Tawana Resources NL

Annual Report – EL10358

TIMBER CREEK DIAMOND PROJECT
Year Ended 21 May 2003

Table of Contents

Tawana Resouces NL

TIMBER CREEK DIAMOND PROJECT – MAY 02-APR 03

1. Introduction

The Timber Creek project is located approximately 360 kilometres SSW of Darwin. The 5 known Timber Creek kimberlites are sited approximately 10 kilometres south of the small township of Timber Creek (Figure 1). These kimberlites were discovered by De Beers during a sampling programme over this area between 1991 and 1993.

The Timber Creek project consists of Exploration Licence (EL10358) covering an area of 6.6 square kilometres over the five known Timber Creek kimberlites. Tawana Resources NL has negotiated a purchase option agreement over tenement EL10358 with the holders Stockdale Prospecting Limited. This EL, as well as approval to conduct mining operations on TC01, was granted on 22 April 2002 for a 6-year period. Negotiations with the Aboriginal landowners and the Northern Land Council to conduct this bulk-sampling project were successful and permission to commence work in this area was given on 17 May 2002.

2. Geology and previous work

The project area is within the early to mid Proterozoic Victoria River Basin (VRB) overlying the concealed North Australian Craton. The VRB consists of both marine and continental sediments, with a maximum thickness of 3500 metres (Palfreyman, 1984) that has undergone at least three periods of gentle folding and warping (Pontifex & Sweet, 1972).

Surrounding the known kimberlites are shallow dipping sediments of the Bullita Group (Fig 2). This is composed of thinly bedded reddish brown dolomitic siltstones and fine sandstone of the Timber Creek Formation (Sweet, 1972), grading up, and into, grey thin-bedded dolomite and dolomitic siltstone of the Skull Creek Formation (Pontifex & Sweet, 1972). The Bullita Group has formed low rounded hills, sometimes capped by overlying unconformable massive quartz sandstone. This sandstone is the Jasper George Sandstone (Auvergne Group) which also caps the gently sloping plateau of the Newcastle Ranges to the northwest.

The only known igneous intrusions in the project area are the five known kimberlites. All have been classified by De Beers as highly altered hypabyssal facies kimberlites. Timber Creek 01 is the largest of these bodies and represents a small pipe or a blow on a dyke. An 84t colluvium sample down-slope from Timber Creek 01 produced 1913 diamonds totaling 19.83ct from the -4.75mm fraction (Berryman et al, 1998). Over 100 diamonds, generally small (0.0016 to 0.0023ct) and predominantly brown to yellow in colour, have been recovered from surface loam sampling alone (Berryman, 1995).

Ground inspection by De Beers led to the discovery of a small kimberlite dyke, Timber Creek 02. Later drilling intersected a thin extension of this dyke. No diamonds have been recovered in this area.

Timber Creek 03 outcrops as a white silicified rock with vague relict igneous textures visible on weathered surfaces (Berryman, 1995). Based on outcrop and chromite distribution from surface loam sampling, this kimberlite was considered relatively small by Stockdale Prospecting Limited. No drilling was completed at the TC-03 site.

Timber Creek 04 is a series of small en-echelon dykes, or a dyke swarm. The kimberlite outcrops as a goethite-rich breccia and was intercepted in De Beers drill hole 93DH32 core as a 75cm wide dyke and small stringer. One diamond from RAB drill hole 93DH01, and over twenty diamonds from surface loam sampling have been recovered in the TC-04 area (Berryman, 1995). The kimberlite samples were both highly silicified and ferruginised.

The final Timber Creek kimberlite, TC-05, does not outcrop, but was intercepted by the single drill hole 93DH33 as a series of thin dykes. No diamonds have been recovered in this area.

3. Objective

The work conducted by De Beers on TC01 suggested a diamond grade in the order of 100cpht with a potential grade of 200cpht. A small pipe with a grade of this nature provided an ideal target for further work for Tawana Resources NL. In order to obtain an average grade and price per carat for the diamonds from TC01, it was decided to extract a 10 000t bulk sample from TC01. It was anticipated that a sample of this size could be excavated, processed through a HMS plant and the concentrate sorted during the Northern Territory dry season of 2002. The 10 000t sample was also considered large enough to give a good grade estimate and average price per carat value.

4. Ground Magnetic Survey of TC01

No anomalies are evident over the Timber Creek kimberlites on the aeromagnetic survey conducted by De Beers over this licence area (figure 3). Their low magnetic susceptibility is attributed to the silicified nature of these kimberlites. As the drilling conducted by De Beers to determine the spatial extent of TC01 only intersected kimberlite in 1 out of 16 holes, a final attempt to determine the approximate size and outline of the body in the form of a ground magnetic survey was carried out over TC01 prior to the commencement of the excavation programme. A 100x80m block was pegged out over the TC01 area and a line spacing of 20m and station spacing of 5m was used in the survey. The results from this survey confirm the low magnetic susceptibility (range of 32nT for the survey) of the TC01 pipe (figure 4). A weakly defined reverse magnetic dipole is evident from this survey, which is likely to be attributed to the TC01 kimberlite. From this survey it appears as though the TC01 body represents a small pipe as no obvious dyke-like feature is evident.

5. Site selection for HMS plant

A site with sufficient water was sought in close proximity to TC01 which would be suitable for the HMS plant. Following consultation with the Aboriginal landowners, it was decided that a spring-fed creek some 14km from TC01 (figure 5) would be suitable for this purpose (Dingo Springs Creek). The approximate layout of the operation was discussed with representatives from the NLC in Timber Creek (Mick Armstrong and Larry Johns). This included a 30x50m tailings dam, a 20x20m freshwater dam and an area of about 140x60m for stockpiling the kimberlite.

6. Earthmoving Equipment

The earthmoving contract was awarded to Kununurra based JSW. The equipment used for the bulk sampling exercise comprised the following:

- Komatsu PC350 35t excavator
- Komatsu WA180 front-end loader
- 2 x 12t tip trucks

The team of 4 operators arrived in Timber Creek on 20 May 2002 and commenced with the digging of the slimes dam at Dingo Springs Creek. This involved the stripping of the top 40cm of topsoil and stockpiling this (together with any removed vegetation) for later stage rehabilitation. Due to the shallow soil profile and competent dolomite and conglomerates below surface, progress was rather slow and the majority of the dam had to be dug using the rock breaker. This took 6 days to complete and the earthmoving equipment then relocated to the site of TCO1 to commence excavation of the pipe.

7. Bulk Sampling of TC01

Excavation of the kimberlite commenced on 26 May 2002. As the below surface extent of TC01 was not known, a 2.5m deep trench was dug across the outcropping portion of silicified kimberlite breccia (figures 6 and 7). Inspection of the profile in this trench enabled the approximate contact of the kimberlite with the surrounding sediments to be determined (figure 8). The NE-SW orientated trench revealed a 19m long section of kimberlite (figure 9). Due to the slope of the ground surface, the thickness of the overburden varied from 50 at the top of the slope to 130cm towards the base of the slope. The overburden was comprised of soil and sandstone/shale scree, which had rolled down-slope due to erosion. Some sections of this overburden also contained small boulders of kimberlite.

The initial sampling plan was to batch each day's excavations in separate stockpiles and treat the stockpiles separately. However, this system would have generated numerous stockpiles, which in turn would have necessitated a large stockpile pad. In order to minimise the destruction of vegetation, it was decided to reduce the number of stockpiles which would therefore require a smaller stockpile area. The sampling yielded a total of 10 separate stockpiles. Where possible, these stockpiles (or batches) were separated according to the observed geology or degree of crustal contamination.

The location of the excavated material comprising each of these stockpiles is shown in figures 10a-c. A brief description of the observations during excavation is also included. The separate excavations have been divided into 3 levels (0-2) obtaining a maximum depth of 6 to 7m in the southwestern portion of the pipe. These levels of excavation are schematically represented in figure 11. Whilst every effort was made to measure up the individual batch excavations as accurately as possible, the irregular nature in which the material was excavated made this difficult. This was largely due to the unknown extent of the pipe boundaries. For the greater part of the excavation work, batch dimensions were determined using a tape measure whilst the final pit outline was surveyed using a laser measuring device.

The following batches were generated during the 23 days of excavating. The batches were individually logged by Trevor Smith and are described as follows:

1. Overburden 1 (OB1) – this batch was collected from immediately over the kimberlite. Although the kimberlite occurs on a relatively steep slope, this batch was collected to establish if any surface enrichment is present over the pipe. Inspection of it revealed predominantly xenolith-rich silicified kimberlitic breccia. Relict olivines can be observed in this kimberlite. It also contains large slabs of siltstone country rock of the Timber Creek Formation. Balls of kaolinite are common. The kaolinite is thought to be highly weathered kimberlite, which is a feature of other north Australian kimberlites (eg. Ashmore).
2. Overburden 2 (OB2) – this surface material was collected downslope of the pipe where natural erosion processes would have transported the diamonds to lower lying areas. The majority of this comprised soil and cobbles of Timber Creek Formation sandstone and siltstone. Some kimberlite cobbles were also evident in this material.
3. Batch 1 (B1) - Batch 1 was excavated from the western edge of the pipe at level 0. The material appears very similar to that from the overburden. The batch is predominately xenolith rich silicified kimberlitic breccia, though it also contains some clay-rich (saprolitic) kimberlite and kaolinite balls.
4. Batch 2 (B2) - Batch 2 was excavated from the northern-central part of the pipe on level 1. The material consists of olive green silicified kimberlitic breccia, with relict olivines and pyroxenes (now replaced by silica) with balls of kaolinite and significant quantities of barite crystals. There are numerous rounded xenoliths of quartzite and siltstone, up to 10 cm in diameter.
5. Batch 3 (B3) - Batch 3 was excavated from the southern half of the pipe on level 1. The material is predominantly saprolitic kimberlite. Weathering is so extensive that textural features are difficult to distinguish. It also contains balls of kaolinite, siltstone and quartzite xenoliths and a trace of sulphides. Figure 12 shows the batch 3 material stockpiled in front of the excavator with the excavator sitting on level 0 and the stockpiled material sitting on level 1. Batch 2 has been removed and is the void to the right of the excavator.
6. Batch 4 (B4) – Batch 4 was excavated from the southern and western margins of the pipe on level 1. This material was the final stage of stripping at this level and the material was progressively stripped until the contact with the country rock sediments was established. The material is predominately xenolith rich silicified kimberlitic breccia with relict olivine textures. It also contains some saprolitic kimberlite and hard "brown mineral" rich kimberlite. A sample of this was submitted to J. Baron for petrography and this was classified as ankerite/siderite.

7. Batch 5 (B5) - Batch 5 was excavated from the northeastern section of the pipe on level 2. Due to the slope of the ground and amount of overburden in this area the exact contact of kimberlite was difficult to determine. This batch may contain some overburden and sediment contamination. The material is predominately xenolith rich silicified kimberlitic breccia with rare balls of kaolinite.
8. Batch 6 (B6) - Batch 6 was excavated from the majority of the pipe on level 2. The material is predominantly saprolitic kimberlite (possibly montmorillonite) with minor xenoliths. It contains sections rich in barite crystals, traces of sulphides and patches of a fine-grained black mineral (thought to be hematite). Figure 13 shows the contact of the country rock sediments with the dark grey-purple clay-rich kimberlite comprising batch 6.
9. Batch 7 (B7) - Batch 7 was excavated in two parts, from the north western part of the pipe and a small area on the eastern margin of the pipe. The batch was defined as xenolith-rich silicified kimberlitic breccia. The section from the eastern margin is suspected as being part of the precursor kimberlite dyke. Also included in this material was a collection of hard boulders from across the pipe. These hard boulders were either silicified kimberlitic breccia or "brown mineral" rich kimberlite.
10. Batch 8 (B8) – This batch comprised an assortment of large hard boulders from other batches within the kimberlite. Many of these are silicified kimberlite breccia. Most of these large resistant boulders were broken down into smaller boulders with the hydraulic rock breaker before being transported to the plant site.

Representative specimens from each of the batches were collected by Wolf Marx and these have been submitted to De Beers for petrographic analysis. No descriptions were available at the time of report writing.

Although the initial plan was to measure up the excavated volume each day, this proved difficult due to the slope of the surface and the undefined margins of the body. As a result the unconsolidated volume of each truckload and its approximate weight was monitored. These sampling statistics are shown in Table 1. During the 3 weeks of excavation work approximately $3359m^3$ of unconsolidated material was collected. This was approximately equivalent to 5430t of material. The exact weight of each batch (excluding batch 8) was determined during hydrascreen processing (see section below). These weights are shown in Table 2. This table shows that the approximated weights and actual weights are reasonably similar for most batches.

Following completion of the sampling of batch 7, it was obvious that a significant amount of stripping of country-rock would be necessary in order to extract more kimberlite safely. During a visit by Wolf Marx it was decided that this would be a lengthy and costly exercise and that the ~5000t collected thus far should give a reasonable indication of the grade of this kimberlite. Two other reasons for reducing the sampling tonnage were water quantity and available stockpile area (additional material would have required large areas to be cleared of vegetation, and the area designated for this contained significant quantities of mature trees).

8. Hydrascreen Processing

Due to the friable nature of much of the material, it was decided that crushing was not necessary for a large proportion of the kimberlite. A hydrascreen plant fitted with a 40mm mesh was hired from JSW in order to produce kimberlite product which could be fed directly into the HMS plant (figure 14). The 40mm sized mesh aperture was arbitrarily chosen at the time as it was believed that this would allow sufficient material to pass through the screen without producing an abundance of oversize material and it was expected that most of the –40mm material would probably ultimately be broken up in the HMS scrubber. This proved very successful and the total stockpiled material (excepting batch 8 which comprised large boulders) was processed through the hydrascreen in 12 days. The daily hydrascreen production is shown in Table 3.

Table 3: Daily production through hydrascreen plant

Date	Batch	Screener feed	Daily total
		(t)	(t)
6/6/2002	OB1	114.6	
6/6/2002	1	125.5	
6/6/2002	2	102.75	342.9
7/6/2002	2	238.15	
7/6/2002	3	373.65	611.8
8/6/2002	3	498.2	498.2
9/6/2002	5	258.95	
9/6/2002	4	194.6	453.6
10/6/2002	4	223.9	223.9
11/6/2002	6	381.35	381.4
12/6/2002	6	446.65	446.7
13/6/2002	6	383.95	384.0
14/6/2002	6	299.3	
14/6/2002	7	203.75	503.1
15/6/2002	7	441.6	441.6
16/6/2002	OB2	668.15	668.15
17/6/2002	OB2	353.3	353.3
TOTAL			**5308.4**

One major advantage of the hydrascreening process was that it enabled all the kimberlite on the stockpile pad to be weighed with the loader weightometer during the screening process so that the exact tonnage of material to be processed was known prior to commencement of the HMS processing. A second advantage of this process was that diamond breakage would have been negligible during the screening process, compared with crushing, due to the non-impacting nature of this process.

The breakdown of the screened material (+40 and –40mm material) in each batch is shown in Table 4. From this it is evident that a high proportion of material passed through the 40mm screen from the majority of the batches, particularly the highly weathered saprolitic kimberlite in batches 3 and 6. The overburden produced a greater proportion of +40mm material compared with the kimberlite due to the presence of numerous siltstone and silicified kimberlite cobbles and boulders.

Table 4: Yield of <40mm material per batch from hydrascreen processing

Batch	Tot wt (t)	Wt of <40mm product (t) Based on HMS hopper feed	Wt of >40mm product (t)	% <40mm for HMS from hydrascreen
OB1	114.6	52.70	61.90	45.99%
OB2	1021.45	not all processed	?	?
1	125.5	92.35	33.15	73.59%
2	340.9	220.65	120.25	64.73%
3	871.85	552.4	319.45	63.36%
4	418.5	238.5	180	56.99%
5	258.95	147.00	111.95	56.77%
6	1511.25	1000.85	510.4	66.23%
7	645.35	353.85	291.5	54.83%
TOTAL	**5308.35**	**2658.30**	**1628.60**	

9. Crushing

During the latter stages of the HMS processing it was decided not to crush the remaining 2000t of material. This was largely due to the fact that difficulty was encountered in obtaining the right equipment to do the job (as ~2000t was not considered a significant enough quantity of material to make the job viable for most operators). In addition, the water level in the creek had dropped significantly and it didn't seem likely that the remaining water supply would be sufficient to treat the remainder of the kimberlite. Furthermore it was believed that there was no reason to assume that the –40mm material should be any different to the +40mm material in terms of diamond content. Table 5 shows the quantity of material remaining in each of the stockpiles that could be crushed during the 2003 season.

Table 5: +40mm kimberlite remaining on stockpile pad requiring crushing (or rehabilitation)

Batch No.	+40mm kimberlite from hydrascreen	Oversize from trommel	TOTAL OVERSIZE
	(t)	(t)	(t)
OB1	61.90	5.95	67.85
OB2	unknown	crushing not recommended	
1	33.15	13.85	47.00
2	120.25	26.40	146.65
3	319.45	62.45	381.90
4	180.00	27.85	207.85
5	111.95	24.70	136.65
6	234.4	235.2	269.60
7	291.50	60.70	352.20
8			Approx. 80.00
Total			**1889.70**

10. HMS Treatment

The HMS plant was hired from Perth-based NTF mineral processing (managed and operated by ex De Beers Tim Fried and Neil Roberts). The plant arrived in Timber Creek in early June and took approximately 1 week to set up. The plant comprised 3 main components which are shown in figures 15 and 16:

- hopper with 6t capacity
- scrubber and trommel fitted with 1mm bottom cut screen and 10mm upper cut screen
- HMS fitted with 6 inch cyclone and rated at 5t per hour

All –40mm material from the stockpile pad was loaded into the plant hopper using a front-end loader. The treatment of the batches was prioritized according to geology and degree of crustal contamination. The feed rate of the product from the hopper was regulated according to the clay content of each of the batches. Where "clay-balling" was observed on the prep-screen, the feed rate was slowed down and ballast (in the form of cobble-sized alluvial sandstone) was added to the scrubber to assist in the attrition of the material within the scrubber.

A screening analysis of each of the hydrascreened batches was conducted to get an idea of the size fraction distribution between each of the batches. Approximately 25kg of material was collected from each of the stockpiles for this purpose. At least 15 small spades full were collected from different positions in the stockpile in an attempt to collect a representative sample. 1mm, 3.35mm, and 5.6mm screens were used for the screening analysis. These results are graphically displayed in figure 17. These results show that each of the batches (including the overburden) display very similar proportions for a particular size fraction. Each of the batches displayed a significant proportion of –1mm material (~30%). A similar exercise was carried out with the HMS lights and these results are shown in figure 18. A much greater degree of variation is displayed in these graphs which represent the +1-10mm HMS product. Batches 1 and 3 display an increasing proportion of material in progressively coarser fractions whilst batches OB1 and 6 display a decreasing proportion of material in the coarser fractions. The proportion of material in each of the size fractions for OB2 is approximately equal.

Tracer tests were conducted on a daily basis prior to initiating the product feed from the scrubber. A range of different sized tracers with varying SG's was used for this purpose. A typical example of the tracer test results is shown in Table 6 below. The operating density of the FeSi was maintained between 2.45 and 2.55 in order to achieve a cut point density of approximately 3.1. In the example highlighted in table 6, a cut point density of 3.18 is SG=4.4). Fragments of kimberlite and flat pieces of country rock also reported to concentrate. The concentrate yield was monitored for the duration of the project and this varied from 0.29% for OB2 to 1.3% for batch 3. The average concentrate yield for all material treated was 0.68% (Table 7).

Table 6: Example of tracer test results (17 Sept 02)

		Small (2mm)			*Medium (3mm)*			*Large (4mm)*		
Colour	**S.G.**	**In**	**Sink**	**Float**	**In**	**Sink**	**Float**	**In**	**Sink**	**Float**
Blue	3.5	5	5		3	3		2	2	

Violet	3.3	5	5		3	3		2	2	
Red	3.1	5	1	4	3		3	2		2
Orange	2.9	5		5	3		3	2		2
Green	2.8	5		5	3		3	2		2
Mauve	2.7	5		5	3		3	2		2

Records of all kimberlite processed were recorded on a daily basis. This was done using the weightometer on the loader (to 50kg accuracy). The individual weights recorded included: weight of kimberlite into hopper, weight of oversize removed from scrubber and weight of HMS lights. The concentrate weight was measured by suspending the concentrate bucket from a spring scale before decanting into the concentrate drum. These parameters enabled the quantity of slimes generated on a daily basis to be calculated. A blank copy of the daily data sheet is shown in Appendix 1. The daily production statistics are shown in Appendix 2. Based on the 120 days production an average daily production of 28t per 10hr working day was achieved. Approximately 45000 litres of water was used per hour. This was divided into 21500L/hr for the scrubber, 8000L/hr from the prep screen and 15500L/hr from the HMS heart. The latter portion was recycled directly into the fresh water dam whilst the scrubber and prep. screen water flowed into the tailings dam.

A summary of the statistics per batch is shown in Table 7. From this table it is evident that a total of 3311.5t of kimberlite was fed into the plant hopper. Of this, 500t did not break down sufficiently in the scrubber to pass through the heart of the HMS, which represents 15.1%. (This result is skewed due to the effect of 276t of +40mm material from batch 6, which was processed during the final week of processing). As a result a total of 2811.5t passed through the heart of the HMS producing a total of 19t of concentrate.

<u>Table 7</u>: Summary of kimberlite treated through HMS plant per batch

Stockpile Batch No.	Wt of ore into plant hopper (t)	Wt of oversize removed from trommel (t)	Weight of treated ore (t)	Wt of lights (t)	Wt of conc. produced (t)	% conc. produced	% slimes of hopper feed	Conc. Drum number(s)
1	92.35	13.85	78.50	15.15	1.000	1.27	67.51	Batch 1 / 1-5
2	220.65	26.40	194.25	40.75	1.680	0.86	68.81	Batch 2 / 1-7
3	552.40	62.45	489.95	92.10	6.362	1.30	70.87	Batch 3/1-19
4	238.50	27.85	210.65	41.05	0.810	0.38	70.77	Batch 4/1-8
5	147.00	24.70	122.30	23.10	0.186	0.15	67.36	Batch 5/1-2
6	1000.85	105.20	895.65	152.60	5.960	0.67	73.65	Batch 6/1-53
7	353.85	60.70	293.15	70.05	0.765	0.26	62.83	Batch 7/1-7
OB1	52.70	5.95	46.75	8.45	0.342	0.73	72.03	Batch OB1/1-3
OB2	376.40	42.15	334.25	40.70	0.966	0.29	77.73	Batch 8/ 1-8
6 (+40mm)	276.80	130.75	146.05	17.10	0.935	0.64	46.25	Batch 6 +40mm 1-7
TOTAL/*Avg*	**3311.5**	**500**	**2811.5**	**501.05**	**19.006**	***0.68***	***69.20***	
6 Lights	81	0.9	80.10	76.8	0.413	0.52	3.56	6 Lights/1-4

Approximately half of the –40mm from OB2 was treated to determine whether or not this material was diamond bearing. This remaining material is stored on the stockpile pad and may be used for rehabilitation if no further processing is undertaken.

As mentioned above, some of the +40mm material from batch 6 was treated to investigate to what degree this would break up in the scrubber and see if there is any notable difference in grade for this material compared with the –40mm material from batch 6. Of the 276t fed into the hopper, 47% constituted oversize from the hopper grizzly and trommel compared with 10.5% for the –40mm material from batch 6. Although the % concentrate produced from the –40 and +40mm material is very similar (0.67 and 0.64 respectively), the +40mm material obviously yielded significantly less slimes (46.25%) compared with the quantity of slimes from the fine fraction (73.65%).

As a check it was also decided to process some of the HMS lights from batch 6 to verify the efficiency of the HMS processing. 80t of these tailings were processed yielding 413kg of concentrate (0.52% yield).

11. Shipment of HMS concentrate to Perth

Initially all concentrate generated on site was decanted from the 30L buckets into 220L fuel drums and the lids were welded closed. Full drums were removed from the plant site and stored in a lockup shed in Timber Creek. Due to the difficulty in handling such large drums, 67L drums were ordered at a later stage. When sufficient concentrate had accumulated to warrant a shipment to Perth, the drums were sent from Timber Creek to Perth with Frontline Transport. Upon dispatch of a load of drums, all details for that consignment were faxed through to Frontline Transport (Kununurra) and Ultrasort in Perth. Ultrasort were requested to confirm receipt of the consignment by return fax to Timber Creek.

12. Diamond recovery (phase 1 Ultrasort)

The first consignment of concentrates were treated at Ultrasort under the supervision of W. Marx in early August. A two-stage X-ray sorting process is in place at Ultrasort. The first stage involves a double pass through a wet sorting X-ray unit (DP3). The concentrates generated from each of these passes are then dried and passed through a single particle sorter (SPS). During this stage of the diamond recoveries, tracer diamonds ("Katz eyes") were used to establish the efficiency of this sorting process. A certain number (usually 10) of these tracer diamonds were introduced to the sample and the recoveries of these diamonds were recorded. An example of this is shown below.

Batch Number		*Tracer Diamonds In*	*Tracer Diamonds Out*	*Timber Creek Diamonds Out*
Batch3 Drum2	DP3 1st pass	10	4	1
Batch3 Drum 2	DP3 2nd pass	-	4	18
Total		10	8	19

As 2 passes are considered necessary for the DP3 unit, these figures yield an 80% efficiency for this recovery method. Numerous other tracer tests showed that lower than acceptable recoveries were obtained using these X-ray machines and although numerous adjustments were made to improve the recoveries, all attempts were unsuccessful. The lack of success with these sortex machines was attributed to the abundance of barite in the concentrate which displays a similar degree of fluorescence within the X-ray units to diamonds which in turn causes numerous ejections resulting in a loss of diamonds. As a result of these poor recoveries a decision was made to adopt the traditional grease table recovery technique.

13. Concentrate milling

Two grease tables were sourced (one from De Beers and the old Diamond Ventures table). In addition two cement mixers for milling the concentrate were loaned to Tawana from De Beers. These were obtained largely due to the fact that observations by Wolf Marx on some of the diamonds recovered during the initial flowsort process showed diamonds that had only been partially liberated from their kimberlite matrix. It was therefore necessary to remove any kimberlite fragments which may have adhered to the surface of the diamonds completely in order to ensure effective recovery using grease tables. All the HMS concentrate that had been sent to Ultrasort was returned to Timber Creek for milling.

The mills were set up at the plant site so that all slimes generated during the milling process could be disposed of in the slimes dam (figures 20 and 21). Steel balls were used to aid the attrition process in the mills. After experimenting with various ratios of steel balls to concentrate and milling times, we finally settled on a steels balls to concentrate ratio of 2:1 and a milling time of 2 hours. The concentrate was milled in aliquot sizes of 40kg (to 80kg steel balls) and the water was changed half way through the milling process (ie. after 1 hour).

During this milling process, a significant reduction in the quantity of concentrate was obtained: on average a 40kg aliquot was reduced to 8kg during milling. The quantity of material milled on a daily basis. The summary showing the average reduction per batch is shown in Table 8. This ranges between 70.1% for batch 1 to 85.9% for batch 4. This milling process proved to be highly beneficial as not only did it significantly reduce the quantity of material for grease table processing, but it also eliminated the vast majority of the barite during the milling process thus enabling the efficiency of the grease table processing to be verified by X-ray recovery.

Table 8: Concentrate batch weights pre and post milling

Batch No.	Wt. before milled (kg)	Avg. wt after milling per 40kg aliquot (kg)	Tot. Wt after milling (from grease table wts)	% reduction due to milling
1	960	?	287	70.1
2	450**	?	126	72.0
3*	5426	8	1149	78.8
4	790	?	111	85.9
5	160	?	27	83.1
6	5040	7.5	892	82.3
6 +40mm	935	8.5	180	80.7
6 Lights	380	?	56	85.3
6 L/Lights	215	7	67	68.8

7	538	?	107	80.1
OB1	280	?	76	72.9
OB2	830	10	196	76.4
TOTAL	**15554**		**3274**	**Avg. 79.0**

** low as excludes 800kg which remained at Ultrasort

* accuracy of this batch doubtful due to lack of scales during initial stages of processing

14. Grease table diamond recovery

Following the milling of the concentrate, the refined concentrate was given a new drum number and transported to Timber Creek where the grease tables were set up (figure 22). This was done as often and quickly as possible (usually once a day) so as so avoid the concentrate sitting around for days on end, which would reduce the hydrophobic nature of the diamonds. The concentrate was poured through a mini scrubber and trommel prior to grease table processing. The aim of this was two-fold: to "freshen up" the concentrate to improve the hydrophobic characteristics of the diamonds prior to passing over the grease, and to screen the concentrate into 3 size fractions, which in turn would improve the efficiency of the grease table processing. These size fractions were +1-3mm, +3-6mm and +6-10mm. The concentrate was poured into the mini scrubber/trommel in approximately 10kg aliquots every 30min, which produced a good production rate for the 1-3mm fraction for grease table processing, which was the rate-determining step. The 1-3mm fraction was processed on the De Beers grease table and the 2 coarser size fractions were processed on the Diamond Ventures grease table (the 6-10mm size fraction was hand sorted in cases where only a small quantity of this size fraction was produced). A 1:4 wax to grease ratio was used throughout the processing.

After the first pass of the 3 size fractions over each of the tables, the material was combined and resized through the mini trommel. This material was then passed over the grease tables a second time. In some cases a third pass was also carried out. The proportion of each size fraction was recorded and a summary of these results is shown in Table 9. On average the 1-3mm fraction produced the greatest proportion of material (39%) followed by the 3-6mm fraction (34.8%) and then the 6-10mm fraction (10.6%). The remaining 15.6% comprised fines of 0.5-1mm. Although it is believed that the milling process is a gentle and low impact form of liberating diamonds, samples of this fine material from batches 3 and 7 were sent to Dynamic

Mineralogical Services for mineralogical examination to determine the likelihood of diamond breakage as a result of this processing. Of the 23 diamonds recovered in these samples, 9 were believed to show signs of secondary fractures marked by very fresh splendent cleavage surfaces with sharp cleavage traces. These fractures are likely to have been derived due to breakage of diamonds during processing. This is suggestive of the very brittle nature of the diamonds recovered from the TC01 pipe.

Prior to the start of grease table processing each day a few diamond tracers ("Katz eyes") and orange ceramic tracers were placed on the grease tables to make sure that they stuck to the grease, thereby checking the quality of the grease.

During the grease table recoveries it was noticed that not all diamonds were sticking to the first shelf and that some were being carried onto the second and third shelves. The feed rate and water volume was reduced in an effort to minimise this and although this did appear to help to some degree, some diamonds were still carried onto the lower shelves. This problem was also reflected in the quantity of diamonds that were recovered during the second pass. The diamond recoveries are shown in Table 10. As a result of the apparent poor efficiency of the grease table recoveries, it was decided to send a batch of grease table tailings to Ultrasort for checking. The initial problems encountered with the abundance of barite in the concentrate were no longer apparent, as most of this had been eliminated during the milling process.

Table 9: Proportion of concentrate per size fraction following screening in mini-trommel

Batch	Initial Wt	1-3mm	% of Tot	3-6mm	% of Tot	6-10mm	% of Tot	<1mm	% of Tot
	kg	kg		kg		kg		kg	
1	287	118	41.1	112	39.0	30	10.5	27	9.4
2	126	33	26.2	49	38.9	39	31.0	5	4.0
3**	1149	372	32.4	457	39.8	107	9.3	213	18.5
4	111	48	43.2	35	31.5	12	10.8	16	14.4
5	27	12	44.4	8	29.6	3	11.1	4	14.8
6	892	379	42.5	257	28.8	78	8.7	178	20.0
6 Lights	56	31.5	56.3	11	19.6	2.5	4.5	11	19.6
6 L/Lights	67	20	29.9	25	37.3	15	22.4	7	10.4
6 +40mm	180	79	43.9	58	32.2	22	12.2	21	11.7
7	107	57	53.3	31	29.0	10	9.3	9	8.4
OB1	76	27	35.5	31	40.8	11	14.5	7	9.2
OB2	196	99	50.5	66	33.7	19	9.7	12	6.1
TOTAL	**3274**	**1275.5**	**39.0**	**1140**	**34.8**	**348.5**	**10.6**	**510**	**15.6**

** accuracy of this batch doubtful due to lack of scales during initial stages of processing

15. Diamond recovery (phase 2 Ultrasort)

The initial batch of concentrates sent to Ultrasort for checking included material from batches 3, OB1 and 6. The results of this second stage X-ray sorting compared with the initial grease table recoveries are shown in Table 11 (comparative data not available for batch 6). These results revealed surprising results and indicated that the grease table recovery for the batch 3 material was very poor (average of 12.4%). The recovery of diamonds from OB1 was significantly better over the grease at 88.3%. The differences in recoveries for these 2 batches are thought to be a function of the makeup of the material (ie. loosely packed overburden vs competent kimberlite), but other factors which may play a role include milling times, residence time in drum after milling prior to grease table processing and grease table operator differences. Based on these results, a decision was made to send all grease table tailings to Ultrasort for final recovery. Due to the apparent lack of success with the grease table recoveries, the milled concentrate from batches 1 and 2 was not processed over the grease.

Table 11: Comparison of diamond recoveries from grease and X-ray for selected drums

Batch	Drum No.	Size fract. (mm)	Grease table diamonds	Grease table carats	Ultrasort diamonds	Ultrasort carats	Grease table efficiency (%)
3	101	1-10	45	2.93	723	33.82	8.0

3	104	1-10	17	1.7	221	9.1	15.7
3	105	1-10	28	2.66	141	8.55	23.7
OB1	106	1-10	238	12.03	37	1.6	88.3
6	1	1-3	? Same size fraction from diff drums combined		591	24.33	?
6	2	3-6	? Same size fraction from diff drums combined		9	1.55	?
6	3	6-10	? Same size fraction from diff drums combined		0	0	?
				TOTAL	**1722**	**78.95**	

The remaining 27 drums of concentrate were treated at Ultrasort during 4-6 December 2002. During this phase of recovery each of the drums were passed through the DP3 twice and the concentrates generated from this were passed through the SPS. Where samples were considered too small (ie.<10kg) to process through the DP3, these were dried and single passed through the SPS. Each of the passes were bagged, labeled and sorted in Melbourne on 9 December 2002. The individual results for each of the diamond-yielding passes are shown in Table 12.

Table 12: Diamond recoveries from Ultrasort during 4-6 Dec 2002

Batch	Drum	Size fract.	Pass	Stones	Carats	Avg. size (ct)	Comments
OB2	1	1-3	1	9	0.75	0.083	
			2	9	0.5	0.056	
1	1	1-3	1	14	0.65	0.046	
			2	7	0.4	0.057	
			3	2	0.07	0.035	
	1	6-10	2	1	0.02	0.020	No diams. in 1st pass, fine fract. diam.
2	1	1-3	1	9	0.48	0.053	
			2	6	0.36	0.060	
3	1	1-3	1	151	11.32	0.075	
			2	74	4.49	0.061	
	2	1-3	1	9	0.5	0.056	
			2	18	1.7	0.094	contains one octahedral diamond
	3	1-3	1	48	4.61	0.096	
			2	117	7.16	0.061	
	1	3-6	2	1	0.02	0.020	1 diam. belongs to fine fraction
	2	3-6	2	2	0.74	0.370	1 diam. belongs to fine fraction
	4	3-6	1	3	0.84	0.280	1 diam. belongs to fine fraction
			2	1	0.48	0.480	
4	1	1-3	1	35	2.31	0.066	
			2	47	2.79	0.059	
5	1	1-3	SPS	12	0.32	0.027	2nd pass SPS conc. only - not thru DP3
6	2	1-3	1	103	5.82	0.057	
			2	59	2.53	0.043	
	3	1-3	1	91	4.36	0.048	
			2	73	3.55	0.049	
	4	1-3	1	14	0.8	0.057	
			2	6	0.33	0.055	
	2	3-6	1	1	0.02	0.020	1 diam. belongs to fine fraction
			2	1	0.02	0.020	1 diam. belongs to fine fraction
	3	3-6	1	2	0.43	0.215	1 diam. belongs to fine fraction
			2	1	0.51	0.510	
	2	6-10	1	19	0.73	0.038	all diam. belong to fine fraction

7	1	1-3	1	2	0.06		0.030
			2	3	0.15		0.050
TOT.				**950**	**59.82**	**Avg.**	**0.063**

A number of observations must be made based on the results above. Firstly, the general recoveries for the processing of this recent batch of drums are lower than the previous recoveries. Compare for example 162 stones from the batch 6, drum 2 material (1-3mm fraction) with 591 stones from drum 1 of batch 6 material (also 1-3mm size fraction) during shown in Table 11. This could obviously be a function of many things from grease table operator to Ultrasort operator to actual differences in grade within batch 6. However this difference does seem quite distinct.

Secondly, a significant number of stones were recovered in the second pass and the average size of these stones is not significantly less that the average stone size for the first pass. In fact, in some cases the average stone size is larger for the second pass than the first pass. Occasionally, a couple of stones were recovered in the second pass of the 3-6mm fraction without any stones being recovered in the first pass (eg. batch 3, drum 2, 3-6mm fraction).

Thirdly, a fair amount of barite was observed in the batch 3 samples. Although there was probably more barite in this batch compared with other batches, this is probably also a function of the amount of milling, as batch 3 was processed through the mills during the early stages of milling and most of this received only 90min of milling compared to 120min during the latter stages of this process. Referring to the batch 3 1st and 2nd pass recoveries for the 1-3mm fraction it is evident that 2 of the 3 drums yielded more stones in the 2nd pass than the 1st pass. This is probably a function of the barite. Having said this, it is interesting to note that the recoveries from each of the passes for the OB2 1-3mm material each yielded 9 stones (although the average stone size is smaller for the 2nd pass). The concentrate from this batch appeared to be completely void of barite.

Finally, it was decided to process 3 passes of batch 1 material in the 1-3mm fraction to establish what may be in the concentrate following the 2nd pass. Although a small number of diamonds were recovered in this drum, it is apparent that some stones remained in the drum following the 2nd DP3 pass (with a small avg. stone size of 0.035ct). In terms of the recoveries from these 3 passes, 8.7% of stones were recovered in the 3rd pass and in terms of carats, 6.3% were recovered in the 3rd pass.

Based on these observations a 3rd and 4th pass was recommended for the drums which yielded larger numbers of diamonds and in particular, drums from batches 3 and 6 which essentially represent pure kimberlite. Reprocessing of drums 1 and 3 (1-3mm fraction) from batch 3, and drums 2 and 3 (1-3mm fraction) of batch 6 were recommended. Also, 800kg of Batch 2 material was found at Ultrasort which had not been milled. These were sent to NTF for milling and back to Ultrasort for diamond recovery.

16. Further diamond recoveries at Ultrasort and Diatech

The selected tailings from the 2nd phase of Ultrasort processing were passed through the Single Particle Sorter on 28 January 2003. More diamonds were recovered. It was decided to put 466 of these diamonds back into a test drum to test the recovery of the DP3 (wet sorter). This drum processed through the DP3 on 4 March and 412 diamonds were recovered (ie. 54 not recovered). The total diamond recoveries for the 3rd and 4th recovery phase are shown in the table below:

BATCH	Ultrasort 3		Ultrasort 4		**Total**	**Total**
	stones	carats	stones	carats	**stones**	**carats**
2	295	8.40			**295**	**8.40**
3	73	2.77	16	0.85	**89**	**3.62**
6	1179	33.32	511	13.09	**1690**	**46.41**
TOTAL	**1547**	**44.49**	**527**	**13.94**	**2074**	**58.43**

Following the poor recoveries from the DP3 it was decided to process these tailings at Diatech on 5 March 2003. The Diatech process involved passing these tailings through a lab-scale DMS which had its media density increased to give a cut point density of 3.3 S.G. The concentrate produced during this separation was almost pure hematite. This concentrate was then passed through a magnetic separator to separate out the non-magnetic fraction. This was tested with Katz Eyes to get the cut off set at the appropriate level. 66 diamonds were recovered from the drum of tailings using this technique. An additional 9 diamonds were recovered on another test from Batch 6. Due to the success obtained from this Diatech process, a further 800kg of Batch 6 material has been sent for diamond recovery. The results of this test work are not yet available.

17. Results and discussion

The combined results for all diamond recovery for TC01 (thus far) are shown in Table 13. These figures represent the unacidised diamond weights. The acidised diamonds for each of the batches need to be combined and weighed per batch as a final verification of the total carats per batch. The final grade per batch calculations should be based on these weights. The discussion below is based on unacidised diamond weights.

From table 13 it is evident that the best grade (29cpht) was obtained from OB1. However, this is likely to be exceeded by Batch 6 once further Diatech recovery has been carried out.

Table 13: TC01 combined diamond recoveries per batch showing grade

	Grease		**Ultrasort**		**Diatech**						
Batch No.	**No. Stones**	**Carats**	**No. Stones**	**Carats**	**No. Stones**	**Carats**	**Tot. Stones**	**Tot. Carats**	**Tons Treated**	**CPHT**	**Av. Stone size (ct)**
1	0	0	149	9.72			**149**	**9.72**	78.5	**12.38**	0.065
2	0	0	640	32.31			**640**	**32.31**	194.25	**16.63**	0.050
3	325	25	1624	91.97			**1949**	**116.79**	489.95	**23.84**	0.060
4	733	42	82	5.10			**815**	**46.67**	210.65	**22.16**	0.057

5	283	17	12	0.32			**295**	**16.83**	122.3	**13.76**	0.057
6	3833	206	2723	93.11	75	2	**6631**	**301.35**	1041.7	**28.93**	0.045
7	1147	56	5	0.21			**1152**	**56.16**	293.15	**19.16**	0.049
OB1	238	12	37	1.60			**275**	**13.63**	46.75	**29.16**	0.050
OB2	920	66	18	1.25			**938**	**66.86**	334.25	**20.00**	0.071
TOTAL	**7479**	**423**	**5290**	**236**	**75**	**2**	**12844**	**660.32**	**2811.5**	**23.49**	0.051

Note: The Diatech method was only used on one drum (119.8kg) of the +1-3mm material of Batch 6.

The lower grades observed for batches 1, 2, 4, 5 and 7 are attributed to the affects of crustal contamination as these batches were collected from the edges of the pipe during which the kimberlite/sediments contact was established during excavation.

During the final 12 days of HMS processing, material from the +40mm stockpile of batch 6 was processed to investigate any possible differences in grade or stone size between the +40 and –40mm material. 146t of this material was processed during this period and the grease table recoveries were compared for the batch 6 +40mm and –40mm material (see table below).

Batch	No. stones	Carats	Av stone size	Tons treated	CPHT
6 -40mm	3363	182.150	0.054	895.65	20.34
6 +40mm	470	24.090	0.051	146.05	16.49

A grade of 20.3cpht was achieved for the –40mm fraction and a grade of 16.5cpht was obtained for the +40mm fraction (these calculations are based on the grease table recoveries only as the grease table tailings for the batch 6 –40mm and +40mm material were combined for final Ultrasort recovery). Although the grades are not significantly different (as expected), the lower grade obtained for the +40mm fraction is likely to be a function of the lower degree of diamond liberation during the scrubbing process due to the coarser nature of the hopper feed. As a result it is expected that some diamonds remain locked up within the kimberlite and would have reported to trommel oversize. It was anticipated that the +40mm material might display a larger average stone size than the fine material; however these results show that the –40mm hopper feed display a slightly larger average stone size compared with the +40mm hopper feed.

As a form of checking the efficiency of the HMS processing, 80t of HMS tailings (HMS lights) were reprocessed through the HMS and the 413kg of concentrate produced during this process was milled and passed over the grease tables. 25 diamonds totaling 0.59ct were recovered from this material. This result yields a grade of 0.74cpht from the batch 6 HMS tailings. The average stone size for these 25 diamonds is 0.024ct, which is significantly smaller than the average stone size in any of the other batches. It is believed that the majority of these small diamonds were contained within larger kimberlite fragments with lower densities, thus reporting to HMS tailings. These diamonds are believed to have been liberated from their kimberlite host during the milling process. As a further check of HMS efficiency, approximately 200kg of tailings from the retreated batch 6 lights were milled and passed over the grease tables. No diamonds were recovered during this process.

Whilst most of the diamonds recovered from the TC01 body appeared green/grey and pale brown in colour, a few pink diamonds were also recovered. One such of these stones is shown in Figure 23. A yellow stone was also recovered in the Diatech process. These yellow diamonds do not fluoresce and it is anticipated more of these stones will be recovered during further Diatech processing.

The shapes of the diamonds recovered from TC01 were mostly highly irregular. In most cases no, or very limited, original crystal faces were preserved. An example of the latter is the orange-brown stone shown to the right of the pink diamond in figure 23. Accordingly, it appears as though the Timber Creek 01 diamonds have undergone a high degree of resorbtion. Only one well preserved octahedral diamond was observed during the sorting. This stone is likely to have been released from a mantle xenolith. Several broken or resorbed macles were also observed during sorting.

The average stone sizes per batch are also shown in Table 13. The average stone sizes range from 0.045ct for batch 6 to 0.071ct for batch OB2. No obvious size differences are apparent from the saprolitic versus silicified kimberlite. An average stone size of 0.051ct was obtained for all diamonds recovered during this bulk-sampling project. A contributing factor to this small average stone size is likely to be the high degree of resorbtion. The individual weighing process for each diamond in order to investigate the diamond size distribution is currently being undertaken.

The diamonds will also be sent for evaluation in order to establish an average price per carat value.

Once these final results have been obtained, a final conclusion regarding the likelihood of further work on the Timber Creek Project can be made.

18. Rehabilitation

Rehabilitation was necessary at both the excavated site and plant site. Complete rehabilitation of the excavated site was not conducted during November 2002 as further developments were dependent upon the bulk sampling results. Nonetheless, the pit was left in a safe state and the following was conducted to ensure this:

- the excavation was completely fenced off
- danger signs warning of cliffs and falling rocks were erected
- all trenches within the pit area were backfilled
- anti-erosion drains were constructed across the inclined sections of the tracks leading to the pit

Furthermore, the dirt road from the highway to the kimberlite was repaired and graded following its degradation due to extensive use of heavy vehicles.

The plant site has been partially rehabilitated. The slimes dams were backfilled to achieve an end result as close as possible to the original surface. Following backfilling of these dams, a layer of topsoil (which had been separately stockpiled) was spread to cover the entire area of disturbance. The stockpile area (which is merely an area cleared of vegetation) awaits rehabilitated as this contains approximately 2000t of uncrushed kimberlite in addition to the tailings from the HMS plant. Once a full interpretation of the available results has been undertaken, a decision will be made to either treat these remaining stockpiles or return them to the excavated site during 2003. A series of photographs showing the stockpiling of the topsoil and final rehabilitation of the plant site are shown below (Figure 24a-f).

19 Mining audit
A site audit was conducted by Gary Taylor and Keith Tayler of the Northern Territory Department of Business Industry and Resource Development on 14 Nov 2002. Two representatives from the Northern Land Council (Darwin office) were also present for this visit. The pit site and plant site were visited during this audit.

No major problems were observed in relation to safety or rehabilitation at either site. A few shortcomings relating to the lack of documentation of safety and evacuation procedures, potential safety hazards, hazard registers etc. were noted during this audit. These are highlighted in Appendix 3.

20. Employment of members of the local community
Although most aspects of the project required specialised skills, some opportunities arose during which members of the local Myatt community were asked to assist. These tasks included:

- manning gates for truck drivers to prevent stock from wandering from one paddock to another
- construction of fence around excavated area
- construction of a security gate and fence line at plant site to prevent tourists and passers by from entering security area

23. Expenditure Summary

Salaries and Wages	$142,536
Field Costs	$ 34,932
Tenement Administration	$11,686
Bulk Sample Treatment	$511,928
Travel/Accommodation	$188,764
Consultants	$ 69,868
Transport	$ 8,548
Insurances	$ 2,771
NLC/Aboriginal	$ 23,804
Total	**$994,840**

24. Future Work Program

It is proposed to process the stockpiled plus 40mm oversize material during 2003 by crushing to minus 25mm and processing this material through a Dense Media Separation ("DMS") plant on site. The crusher and DMS and ancillary equipment such as front-end loaders and generators will be brought to site for the duration of the processing and removed on completion of the program. Diamond recoveries will be by means of grease tables located at Timber Creek and x-ray techniques at Ultrasort in Perth.

It is also proposed to excavate a 200 tonne sample from a fissure (dyke) associated with TC01, which was discovered during work in 2003. The purpose of this sample is to establish whether the fissure is also diamondiferous and if so what the likely quality of the diamond could be.

It is also proposed to map the alluvial channels and palaeo-channels downstream of TC-01 that were noticed in the tenement areas during work in 2002.

The expenditure of this future work program is estimated to be $100,000.

REFERENCES

Berryman, A.K., 1995. Exploration Licence 5441 Timber Creek Area Final Report. Unpub. report by Stockdale Prospecting Limited. *Northern Territory Department of Mines & Energy Open-file Report CR1995/0668.*

Berryman, A.K., Stiefenhofer, J., Shee, S.R., Wyatt, B.A., & Belousova, E.A., 1998. The discovery and geology of the Timber Creek Kimberlites, Northern Territory, Australia. In *Proceedings of the Seventh International Kimberlite Conference*, Cape Town. (draft copy only, *In Press*).

Palfreyman, W.D., 1984. Guide to the Geology of Australia. *Bureau of Mineral Resources, Geology and geophysics, Australia*. Bulletin 181.

Pontifex, I.R., & Sweet, I.P., 1972. 1:250,000 Geological Series - Explanatory Notes, Auvergne, Northern Territory. *Bureau of Mineral Resources, Australia*, Canberra

Sweet, 1972. 1:250,000 Geological Series - Explanatory Notes, Delamere, Northern Territory. *Bureau of Mineral Resources, Australia*, Canberra.