THE DESERT LAKE PROJECT:
A Geological Evaluation of the Economic Potential
of the Richardson Feldspar Mine, Bedford Twp., Ontario

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Ottawa, Ontario

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December 19, 1986

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MINING LANDS SECTION
SUMMARY

The Richardson Feldspar mine is hosted in a zoned granite pegmatite dike, which consists of a wall zone, an intermediate zone, and a quartz core. Previous production centered on the feldspar component of the pegmatite. During the period 1900 to 1951, 228,690 tons of feldspar were mined from the dike (Hewitt, 1967). Interest is now being shown towards the quartz core of the dike. A study by MacIsaac (1982) indicated that the core contained 80,000 tons of quartz. The present study has shown that the quartz core may be much larger than previously thought. If this is true, substantially more tonnage exists on the property than outlined by MacIsaac (1982). It is recommended that the dimensions of the quartz core be further delineated using a resistivity survey and diamond drilling.
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I. INTRODUCTION

Purpose

The purpose of this study was to investigate the economic potential of the Richardson feldspar mine, Bedford Township, Ontario.

Background

The Richardson feldspar mine, located in the southwest corner of Bedford township was the largest feldspar mine in Ontario. Between 1900 and 1951, 228,690 tons of feldspar were mined (Hewitt, 1967). All production was from a zoned granite pegmatite dike. The workings were 150 m (500 ft) in length, 60 m (200 ft) in width, and 45 m (150 ft) deep.

In zoned pegmatites the mineral constituents are segregated into recognizable lithologic units. Usually four zones are present (Figure 1), they are:

1. Border zone (outermost zone).
2. Wall zone.
3. Intermediate zone or zones.
4. Core or innermost zone.

Contacts between zones may be sharp or gradational. Two or more zones may merge to form a single zone. Zones may be incomplete, discontinuous, or lacking altogether.

Three zones are present in the pegmatite that hosts the Richardson mine (Figure 2), they are:

1. A wall zone consisting of graphic granite, microcline, perthite, quartz, and albite.
2. An intermediate zone consisting predominantly of brick red microcline perthite, with some quartz.
3. A central core of quartz.

In the past, production centered on the feldspar component of the pegmatite, the quartz core was not mined. Recently however, interest has been shown in pegmatitic quartz as a source of silica. With this in mind, it was decided that the main objectives of this study would be to:
FIGURE 1. ISOMETRIC BLOCK DIAGRAM SHOWING IDEALIZED POD-SHAPED PEGMATITE BODY WITH CONCENTRIC ZONAL STRUCTURE

(after Cameron et al., 1949)
Figure 2. General geology of the Richardson Feldspar Mine, lot I, Con II, Bedford township (after Hewitt, 1967).
1. Map the extent of the zoned pegmatite.
2. Delineate the dimensions of the quartz core.
3. Assess the quality of the silica present.

To obtain these objectives, geological mapping and sampling was carried out on the property.

Location and Access

The property is located approximately 30 km (20 miles) north of Kingston, Ontario (Figure 3). The city of Kingston is approximately 240 km (150 miles) east of Toronto.

The best means of access to the property is via road. Take Highway 38 north from Kingston to Verona, to the Desert Lake Road (30.4 km north of Kingston). Proceed east on the Desert Lake Road for approximately 7.8 km to a gravel road which branches to the north beside an old Anglican Church. Follow this gravel road for 0.5 km to the southwestern corner of the claim block (Claim No. 921228). The Richardson feldspar mine is another 0.5 km north on the east side of the road. The mine is located on Harold Morey’s farm in the first lot of the second concession of Bedford township.

Physiography

The property lies between Thirteen Island Lake and Desert Lake (Figure 4). The area is generally marked by low relief, but hills and ridges rise in some places more than 45 m (150 ft) above the surrounding country and constitute rather prominent topographical features.

Vegetation consists primarily of hardwood forest, locally with small stands of pine. Approximately 20% of the property consists of open fields, probably once farmland. Locally a few swampy areas were encountered.

The property contains up to 20% bedrock exposure. Overburden consists primarily of sand and gravel, average thickness is probably less than 1 m.

Claims and Ownership

The property consists of five contiguous, unpatented mining claims located between Thirteen Island Lake and Desert Lake in Bedford township, Eastern Ontario Mining Division, Ontario (Figure 5). The numbers of these claims and their expiry dates are presented in Table 1.
Figure 3. General location of the Desert Lake Property.
Figure 5. Mining claims in the Desert Lake Property.
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Previous Geological Work

The Olden-Bedford area has an extensive mining and mineral exploration history. For the purpose of this report only previous work done in the immediate area around the property will be discussed. The reader is referred to Harding (1947) for details on other areas.

Mining at the Richardson Feldspar mine commenced in 1901, headed by H. Richardson of Kingston, Ontario. He secured the mineral rights and organized the Kingston Feldspar and Mining Company to control the operation. Feldspar was produced continuously by the company until 1916 when the property was acquired by Feldspar Limited of Toronto. Production was suspended in December 1918. The property remained idle until 1928 when the mine was acquired under lease by the Genesee Feldspar Company of Rochester New York. Production only lasted until 1930. The property remained idle until 1941 when the mine was leased to E.H. Storms and S.A. Price of Toronto. They dewatered the pit and produced 414 tons of feldspar under the name of the Federal Feldspar Company (Harding, 1947). Owing to the war-time difficulty of securing labour and materials, operations were again suspended in 1944. In 1945, the mine was purchased by the Canadian Flint and Spar Company Limited of Ottawa, who mined the dike in 1947, 1948, 1950, and 1951.

The property remained inactive up until its acquisition by NRD on October 10, 1981. NRD contracted A.C.A. Howe Int. to map the mine and surrounding area in 1982. A.C.A. Howe completed their study and estimated that the core of the pegmatite contained approximately 80,000 tons of quartz. Unfortunately their report did not meet assessment requirements and the property reverted back to the crown in 1982.

This mine was the largest feldspar mine in Ontario, having produced 228,690 tons of feldspar and an unspecified amount of quartz between 1900 and 1951 (Hewitt, 1967).

II. GEOLOGY

Regional Geology

The general geology of the Olden-Bedford Area is shown on Map 2 (Appendix 1). Only the geology of Bedford township will be discussed in this section.

Geologically the property is situated in the Grenville Structural Province of the Canadian Precambrian Shield. All rocks in the area are Precambrian in age. The rocks in the area can be divided into four main groups. These groups are summarized in the Table of
Formations (Table 2).

The oldest rocks in the area are the Grenville sediments. These sediments consist of crystalline limestone, greywacke, and quartzite. The greywacke and quartzite tend to occur as small lenses widely distributed throughout the limestone units, they probably represent the remains of former substantial beds. These sedimentary units although strongly deformed, generally trend east-northeast across the township. The dips are highly variable. In several places the greywackes can best be described as quartz-feldspar-biotite gneisses.

The sediments are intruded by dark coloured basic igneous rocks, most of which are equivalent in composition to gabbros. Locally anorthositic, dioritic, and syenitic units have been found. The mafic intrusive rocks have generally been injected subparallel to bedding in the Grenville sediments. They often contain xenoliths of the invaded rock. The gabbroic and anorthositic phases are generally strongly magnetic.

Intruding both the Grenville sediments and older mafic intrusive rocks are a complex of granites and gneisses. Most of the rocks in this complex are pink or grey in colour and are gneissic in character. Many of the gneisses may represent granitized and metamorphosed Grenville sediments. In several areas pink pegmatite dikes occur. It is one of these granite pegmatite dikes that hosts the Richardson Feldspar Mine.

As can be seen from the table of formations the youngest rocks are gabbro dikes. These dikes are extremely limited in their extent.

Most of the rocks have been subjected to intense deformation, which includes folding, shearing, and faulting. Most of the folds strike in northeasterly-southwesterly directions. Much of the deformation was taken up in the limestones, which have been folded, brecciated, and recrystallized.

The rocks have also been subjected to extreme metamorphism. In areas where sediments are exposed, many of the primary structures and other characteristics of the rocks have been obliterated, and rock identification in many instances involves considerable speculation.

Regional Mineralization

There are a large number of mineral occurrences in the Olden-Bedford Area. They can be subdivided into industrial and metallic mineral occurrences. The industrial minerals found in the area are apatite, asbestos, barite, brucite, corundum, feldspar, mica, and serpentine. The metallic minerals found in the area include copper, gold, graphite, iron, lead, molybdenum, and zinc. Detailed descriptions of the various mineral occurrences can be found in the report by Harding (1947).
Table 2. Table of Formations for the Olden-Bedford Area
(modified from Harding, 1947).

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<th>CENOZOIC</th>
<th>PRECAMBRIAN</th>
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<td>PRECAMBRIAN</td>
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<td>Younger Mafic Intrusives</td>
<td>Gabbro dikes.</td>
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<tr>
<td>Granite and Gneiss Complex</td>
<td>Pegmatite, alaskite, granite, syenite, granite gneiss, syenite gneiss and paragneiss.</td>
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<td>Older Mafic Intrusives</td>
<td>Diorite, gabbro and anorthosite.</td>
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<tr>
<td>Grenville Sediments</td>
<td>Crystalline limestone, greywacke, quartzite, and paragneiss.</td>
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Property Geology

Geological mapping was carried out on enlarged aerial photographs at a scale of 1 inch to 125 feet (1:1500). Geological data was collected along claim lines and pace and compass traverse lines. The location of the traverse lines is shown in Figure 6. The property geology is presented on Map 1 (Appendix 1). All of the rock units are Precambrian in age.

The oldest rocks on the property are the Grenville Supergroup Metasediments. These can be subdivided into clastic and calcareous metasediments. The exact age relationship between these two units is unclear and thus it is impossible to determine which unit is the oldest.

The calcareous metasediments were classified as crystalline limestone by Harding (1947). In this report they have been subdivided into marble and calc-silicate. The marble is generally medium to coarse grained (grains usually < 1 cm in size) and massive. The marble is generally pure white in colour and reacts to dilute hydrochloric acid (10%) quite readily, indicating its primary component is calcite. Locally the marble contains 1 - 5%, 1 - 4 mm sized flakes of biotite and up to 1% fine grained flakes of graphite.

Calc-silicates were noted in one or two locations. They are very similar in appearance to the marbles, but contain 5 - 10% diopside. The diopside is light green in colour and forms 1 - 4 mm sized crystals.

The clastic metasediments were previously classified as greywacke, quartzite, and paragneiss by Harding (1947). In this report they have been subdivided into aluminous (pelitic) metasediments and quartz-feldspar-biotite paragneiss.

Most of the clastic metasediments in the map area are quartz-feldspar-biotite paragneiss. These rocks are usually fine to medium grained and weakly to moderately magnetic. They usually exhibit a strong foliation, which may be indicative of bedding, but cannot be said for certain. The paragneiss units generally trend east-northeast and dip steeply. Folding on an outcrop scale was not observed, but slight variations in the strike and dip of the foliation may represent folding on a larger scale. Locally some garnetiferous horizons were found in the paragneiss. The garnets are believed to be almandine in composition. The main constituents of the paragneiss are quartz, feldspar, biotite and locally hornblende.

Aluminous metasediments are only present in a few places. They form narrow, 1 - 3 cm wide layers or horizons interbedded with the paragneiss.

The earliest intrusive rocks are mafic in composition. These rocks are metagabbros and anorthosites. The metagabbro ranges in colour from dark green-black to amber-green depending on the plagioclase content. The plagioclase content varies from 10 - 60%. The metagabbro is fine to very coarse grained and weakly to strongly magnetic. Locally 1 - 2 m sized xenoliths of paragneiss were found in the metagabbro. In
Figure 6. Traverse Line Locations (shown in red).
Anorthosite was noted in one or two places, usually in gradational contact with metagabbro. It tended to be coarse grained and amber-green in colour due to the feldspar content.

The mafic intrusive rocks are locally weakly foliated, and seem to trend roughly northeast.

The youngest rocks on the property are the felsic intrusive rocks. These rocks can be subdivided into leucocratic granite and pegmatite.

Small intrusive bodies of granite occur throughout the map area. The granite is medium to coarse grained and in some localities almost pegmatitic. The colour varies from white to pink, the white variety being more siliceous. The chief mineral constituents are quartz, microcline, and albite with minor amounts of biotite and in one or two places tourmaline. Locally rusty zones have been noted. These are probably due to trace amounts of pyrite. The granite is often moderately foliated, however no distinct trend in the foliation can be observed. In one or two places it displays a graphic texture.

Several pegmatite dikes have been noted on the property. They range in thickness from 10 - 20 cm up to 80 m (250 feet). The most important pegmatite dike is the one that hosts the Richardson Feldspar mine. This is a zoned granite pegmatite, composed primarily of quartz and microcline. Three zones have been noted in the dike: a wall zone; an intermediate zone; and a core zone (Figure 2).

The wall zone is best developed on the east side of the dike. It is coarse grained and up to 50 m (50 feet) thick. Minerals found in this zone include plagioclase, perthitic microcline, quartz, biotite, and minor muscovite.

The intermediate zone is well developed, in places it reaches up to 50 m (150 feet) thick. It consists of the same minerals as the wall zone only much coarser grained, sometimes up to 3 m (10 feet) across. This zone hosts a small pod or lense of disseminated pyrite at the north end of the pit. The pod is 3 - 5 m (10 - 15 feet) wide and consists of 80 - 90% fine pyrite. Most of the material mined came from the intermediate zone, so exposure of this zone is extremely limited.

The core of the pegmatite is essentially a solid mass of barren milky white quartz. Locally minor crystals of feldspar and 1 - 2% finely disseminated pyrite were noted. Two samples consisting of quartz and 1 - 2% pyrite (S-1 and S-3) were analyzed for gold, arsenic, platinum and palladium. The results were negligible. The analytical results and techniques used are summarized in Appendix 2. The quartz pod appears to strike north. It ranges from 3 - 20 m (10 - 60 feet) in width and is at least 60 m (200 feet) in length. A totally barren section of the quartz pod was sampled and analysis shows it contains 99.7% SiO2. The complete chemical analysis and a description of the analytical technique used is presented in Appendix 2.
Approximately 200 m north of the mine a similar zoned pegmatite was observed. At one location in this pegmatite a 3 - 4 m (10 - 12 foot) wide quartz pod was noted. This is probably the same pegmatite and quartz pod observed at the mine site. Proof of this can only be determined using a resistivity survey and/or diamond drilling. If these are the same zones as exposed at the mine, the quartz pod would have a minimum strike length of approximately 270 m (900 feet).

Conclusions and Recommendations

During the course of the present study, three types of mineralization were noted on the property: graphite; pyrite; and quartz.

The graphite occurs as fine grained flakes disseminated throughout marble. However, the occurrence of graphite is very limited and where it does occur, the quantity never exceeds 1%. Thus the potential for an economic deposit is considered to be poor.

The pyrite is usually associated with the quartz core of the pegmatite. Two samples were analyzed for gold, arsenic, platinum and palladium. The results indicate that the potential for precious metal mineralization is poor.

Previous workers have outlined 80,000 tons of quartz in the core of the pegmatite at the Richardson Feldspar mine (MacIsaac, 1982). Mapping by the author indicates that the quartz core of the pegmatite may extend north of the old mine workings. If this proves to be true it will be possible to delineate substantially more tonnage.

To determine the exact dimensions and strike length of the quartz core in the pegmatite that hosts the Richardson Feldspar mine, the following two phase exploration program is recommended:

1. A resistivity survey over the old mine workings and then north to the northern claim boundary of claim number EO 921227 (the extent of this survey is shown in Figure 7).

2. Diamond drilling to verify the geophysical results and to obtain fresh samples of the quartz pod for further analytical testing.

The exact amount of diamond drilling needed to delineate the quartz core will depend on the results of the resistivity survey.

Respectfully Submitted

Brian J. Christie (M.Sc.)
Figure 7. Area to be covered by a resistivity survey (area is outlined in red).
References


APPENDIX 1. GEOLOGICAL MAPS

Map 1. General geology of the Desert Lake Property.  
Scale 1:1,500.

Map 2. Geology of the Olden-Bedford Area (Map 1947-5).  
Scale 1:63,360.
APPENDIX 2. ANALYTICAL TECHNIQUES AND RESULTS.
REPORT: 016-5665 (COMPLETE)

CLIENT: MR. WILLIAM KENNEDY
PROJECT: NONE

SUBMITTED BY: MR. KENNEDY
DATE PRINTED: 26-JAN-87

ORDER | ELEMENT | NUMBER OF ANALYSES | LOWER DETECTION LIMIT | EXTRACTION | METHOD |
-------|---------|-------------------|------------------------|------------|--------|
1      | As      | 2                 | 2 PPM                  | HNO3-HC104 | Colourimetric |
2      | Scan    | 2                 | 2 PPB                  | AQUA REGIA | X-Ray Fluorescence |
3      | Pd      | 2                 | 2 PPB                  | AQUA REGIA | FireAssay/DC Plasma |
4      | Pt      | 2                 | 15 PPB                 | AQUA REGIA | FireAssay/DC Plasma |
5      | Au      | 2                 | 1 PPB                  | AQUA REGIA | FireAssay/DC Plasma |

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REPORT COPIES TO: MR. BRIAN CHRISTIE

CRUSH, PULVERIZE -200 2

INVOICE TO: MR. BRIAN CHRISTIE
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## SEMI-QUANTITATIVE ANALYSIS

**Sample No.:** 93  
**Method:**  
**No of Elements:**  
**Analyst:**  

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<th>3.0-.10</th>
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| TRACE ELEMENTS (%) | V     | Cr     | Mn     | Co     | Ni     | Cu     | Zn     | As     | Sr     | Y      | Zr     | Nb     | Mo     | Ag     | Sn     | Sb     | Ba     | La     | Ce     | W      | Pb     | Bi     | Th     | U      | REMARKS |
|-------------------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|        |        |
|                   |       |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |         |         |

**REMARKS**
## Certificate of Analysis

**REPORT: 516-5665 (COMPLETE)**

**CLIENT:** Mr. William Kennedy  
**PROJECT:** NONE

**ORDER** | **ELEMENT** | **NUMBER OF ANALYSES** | **LOWER DETECTION LIMIT** | **EXTRACTION** | **METHOD**
---|---|---|---|---|---
1 | SiO₂ | 1 | 0.01 PCT | Assay |  
2 | Al₂O₃ | 1 | 1 PPM | Assay |  
3 | Fe₂O₃ | 1 | 1 PPM | Fe total as Fe₂O₃ |  
4 | K₂O | 1 | 1 PPM | Assay |  
5 | Na₂O | 1 | 1 PPM | Assay |  
6 | MnO | 1 | 1 PPM | Assay |  
7 | AgO | 1 | 1 PPM | Assay |  
8 | CaO | 1 | 1 PPM | Calcium Oxide - Assay |  
9 | S tot | 1 | 1 PPM | Total Sulphur |  
10 | LOI | 1 | 0.01 PCT | Loss on Ignition |  
11 | TiO₂ | 1 | 1 PPM | TiO₂ - Assay |  
12 | P₂O₅ | 1 | 1 PPM | P₂O₅ - Assay |  

**SAMPLE TYPES** | **NUMBER** | **SIZE FRACTIONS** | **NUMBER** | **SAMPLE PREPARATIONS** | **NUMBER**
---|---|---|---|---|---
PREPARED PULP | 1 | -200 | 1 | AS RECEIVED, NO SP | 1

**REPORT COPIES TO:** Mr. Brian Christie

**INVOICE TO:** Mr. Brian Christie
### Certificate of Analysis

**REPORT: 516-5665**

<table>
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<th>SAMPLE NUMBER</th>
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<th>SiO₂ PCT</th>
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<th>MgO PPA</th>
<th>CaO PPA</th>
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CERTIFICATE

With regards to my report of December 19, 1986, prepared for W.S. Kennedy of Ottawa, Ontario, I, Brian J. Christie of RR# 2, Inverary, Ontario, do certify that:

1. I hold an Honours B.Sc. degree in geology from the University of Toronto (1979).

2. I hold an M.Sc. degree in geology from Queen's University, Kingston, Ontario (1986).

3. I have been practising my profession since 1979.

4. I am an Associate Member of the Geological Association of Canada (Fellowship Pending).

5. I am the sole proprietor of Grenville Exploration Services.

6. I have no interest in the claims covered by this report.

December 19, 1986

Brian J. Christie
Grenville Exploration Services
Geologist
**Report of Work #87-4**

*Northern Development Mines (Geophysical, Geological, Geochemical and Expenditures)*

---

**Claim Holder:**
William S. Kennedy

**Address:**
Box 6039, Station J, Ottawa, Ontario K2A 1T1

**Survey Company:**
Grenville Exploration Services

---

**Geophysical Survey**

- **Electromagnetic**
- **Magnetometer**
- **Radiometric**
- **Other**

**Geological**

**Geochemical**

---

**Credits Requested per Each Claim in Columns at right**

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<th>Days per Claim</th>
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<td>- Magnetometer</td>
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<tr>
<td></td>
<td>- Radiometric</td>
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<tr>
<td></td>
<td>- Other</td>
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<tr>
<td>For each additional survey: using the same grid:</td>
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<td>- Magnetometer</td>
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<td>- Radiometric</td>
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<tr>
<td></td>
<td>- Other</td>
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</tbody>
</table>

**Man Days**

- **Geophysical**
- **Magnetometer**
- **Radiometric**
- **Other**

**Complete reverse side and enter totals here**

**Type of Work Performed**

- **Expenditures (excludes power stripping)**

<table>
<thead>
<tr>
<th>Claim Number</th>
<th>Days per Claim</th>
<th>Expended Days Cr.</th>
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<tr>
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<tr>
<td>E0 921229</td>
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**Calculation of Expenditure Days Credits**

<table>
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<th>Total Expenditures</th>
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**Expenditures**

**Type of Work Performed**

<table>
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<th>Claim Number</th>
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<td>E0 921228</td>
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<tr>
<td>E0 921229</td>
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</tr>
</tbody>
</table>

**Total number of mining claims covered by this report of work:**

5

**Certification Verifying Report of Work**

I hereby certify that I have a personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the work or assisted same during and/or after its completion and the annexed report is true.

**Name and Postal Address of Person Certifying:**
William S. Kennedy, Box 6039, Station J, Ottawa, Ontario K2A 1T1

**Date:** Aug. 11/87

---

**Instructions**

Total Days Credits may be apportioned at the claim holder's choice. Enter number of days credits per claim selected in columns at right.

---

**Recorded Holder or Agent (Signature):**
William S. Kennedy

**Date Recorded:** Aug. 11/87

---

**Received:**

SEPT 1-8 1987

**Mining Lands Section**

---

**For Office Use Only:**

Total Days Cr. Date Recorded

100

**Certified by (Signature):**
William S. Kennedy

**Date Certified:** Aug. 11/87