CENTRAL BORDERLANDS PROJECT
EL 31587
(surrendered December 18, 2018).

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ABSTRACT

**EL 31573** formed part of the Central Borderlands Project area (along with the adjoining **EL 31587**). The two were applied for to test and determine the geological nature of certain anomalous botanical features situated within their combined boundaries and, in particular, to establish whether or not one or some or all of those features were kimberlitic or lamproitic.

The Licences were duly granted, an MMP (exploration) was subsequently approved, a number of shallow RAB holes were drilled and each one metre sample was examined on reaching the light of day. And every sample taken from below the regolith returned granite – weathered at first, naturally, and less weathered with depth.

And so each feature proved to be the top of a relatively small body of granite (as granite bodies go), set in the project area's wider region of granulite facies felsic gneiss. The two units now share the same almost-level subsurface horizon, have developed a similar style and depth of regolith and become covered by the same topsoil alluvium.

Their botany, however, is very different. The broader gneiss areas now support forests of mulga etc with grass and shrub species undergrowth, while those underlain by the granite bodies are completely covered with spinifex, in places with a sparse scattering of trees and shrubs here and there and with clearly defined boundaries.

PHILOSOPHIES AND REASONING

The search for diamond indicator minerals is conducted via a number of different methods and philosophies, with one of the latter being a line of logic based on the possible evidence a hypothetical kimberlitic or lamproitic diatreme may be presenting at a landform's surface today. Such a notion would include items like seemingly anomalous soil or drainage irregularities (for example), or roughly circular ground features of some sort which lack obvious explanations.

Sites of this nature are (used to be) easily tested, as in most cases one small-diameter RAB hole through its regolith and weathered top layers would reveal the feature's underlying geology – though not necessarily the reason for its existence. That being the case one would invariably find one's self "ticking the box" so to speak and heading home, no sample testing required and no data generated.

These days, however, for a privateer prospector at least, just acquiring the rights to drill a small hole has become a test of one's endurance – along with one's literacy, graphics ability, patience, resolve and financial stamina. This is of little consequence, however. In today's mineral exploration world privateer prospectors are creatures of the past and, as a species, pretty much extinct anyway.

That aside, from the mid 1970s to the mid 1990s I tested a number of such features in Central Australia, having become aware of them via air photos or having seen them from an aircraft etc. Others were active in the region as well during this period, large long-established industry players employing different philosophies and techniques to one's own modest efforts, and with substantially larger work teams and budgets (...but the same results).

Since that time, however, the focus of diamond exploration has changed – as S. B. Shirey and J. E. Shigley explain in their 2013 article "Recent Developments In Understanding The Geology of Diamonds":

"A new revelation, the result of dating both the diamonds and the depletion of their host mantle, is that diamond formation can appear associated with mobile belts, and that those intracratonic regions near Archean cratons may contain Archean mantle keel that was later remobilized."
These could be ancient cratonic specimens that survived later tectonism in the mantle keel, or simply appear to be in a mobile belt because the latter was thrust onto the craton. A third possibility is that they could actually be younger diamonds formed from much older components.

Indeed, the Argyle mine lies in just such a mobile belt, as do other very productive mines (e.g., Venetia) or diamond-rich localities (e.g., Sloan, Buffalo Head). Far from the simple correlation with just ancient crust, predicting where to look for diamonds must now include new thinking about the geologic evolution of the mantle lithosphere and the geologic sources of the diamond-forming fluids.”

Well, yes, thunk me. Verrry interesting. ...except that eight years prior to its publication I had retired from all forms of work including prospecting: totally-absolutely and utterly irrevocably. My wife and I had then set out to tour this Great Land Of Oz in our 12m ex touring-coach and palaise-de-passione motor home "Tar Baby" – to see the sights, have wild and exciting adventures, to sponge on the children as much as possible and to be amazingly cool generally.

But coming across Shirey and Shigley's work in 2017 rekindled a flame. And whilst prior to reading their article one would drift around in idle moments viewing our wonderful Central Oz landforms via the region's ever-improving satellite imagery, post that event I found myself concentrating on the Musgrave Province.

And when the feature below appeared on my computer screen, unblemished by any activities of man, it came without quarter: either take up the quest again or...

Or what? ...lie awake at night agonising endlessly about the potential it may harbour?

FIGURE 1

And so Once more unto the breech [it was], dear friends, once more – and bloody pronto, too, in case some other bugger got onto it and turned up the world's best diamond mine.

Thus came about the Central Borderlands Project, the aim of which was to acquire the rights to plumb, test and otherwise identify the geological nature of this and other similar (but somehow less-exciting) botanical features situated near the eastern extremity of the Musgrave Province geology, on what later would become EL 31573 and the subject of this report.
THE LIE OF THE LAND

Figure 2, below, shows Central Borderlands project area and the portion comprising EL 31573. The project area was bounded by the SA border to the south, the Adelaide/Darwin Railway easement to the west (approximately), and – more loosely speaking – the Kulgera/Finke Road to the north. Eastward EL 31573 extended into the Umbeara Pastoral Lease about five kilometres, while its south western corner had an easment clearing an Aboriginal Homeland block.

In addition, EL 31573 lay in its entirety on the Mount Cavenagh/Victory Downs and Umbeara Perpetual Pastoral Leases, all of which are the subject of Granted Native Title.

The nearest major town to the project area and EL 31573 was Alice Springs. Access from there was via the Stuart Highway, 270 Kms south to the settlement of Kulgera and then 13.5 Km along the Finke Road to the Adelaide/Darwin railway crossing. The project area's north western corner (on EL 31587), was situated on the eastern side the railway easment, ninety metres from the railway line and seventy five metres south of the Finke Road – give or take a millimetre or two.

FIGURE 2

PREVIOUS EXPLORATION ACTIVITIES AND CURRENT STATUS

The East Kulgera region has seen a considerable amount of mineral exploration in the past, though interest has tended to wain with increasing distance from its outcropping geology. Previous Exploration Licences which wholly or partially covered EL 31573 prior to the Central Borderlands Project include EL10055, EL 24204, EL 24535 and EL 28169 (Figures 3, 4, 5 & 6 below).

No report mentioning earlier "substantial disturbance" work was discovered inside EL 31573's boundaries and neither was this surprising, as its almost total lack of outcrop and broad areas of dense and difficult mulga scrub would have discouraged anything other than satellite image reconnaissance and airbourne surveys.
REGIONAL OVERVIEW AND CURRENT PROJECT SITE CONDITIONS

(Please note: The following comments and observations are of a purely empirical nature and may well be at odds slightly with the current wisdom. (...or reality, even, for that matter.)
Pay no attention.)

The Central Borderland Project and its EL31573 lay at the eastern end of the Musgrave Province’s Fregon Subdomain (as shown on Figure 7, below), hard against the SA border.

FIGURE 7

EAST KULGERA REGION GEOPHYSICS

In Figure 8 (below) the vertical derivative magnetics (black) show, among other details, the two principal structural elements in this section of the Musgrave Province. These are 1), the Province’s clearly visible south west / north east trending local boundary with the Amadeus Basin sediments and 2), the Umbeara Fault. Also shown is the local rising north west to south east gravity regional gradient trend, which (coincidentally ?) occurs at ninety degrees to the general strike direction of the Umbeara Fault.
In addition, Figure 9 (below) shows the project locality's TMI data as a contour graphic, with the Central Borderland's two EL's and the project's areas of interest superimposed onto it. It clearly indicates on this regional scale the absence of any coincidental magnetic variation with those areas and, with the target areas already identified, local surveys were not warranted.

**FIGURE 9 (from NTGS TMI Data)**
EAST KULGERA REGION GEOLOGY

This section from the Northern Territory Geological Survey's 1:500,000 Musgrave Province Geological Map (NT portion) shows the Central Borderland Project's basement geology as comprising two units of granulite-facies felsic Musgravian Gneiss (Figure 10 and notes below). These are 1), a moderately highly magnetic unit in the general north eastern sector and 2), a weakly magnetic unit in its south western sector.

FIGURE 10

10

(Note: Some rock unit and other names may have been adjusted when compared with earlier maps.)
NEAR-SURFACE PROJECT AREA FAULT INTERPRETATION

Much of the Southern Borderland geology’s subsoil fracturing can be inferred from preferential scrub-growth linearments evident on satellite images of the heavily timbered areas. These are probably indicative of a shallow regolith, with shrubs and trees growing more robustly over moisture retaining fractures.

The two ephemeral waterways traversing the project area also appear to be fault controlled, as do many of the minor channels and watercourses in the project area’s western sector (Figure 11, below).

Little correlation seems to exist between all this and the deeper inferred structural elements shown in Figure 8, however, and in Figure 12, below.

FIGURE 11

FIGURE 12
AREAS OF INTEREST

The subjects of this exercise were some anomalous areas of spinifex (as identified in Figures 8 & 9, above), two of which were situated on EL31573 (Perseverance and the Enigma archipelago). And while spinifex is common enough in Central Oz, here such botany is thoroughly at odds with that of the project's wider locality.

None of these spinifex areas present as a mound or depression; all have the same sandy to clayey red loam as the surrounding countryside and all exhibit the same well-defined boundaries (Figure 12, below) – though this is a particularly clear example. Other sections can be more scrub blurred.

FIGURE 13

For the purposes of the exercise the two features on EL 31573 were named "Perseverance" and "Enigma" (and the Figure 1 feature situated on (what later became) EL 31587, "Serendipity"). Perseverance is oval in shape and slightly larger than Serendipity, while Enigma comprises an archipelago of closely associated, irregularly shaped, larger and smaller spinifex areas.

Separating all of these islands of spinifex is an ocean of mulga scrub – forests which, typically, vary from open to considerably less open. And in the project area's many broad, channel-free low-gradient water courses this scrub density can reach a point where making headway on foot can become very, very, tiresome.

Other trees to be found in the project area include eucalypts and other acacia species, notably ironwoods – some of which have grown to huge proportions. And the forests generally have patches and areas with undergrowthis of native grasses, and Cassia and Eremophylla shrubs ... but no spinifex whatever (Figure 13, above).

Within the project area there is an almost total lack of outcrop – the exceptions being a prominent gneiss hill a kilometre or so NW of the Wellmullina Creek stock yards, a number of minor ground level quartz occurrences and the odd patch of calcrete.

The two major streams crossing the project area are the Hamilton Creek and Wellmullina Creek, the Wellmullina flowing in a south easterly direction to where it joins the southward-flowing Hamilton some two kilometres short of the SA border. Their joint catchment comprises about 500 square kilometres – a similar area to that of the Todd River upstream from Heavitree Gap – and both, typically, have a healthy population of river red gums.
Most of the Southern Borderlands project area appears flat and, for the greater part – certainly to any scrub-bound observer – its low angle gradients and broad-but-minor variations in elevation are difficult to detect. In the following map and attached diagrams (Figure 14), the section line profiles A-B, C-D and E-F demonstrate the project area’s overall gradient regularity. (The section diagrams are not to scale, of course, and exaggerate the slope angles.)

As a result of these properties, flash flooding from heavy downpours is slow to migrate, not only through the area’s heavily forested regions but also along the local bore roads, where evidence of erosion was nonexistent.

**FIGURE 14**
As mentioned earlier, much of the Southern Borderlands project area is devoid of outcropping Musgrave geology, though a few showings of the Fregon Unit's Calamity Gneisses can be found in EL 31573's eastern sector.

In the Licence's more heavily forested sections the predominant surface geology appears to be quaternary alluvium and/or sheetwash(?), while in the slightly elevated mid regions of EL 31573 there are patches of quartz gravel and granite residuals.

Throughout the project area much evidence of one particular ant type's mining activities was seen (but very few of its ants). Current examples include their many 100mm high "volcanic" cones, each of which is comprised of 1mm to 1.5mm sand grains, most of them quartz.

Historical examples are there as well and come in the form of anomalous little vegetation free areas covered with those same, size-graded grains.

Such grains make a handy prospecting tool, having been brought up from whatever depth the ants have gone to access moisture. (None checked on the spinifex areas included garnet and/or ilmenite etc grains, but they still had to be drilled.)

The Figures 15 & 16, at left, are pics taken in a vertically sided, three metre deep borrow-pit at Lyndock Well, on the adjoining EL (31587). It was excavated by the Mount Cavenagh Station management, as fill-material was required there to build up the area around the stock-watering tank.

Figure 12 shows the topsoil and subsoil depths there and the calcrete development to its floor at three metres. The vertically trending textures visible in it are a natural characteristic and not the result of being scraped clean, as subsequent rain had left the pit walls stained with a mud coating.

Figure 13 shows the calcrete in detail.
WORK CARRIED OUT

A light RAB drill was used for the project – namely an Edson 2000 machine mounted on an Isuzu FTS-700 4x4 truck (Figure 17, below). The trailer-mounted compressor used was hired from a Darwin business called Air Powered. It was freighted to Alice Springs by truck, but a lack of loading space northward required it be towed back to there, and so a pleasant weekend's drive ensued in the service vehicle seen here.

FIGURE 17

Drilling on EL 31573 comprised two 110mm RAB holes within each of three x 200m diameter approved drill sites: one on Perseverance and two on different areas of Enigma (Figures 18 19 & 20, below).

FIGURE 18
The drilling on EL 31573 was carried out during the third week of November, 2018 and all six holes were drilled vertically.

All holes returned soil and some fragments of calcrete, then weathered granite, then less weathered granite. And inasmuch as one was looking for diamond hosting geology, no sample analyses were required as the field observations were conclusive. As a result of this no data were generated.
Drilling Details (continued)

Drilling on EL 31573 was as follows:

(Perseverance):
- PPH 001 - 25.9520 x 133.4920 - 34m - 33 samples
- PPH 002 - 25.9530 x 133.4930 - 28m - 27 samples

(Enigma West):
- EWP 001 - 25.9300 x 133.5530 - 25m - 24 samples
- EWP 002 - 25.9290 x 133.5520 - 25m - 24 samples

(Enigma Prime):
- EPP 001 - 25.9050 X 133.5780 - 28M - 27 samples
- EPP 002 - 25.9061 x 133.5790 - 33m - 32 samples

Drilling totals on EL 31573 targets were as follows:

(Perseverance): 62m x 1m samples, discounting Metre 1
(Enigma): 111m x 1m samples, discounting Metre 1
... giving a total of 173m.

<table>
<thead>
<tr>
<th>Hole Type</th>
<th>Hole Number Range</th>
<th>No of Holes</th>
<th>Total Metres</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAB</td>
<td>AARB certainly, but what? 1 to 6?</td>
<td>6</td>
<td>173</td>
</tr>
</tbody>
</table>
CONCLUSIONS

And so, rather than the hyperdiamondiferous kimberlitic or lamproitic geology one had been slightly hoping to find on EL31573, one has established instead that the spinifex is simply growing preferentially on an area of shallow, non-outcropping granite, where the surrounding regional geology is an equally shallow non-outcropping granulite facies felsic gneiss (as per Page 8's Figure 8 NTGS Musgrave geology map detail).

And therein, one rock type *vis-s-vis* the other, lies the answer to whatever is controlling the botany of these areas, be it chemical (trace element abundance or deficiency), moisture retention characteristics (high or low), or some or all of these factors plus others such as their differing depths of weathering, the depth of topsoil on their respective calcrete zones ... or simply the depth of the calcrete development itself.

Whatever the case, the spinifex fairly thrives on these granite areas and the mulga does not, while the mulga likes the felsic gneiss country and the spinifex *absolutely* does not.

And so, disappointed at not having discovered even a *barren* kimberlite (but greatly appreciating the utterly non-ambiguous answer one's exploration efforts returned), one has taken one's drill and gone home ... poorer, certainly, yet thoroughly enriched by having had the privilege of testing these areas – and in particular the beautiful Serendipity. (...beauty lying, of course, in the eye of the beholder.)

As for further work... Well, there are the somewhat academic questions of what exactly *is* controlling the botany so tightly perhaps, and the fairly predictable answer (one presumes) to the type of granite involved, but little else comes to mind.

Pity, though. This would have been the perfect place for a diamond mine. I mean it's marginal grazing country, it's only ten K's to an established railway siding and just twenty to a sealed highway and airstrip.

Also ... happy days – it's only twenty kilometres to the nearest pub..

Cheers, ay.

Linz Johannsen

(...absolutely totally and utterly permanently retired, failed long-term diamond prospecting tragic.)