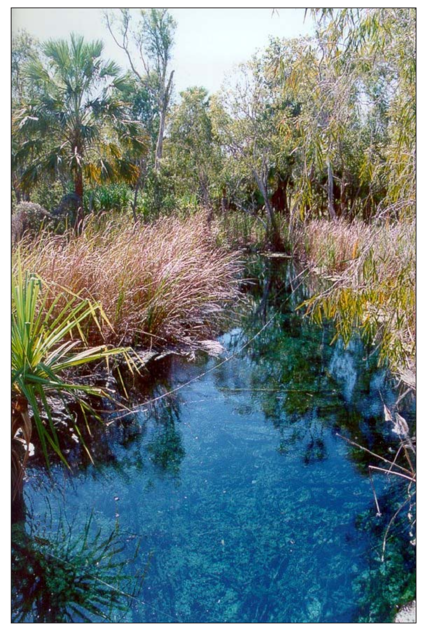



## THE BIG PICTURE

A cavernous limestone aquifer extends across a large part of the Northern Territory and into Queensland. The springs at Mataranka are one of several outlet points for the aquifer. Other big springs are found on the Flora, Katherine and Daly Rivers and in Queensland on the Lawn Hill Creek and Gregory River. At Mataranka the water originates from areas to the southeast as far away as the Barkly Tablelands and from the northwest as far as the King River.

## WHY ARE THE SPRINGS WHERE THEY ARE ?

The edge of the limestone aquifer is at its lowest point in the catchment where the Roper River cuts it just east of Mataranka. Groundwater flows from high areas to low areas; thus Mataranka is the natural outlet for the water. The location of individual springs is governed by geological structures. Rainbow and Bitter Springs lie along fractures that run from northwest to southeast. These provide weaknesses in the rock where caves can more easily form and allow groundwater to escape to the surface. The Roper Creek has a very straight course, which coincides with such a fracture.



Bitter Springs on the Roper Creek

## THE AQUIFER

A layer of rock known as the Tindall Limestone hosts the regions main aquifer. The limestone was deposited in a shallow sea some 500 million years ago. It has been subjected to weathering over a long period, resulting in a network of solution cavities ranging from microscopic to the size of caves. These cavities together with cracks in the rock comprise the aquifer. A large volume of groundwater is stored in and flows through the aquifer.

## 1. THERMAL SPRINGS

Rainbow Spring is commonly referred to as a "thermal" spring. Both Rainbow and Bitter Springs are 33°C at their sources. This is within the range of the ambient temperatures of groundwater in the Top End, indicating that they are not true "thermal" springs. The Douglas Hot Springs north of Katherine is one of the few thermal springs in the Northern Territory, with a temperature of 50°C.

## 2. MATARANKA SPRINGS

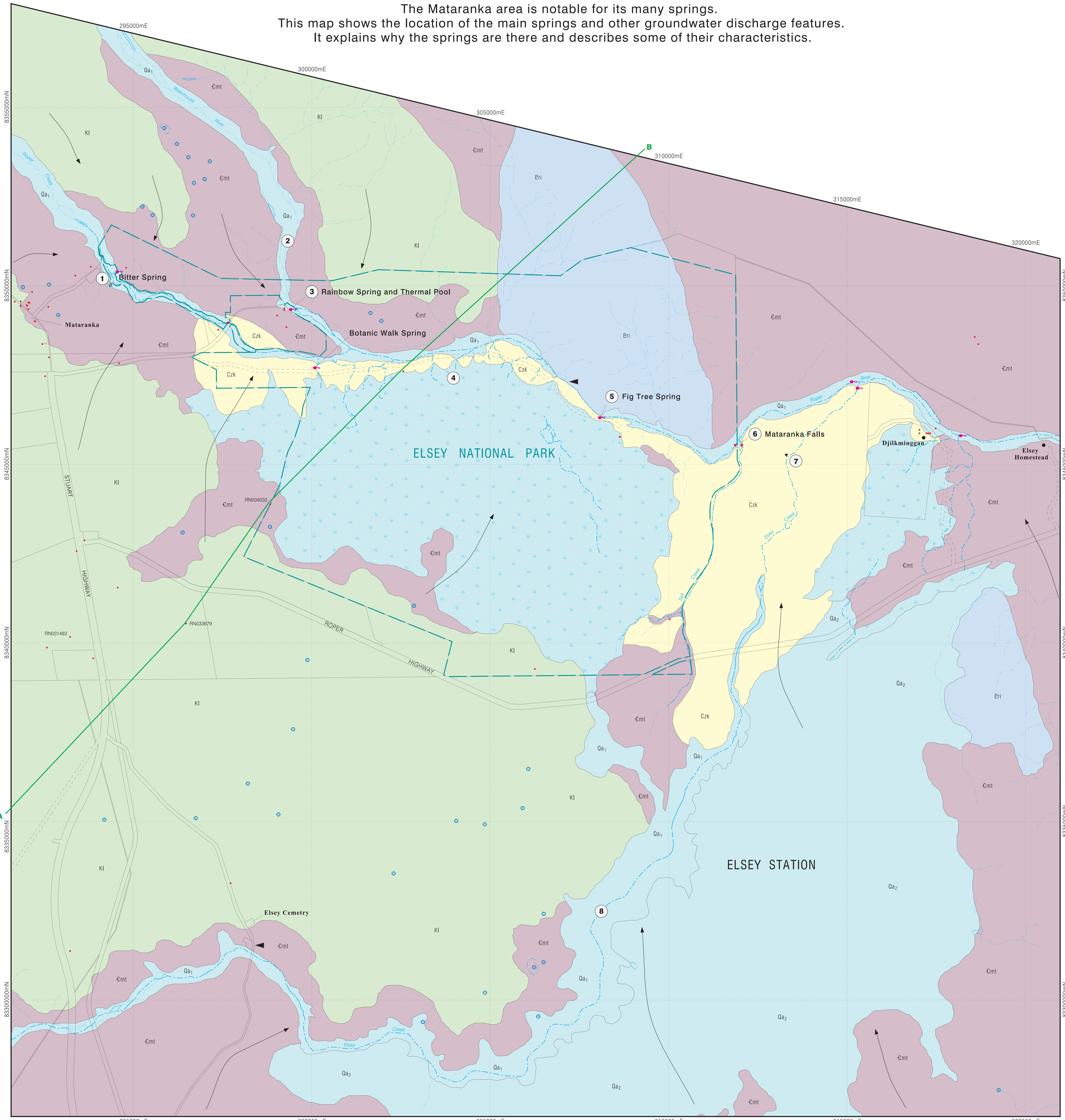
There are many springs just east of Mataranka between the Roper River and the Roper Highway. The most prominent are Rainbow and Bitter Springs, which issue directly from caverns in the limestone. These have large flows of crystal clear water and flow throughout the year. Less obvious but more widespread sites of groundwater discharge are rivers and swamps. Rivers receive groundwater seepage through their beds and banks. Some of these streams flow throughout the dry season, while others dry up before the wet season begins. Swamps are also groundwater discharge sites. Vegetation taps the shallow watertable and water is also directly evaporated through the soil.

The Waterhouse River near Rainbow Spring

## 3. A LOT OF WATER !

The combined flow from all the springs in the area is typically about 1500 litres per second at the end of the dry season. This amount has varied between 700 and 6000 litres per second depending whether rainfall in the preceeding years has been above or below average. Bitter Spring and Rainbow Spring contribute the most water, with flows averaging 130 and 300 litres per second respectively. The volume of groundwater discharged in swamps via vegetation use and evaporation is comparable to that discharged in springs.

The source of Rainbow Spring, a cavern in limestone.



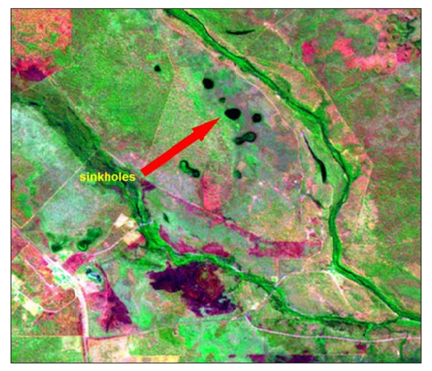

## GROUNDWATER FEATURES

| | |
|---|---|
| | Stream, seasonally groundwater fed |
| | Stream |
| | Swamp or marsh |
| | Sinkhole |
| | Spring |
| | Bore |
| RN32148 | Bore registered number |
| | Tufa dam inactive |
| | Tufa dam active |
| | Gauging station |
| A — B | Line of cross-section |
| | Groundwater flow |

## LEGEND

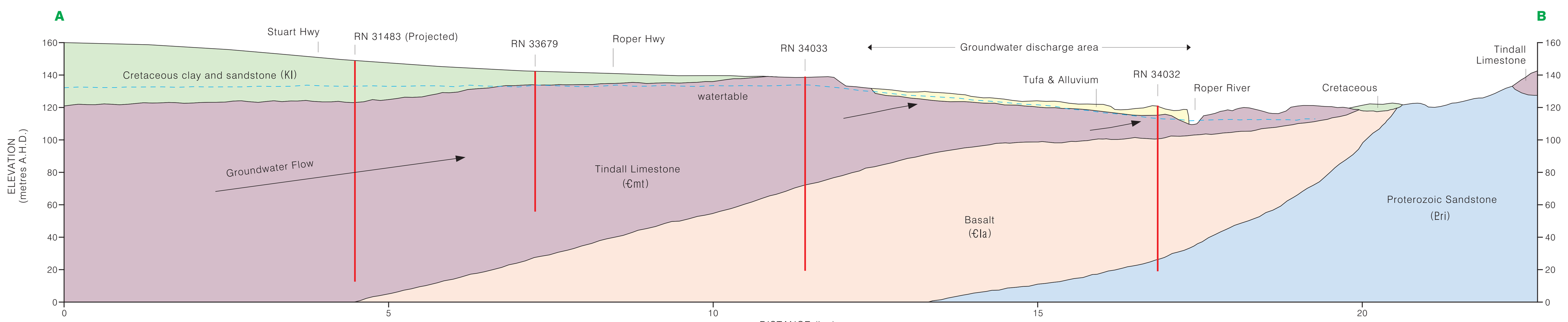
Age (million years)

| | | | | |
|---|---|---|---|---|
| 0 | Qa | Silt and clay often with tufa at shallow depths, swampy areas, seasonally groundwater fed, numerous springs | | CAINOZOIC |
| | $Qa_1$ | Clay, silt, sand and gravel, alluvial and swamp deposits (active), seasonally groundwater fed | | CAINOZOIC |
| | $Qa_2$ | Clay, silt, sand and gravel, alluvial and swamp deposits (inactive) | | CAINOZOIC |
| 65 | Czk | Limestone and sandy limestone, tufa and calcrete deposits, minor cavernous rock aquifer | | CAINOZOIC |
| 65–141 | Kl | Clay and sandstone | CRETACEOUS | MESOZOIC |
| 490 | Ꞓmt | Limestone, tindall limestone, minor siltstone, major fractured and cavernous rock aquifer | CAMBRIAN | PALAEOZOIC |
| 545 | Ꞓla | Basalt (cross-section only), minor fractured rock aquifer | CAMBRIAN | PALAEOZOIC |
| 545–1600 | Ꝑri | Sandstone, minor siltstone, minor fractured rock aquifer | | PALAEOPROTEROZOIC |



## Sinkholes

Some sections of the limestone aquifer are so riddled with solution cavities that the ground above collapses forming depressions known as sinkholes. Many of these are filled with water and are probably sites of groundwater discharge.




kilometres 0 2 4 6 8 10 Kilometres

Black numbered lines are 5000 metre intervals of the Map Grid of Australia (MGA) Zone 53
Universal Transverse Mercator Projection
Horizontal Datum: Geocentric Datum of Australia (GDA) 1994

Bare saline soil caused by a shallow brackish watertable.

## 4. THE SWAMP

The large swampy area located on the south side of the Roper River also owes it's existence to a geological structure that has caused the aquifer to become shallower and to thin out towards the Roper River (see the cross-section). This has resulted in a broad area underlain by a shallow watertable and zones of seepage. Extensive tufa deposits formed there because a ridge of bedrock located downstream of the seepage zone, ponded the water in a similar manner to the rock bars in streams as described in the note on tufa formation. The ridge formed a base for tufa to accumulate. Tufa dams merged and grew over older ones, eventually forming a continuous sheet of limestone. This occurred in the recent geological past. Tufa is not forming in this environment at the present day.

Fig Tree Spring (at arrow), a brackish spring emerging from cliffs of tufa limestone. Note the bare rock pavements composed of ancient tufa

## 5. FRESH AND BRACKISH SPRINGS

The water from Rainbow Springs, Bitter Springs and Elsey Creek can be classed as fresh. This contrasts with most other springs in the area, which have two or three times the amount of dissolved solids (salts) and which can be termed as brackish. The reason for this is that the first three springs are sourced directly from the aquifer probably via caverns. No evaporation takes place prior to the water emerging from the springs and so their water quality is similar to that of the regional groundwater. Beneath the swampy areas however, the watertable is located close to ground level. Over thousands of years the swampy vegetation (paperbarks, pandanus and palms) have tapped the watertable, removing water but leaving behind the salts. In some cases the watertable is close enough to the surface to allow direct evaporation and accumulation of salts in the soil. The end result is that salt concentrations have increased in the shallow groundwater and in the many springs, which drain from it.

## 6. TUFA, AN INDICATOR OF PAST AND PRESENT SPRINGS.

Tufa is a type of limestone commonly associated with springs. It forms when evaporation causes the spring water to become super-saturated with calcium carbonate. The mineral then precipitates as a rocky deposit. It often forms "dams" across streams, commonly on top of existing rock bars. Evaporation concentrates the minerals in the waterholes upstream of the rock bar. As the water cascades over the bar, turbulence provides the trigger to precipitate the calcium carbonate as tufa. The process is self-sustaining. As the tufa builds up, the water level behind the dam is raised, more turbulence occurs at the dam, resulting in more tufa formation. Tufa dams have a characteristic scalloped shape and often form a series of step like terraces. Only two active tufa dams are present today, Mataranka Falls on the Roper and an unnamed one, not far away on Salt Creek. Tufa formation was apparently much more active in the past, as evidenced by extensive tufa deposits adjacent to the Roper River. Many good examples can be seen along the walking track that follows the river.

Mataranka Falls

An ancient tufa dam on Elsey Creek showing "stalactites" that grew underwater around pandanus roots (view looking downstream).

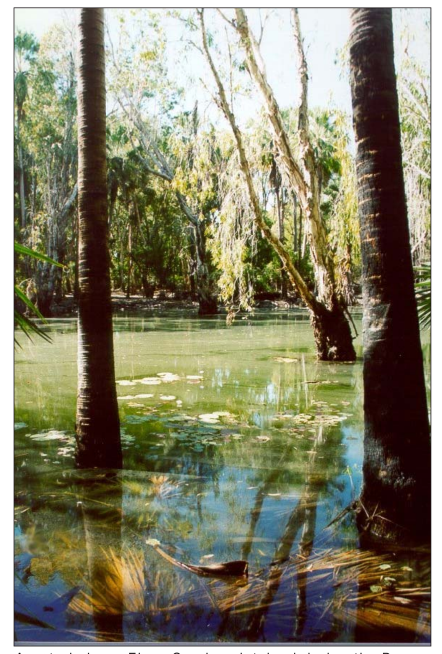
## 7. "UNDERWATER" STALACTITES

A six metre high wall of tufa once damned the Elsey Creek. It formed at a time when average rainfall was higher than at present, causing elevated watertables and thus more groundwater discharge. The dam must have held back a permanent waterhole many kilometres long. During the Dry season the water would have been saturated with calcium carbonate. Pandanus roots extending into the water became encrusted with limestone, forming "stalactite" like features that lined the dam wall. The "stalactites" often have hollow cores where the roots once were.

When the climate dried waterlevels dropped, exposing the dam wall. It would have been subjected to corrosion by the areas slightly acidic rainfall. Solution cavities developed and the wall was eventually breached. It now stands as a relic feature, reflecting a wetter climate. Note that this site is on private property.

## 8. A GROUNDWATER FED STREAMS

Some local rivers and creeks receive groundwater inflow through their beds as well as from springs along the banks. In some cases discrete springs can be seen under the water but often the water probably seeps through wide areas of stream bed. In the case of Elsey Creek a 20 kilometre long waterhole is maintained throughout the Dry season, upstream of the Roper Highway.

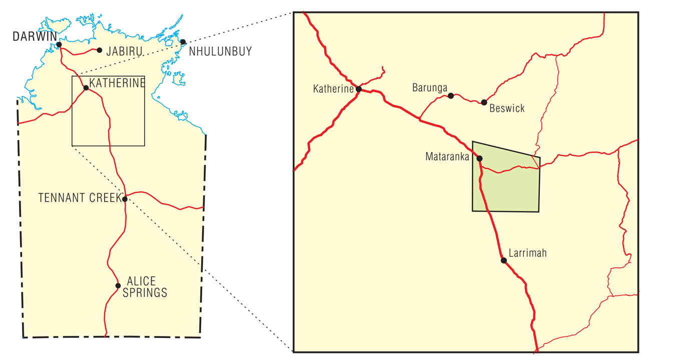


A waterhole on Elsey Creek maintained during the Dry season by groundwater inflow.

## GENERAL FEATURES

| | |
|---|---|
| | Major road |
| | Vehicle track |
| | Cadastral boundary |
| | Geological boundary |
| | Park boundary |
| • Elsey | Place name |

## MAP LOCALITY





Map compiled by S. Tickell,
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GDA This map was produced on the Geocentric Datum of Australia 1994 (GDA 94)

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