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OPERATIONAL PROBLEMS AND CONDITIONS IN THE NORTH-EAST CANNING BASIN, W.A.

by

J.N.CASEY AND A.T. WELLS

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TABLE OF CONTENTS

SUMMARY

Operational problems and conditions experienced during a geological reconnaissance of the north-eastern part of the Canning Basin are discussed, and some points of interest illustrated.

The area is a semi-arid desert, largely covered by sand plains and seif dunes, with isolated rock outcrops, breakaways which terminate in scarps 150 feet high, scattered hard claypans and salt lakes.

The modified Landrovers and Morris truck used are described and some additional modifications recommended.

The vegetation, animal life, climate, topography, and natural water supplies are described.

The party organisation, wages paid, and astrofixes taken, are discussed.

Comparisons are made with the conditions experienced previously in the south-western part of the Canning Basin.

GENERAL

As oil exploration is continuing in Western Australia, and as the Canning Basin is a possible oil-bearing area, the conditions experienced and problems arising from a geological investigation of such a desert area will give future operators some information that may help them to plan their programmes economically and safely.

The Canning Basin is defined, for geological purposes, as an area containing Palaeozoic, Mesozoic and Tertiary sediments, bounded on the north by the Precambrian of the Kimberley Region, on the south by the Precambrian of the Pilbara area, and on the east by Precambrian rocks near the Northern Territory border, and extending west on to the continental shelf; the Fitzroy Basin is in the northern, smaller basin within the Canning Basin.

The area surveyed in 1955 covers the north-east part of the Canning Basin, and includes the Military 4-mile Map Sheets of Billiluna, Mt. Bannerman, Cornish, Lucas, and Stansmore. Only three homesteads exist in this area of 35,000 square miles and vehicle tracks are rare and practically confined to the Billiluna Sheet. Billiluna and Sturt Creek Stations both run cattle. The Pallottine native mission at Balgo Hill runs 500 sheep and a herd of goats; the number of natives (average 100) at the mission varies, depending on the season; the better the season the fewer the natives at the settlement, as most then go "walkabout".

Fairly steep-sided seif dunes trending west to north-west cover most of the area, particularly in the southern part; seif dunes are long longitudinal dunes formed by bi-directional winds. Many claypans, 200 to 1,000 yards in diameter, are scattered throughout the area and are eminently suitable for emergency landing strips.

Before the party left Canberra, air photos taken by R.A.A.F. in 1949 and 1953 at a scale of 1:50,000 were laid out and traverses planned; in this initial preparation the traverses were designed to cover all photo-patterns, prominent outcrops, and outcrops showing any structure; at the same time traverses would avoid as many dunes as possible but cross likely surface water localities so that 200 to 300 miles could be covered without refuelling the Landrovers or returning to base for water.

Barometric traverses were run in conjunction with the geological work. Heights ranged from 1,010 feet at Gregory Salt Lake to 1,700 feet at the Stansmore Range.

A gravity traverse was run on the journey from Billiluna to Stansmore Range and return.

PARTY ORGANISATION AND WAGES

Bulk food supplies are ordered from a retail store (Sara and Cook) in Perth and they are designed to last a party of 6 men for 6 months; the cost of about £200 represents a saving of at least 25% on the local price.

It is essential to keep the party as small as possible, for not only is the food requirement increased for a larger party but the water carrying capacity of the vehicles has to be increased (at a rate of 1½ gals. of water per man per day) or the range of the party's operation decreased.

The essence of a regional reconnaissance party is its manoeuvrability and independence; the personnel, particularly employees, must therefore be "jack-of-all-trades" and not specialists and they must be prepared to work long and continuous hours; it is better to employ field assistants (survey hand-motor drivers) who do more than one type of work rather than employ specialists.

The employees wages for this type of work are usually slightly higher than for normal "base-camp" field parties. They are paid per week, about £21 to £26 made up of £16 basic wage, £1.10.-. district allowance, 12s. or 8s6d. per day camp allowance (depending on whether they are married or not), cooking allowance (several shillings per week) and they receive overtime for driving on Sundays. Travelling allowance of 29s. per day is paid when travelling between towns, but in this case no camp or district allowance is paid.

In areas where a surveyor is required to determine astrofixes, it is convenient and practical to use a geologist as a "booker" for recording the surveyor's observations and chronometer time.

As a regional geological party's annual fuel requirements are about 1,000 gals. or more, this will prove a drain on local resources. Any future party should notify the local fuel agent, at least several months before operations begin, of the fuel supplies required.

Hall's Creek draws its supplies both from Derby and Wyndham; fuel supplies come mainly from Derby where Mr. L.Kent is the agent for Vacuum and Mr. R. Rowell for Shell brands. Bulk food supplies and fuel for Billiluna station is carted from Wyndham by Mr. Findlay, carrier of Wyndham.

VEHICLES AND MODIFICATIONS

In the Canning Basin there are thousands of square miles without roads, and hundreds of sand dunes, either parallel and unbroken for miles, or "braided". Either of these would present problems of transport; together they form a serious obstacle to exploration.

Therefore the conventional 4-wheel drive vehicles used in ordinary cross-country work need to be modified, and, broadly speaking, the vehicles need to be as light as possible, to have a short wheel base, to be heavily sprung, to have oversized low-pressure tyres, and to be equipped with extra petrol and water tanks to give an extended range of operation.

The Landrovers (Type 86) used in the investigation of the south-west part of the Canning Basin in 1954 were used again in the 1955 field season. The modifications carried out on these vehicles in 1954 were described in Records 1955/56, which should

be read in conjunction with this report. The modifications were expertly carried out by Stores and Transport Section, Karrakatta, Perth under supervision by Mr. Savage. The more important of these modifications were:

(a) Steel plating $\frac{1}{8}$" thick was fitted under the engine, gear box, clutch and brake pedal linkages, in front of the steering linkages and the rods and fuel tank; this is necessary because many clumps of spinifex grow over and conceal large rocks, tree stumps and solid ant hills, any one of which would cause serious damage if hit even at the slowest speeds of 2-3 m.p.h. (normal travel is at 5-8 m.p.h.).

(b) Reinforced bumper bar and scrub deflectors are fitted and 1" steel mesh attached to the bumper bar in front of the radiator; this enables a vehicle to return over its outward path through heavy scrub and not run the risk that bushes, now leaning into the returning vehicle, will puncture the radiator, break the fan belt, or knock the radiator tap 'on' and allow the water to escape.

(c) Low pressure sand track tyres 900 x 13 were fitted; these tyres required a smaller wheel and the normal wheel had to be cut and re-welded. "Bar-treads" are not recommended for sand work as they tend to "dig in" when under power.

(d) The differential drain plugs were protected by a brass sleeve.

Besides these modifications several other alterations and improvements were made:

1. Large double-acting truck-type shock absorbers were fitted; these are more durable and afford greater protection to the springs than the conventional shock absorbers. A special pin was welded to the chassis to fit them. The new Landrover, type 107, has larger shock absorbers as standard equipment.

2. A second filter bowl, fitted under the centre front seat, was incorporated in the fuel system; dust entering through the air hole in the petrol cap was thus prevented from passing into the carburettor.

3. An extra 17 gal. water tank and an extra 15 gal. petrol tank were mounted behind the front seat across the vehicle; the tanks, on top of each other, were shielded by pine frames and rubber mounting. A portable type 51MA Traeger transceiver was mounted on the top tank (water tank). This enabled two spare tyres to be carried, one on each side of the tray; the tyres were secured by web straps and were easily removed when required without disturbing the load.

4. A duralumen canopy, with hinged rear doors, was fitted to one Landrover to provide easier access to the load; it proved to be better than the canvas hoods.

5. Clips were fitted on the outside of the front bumper bar to carry complete spare front and rear springs.

A trailer was used primarily in areas where tracks existed or where few dunes occurred. It was fitted with a raised canopy and oversized sand tyres of the same dimensions as those on the Landrovers. In the report on the 1954 operation, we advised against using trailers, but trailers fitted with large tyres (900 X 13) were used in 1955 and were found to be better than the standard trailer, though not completely satisfactory because it still requires two Landrovers to pull a Landrover and Trailer over even the smallest of dunes.

A Morris 4x4 30cwt. truck was used as a bulk supply vehicle with the following modifications: a spare wheel was mounted under the rear of the vehicle; a rebound leaf was fitted to the rear spring; a 90 gal. two-compartment water tank was mounted behind the cabin, in the space originally occupied by the spare tyre; a cylindrical air compressor was fitted - apart from blowing up tyres, this modification was used extensively for cleaning the radiator cores blocked by dust and seeds on all vehicles; wooden drop sides were fitted to the tray and a set of wooden cupboards with compartments was mounted on one side of the tray; the cupboard doors opened outwards when the tray side was dropped; the width of the cupboards was such that two 44 gal. drums could still be fitted side by side across the width of the vehicle; two petrol tanks with a total capacity of 50 gals. were installed to give a 150-200 mile range to the vehicle; a hinged front windscreen was made and an electric rubber-bladed, fan was installed. Asbestos sheet was used for insulating the drivers cabin from the engine. This modification increases enormously the comfort of the driver in an otherwise very hot cabin; temperature gauge and fractional speedo meter were fitted; fine wire mesh was attached to the front of radiator to prevent clogging by seeds.

The Morris did not have to be used to cross sand dunes, but it proved successful in sandy country. Oversized tyres were requested for the Morris but suitable wheels could not be obtained at the time.

By using a third Landrover to carry a 44 gal. drum of petrol, the range of three Landrovers was about 300 miles and most of the traverses in 1955 across trackless country were completed without relying upon fuel from the supply vehicle.

On bitumen roads, the Morris, carrying at least 20-30 cwt. load, averaged 12-14m.p.g., on unsealed sandy roads about 8-10m.p.g., and traversing soft sandy country about 3m.p.g.. The petrol consumption for the Landrovers did not vary appreciably from the figures given in Record No.1955/56 - about 7 to 8m.p.g. over sand and dune country. The 900x13 sand tyres used on the Landrovers during the season proved invaluable for traversing soft sand country and crossing dunes, but punctures again were numerous and annoying; on some days the lead vehicle would have as many as 8 punctures. The only additional modifications suggested for the Landrovers are :

1. The fitting of a tubular steel carrier rack to the roof of the Landrover with the duralumin canopy to facilitate carrying bulky light spares such as tyres and tubes.

2. The attachment, if mechanically possible, of the engine and gear box shielding wholly to the vehicle chassis to prevent the bolts holding the shielding to the cross member from shearing by vibration. The forward part of the shielding was attached directly to the sump.

3. The application of "safe-T-seal" or "Safety-seal" to the tubes, to lessen the effect of puncturing by small stakes. This viscous substance is injected into the tube and in the event of a large puncture, the tube is removed and mended in the usual way. The substance is more efficient in high than in low pressure tyres. It has been favourably tested by the Defence Standards Laboratory and was the subject of pamphlet 29 entitled "Evaluation of Safety Seal as a Puncture preventative" Oct. 1954. The substance, consisting primarily of mica flakes in a viscous fluid, is manufactured by The Safety-Seal Coy., 353 High Street, Northcote, Victoria.

4. Protection of the forward projection of the front differential to prevent the differential housing being dented and knocked on the crown wheel.

On all Landrovers the ten nuts holding the crown wheel to

the driving shaft became loose and in some cases the nuts sheared; the effect is likened to a broken axle. It is recommended that the differentials on all vehicles be examined at the completion of a field season to check specifically that the crown wheel securing bolts are tight and in good condition.

We also experienced trouble with the rear shackle pin that passed through the chassis on the Landrover front springs. If a spring broke, the shackle bolt could not be removed or was removed with difficulty, because the rubber of the rubber bush became fastened to the chassis. An "oxy-torch" or a heavy jack often had to be used to free the pin. It is suggested that either graphite grease be used in the assembly or the pin be cut so that the spring bush rests on the edge of the pin and not on the whole length.

TOPOGRAPHY INCLUDING SAND DUNES

The altitude varies in the desert but the variation is small and gradual; hills are never more than 200 feet above the surrounding plain. Flat country, covered by sand or pisolitic ironstone, often terminates in breakaways which break down further into isolated hills.

The travelling conditions near these hills and breakaways is good, apart from the small gullies draining from them. The pisolitic ironstone flats, which appear as a dark uniform smooth pattern on air photos, provide soft but good travelling; the lead vehicle will leave tracks about 1 inch deep, the following vehicles can then move fast and comfortably.

Many topographic features were without names, so many of the features were given names which have been approved by the Lands and Survey Dept., Perth. Some photos at the end of the report illustrate some of the newly named features.

The sand dunes encountered during cross-country traverses were generally much lower than those crossed in the south-west part of the basin in 1954. Their heights averaged 30-40 feet; the highest one crossed was 60 feet. The dunes trend east to west and are not severely braided except in the southern part of the area (particularly on Helena, Stansmore, and the west part of Cornish Sheets) where they are numerous as well as braided. Here their density is generally 15 to 17 dunes per 5 miles measured normal to their trend.

Some of the dunes have flat tops 30 feet wide, whereas others have sharper crests; the sharper the crest the rougher is the top. The interdune valleys are flat and covered by the ubiquitous spinifex and acacia, but they usually provide fair travelling conditions. The higher and more well defined the dunes, the better the interdune valley for travelling.

The dunes are generally fixed by spinifex, scrub and some large gums, but the top of the dune still moves slightly towards the west.

Ranges, breakaways and isolated hills, less than 200 feet high, interrupt the dunes; on the west side of these features occurs a sand-free zone up to 2 miles wide which supports good grass, herbage, and taller trees.

In areas underlain by Precambrian metamorphic rocks and granite, few dunes occur, and the open sand plains provide good travelling, particularly where they overlie granite, as in the Lewis Range area; over other Precambrian rocks, although dunes do not occur or are sparse, the sand plain is covered by dense acacia scrub as well as by spinifex.

WATER SUPPLIES

When on traverse, water did not prove a limiting factor as the party could carry sufficient to last 10 days (at 1½ gals. per man per day), in which time surface water had always been found and the party's supply replenished at rockholes (in the Stansmore Range, Godfrey Tank, Lewis Range, Gardiner Range, French Hills, Roberts Range, Mt. Bannerman), springs (south-east of Christmas Creek Homestead, Gardiner Range), native wells (near Mt. Elphingstone, north of Lake Lucas) and waterholes (Pt. Moody, Sturt Creek, Christmas Creek, Godfrey Tank, Stansmore Range, Bishop Dell) whenever necessary.

Because of the heavy and unseasonable rain the area experienced in 1955, (over 10 inches) all rockholes, springs, native wells, waterholes and claypans were full; but in a normal year much less water would be available. Many sources of water mentioned by early explorers (Warburton, Carnegie, and Canning) were visited and a plentiful supply of water found.

Permanent waterholes are numerous along the course of Sturt Creek. Large rockholes in the ranges bordering the desert and in some of the large desert breakaways provided supplies of water after rains, but these are not reliable. Godfreys Tank, situated in an isolated range of hills near Well 48, contained 30,000 gallons of water; but the Terry expedition in 1925 found it dry.

Natural springs are common south-east of Christmas Creek Homestead in Tertiary marls, chalcedony, and travertine which overlie Permian shale and sandstone; although this water contains an appreciable percentage of dissolved salts it is fit for human consumption.

Some of the waterholes and rockholes are illustrated at the end of the Record.

TRAVELLING CONDITIONS

Travelling conditions in the north-east part of the basin were generally much better than in the south-west. The sand dunes are fewer and lower; there are large sand plain areas underlain by granite; natives are more active, and more country is cleared by fire. Claypans outnumber saltpans, which are usually treacherous and must be tested before use by vehicles or aircraft. The saltpans in the north-east were not as salty or as soft as those in the south-west, probably because of the prevalence of fresh water rather than marine sediments. Claypans occur near the edges of many large saltpans, and could be used in an emergency by aircraft; Lake Lucas has a firm foundation and although the top 6 inches of sand and salt are soft, the vehicles were never in danger of being bogged, and there was no difficulty in travelling along the edge of the lake. The travertine country, usually covered with ti-tree scrub, is smoother and provides good travelling; on aerial photographs this type of country shows as a grey and dark grey mottled pattern.

Navigation was done solely by use of aerial photographs (at an approximate scale of 1 inch to 3/4 mile). As recent fire burns provide not only a navigational feature, but afford good travelling, and as these burns become overgrown by spinifex after a few years, it is a distinct advantage to have recent photographs when exploring the area. The party noticed how easy travelling and navigation was using photographs taken in 1953 for most of the area, compared with those covering the Billiluna 4-mile sheet, taken in 1949.

Access into the area was easier than in the south-west part; Halls Creek was the base for mail and extra supplies. A track now runs from Billiluna to Godfrey Tank, and stores of petrol were taken to this point by the Morris truck. Good water was obtained from well 48 (water level was at 50 feet in June), near Godfrey Tank - the Tank is a large rockhole in a gully and is inaccessible by vehicle.

As much as 50 miles per day could be covered across trackless sand plain and over numerous dunes when the spinifex had been burnt, but in unburnt country, only 30 miles per day were covered. Crossing sand dunes after rain was much easier than in hot, dry weather; the sand on top of dunes is usually moist about 2 feet from the surface; dunes seem easier to cross early in the morning rather than later in the day.

Stoney and laterite-covered rises provided particularly good, though soft, travelling; these rises appear as dark patterns on air photos and they commonly terminate in breakaways.

The travertine country is good travelling in this area, but much of it is covered by a thick growth of ti-tree, the dead roots and burnt stumps of which are extremely hard and splintery and puncture sand tyres easily.

In the event of future work by seismic or drilling crews which would necessitate using heavy vehicles, a track would have to be graded over the rough spinifex-covered sand and tracks bull-dozed over, or zig zag paths found through the dunes; in some very few areas pisolitic ironstone or laterite occurs in sufficient quantity to use as road metal over breached dunes or particularly soft sand patches. Large trees are not always available to winch vehicles over sand dunes.

The additional modifications to the vehicles in 1955 proved successful; there were fewer broken springs (and it must be remembered that this was the second year the springs were used, so that fatigue must be taken into consideration if the same vehicles are used in future seasons) and the comfort to the driver was increased by using large shock absorbers.

CLIMATE

The Canning Basin lies north of the Tropic of Capricorn; it normally has, particularly in the northern part, a hot wet summer and cool dry winter. Field activities should be confined to the period between April and October. However, for the past few years, a few inches of winter rain has fallen in the area. The summer day temperatures are often greater than 100°F; in winter, the day temperature is between 70 and 90°F, and the nights as low as 40°F.

The prevailing winter wind is from the south-east; therefore in planning traverses towards the close of the cooler weather, when Landrovers are in need of an overhaul, and have their radiators clogged with spinifex dust and seeds, it is best to try to move into the wind, i.e. to the east or south; a "tail" wind not only causes the radiators to boil, but because of the low speeds vehicles travel (3-6 m.p.h.), the dust etc. disturbed by pushing over spinifex clumps swirls into the cabin and almost chokes the driver.

FAUNA AND FLORA

Although "Spinifex" (Triodia) is predominant a wealth of low herbage, flowering shrubs and grasses appears after fires, but these are gradually overcome by the spinifex within a few years; rain is not necessary before the low herbage appears after fires. Spinifex that grows over rocky ground is more resinous

than usual, and its spines are harder and are covered with a sticky juice. Large gums (Eucalypts) are scattered along the tops of some dunes, around many of the claypans and small watercourses and along the only large creek - Sturt Creek, which drains south into Gregory Salt Lake. Mulga ("Boree") grows thickly around the overflow of Sturt Creek, as well as in and around isolated gypseous salt pans. Large groves of Desert Oaks ("Casuarina" - Acacia peuce) growing near Sturt Creek provide tough timber for all buildings, yards and fences on the stations in the northern part of the area. The main vegetation in the desert proper is the stunted scraggy acacia bush which grows 4-6 feet high; it is dwarfed by 12-foot high Desert Walnut ("Quandong") with its dark green foliage; the Walnut is scattered through part of the area.

Ti-tree scrub covers areas of travertine and it is in this type of country that many native wells are found.

At the bases of breakaways and groups of hills, and extending from them for two miles or so, are loamy flats on which grow gums, mulga, salt-bush, corkwood, and grass and herbage of various kinds.

Very few animals were observed; some rabbits were seen near Gregory Salt Lake and Lake Lucas, where their warrens are numerous in the travertine country bordering these and other salt lakes. A few kangaroos, birds (including turkeys), fewer dingos and wild cats, and numerous lizards were the only life of note. Flies are numerous, except in the coldest weather, but mosquitoes are rare.

Because of the rare occurrence and stunted variety of vegetation, it is sometimes difficult to find wood for fuel; for this reason the party carried a double-burner pressure kerosene stove which was used in conjunction with a pressure cooker to prepare quick meals; the pressure cooker, using little water for cooking, served as a valuable water conserver and is recommended for parties operating where water becomes an important factor.

COMMUNICATIONS

A Traeger 51 M.A. portable transceiver was mounted in one Landrover behind the passenger's seat and over the water tank. A Type 43 M.A. transceiver was used in the Morris truck or in base camp so that base could keep in touch with the traverse party; the base camp set could also be mounted on the centre seat of a Landrover if necessary. Communications were sent through the Royal Flying Doctor Service at Wyndham (another control station has now been established at Derby), operating on a frequency of 56.6 metres or 5300kc/sec. (medium wave). No difficulty was experienced in contacting these control stations from 400 miles away at any time that they were in operation.

The Wyndham control station commences operation at 6 a.m. (West Australian time) and closes with a medical call at 5 p.m., on all days except Sunday. When the Derby station was set up in July, Wyndham used the even hours and Derby the odd, as both stations had the same frequencies. Apart from a few periods contact could be made with either control station throughout the day.

It is recommended that two 51 M.A. transceivers be used in future, as they have a higher power output than the 43 M.A., are less bulky, more robust and easier to handle.

ASTROFIXES

A party of surveyors from the Lands and Surveys Department, Perth, led by Mr. Nelligan, obtained astrofixes on the Mt. Bannerman, Billiluna, Cornish, Stansmore, and Lucas Sheets.

These were used to control the four-mile photo-mosaics. The Bureau of Mineral Resources and West Australian Petroleum Pty. Ltd. parties combined with the surveyors' party on many traverses, so that observations could be carried out more conveniently and quickly. During geological traverses a surveyor accompanied the party and took observations; a geologist then acted as "booker". It is suggested that this procedure be adopted for future work in such areas, and that only one qualified surveyor (particularly one experienced and competent in astrofix work as were all the team from Lands and Survey in 1955) is necessary in the party.

The latitude and longitude were calculated by the Position Line Plot Method and a Wild T2 Theodolite was used. The chronometer was checked by time signals picked up on the 51 M.A. transceivers. The time signals are transmitted from W.W.V. Washington and relayed through Honolulu. 28 observations were taken; 10 of these were carried out by a surveyor accompanying the Bureau party, 10 taken solely by the survey party, 6 taken by the survey party jointly with the Bureau party, and 2 taken by a surveyor on a traverse with a geologist and using W.A.P.E.T. vehicles. Only 3 astrofix positions would not normally have been visited by the geologists.

The position of the astrofix was marked on the aerial photograph and its position transferred to the uncontrolled 4-mile mosaics. The co-ordinates of the astrofix were compared with the co-ordinates of the point as plotted on the uncontrolled mosaic; if these co-ordinates showed only slight variation then a distorted grid was prepared; if a large variation was proved a new 4-mile mosaic was prepared by National Mapping (this applied to Stansmore and Cornish 4-mile sheets). Astrofix positions were marked in the field by a cut post as well as by a cairn of stones (if any cropped out nearby) and bearings were taken to any conspicuous features.

LANDING GROUNDS

Throughout the desert area suitable surfaces on which aircraft can land can be found. Claypans in particular would provide a safe and hard surface for small as well as medium-sized (DC 3) aircraft. Some claypans are over 1,000 yards long; normally they are between 200 and 1,000 yards long and are roughly circular in shape. Saltpans on the other hand are treacherous; a careful analysis of aerial photographs will reveal a difference in pattern between claypans and saltpans; the saltpans give a variable, "streaked" pattern whereas claypans produce normally uniform dark or light pattern. Small claypans are often found near the margins of large salt lakes.

Sand plains, recently burned, would provide a safe landing strip for light planes were it not for the short burnt stakes that may remain.

Lateritized rises which are not covered by low scrub could serve as an emergency strip.

If a ground party were to be sup lied by air, suitable strips could be cleared on laterite rises, burned sand plains and claypans for at least light aircraft.

CONCLUSIONS

The modified Landrovers and the 4x4 Morris truck proved quite satisfactory for negotiating sand and dune-covered trackless desert. However, in long traverses across this country only Landrovers are recommended, because larger vehicles consume too much petrol and the rough, heavy conditions impose a severe strain on their chassis; therefore, their load consists mainly of their own fuel, leaving little space to carry fuel for Land-

rovers and food and water for the party. If a trailer is used it must be remembered that two Landrovers are required to tow one Landrover and a loaded trailer over the smallest of dunes.

In order to traverse the desert from one side to the other, (a distance of more than 700 miles from supply points) using vehicles, it is essential to have supplies of fuel, water and food dropped or landed at regular intervals by aircraft. Suitable claypans can be found in most areas to accommodate a DC3 type plane. A large vehicle such as a Commer 3-ton truck, which gives only 1½-2 miles per gallon m.p.g., is unpractical to use, as it could not carry enough fuel for its own use and a ferrying service to lay dumps of fuel would have to be undertaken. There is no track or semi-track vehicle that could be relied upon to carry or tow supplies over this type of country. The most suitable tractor, a T.D. 9, has a draw-bar pull of 5 short tons and would require 10 short tons of fuel for such a journey.

The conclusion reached is that, although it is not impossible to carry supplies by Landrovers and, say, Morris trucks for a survey of such length, it becomes impracticable when supplies have to be ferried in and journeys made back and forth until dumps of fuel, water and supplies are so situated as to allow the Landrovers to travel on independent of a supply vehicle; a point to note is that water in 44 gal. drums often becomes tainted after 2-3 weeks and it is advisable to chlorinate such water. It is much better to avoid the wear and tear on heavy trucks and personnel, by dropping or landing supplies by aircraft, thereby permitting the Landrovers to continue an uninterrupted traverse.

The cost of dropping supplies by parachute (the parachutes would be expendable) is of the order of £500 to £1,000 per drop; by using Landrovers alone, a drop would be required every 10 to 14 days. But in many places, claypans could serve as a landing place and a drop would therefore not be required.

The number of personnel in the party was considerably reduced from that in 1954. It seems unnecessary to send a separate survey party into the same area, particularly an inexcessible area; one experienced qualified surveyor accompanying the geological party has proved to be most satisfactory. A combined party, undertaking reconnaissance work in a remote, inhabitated area, should consist of two geologists, one geophysicist, one surveyor, one mechanic, and a field assistant using 4 Landrovers with air support, or 4 Landrovers, a trailer, and 1 or 2 Morris trucks without air support. The trucks are solely engaged in ferrying supplies to form an extended line of dumps; they can be fitted with 1100 x 16 tyres which greatly improves their performance in sand compared with the standard 900x20 tyres.

It is of interest to note that in Arabia, exploration parties use Power Waggons equipped with 900x16 tyres for road work, 1100x16 6 ply tyres for sand and 1700x16 6 ply tyres for treacherous sand. Kenworth 853 tractor trucks with all-wheel drive and tandem rear axle equipped with 1400x20 and 1800x24 sand tyres are the heavy haulage vehicles used (Hasson, Mines Mag., Oct. 1955 P.119).

Cretaceous sandstone breakaways in an isolated Range in which Godfreys Tank is situated, looking north east.

Lands and Survey and B.M.R. Landrovers in typical tall spinifex country near Billiluna Station.

Part of the Lewis Range with Point Nelligan on the right. Composed of quartzitic sandstone overlying Precambrian granite.

Point Alphonse, near old Djaluwon Mission, 20 miles S.W. of Balgo Mission. Note profile resembling human head. Bedded fine-grained and medium-grained sandstone is Permian.

Landrover crossing soft, high sand-dune, western part of Cornisn 4-mile sheet.

Large fracture (with full-circle sleeve showing), small cracks, and stake holes showing in a discarded 900x13 sand tyre.

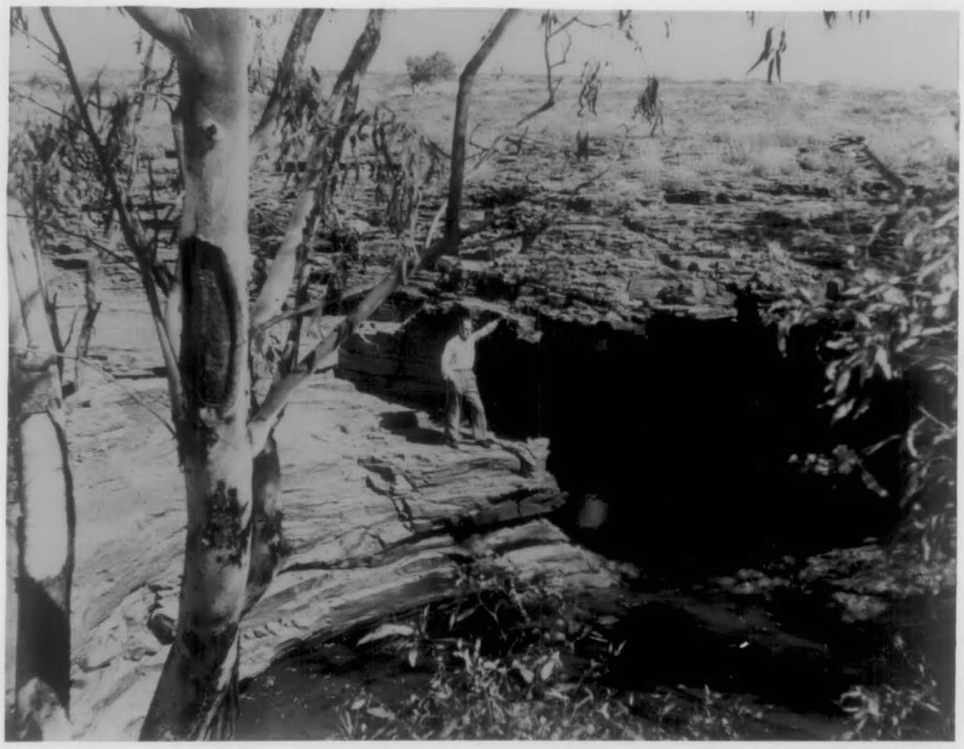
Top of 30 foot high sand dune near Fisher Bluff in the Southesk Tablelands.

Typical sand-covered pisolitic ironstone country, 30 miles north of Billiluna; ant hills, spinifex clumps dead acacia and needlewood trees cover the surface.

Panorama of sand dune country looking S.E. from the Stansmore Range towards Lake Wills and the Northern Territory border. The row after row of sand dunes are about 50 feet high.

Ima-Ima (Red Rock) pool, Sturt Creek. The pool is about 4 miles long and about 200 yards wide.

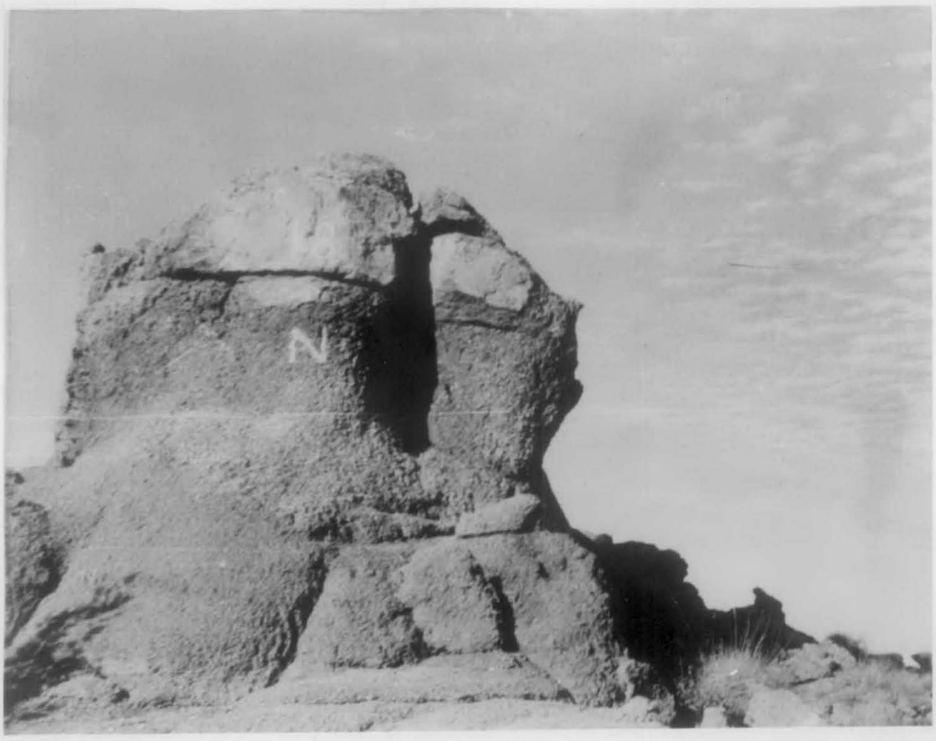
Cairn, probably erected by M. Terry (1925) on Mt. Rosamund in the Dummer Range, west of Mt. Cornish. Looking north-east.



Gunna warra-warra rockhole, 8 miles south of Balgo Mission. Altitude 1300 feet. Bedded sandstone is Permian in age.

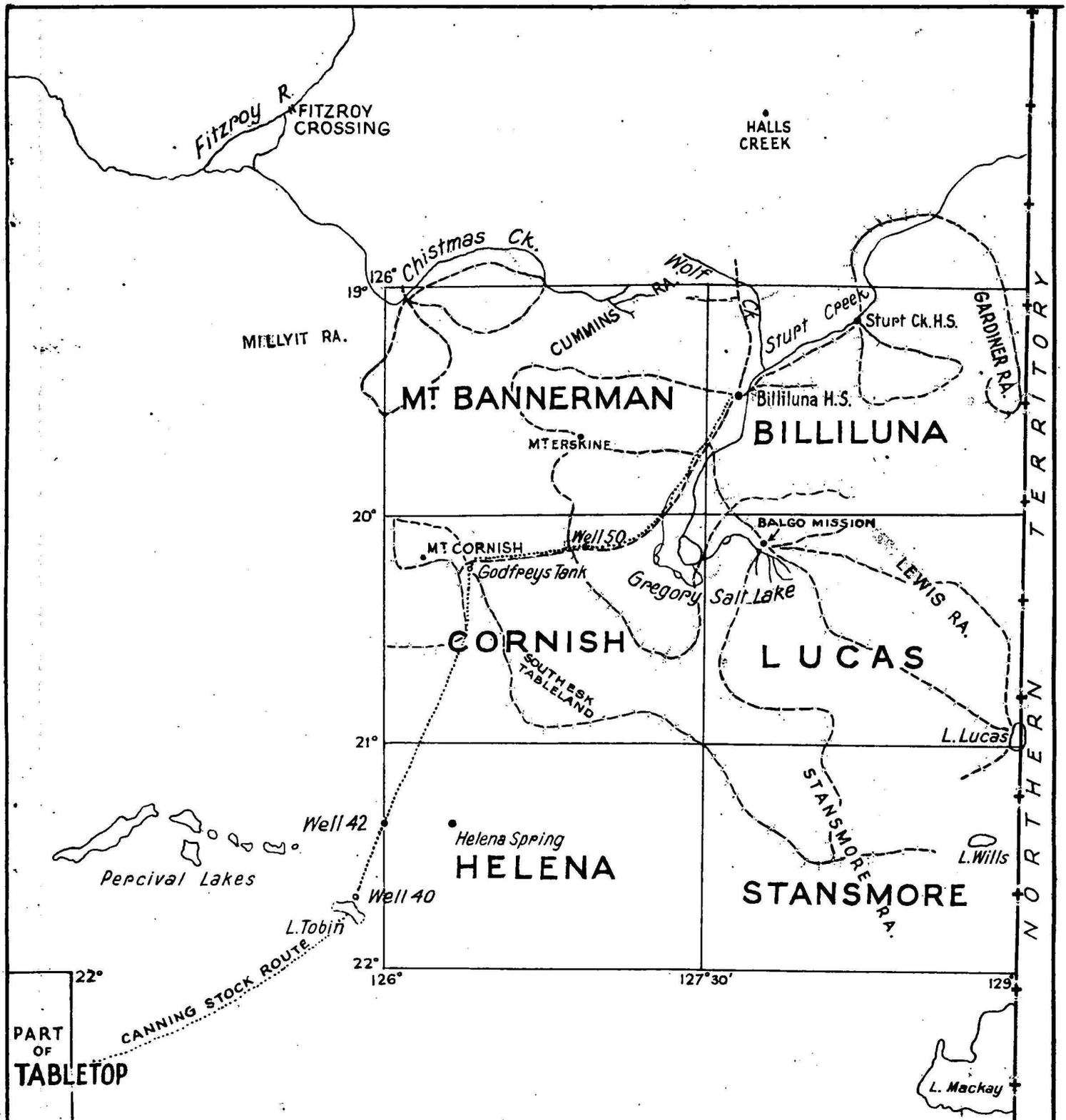
Bababaru rockhole, 44 miles S.S.W. of Balgo Mission Situated in Upper Permian massive plant sandstone. The rockhole is 15 feet deep and many native paintings are visible nearbye. The trees are rock-figs.

Surveyor Fisher and Geologist Wells observing for Astrofix. Note modifications to vehicles and mounting of spare springs.

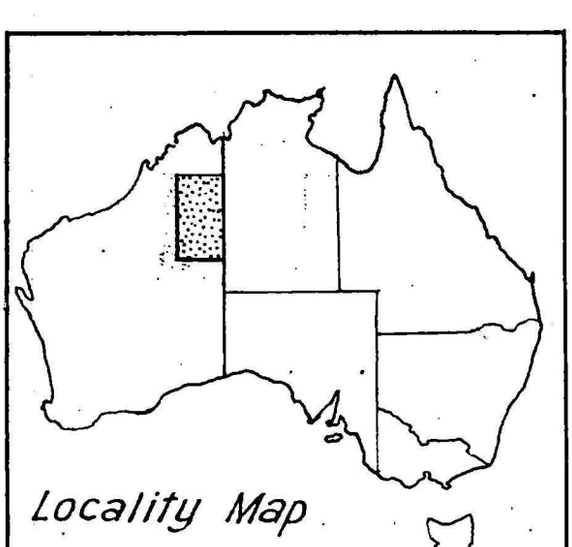


Astrofix N18 position marked on granite knob near Lewis Range.

Combined parties at Billiluna Station. Left to right - T.Cole (mechanic, Lands and Surveys), A.Wells (geologist, B.M.R.), M. Fisher (surveyor), D.Roberts (geologist, W.A.P.E.T.), Greg Fall (cook, W.A.P.E.T.), P. Nelligan (party leader, Lands and Surveys), A.White (mechanic, B.M.R.), J. Casey (party leader, B.M.R.), R.Elliot (party leader W.A.P.E.T.), J. Crompton (mechanic W.A.P.E.T.), absent, F. Griffiths (field assistant B.M.R.).



CANNING BASIN
Geological Survey
1955



SCALE OF MILES

40 20 0 40 80

Traverses

MAGNETIC +3½°

Bureau of Mineral Resources, Geology & Geophysics. Nov 1955.

WA.22-3