REPORT ON GEOLOGICAL MAPPING AND RADIOMETRIC SURVEYS

BETA CLAIM GROUP
(YA-10079 to YA-10104)

NTS 116B-7, Latitude 64°25', Longitude 138°31'

August 5 to August 30, 1977

February 1, 1978

John A. Brophy

090275
This report has been examined by the Geological Exploration Unit and is recommended to the Council. The total costs are considered to be acceptable in the amount of $8,797.55.

[Signature]
Grade Bookkeeper

Considered as exploration work under Section 50 (4) Yukon Quartz Mining Act.

[Signature]
F.R. Baxter
Supervising Mining Recorder

[Signature]
Commissioner of Yukon Territory
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1. SUMMARY

On the Beta claim group, radioactive mineralization consisting dominantly of thorium is found in dikes or dike-like segregations of pink alkali granite within a host rock of coarse-grained pink granite.

Detailed work was conducted on one 10-foot wide radioactive dike which was traced over a strike length of 750 feet. Five representative samples from the dike were found to contain from 0.11 to 0.31 lbs U/ton. Two of these samples were analyzed for thorium and were found to contain 1.7 to 2.0 lbs Th/ton. Spectrometer surveys confirmed that thorium was always more abundant than uranium in the dike.

Within glacial moraine several boulders were located which contained a surficial veneer of radioactive mineralization. One of these contained 0.39 lbs U/ton and 22.36 lbs Th/ton. The host rock was pink granite, and the mineralization has not been traced to source.

Elsewhere on the property, mineralized float was found which contained molybdenite and chrysocolla. No in-situ copper or molybdenum minerals were located.

At another locality, a uranophane(?) stain was observed on a rock face of porphyritic syenite.
ii. CONCLUSIONS

Radioactive mineralization on the Beta claim group is mostly attributable to thorium. Thorium mineralization is found in pink dikes of alkali granite, although further mineralization might be associated with joint surfaces of pink porphyritic syenite as evidenced by boulders in float containing a surficial veneer of radioactivity.

Other minerals of possible economic significance found in float include molybdenite and chrysocolla. The molybdenite occurs on a planar surface and is probably related to joints along which there is some evidence of movement. The chrysocolla appears to be associated with grey syenite.

The significance of uranophane(?) staining at one locality has not been determined.

iii. RECOMMENDATIONS

Further prospecting is warranted to locate the source of molybdenite and chrysocolla float and to evaluate the significance of uranophane(?) staining which was found at one locality.
1. **INTRODUCTION**

A uranium exploration programme was conducted by Uranogesellschaft Canada Limited (UG Canada) between August 5 and August 30, 1977, over the Beta group of claims in the Tombstone area of the Yukon. The claims were staked in April 1977 on the basis of anomalous uranium in stream waters as reported by the Geological Survey of Canada (GSC) in Open File 388, Part 2.

Grid scintillometer surveys, geological mapping and prospecting were conducted to evaluate the property. Some spectrometer surveys were conducted over a radioactive dike which was examined in detail. A list of personnel involved in the project is shown in Appendix 1. The specifications for the scintillometers and spectrometers used in the surveys are shown in Appendix 2.

2. **PROPERTY LOCATION AND DESCRIPTION**

The Beta claim group consists of 26 contiguous claims with tag numbers YA-10079 to YA-10104 inclusive.

<table>
<thead>
<tr>
<th>Claim</th>
<th>Tag #</th>
<th>Claim</th>
<th>Tag #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta 1</td>
<td>YA-10079</td>
<td>Beta 14</td>
<td>YA-10092</td>
</tr>
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<td>Beta 2</td>
<td>YA-10080</td>
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<td>Beta 3</td>
<td>YA-10081</td>
<td>Beta 16</td>
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<td>Beta 4</td>
<td>YA-10082</td>
<td>Beta 17</td>
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</tr>
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<td>Beta 5</td>
<td>YA-10083</td>
<td>Beta 18</td>
<td>YA-10096</td>
</tr>
<tr>
<td>Beta 6</td>
<td>YA-10084</td>
<td>Beta 19</td>
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<tr>
<td>Beta 7</td>
<td>YA-10085</td>
<td>Beta 20</td>
<td>YA-10098</td>
</tr>
<tr>
<td>Beta 8</td>
<td>YA-10086</td>
<td>Beta 21</td>
<td>YA-10099</td>
</tr>
<tr>
<td>Beta 9</td>
<td>YA-10087</td>
<td>Beta 22</td>
<td>YA-10100</td>
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<td>Beta 10</td>
<td>YA-10088</td>
<td>Beta 23</td>
<td>YA-10101</td>
</tr>
<tr>
<td>Beta 11</td>
<td>YA-10089</td>
<td>Beta 24</td>
<td>YA-10102</td>
</tr>
<tr>
<td>Beta 12</td>
<td>YA-10090</td>
<td>Beta 25</td>
<td>YA-10103</td>
</tr>
<tr>
<td>Beta 13</td>
<td>YA-10091</td>
<td>Beta 26</td>
<td>YA-10104</td>
</tr>
</tbody>
</table>
The claims are located in west-central Yukon Territory in NTS 116B-7 (Fig.1) at latitude 64°25' and longitude 138°31' (Fig.2).

The claims are situated in the Ogilvie Mountains and lie entirely above tree line at elevations between 4600 and 7000 feet. The claim group is centred over a cirque which opens northwestwards onto the Tombstone River Valley. The walls of the cirque are precipitous and parts of the claim group are inaccessible. Deposits of alpine glaciation including moraine and boulder glaciers cover the floor of the cirque to an uncertain depth.

3. ACCESSIBILITY AND CLIMATE

The Beta claims are situated 32 miles northeast of Dawson City and are accessible by helicopter from that community. The Dempster Highway is located 9 miles east of the claim group. The climate of the area is continental, with short, warm summers and long, cold winters. Exploration on the Beta claim group was discontinued by August 30 due to snow conditions which made traversing hazardous.

4. PREVIOUS WORK

No signs of previous exploration activity were observed on the Beta claim group. The Geological Survey of Canada has conducted investigations in the region which are described in the following publications:

GSC Memoir 364: "Geology of Nash Creek, Larsen Creek and Dawson Map Areas, Yukon Territory" by L.H. Green, 1968

GSC Bulletin 180: "Stratigraphy and Structure of the Keno Hill Quartzite in Tombstone River - Upper Klondike River Map Areas, Yukon Territory" by D.J. Tempelman-Dluit, 1970
GSC Report of Activities 77-1B: "Geochemical Distribution of Uranium, Tungsten and Molybdenum in the Tombstone Mountains, Batholith, Yukon" by W.D. Goodfellow and I.R. Jonasson, 1977

GSC Open File 388 and 418: Results of "Uranium Reconnaissance Program" Surveys.

5. REGIONAL GEOLOGICAL SETTING

The Beta claim group is located in a southeast portion of the Tombstone Stock, an alkali syenite intrusion of Middle Cretaceous age (Fig.3). The stock intrudes a northeasterly trending belt of Mesozoic sediments and volcanics dominated by a Lower Cretaceous succession of ortho-quartzites known as the "Keno Hill Quartzite." Diabase and gabbro sills are commonly found in the succession and are thought to represent one sill tectonically repeated by folding and thrust faulting which occurred prior to the emplacement of the pluton. The regional geology in the vicinity of the Tombstone Stock is shown on Fig.4.

6. EXPLORATION PROCEDURE AND LOGISTICS

a) A 6000 foot baseline was chained along the length of the cirque from which anomalous uranium in stream waters was reported by the GSC.

b) Crosslines were established at 400 foot intervals along the baseline. The resulting grid is shown on Drawing 9.

c) Total count scintillometer readings were recorded at 100 foot intervals along the grid.
d) Surficial and bedrock geology was mapped.

e) Detailed geological mapping and radiometric surveys were conducted over accessible portions of a radioactive dike.

Pacing, compass resections and altimeters were used for ground control. Base maps were 1:10,000 scale blow-ups of 1:50,000 scale contour maps.

A Jet Ranger 206-B jet helicopter was chartered on a casual basis from Trans North Turbo Airlines in Dawson City for mobilization, demobilization and transportation of personnel to remote parts of the claim group. Camp provisions were purchased from the DCW general store in Dawson City and delivered by helicopter.

7. SURFICIAL GEOLOGY, BETA CLAIM GROUP

Drawing 10 shows the surficial geology of the Beta claim group and is a compilation derived from ground work and air photo interpretation. Surficial deposits include moraine, boulder glaciers, and scree. All the deposits consist of angular to sub-angular boulders which vary considerably in size, although most boulders range between 1/2 and 3 cubic feet. The overall sorting of the deposits is poor, but increases from boulder glaciers to scree to moraine. The boulders tend to be sub-equant to slightly slabby.

Scree deposits are thin on moderate slopes but are considerably thicker at the base of steeper cliffs. The depth of moraine, the most extensive surficial deposit, has not been ascertained. It may achieve depths of up to 100 feet at the back wall of the cirque. Boulder glaciers do not appear to be thicker than 50 feet.

*) Personal communication, Dr. O. Hughes, GSC Calgary
8. BEDROCK GEOLOGY, BETA CLAIM GROUP

A geological mapping of the Beta claim group is shown on Drawing 11. The various units listed in the Table of Formation (Table 1) are described below:

8.1 Unit 4

Unit 4 is a pink alkali granite forming steeply dipping dikes or dike-like segregations within syenite in the north-central portion of the property. Dikes seldom exceed fifteen feet in width and have been traced over distances of 750 feet. Trends vary from northeast to east-southeast. Invariably the rocks are anomalously radioactive or contain a high radioactive background. Commonly, smaller segregations of this material are found over areas measuring several square feet. Unit 4 is distinguishable from adjacent syenites by the presence of anhedral smoky quartz (10 - 20%). The remainder of the rock consists of medium to coarse-grained, subhedral to anhedral and commonly porphyroblastic alkali feldspar (60 - 80%) and mafics (10 - 20%).

8.2 Unit 3

Unit 3 is a white alkali granite. It is found in the western part of the property and is commonly medium-granied, phaneritic and equigranular. It contains 60 - 80% white, anhedral to subhedral alkali feldspar, 15 - 30% glassy quartz, and 10 - 15% subhedral to anhedral mafic minerals. Occasionally, pink and/or porphyritic varieties of this unit can be found. Structural elements within this unit consist of north-northeast and east-southeast trending vertical to subvertical joints. The easterly trending joints sometimes show signs of movement as evidenced by slickensides. Hydrothermal activity along these fault-joints is indicated by crystallization of minerals such as molybdenite and green mica along joint surfaces.
<table>
<thead>
<tr>
<th>TABLE OF FORMATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Middle Cretaceous</strong></td>
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<tr>
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<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Mesozoic</strong></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
The contact between this unit and unit 2 (described below) was not actually observed, but is thought to be sharp, as a transition between quartz-rich and quartz-deficient rocks occurs within a 200 foot interval at one locality.

8.3 Unit 2

Unit 2 is the most extensive unit on the property. It consists of various types of syenite, most of which are porphyritic and most of which have the approximate composition:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>orthoclase</td>
<td>60 - 80%</td>
</tr>
<tr>
<td>amphiboles and/or pyroxenes</td>
<td>10 - 30%</td>
</tr>
<tr>
<td>quartz</td>
<td>0 - 5%</td>
</tr>
<tr>
<td>plagioclase</td>
<td>10% (?)</td>
</tr>
<tr>
<td>accessories (magnetite, hematite, garnet, fluorite)</td>
<td>0 - 5%</td>
</tr>
</tbody>
</table>

Orthoclase is tabular, subhedral to euhedral, and commonly porphyritic. Carlsbad twins could be observed on coarser lathes. Mafics and plagioclase (?) are anhedral and interstitial to the orthoclase. Much of the syenite contains sufficient iron to deflect the compass needle considerably. In some localities, quartz in excess of 10% was recorded.

The syenite has been divided into the following sub-units for mapping purposes. All contacts between these sub-units are gradational and somewhat arbitrary.
Unit 2a: pink to greyish pink, medium-grained to coarse-grained porphyritic syenite with less than 20% mafics

Unit 2b: grey to pinkish grey, medium-grained to coarse-grained porphyritic syenite with less than 20% mafics

Unit 2c: vari-coloured porphyritic syenite with more than 20% mafics

Unit 2d: vari-coloured "pegmatitic" porphyritic granite with crystals of orthoclase exceeding 1 cm in length

Phaneritic and pegmatitic (non-porphyritic) phases are locally important. Unit 2b often contains hematite. All units commonly contain magnetite. Unit 2d often has zoned orthoclase phenocrysts with grey-blue cores and pink rims. Joints in the syenite trend NNE and SSE and generally dip steeply.

8.4 Unit 1

Unit 1a: meta-diorite(?); a fine-grained, mafic rock seen as isolated xenoliths within unit 3 and also as mappable-size inclusions

Unit 1b: various small inclusions of older Mesozoic sediments, commonly gossanized quartzite or calc-silicate rocks; little assimilation with the intrusion is evident

The above descriptions are based on megascopic examination of the rocks as thin sections were not available at the time of this writing.

.../15
9. GRID RADIOMETRIC SURVEYS AND ROCK GEOCHEMISTRY

Drawing 12 shows the results of the grid scintillometer survey. All anomalies greater than 800 cps (approx. twice background) are indicated as well as the readings at 100 foot intervals along the grid. Surficial geology is also indicated.

In the south part of the property, four boulders were found in float which contained a surficial veneer of radioactivity from 1400 to 2600 cps. These are apparently related to crystallization of radioactive minerals along joint surfaces in pink porphyritic syenite. Crystals of titaniferous andradite up to 2 cm in diameter are associated with the radioactivity which spectrometry has demonstrated to be due to thorium. The float is found in a boulder glacier and has not been traced to source.

Radioactive boulders registering 820 to 4500 cps are scattered across the glacial moraine. One boulder (4500 cps) was found to contain 0.39 lbs U/ton and 22.36 lbs Th/ton.

Radioactive boulders were found in scree in the northern part of the property. These were traced to the radioactive dikes (Unit 4) which were described in the previous section. Detailed work which was conducted on the longest of these dikes is described below.

10. GEOLOGY, RADIOMETRIC SURVEYS, AND ROCK GEOCHEMISTRY, RADIOACTIVE DIKE

Drawing 13 shows the results of detailed mapping, scintillometry, spectrometry and rock geochemistry conducted on a radioactive dike found near the end of Line 40N. The location of the dike is shown on Drawing 11 and 14.
The dike measures 750 feet by 10(?) feet, strikes 100 to 120°, dips steeply north, and is open on both ends. Much of the dike is not accessible so that accurate widths were difficult to determine.

Radioactivity is generally greater than 1000 cps and ranges to 4500 cps. Spectrometer equivalent assays show that thorium is more abundant than uranium. Geochemical analyses of 5 samples indicate a uranium content of 0.11 to 0.31 lbs U/ton. Thorium was analyzed for 2 of these samples and returned values of 1.97 and 1.71 lbs Th/ton.

11. REGIONAL RADIOMETRICS

Regionally on the property (Drawing 4) anomalous radioactivity is found in alkali granite dikes (Unit 4) and in scree derived from these dikes. Often, the dikes could not be traced due to the precipitous nature of the terrain. One sample from the easternmost dike contained 0.24 lbs U/ton. Thorium was not analyzed.

A small uranophane stain was located in the northeast extremity of the property on a syenite face. The significance of this staining has not been determined.

12. OTHER METALS

Rosettes of molybdenite were found in float on a joint surface of Unit 3, just outside the northwest corner of the property. Secondary copper stains (chrysocolla) were located in float in the north and northeast parts of the property. These areas of mineralized float are indicated on Drawing 14. Minor sulfides are found elsewhere on the property in association with small, commonly gossanized inclusions of mesozoic sediments.
13. SUMMARY AND CONCLUSIONS

Radioactive mineralization on the property is apparently due to thorium. Several radioactive dikes have been located in the north-central part of the claim group and it is possible that others are located in inaccessible portions of the same area. Together, they might comprise considerable tonnage potential. Elsewhere on the property, radioactivity is probably confined to shears. Exploration on the Beta claim group was cut short due to extreme weather conditions. The significance of uranophane staining and the source of copper and molybdenite boulders could therefore not be assessed.

14. RECOMMENDATIONS

Some further work is warranted on the Beta claim group to locate the source of mineralized float and to investigate the significance of uranophane staining in the northeast corner of the property where only cursory exploration was conducted.
APPENDIX 2

SPECIFICATIONS OF INSTRUMENTS

A) SCINTREX BGS-1SL SCINTILLOMETER

Detector: Thallium activated sodium iodide crystal and photomultiplier assembly

Detector Volume: 1.5" x 1.5" for 2.65 cubic inches (43.5 cm$^3$)

Energy Response: Broadband, all gamma energies above 0.1 MeV

Ratemeter Ranges: 30, 100, 300, 1000, 3000, 10000 cps
(1 cps = 2.5 x 10$^4$ mR/hr)

Accuracy: ± 5% of full scale

Temperature Range: -20°C, + 55°C

Power Supply: 4 "D" cells

Dimensions: 240 mm x 90 mm x 150 mm

Weight: 2.2 kg (with batteries)

B) EM-16, VLF ELECTROMAGNETIC UNIT

Source of Field: VLF Station, Maine, U.S.A.

Parameters Measured: 1) Vertical in-phase component
2) Vertical quadrature component

Frequency Range: 15 - 25 kHz

Scale Range: in-phase ± 150%
quadrature ± 40%

Readability: ± 1%

Temperature Range: -40°C to +50°C

Power Supply: 6 "AA" cells

Dimensions: 42 x 14 x 9 cm

Weight: 1.6 kg
VERSATILE OPERA TION

Precise gamma ray measurements are a powerful tool for uranium prospecting and geologic mapping. The DISA-400A provides simultaneous (real time), high resolution measurements of the natural gamma radiation emitted from near-surface rock formations, with specific "windows" for the total spectrum (TI/C), potassium (K\(^{40}\)), uranium (as U\(^{238}\)), and thorium (as Th\(^{232}\)). At the push of a button, the radiation environment is sampled for a selectable time period (1 second to 30 seconds/minutes); an audible "ready" alarm indicates the sample period is completed and the measured data is ready to be visually displayed on the front panel 4-digit readout. The data on each channel is sequentially displayed as Total Count, potassium, uranium, and thorium.

The DISA-400A is designed to be used with a variety of specialized crystal detectors from 21 to over 110 cubic inches for all man-carry portable, laboratory or vehicular survey applications. A selectable channel analog output is provided for those applications that require continuous recording of the gamma radiation from any one of the four channels.

The DISA-400A offers technological improvements that have been recognized by the mining industry; a compact pushbutton spectrometer console, compatibility with a wide variety of detector configurations, moderate price and operational reliability. The DISA-400A allows optimum use of the survey dollar with increased survey capability.

COMPLETE FIELD SYSTEM

The Model DISA-400A field system typically includes the Model N\(_4\)-21 hand-held detector shown above, and consists of:

1. Electronics console
2. Model N\(_4\)-21 crystal detector (21.2 cu. in.)
3. Calibration Source (Cs\(^{137}\))
4. Interconnect Cables
5. Adjustable padded shoulder harness
6. Instruction Manual, complete set of batteries, and leather storage case.

CONSOLE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Energy Discrimination:</th>
<th>Three switch selectable differential window settings (factory adjusted), and one total count (threshold) setting: Potassium (K(^{40})): Window peak—1.46 MeV Window width—200 KeV Uranium (as U(^{238})): Window peak—1.76 MeV Window width—200 KeV Thorium (as Th(^{232})): Window peak—2.62 MeV Window width—400 KeV Total Count (TI/C): All energy above 0.4 MeV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count Rate:</td>
<td>Switch selectable sampling times of 1, 2, 4, 6, 8, 10, 20 or 30 seconds/minutes. Sampling is activated by front panel pushbutton.</td>
</tr>
<tr>
<td>Ready Alarm:</td>
<td>Audio tone (constant) indicates count rate is completed and data is ready to be displayed.</td>
</tr>
<tr>
<td>Data Output:</td>
<td>Visual: Illuminated 4-digit numeric readout. Data is displayed sequentially as TI/C, K, U and Th. Analog: Continuous count of any one channel from front panel BNC connector. Output Level: 1, 5 ma. max. (100 counts/sec full scale) Full Scale Range Expander: (\times 1, 2, 4, 8, 32, 64, 128) Sampling Time Constant: 1, 2, 5, 10 seconds</td>
</tr>
<tr>
<td>Calibration Source:</td>
<td>Cesium—137 (Cs(^{137}))</td>
</tr>
<tr>
<td>Power Requirements:</td>
<td>Twelve 1.5 v &quot;D-cell&quot; flashlight batteries. Charge state indicated by front panel meter. One set batteries allows approximately 40 hours continuous operation (Note: Battery life diminishes with a decrease in ambient temperature).</td>
</tr>
<tr>
<td>Temperature Range:</td>
<td>(-20^\circ)C to (+85^\circ)C</td>
</tr>
<tr>
<td>Size:</td>
<td>3.5 in. high x 7.0 in. wide x 10.5 in. deep (9 x 18 x 27 cm)</td>
</tr>
<tr>
<td>Weight:</td>
<td>7 lbs. (3.2 kg) including batteries</td>
</tr>
</tbody>
</table>

DETECTOR SPECIFICATIONS

A variety of crystal detectors may be used with the DISA-400A console for specific applications. Each detector consists of a sodium-iodide (NaI) crystal optically coupled to a high-gain photomultiplier tube and hermetically sealed within a thermally insulated housing. Each housing also contains a high voltage power supply (nominal 900V regulated to within \(\pm 0.05\%\)) and preamplifier. Appropriate interconnecting cables are included.

<table>
<thead>
<tr>
<th>Portable Detector:</th>
<th>Model N(_4)-21</th>
<th>Crystal: 3&quot; dia. x 1 1/8&quot; thk. (7.6 x 7.6 cm)</th>
<th>Volume: 21.2 cu. in. (347 cm(^3))</th>
<th>Housing: Aluminum</th>
</tr>
</thead>
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<td>(Model N(_4)-21)</td>
<td></td>
<td>Size: 4.5&quot; dia. x 14.1 (11.5 x 36 cm)</td>
<td>Weight: 7.5 lbs (3.4 kg)</td>
<td></td>
</tr>
<tr>
<td>Laboratory Detector:</td>
<td>Model N(_4)-LAB/50</td>
<td>Crystal: 4&quot; dia. x 4&quot; thk (10.2 x 10.2 cm)</td>
<td>Volume: 50 cu. in. (823 cm(^3))</td>
<td>Housing: Cylindrical aluminum container with 2&quot; thick (5.1 cm) lead lining</td>
</tr>
<tr>
<td>(Model N(_4)-LAB/50)</td>
<td></td>
<td>Size: 12&quot; dia. x 22&quot; h (30.5 x 55 cm)</td>
<td>Weight: 405 lbs (184 kg)</td>
<td></td>
</tr>
<tr>
<td>Vehicular Detector:</td>
<td>Model N(_4)-110</td>
<td>Crystal: 6&quot; dia. x 4&quot; thk (15.2 x 10.2 cm)</td>
<td>Volume: 113.1 cu. in. (1853 cm(^3))</td>
<td>Housing: Aluminum container w/shock mounts</td>
</tr>
<tr>
<td>(Model N(_4)-110)</td>
<td></td>
<td>Size: 12&quot; l x 12&quot; w x 26&quot; h. (30.5 x 30.5 x 64 cm)</td>
<td>Weight: 41 lbs (18.5 kg)</td>
<td></td>
</tr>
</tbody>
</table>

geoMeters

395 JAVA DRIVE
SUNNYVALE, CA. 94086 U.S.A
(408) 734-4616
CABLE: "GEOMETRICS" SUNNYVALE
TELEX NO: 337-426

GEOMETRICS INTERNATIONAL CORP.
80 ALFRED ST, WILSONS POINT
SYDNEY NSW 2061 PHONE: 929-9942

Exploranium

436 LIMESTONE CRESCENT,
DOWNVIEW (TORONTO), ONTARIO, CANADA
TELEPHONE (416) 817-1966
TELEX NO: 06-20964

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