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National Uranium Resource Evaluation

**Airborne Gamma-Ray Spectrometer
And Magnetometer Survey
Ukiah Quadrangle, California**

Final Report - Volume I

**Aero Service Division
Western Geophysical Company of America
Houston, Texas 77001**

April 1981

PREPARED FOR U.S. DEPARTMENT OF ENERGY
Assistant Secretary for Resource Applications
Grand Junction Office, Colorado

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AIRBORNE GAMMA-RAY SPECTROMETER
AND
MAGNETOMETER SURVEY

UKIAH QUADRANGLE
CALIFORNIA

FINAL REPORT
VOLUME I

AERO SERVICE DIVISION
WESTERN GEOPHYSICAL COMPANY
OF AMERICA
HOUSTON, TEXAS

MAY, 1981

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Figure 1
 UKIAH QUADRANGLE
 INDEX MAP

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INTRODUCTION

During the months of August, September, and October of 1980, Aero Service Division Western Geophysical Company of America conducted an airborne high sensitivity gamma-ray spectrometer and magnetometer survey over ten (10) areas over northern California and southwestern Oregon. These include the 2° x 1° NTMS quadrangles of Roseburg, Medford, Weed, Alturas, Redding, Susanville, Ukiah, and Chico along with the 1° x 2° areas of the Coos Bay quadrangle and the Crescent City/Eureka areas combined. This report discusses the results obtained over the Ukiah, California, map area.

Traverse lines were flown in an east-west direction at a line spacing of six (6) miles. The lines were flown north-south approximately eighteen (18) miles apart. A total of 16,880.5 line miles of geophysical data were acquired, compiled, and interpreted during the survey, of which 1517 line miles are in this quadrangle.

This report is a result of work performed under Bendix Field Engineering Corporation Subcontract No. 80-460, Project No. IG0205, as part of the National Uranium Resources Evaluation. NURE is a program of the U. S. Department of Energy's Grand Junction, Colorado, office to acquire and compile geologic and other information with which to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the United States.

The data were reduced and compiled in accordance with the technical specifications of the contract as stated in BFEC 1200-C and BFEC 1250-A. The parameters used in the processing of the radiometric data have been substantiated in a previously submitted calibration report of the Sikorsky S-58T installed airborne gamma-ray spectrometer system.

DATA ACQUISITION

Aircraft

The survey was conducted using a Sikorsky S-58T helicopter, registration N94523, owned and operated by Carson Helicopters, Inc., Perkasio, Pennsylvania. The flight crew consisted of a pilot (Carson), a navigator (Aero), and an electronics system operator (Aero). Some of the more pertinent characteristics and specifications of the aircraft are listed below:

T A B L E I

Aircraft Specifications and Characteristics

Aircraft	Sikorsky Model S-58T, Registration N94523
Engine	Pratt - Whitney PT 6T Twinpack
Take off power	1875 Shaft HP.
Fuel Capacity	350 U. S. Gal.
Hourly Fuel Consumption	100 U. S. Gal.
Range at Cruise Speed	350 Miles
Rate of Climb	1200 Feet per Min.
Service Ceiling	12500 Feet
Maximum Gross Weight	13000 Lbs.
Empty Weight	7200 Lbs.
Useful Load	5800 Lbs.
Pay Load	1700 Lbs.

Gamma-Ray Spectrometer System

The survey was conducted using Aero Service's HISENS A(irborne) G(amma)-R(ay) S(pectrometer) 2000 R system shown in block diagrammatic form in Figure 3, page 12.

The detector assembly of the spectrometer consists of a primary detector, sensing data over a 4π solid angle, and an upward looking detector, sensing data over a 2π solid angle only. The primary detector package consists of 12

-12-

Figure 3

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AERO SERVICE
LITTON HOUSTON TEXAS

DWN	DATE	TITLE
CHKD		

BLOCK DIAGRAM
HISENS AGRS 2000R SYSTEM

SIZE	DRAWING NO	REV	SHEET
B			

logs of 4" x 4" x 16" of Polyscin®, NaI(Tl), each hermetically sealed in a steel container and coupled to a high quality photo-multiplier tube. The sensors are assembled in three slabs of four logs each. Each slab is enclosed in a heated and thermally stabilized container. Total volume of the primary detector is 3072 cubic inches (50.34 liters).

The upward looking detector consists of two 4" x 4" x 16" logs of Polyscin®, each hermetically sealed in a steel container and coupled to a high quality photo-multiplier tube and enclosed within separate heated and thermally stabilized containers. Each of the upward looking detectors is mounted on top of one of the primary detector packages, separated by a 0.75" slab of lead shielding, in order to provide the 85% shielding effect @ 3.000 MeV.

The preamplifiers provide, with the photo-multipliers, virtually the total signal amplification. In order to ensure maximum stability, the preamplifiers are enclosed within the thermally stabilized packages.

The combined signal of each detector slab is output into the amplifiers, whose main purpose is summing the incoming pulses and shaping them into a bipolar gaussian form.

The summed and shaped signal from the amplifiers is input into the pulse height converter. This unit performs basically three functions: it determines whether a pulse has been received, it determines its amplitude and it converts the amplitude into a digital number. Since a successive approximation analog to digital converter is used, total dead time of the system is the same regardless of the energy of the pulse. This dead time is approximately 8 μ seconds per pulse due to the converter and approximately 1.5 μ seconds due to the remainder of the electronic circuit, for a combined total dead time of approximately 9.5 μ seconds per pulse. The exact system dead time, or rather live time, is measured in microseconds and recorded in milliseconds as channel zero (0) of the multispectral gamma-ray data.

The function of pulse height analyzer is performed by the HP 21 MX series Hewlett Packard minicomputer, which also stores and formats the data, outputs them on tape and compares the recorded data with the data stored in memory for a fool-proof read after write check.

The gamma-ray spectrometer system includes further a Rosemount barometric

altimeter, a Honeywell radar altimeter and a temperature transducer. A discrete interface exists in the Hewlett Packard minicomputer to accommodate a Doppler navigation system as well as other navigation systems, such as ANA, LORAN-C, OMEGA and others, although none of these were used.

Two tape drives are employed to record the data and automatic switching between the two occurs as each tape ends. Data are collected each second and recorded every five seconds. In addition to the gamma-ray spectrometer data of both the primary and upward looking systems, radar altimeter, barometric altimeter, atmospheric temperature, real time, gamma-ray spectrometer live time and magnetometer data are recorded.

Additional ancillary equipment carried aboard the helicopter includes a cathode ray tube display, a 6-channel heat sensitive analog recorder and a 35mm camera, triggered by the data controller at a preselected interval.

Magnetometer

The magnetic sensor used for the survey was a Varian V-85 proton free-precession magnetometer. This sensor was housed in a fiberglass bird and trailed approximately 100' below the aircraft to ensure optimal signal sensitivity without need for extensive aircraft compensation. The magnetic data were recorded in increments of 0.01 gammas, with a sensitivity of 0.1 gammas.

PRODUCTION SUMMARY

The 2° x 1° NTMS quadrangle of Ukiah, California, was surveyed as part of a subcontract covering ten (10) areas located over northern California and southwestern Oregon. These include the 2° x 1° quadrangles of Roseburg, Medford, Weed, Alturas, Redding, Susanville, Ukiah, and Chico along with the 1° x 2° areas of the Coos Bay quadrangle and the Crescent City/Eureka areas combined. The subcontract covered the flying of a total of 16,880.5 line miles, of which 1517 miles are in the Ukiah quadrangle.

Four main bases of operations were used during the survey. Eugene, Oregon, located just north of the Roseburg quadrangle, was used from the commencement of operations through Flight 27 on August 22, 1980. Medford, Oregon, in the Medford quadrangle, was then used up through Flight 86 on September 19th. The aircraft and crew then moved to Redding, California, for operations through Flight 130 on October 2, 1980. The final base of operations was located at Yuba City, California, in the Chico quadrangle. Throughout the survey, extensive use was made of both a fuel truck and smaller, secondary airstrips for remote refueling stops, thus extending the helicopter's effective production range.

The first production flight was made on August 11, 1980. A total of 143 flights were made with the last flight being completed on October 9, 1980. Production flights were not possible for twenty of the sixty-one days the aircraft and crew were on site. One day was used to complete the high altitude calibration flight, ten days were lost to inclement weather conditions, six days were lost to aircraft maintenance, one day to electronic maintenance, and two days to the illness of the AGRS system operator. Many of these nonproduction days were used to complete the three moves to new operations bases. A complete summary of daily operations is given in Table II, pages 16, 17 and 18.

Total flying time was 253.2 hours for an average production rate of 66.7 miles per hour. An average of 118.1 miles were acquired per production flight and 411.7 miles were acquired each production day. When computed over the total number of days on site, data acquisition averaged 276.7 miles per day.

Flight line directions and spacing for the Ukiah quadrangle were east-west traverse lines 6 miles apart and north-south tie lines flown at 18 mile intervals. The nominal terrain clearance for the survey was 400 feet.

T A B L E II
Daily Production Summary

<u>DATE</u>	<u>BASE</u>	<u>ACTIVITY</u>	<u>FLIGHT NO.</u>
08/09/80	Eugene, Oregon	Ferry to Eugene, Ore.	
08/10/80	Eugene, Oregon	High altitude test	
08/11/80	Eugene, Oregon	Production	11, 12
08/12/80	Eugene, Oregon	Weather	
08/13/80	Eugene, Oregon	Weather	
08/14/80	Eugene, Oregon	Production	13, 14
08/15/80	Eugene, Oregon	Abort - helicopter	15
08/16/80	Eugene, Oregon	Helicopter maintenance	
08/17/80	Eugene, Oregon	Helicopter maintenance	
08/18/80	Eugene, Oregon	Helicopter maintenance	
08/19/80	Eugene, Oregon	Helicopter maintenance	
08/20/80	Eugene, Oregon	Production	16, 17, 18, 19
08/21/80	Eugene, Oregon	Production	20, 21, 22
08/22/80	Eugene, Oregon	Production	23, 24, 25, 26, 27
08/23/80	Medford, Oregon	Weather	
08/24/80	Medford, Oregon	Production	28, 29, 30, 31
08/25/80	Medford, Oregon	Production	32, 33, 34, 35, 36
08/26/80	Medford, Oregon	Production	37, 38, 39
08/27/80	Medford, Oregon	Weather	
08/28/80	Medford, Oregon	Production	40
08/29/80	Medford, Oregon	Production	41, 42, 43, 44, 45
08/30/80	Medford, Oregon	Production	46
08/31/80	Medford, Oregon	Abort-cloud cover	47
09/01/80	Medford, Oregon	Production	48, 49, 50
09/02/80	Medford, Oregon	Weather	
09/03/80	Medford, Oregon	Production	51, 52, 53
09/04/80	Medford, Oregon	Production	54, 55, 56
09/05/80	Medford, Oregon	Weather	
09/06/80	Medford, Oregon	Production	57, 58, 59, 60

Daily Production Summary

<u>DATE</u>	<u>BASE</u>	<u>ACTIVITY</u>	<u>FLIGHT NO.</u>
09/07/80	Medford, Oregon	Production then high winds	61, 62
09/08/80	Medford, Oregon	Magnetometer failure then production	63, 64, 65
09/09/80	Medford, Oregon	Helicopter maintenance	
09/10/80	Medford, Oregon	Production	66, 67
09/11/80	Medford, Oregon	Production	68, 69, 70, 71, 72
09/12/80	Medford, Oregon	Weather	
09/13/80	Medford, Oregon	Weather	
09/14/80	Medford, Oregon	Clouds and fog, then production	73, 74, 75, 76, 77
09/15/80	Medford, Oregon	Production	78, 79, 80, 81, 82
09/16/80	Medford, Oregon	Production	83, 84, 85
09/17/80	Medford, Oregon	Production	86
09/18/80	Redding, California	Weather	
09/19/80	Redding, California	Production	87, 88
09/20/80	Redding, California	Production	89
09/21/80	Redding, California	Production	90, 91, 92, 93, 94
09/22/80	Redding, California	Production	95, 96, 97, 98
09/23/80	Redding, California	Production	99, 100, 101, 102
09/24/80	Redding, California	Production	103, 104, 105, 106
09/25/80	Redding, California	Production	107, 108, 109, 110, 111
09/26/80	Redding, California	Production	112, 113, 114, 115
09/27/80	Redding, California	Production	116, 117, 118, 119
09/28/80	Redding, California	Production	120, 121
09/29/80	Redding, California	Production	122, 123, 124, 125
09/30/80	Redding, California	Production	126
10/01/80	Redding, California	Production	127, 128, 129, 130
10/02/80	Redding, California	Operator sick	
10/03/80	Yuba, California	Operator sick	
10/04/80	Yuba, California	Production	131, 132, 133, 134
10/05/80	Yuba, California	Production	135, 136, 137, 138
10/06/80	Yuba, California	Production	139, 140, 141, 142, 143

Daily Production Summary

<u>DATE</u>	<u>BASE</u>	<u>ACTIVITY</u>	<u>FLIGHT NO.</u>
10/07/80	Yuba, California	Production	144, 145, 146, 147
10/08/80	Yuba, California	Production	148, 149, 150, 151
10/09/80	Yuba, California	Production	152, 153

Figure 4 shows a histogram of the terrain clearance of the helicopter as recorded by the radar altimeter. The histogram takes into account all final samples in this quadrangle. The mean terrain clearance, as observed, is approximately 420 feet. The ground speed of the aircraft, as determined from the distances between samples based on their final X-Y positions, is depicted in graphic form in the histogram of Figure 5, page 21.

AEFC SERVICE
 QUAD UKIAH

TERRAIN CLEARANCE HISTOGRAM
 JOB 627

Figure 4

AERC SERVICE
QUAD UKIAH

GROUND SPEED
JOB 627

HISTOGRAM

DATA REDUCTION

The data reduction process as used in the processing of the airborne gamma-ray spectrometer and magnetometer data obtained within the Department of Energy (DOE) National Uranium Resource Evaluation (NURE) program is shown in flow chart form in Figure 6, page 24.

Upon arrival in the Houston office, the digital data are edited and a back-up tape is generally produced. The EDIT consists partly of a data quality check, enabling the elimination of single record spikes in any field, outside a specified preselected limit. The EDIT program further checks for data continuity and flags all data acquired at terrain clearances exceeding the survey specification. The EDIT further sums a preselected number of spectral records at the beginning and end of each survey line and fits a gaussian curve to diagnostic photopeaks, such as the Tl^{208} peak at 2614.5 KeV and the K^{40} peak at 1460 KeV for low altitude lines and the annihilation peak at 511 KeV and the K^{40} peak at 1460 KeV for high altitude lines. The position of these photopeaks is determined with an accuracy of better than 0.1 of a channel and is used to determine the exact position of the energy windows with regard to channel numbers. At the same time the calculated standard deviations of the fitted gaussian curves serve to obtain the system resolution at the photopeaks used. Note that the 2π system resolutions as determined at the K^{40} photopeak proved to exceed the 8% specification throughout much of the survey. This was most likely due to a small crack in one of the two 2π crystals. However, this condition proved not to adversely affect the acquisition or reduction of the radiometric data and it was decided, after consultation with BFEC, not to replace the crystal in the interest of expediting the completion of the survey. The window count rates are normalized for live time and are calculated as follows:

K	:	1362 KeV - 1566 KeV (Channel 114 → 130, @ 12 KeV/Channel)
U	:	1662 KeV - 1866 KeV (Channel 139 → 155, @ 12 KeV/Channel)
T	:	2406 KeV - 2826 KeV (Channel 201 → 235, @ 12 KeV/Channel)
T.C.	:	390 KeV - 2982 KeV (Channel 33 → 248, @ 12 KeV/Channel)
Cosmic	:	3054 KeV - 6000 KeV (Channel 255)
$U_{2\pi}$	:	1662 KeV - 1866 KeV (Channel 139 → 155, @ 12 KeV/Channel)

The above channel numbers are valid only if system gain corresponds

Figure 6

exactly to 12 KeV per channel and there is no zero shift.

The CORRECT program applies the background and cosmic corrections to the single record window count rates, corrects the data for Compton scatter and atmospheric radon, and normalizes the terrain clearance. Background count rates and cosmic factors were determined from high altitude test data acquired over the Pacific Ocean, offshore California.

Potassium Background	=	50.04 counts per second
Uranium Background	=	8.21 counts per second
Thorium Background	=	7.26 counts per second
Total Count Background	=	286.06 counts per second
2 π Bismuth Background	=	0.81 counts per second

Potassium Cosmic factor	=	0.250	c.p.s. per count 4 π cosmic
Uranium Cosmic factor	=	0.202	c.p.s./cps 4 π cosmic
Thorium Cosmic factor	=	0.278	c.p.s./cps 4 π cosmic
Total Count Cosmic factor	=	4.438	c.p.s./cps 4 π cosmic
2 π Bismuth Cosmic factor	=	0.0505	c.p.s./cps 4 π cosmic

The Compton scatter functions were determined from data obtained over the Grand Junction test pads, using the radiometric analysis of the bulk sample with natural water content.

$$T/U = \tau = 0.08$$

$$U/T = \alpha = 0.30 + 0.02 + 0.000076H$$

$$K/T = \beta = 0.37$$

$$K/U = \gamma = 0.90$$

The 2 π and 4 π uranium window count rates are related through the geometric or equivalency factor. For the present system, installed in the Sikorsky S-58T, this factor, $f = 5.1$. Part of the terrestrial radiation of energy higher than 1662 KeV - the lower threshold of the uranium window - is detected in the uranium window of the upward looking detector, due to incomplete shielding, skyshine and shine-around. This shine-through/shine-around effect is assumed to be a function of both the intensity of the terrestrial uranium and thorium radiation and of the aircraft terrain clearance. From multi-altitude data acquired over the Lake Mead Dynamic Test Range the shine-through/shine-around effect was determined for each altitude

level. The data provided a best fit for a linear terrain clearance function as follows:

$$\text{shine-through/shine-around} = (0.067 - 2.6 \times 10^{-5}H) (U_{4\pi} + 0.30T_{4\pi})$$

The shine-through/shine-around corrected Blair Count rate is then:

$$U_{2\pi c} = \frac{U_{2\pi} - (U_{4\pi} + 0.30T) (0.067 - 2.6 \times 10^{-5}H)}{1 - 5.1 (0.067 - 2.6 \times 10^{-5}H)}$$

The shine-through/shine-around correction is applied to the $U_{2\pi}$ count rate at each single record. The single record $U_{2\pi}$ count rates are then averaged over 35 records to make them statistically compatible with the data of the primary system. The atmospheric radon correction is applied to both the $U_{4\pi}$ and the Total Count count rates. The equivalency factor for the $U_{4\pi}/U_{2\pi} = 5.1$, for Total Count/ $U_{2\pi}$ it is 73.5.

Within the CORRECT program the data are normalized to a common datum of 400 feet terrain clearance. An exponential formula is used, based on an air column reduced to a standard temperature and pressure of 0°C and 760mm Hg. (32°F and 29.92" Hg). The air absorption coefficients used are those derived from the multiple altitude flight over the Lake Mead Dynamic Test Range for thorium, potassium and Total Count. The air absorption factor for uranium is obtained by straight interpolation between the potassium and thorium air absorption factors. Their values are respectively:

$$\begin{aligned}\mu_K &= 2.67 \times 10^{-3} \text{ per foot} \\ \mu_U &= 2.52 \times 10^{-3} \text{ per foot} \\ \mu_T &= 2.11 \times 10^{-3} \text{ per foot} \\ \mu_{TC} &= 2.16 \times 10^{-3} \text{ per foot}\end{aligned}$$

The formula used for the altitude normalization is:

$$N_{400} = N_H \cdot e^{\mu(400 - \frac{273}{273+t} \cdot \frac{P}{29.92} \cdot H)}$$

Where N_{400} , N_H are respectively the count rates at 400 feet and at altitude H, μ is air absorption factor, t is temperature in degrees Celsius and P is barometric pressure in inches Hg.

The last operation in the CORRECT program is the determination of

statistical adequacy of the data. The criteria for adequacy of the data are based on the work of Lloyd A. Currie (op.cit.). A critical level is recognized, below which all observations made fail to detect a signal, i.e. 95% of all measurements fall within the "normal" distribution of "noise". The detection level is similarly defined as the level above which 95% of the measurements made fall within the normal Poisson distribution of "signal". Currie's critical level has been adopted as the count rate level below which data are inadequate. Data with count rates above the critical level but below the detection level are considered marginal. Above the detection level data are considered adequate. For the single record data the formulas are then:

Count Rate ≤ 2.33 (Sum Corrections)^{1/2}: data inadequate

2.33 (Sum Corrections)^{1/2} < Count Rate $\leq 2.71 + 4.65$ (Sum Corrections)^{1/2}:
data marginal

Count Rate > $2.71 + 4.65$ (Sum Corrections)^{1/2}: data adequate

No ratios have been calculated involving inadequate data in either numerator or denominator. Ratios have been calculated when the data in the numerator are marginal, provided the data in the denominator are adequate.

The thorium, uranium and potassium data are subsequently averaged over 9 records in the SPECAVG program. The output is a spectrometer master tape containing both averaged and single record data.

Parallel with the radiometric data reduction process, the magnetic data are edited and processed. Using the recovered film intersections and the established ground identities, preliminary flight paths are prepared. The flight path is refined in the magnetic adjustment program until an accurate final flight path has been obtained. The reduced spectrometer data are then merged with the final X-Y position of the data points, the reduced magnetic data and the digitized geology, and a master tape is produced with data that pertain to each quadrangle only. The REGROUP program then eliminates all duplicate line segments, inserts reflight segments where required, orders the remaining line segments and rennumbers the fiducials of these segments such that the resulting line is directionally consistent with location sequential sample numbers. The renumbered fiducials increase from west to east for traverse lines and south to north for tie lines. A listing relating the renumbered fiducials to the original fiducial numbers as recorded in flight is

included in this volume as Appendix N and can also be found in the back of Volume II. This listing gives both the line number as it appears on all final data and the line number as recorded in flight. Similarly, the start and end fiducials of each final line and/or line segment shown on the flight path base map are given along with the corresponding start and end fiducials as recorded in flight. When correlated with the final fiducial numbers, the original fiducials will increase sequentially for lines flown west to east or south to north and decrease for lines flown in the opposite directions.

The following processing steps are STATANAL and HISTGRM. HISTGRM groups the radiometric data by geological cell units, determines the distribution of the data as normal or lognormal, calculates the mean (for normally distributed data) or the mode (for lognormal distributions) as well as the standard deviations. The results from HISTGRM are used in the STATANAL program, which calculates the signed standard deviation from the mean for each averaged sample for each of the six radiometric parameters. Its output is the Final Spectrometer Master Tape, from which the anomaly maps, the statistical analysis tape, the averaged record and single record reduced data tapes and listings, the flight path maps and the radiometric and magnetic profiles are produced.

DATA PRESENTATION

General

The final data are presented in four different forms: on magnetic tape; on microfiche; in graphic form as profiles and histograms; and in map form as anomaly maps, flight path maps, and computer printer maps.

The histograms and the multiparameter profiles are presented with the anomaly maps and flight path map in a separate bound volume. Complete data listings of both the reduced single record and the reduced averaged record data are found in the back of this report. The format of the printout of the microfiches and the format of the data files delivered on magnetic tape are in accordance with the specifications of the BFEC 1200-C and are described in appendices F through L of this report.

Radiometric Multiple-Parameter Stacked Profiles

The radiometric profiles have been prepared at the horizontal scales of 1:250,000 and 1:500,000 on an automated flatbed plotter. Displayed are from top to bottom: total magnetic intensity, IGRF removed, in gammas; radar altimeter, in feet; ratio of eT concentration in ppm/potassium concentration in %; ratio of eU/K; eU/eT ratio, atmospheric radon (BIAC) in counts per second, equivalenced to the 4π count rate; apparent concentration of terrestrial eT in ppm, apparent concentration of terrestrial eU in ppm; apparent concentration of potassium in %; "Total Count" count rate. Flags are indicated, where needed, below the base line of the corresponding parameter. A short flag indicates marginal data, including terrain clearances between 700 and 1000 feet, while a long flag indicates inadequate data. Fiducial markers are plotted every 200 records, along the top of the profile, every 10 records near the bottom.

The flight path and the geologic formations overflown along the line are shown on the bottom of both the radiometric and magnetic multiple-parameter stacked profiles below the lower fiducial markers. Six tiers of formation identifiers along with short markers on the flight line are used to indicate changes along the profile with the base of the identifier letters aligned with the corresponding marker. The first identifier found on the westernmost end of the profile applies to the start of the line and this formation continues until the next marker is encountered. Subsequent changes to the geology are

similarly indicated along the profile.

Magnetic and Ancillary Parameter Stacked Profiles

The magnetic profiles have also been plotted at scales of 1:250,000 and 1:500,000 on an automated flatbed plotter. The plotting sequence of the profiles is, from top to bottom: barometric pressure at aircraft altitude in mm Hg; atmospheric ambient temperature in degrees Celsius, terrain clearance in feet; magnetic variations at base station, in gammas; total magnetic intensity, IGRF removed, plotted at 50 gammas per scale division. Fiducial markers are again plotted every 200 records along the top of the profiles, every 10 records near the bottom.

Histograms

Histograms have been prepared for the six radiometric parameters for each geologic cell unit of the NTMS quadrangle area. The horizontal scale of the plots is constant for each of the parameters. Frequency grouping has generally been done in 100 groups per full scale, although in some cases more groups may have been used for better definition. In all cases the vertical scale was normalized to the number of samples observed in the group with the highest sample frequency.

For each histogram the frequency distribution type (normal or lognormal) is listed, as well as the mean (or mode in case of lognormal distribution) and the signed standard deviations. Note that for both the normal and lognormal distribution curves the standard deviation is given in terms of the parameter value (K , eU , eT , eU/K , eU/eT and eT/K). The actual standard deviation is obtained by subtracting the mean parameter value from the +1 standard deviation figure in case of a normal distribution, by dividing the mode value into the +1 standard deviation figure in case of a lognormal distribution. In case of lognormal distribution curves the standard deviation is thus a multiplication factor.

Each histogram further lists the total number of samples observed in the geologic unit and the number of statistically adequate/marginal data samples in each parameter plot.

Anomaly Maps

The anomaly maps have been prepared at scales of 1:250,000 and 1:500,000

on an automated flatbed plotter. The fiducial numbers along the flight lines match those of the corresponding profiles. Positive signed deviations of the mean are indicated by a plus sign to the north or west of the flight lines; while negative signed deviations are indicated by a minus, plotted to the south or east of the line. The number of pluses or minuses corresponds with the levels of standard deviation from the mean. To avoid crowding, standard deviation signs are calculated and plotted for every fifth sample only.

Computer Printer Maps

Computer printer plots are produced for the total field and the six radiometric channels. Upper and lower limits were chosen based on the minimum and maximum values of the gridded data. Ten intervals are represented by the contour values 0 to 9. A minus (-) or a plus (+) sign represents those values less than the lower limit or those values higher than the upper limit.

The interval for each integer contour is further divided into two groups. For those values less than .5, the contour is printed; e.g. for values 4.0 to 4.5, the value 4 is printed, while values of 4.6 through 4.9 are left blank.

GEOLOGY

General

The Ukiah quadrangle is located in northern California and occupies the area between 39° and 40° north latitude and 122° and 124° west longitude. Portions of three geomorphic provinces are contained within the quadrangle. The western portion, to a great extent, is comprised by the Northern Coast Ranges, a system of longitudinal mountain ranges and valleys with elevations rising from 2000 to 4000 feet above sea level. The range-valley system is resultant from structural control, dominantly large-scale folding and faulting trending approximately N35°W, and terminates on the east where strata dip beneath alluvium of the Great Valley. In the north, the rocks of the Franciscan Formation present a Coast Range topography that is characteristically irregular, knobby and prone to landslide.

The Great Valley of California is a broad alluvial plain which reaches a width of approximately 40 miles in the Ukiah quadrangle. Situated east of the Coast Ranges, this province extends eastward off the quadrangle where it is bound by the Sierra Nevada. On the west, deeply buried, eastward dipping Cretaceous-Cenozoic strata lap over westward dipping Sierran bedrock to the east, forming a broad trough which is drained southward by the Sacramento River.

The Klamath Mountains Province, a small part of which extends across the northern border of the quadrangle, presents a complex, rugged topography due in part to severe dissection of the uplifted plateau. Transverse to irregular channels cut by rivers and streams in the quadrangle expose hard pre-Cretaceous rocks, similar to those in the Sierra Nevadas.

Stratigraphy

Mostly undivided Cretaceous marine sediments comprise the western portion's stratigraphy, although Mesozoic ultrabasic rocks, Franciscan volcanics and metavolcanics, and a variety of post-Pliocene marine and nonmarine dune, alluvial and terrace deposits also occur to a lesser degree. In the eastern portion of the quadrangle, predominantly late Mesozoic rocks of the Franciscan Formation along with pre-Cretaceous metasediments and younger volcanic and ultrabasic intrusives comprise the section. In the Great Valley a wide collection of various Quaternary sediments, predominantly alluvial,

fanglomerate and deltaic deposits, commonly occur.

Locally cropping out, Tertiary basalts and Pliocene pyroclastics have been noted. A brief description of the units occurring in the Ukiah quadrangle follows.

Pre-Cretaceous Metavolcanic Rocks (Mv)

The pre-Cretaceous metavolcanics in the area consist of massive amphibolite, chlorite schist and tuffaceous schist which are locally cut by metamorphosed diabase dikes. Occurring more rarely are beds of metachert, argillite and limestone.

Pre-Cretaceous Metasedimentary Rocks (ms)

The pre-Cretaceous metasediments are comprised typically of mica and quartz rich phyllites and schists, metamorphic chert, quartzite and slate.

Mesozoic Ultrabasic Intrusives (ub)

The ultrabasic intrusives of Mesozoic age which occur in the area are largely serpentinitized peridotite, pyroxenite and dunite. Talc schist and soapstone occur only locally.

Knoxville Formation (JK)

The Knoxville formation is exposed in the area as interbedded shale, sandstone and conglomerate. It is locally characterized by calcareous or serpentinitic beds.

Franciscan Formation (Kjf)

This unit is composed of massive graywacke and minor amounts of dark-gray shale, thin bedded chert, greenstone, and glaucophane schist.

Franciscan Volcanic and Metavolcanic Rocks (KJfv)

The volcanic and metavolcanic rocks of the Franciscan Formation consist primarily of diabase, basalt, and agglomerate.

Lower Cretaceous Marine Sedimentary Rocks (Kl)

The lower Cretaceous sediments occur generally as sandstones, shales and interbedded conglomerate. In the Redding quadrangle, marine sediments also include mudstone, siltstone and graywacke. Serpentine occurs locally in the Ukiah quadrangle.

Upper Cretaceous Marine Sedimentary Rocks (Ku)

The marine sediments of upper Cretaceous age consist of interbedded sandstone, shale and locally massive conglomerate.

Undivided Cretaceous Marine Sedimentary Rocks (K)

This undivided marine unit includes interbedded sandstone, graywacke, shale and conglomerate.

Tertiary Volcanic Rocks (Tv)

The volcanics of the Tertiary period in the area are comprised of light colored andesite flows, basaltic flows and plugs, and locally pyroclastic tuffs and breccias. The Ukiah quadrangle Tertiary volcanics are comprised of basalt (Tv^b) only.

Paleocene Marine Sedimentary Rocks (Ep)

Paleocene marine sediments in the area typically occur as fine-grained, gray sandstones.

Eocene Marine Sedimentary Rocks (E)

In the Chico quadrangle, the Eocene marine sediments occur as glauconitic fossiliferous claystone and shale. In the Ukiah quadrangle, these sediments consist of fine to medium-grained sandstones which are locally carbonaceous and conglomeratic.

Middle Miocene Marine Sedimentary Rocks (Mm)

The middle Miocene marine sediments are comprised generally of alternating beds of silt, sand, gravel and clay.

Pliocene Volcanic Rocks (Pv)

The Pliocene volcanics in the Chico, Susanville and Alturas quadrangles consist of rhyolites, andesites, basaltic flows and breccias, along with pyroclastic tuffs and mudflows. The Weed, Eureka and Redding volcanics are essentially the same assemblage with the exception of the rhyolites. Pyroclastic tuffs (Tv^p) are the prevalent volcanic rock types in the Ukiah quadrangle.

Middle and/or Lower Pliocene Marine Sedimentary Rocks (Pml)

Mudstones, sandstones and siltstones comprise the middle and/or lower

marine sediments in the area. The Redding quadrangle sands are locally glauconitic.

Upper Pliocene Nonmarine Sedimentary Rocks (Puc)

Locally tuffaceous silt, sand, gravel and claystones comprise the bulk of the upper Pliocene nonmarine section in the area. In the Alturas quadrangle, fossiliferous sandstones and conglomerates also occur. Lacustrine deposits in the Susanville and Weed quadrangles are characterized by being locally diatomaceous.

Quaternary and/or Pliocene Cinder Cones (*)

Locally basaltic cinder cones occur in the Susanville and Alturas quadrangles and are associated with volcanic tuffs in their occurrence in the Chico quadrangle.

Pliocene - Pleistocene Nonmarine Sedimentary Deposits (QP)

Largely undifferentiated lacustrine and fluvial deposits containing local conglomerates and interbedded sandstones and claystone comprise the bulk of the Pliocene - Pleistocene nonmarine sediments in the area.

Pleistocene Volcanic Rocks (Qpv)

Basaltic flows and pyroclastic tuffs occur throughout the area in all but the Ukiah and Redding quadrangles. The Pleistocene volcanics in the Alturas, Susanville and Weed quadrangles are comprised predominantly of andesites and rhyolites.

Pleistocene Nonmarine Sedimentary Deposits (Qc)

Pleistocene nonmarine sediments consist generally of conglomerates, deltaic sandstones, siltstones, gravel and clay. In the Susanville, Chico and Redding quadrangles the sediments also include intercolated volcanic ash or debris.

Pleistocene Marine and Marine Terrace Deposits (Qm)

The Pleistocene marine terrace deposits are predominantly comprised of alternating facies of sands and clays.

Quaternary Nonmarine Terrace Deposits (Qt)

The Quaternary nonmarine terraces include river, stream and lake terrace

deposits, along with some fanglomerates, deltaic and slopewash deposits.

Recent Volcanic Rocks (Qrv)

Andesitic (Qrv^a), basaltic (Qrv^b), rhyolitic (Qrv^r) and pyroclastic (Qrv^p) volcanics occur throughout the area. Rocks in the Susanville, Alturas and Weed quadrangles are further characterized by the occurrence of tuff, lapilli, and local obsidian and cinders.

Recent Basin Deposits in the Great Valley (Qb)

Recent basin deposits in the Great Valley consist of sediments deposited during flood stages of major streams in the area between natural stream levees and fans.

Recent Alluvial Fan Deposits in the Great Valley (Qf)

Alluvial fan deposits ranging in age from Pleistocene to Recent are carried by streams emerging from high lands surrounding the Great Valley.

Recent River and Major Stream Channel Deposits in the Great Valley (Qsc)

Recent deposits of sand, gravel, silt and minor amounts of clay occur along channels, flood plains and natural levees of major streams in the Great Valley area.

Recent Alluvium (Qal)

Alluvial silt to coarse gravel which is locally brecciated or conglomeratic, occurs in the Great Valley and is often associated with fan, terrace or local lacustrine deposits. Recent alluvium in the Weed and Westwood quadrangles also includes areas of local glacial outwash.

Recent Dune and Coast Sand (Qs)

Well sorted dune sand and older eolian sand occur along the coastal areas of the Eureka and Ukiah quadrangles.

Structure

The San Andreas Fault, one of the most well-known structural features of California, cuts across the southwestern corner of the Ukiah quadrangle. Entering the Pacific at the transected corner of the quadrangle, the fault trends in a generally north to northwesterly direction and varies in distance from land from approximately 12 miles, halfway up the map area, to less than

one mile offshore in the northwestern area of the survey. Regional structural trends tend to be somewhat parallel with the trace of the San Andreas Fault. Other major faults in the area include the Willows Fault, near the Sacramento River in the central portion of the quadrangle, and the Paskenta Fault, located northwest of the Black Butte Reservoir. Though less catastrophic than the San Andreas Fault, several smaller scale splays have been very recently active near Clear Lake in the south central part of the quadrangle. The Coast Range Thrust, the upper boundary of a long inactive, late Mesozoic subduction zone, extends from the northern border of California, south, almost to Santa Barbara. Outcrop of the feature is discontinuous in the Ukiah quadrangle due to truncation by younger faults and concealment by overlying deposits. Hot springs mark part of its trace especially east of Clear Lake, the locality of a Cenozoic volcanic cone.

INTERPRETATION

General

The airborne gamma-ray spectrometer survey is conducted in support of the Department of Energy's National Uranium Resource Evaluation (NURE) program. The primary purpose of the survey is regional resource evaluation as opposed to local anomaly identifications. The interpretation of the radiometric data is directed towards determining zones of possible depletion of uranium which may have served as possible uranium sources, outlining areas of regional enrichment in uranium and indicating the geological formations which are most likely to be mineralized within a possible uranium province.

The areas of possible uranium depletion/enrichment are outlined with the aid of anomaly maps, which have been previously described. Enrichment or depletion of uranium on a regional scale is assumed to have taken place if the U/T and U/K ratio values remain higher/lower than at least one standard deviation above/below the mean for a distance of at least a mile, provided the K, U and T count rates are at the same time not less than one standard deviation below the mean. One mile equals approximately 35 samples.

The probability of a geologic formation to be mineralized by a given element may be estimated from the dispersion of the geochemical distribution curve (i.e. the smaller the ratio of the standard deviation over the mean) the less the likelihood that an extremely high concentration of that element exists within that formation. Obviously, the opposite holds true as well.

The decision of both the "favorability" of a formation and of the presence of a regional geochemical anomaly is influenced to a large extent by the choice of the geological cell units used in the correlation of the radiometric and geologic data.

The radiometric parameters used in the present report are concentrations in parts per million of equivalent uranium and equivalent thorium and in percent of potassium and their ratios. The radiometric count rates of the helicopter borne A.G.R.S. (Airborne Gamma-Ray Spectrometer) system were calibrated at the Lake Mead Dynamic Test Range against sources of known concentrations of potassium, uranium and thorium. The sensitivities of the A.G.R.S. system, normalized to 400 feet terrain clearance at standard temperature and pressure are:

<u>Radioelement</u>	<u>Count Rate</u>	<u>Concentration</u>
Potassium	105.71	1%K
Uranium	12.05	1ppm eU
Thorium	7.32	1ppm eT

Geochemical Analysis

Twenty-five geologic rock units were encountered in the Ukiah quadrangle survey, as well as a group of radiation samples across an unmapped area along the north central map sheet margin and a group of radiation samples obtained over water (mainly Clear Lake, in the south center). In two instances, formations with insignificant exposure and sampling were included in the statistics of a more widely exposed closely associated formation, so that the total number of geologically significant histogram sets is twenty-three.

The oldest rock system that was exposed and sampled extensively is the pre-Cretaceous metasediments (ms) which are exposed in several large irregular areas in the center of the quadrangle, in contact with rocks of the Franciscan Formation (JKf). The histogram distribution curves of the pre-Cretaceous metasediments (ms) are normal on all three spectral channels and they show modest dispersion. The mean elemental concentrations are fairly high. The formation is apparently homogeneous in its general composition, despite the fact that it is a "catch-all" undifferentiated unit. The mean elemental concentration values suggest that the rock unit is highly siliceous and feldspathic. In the north central part of the quadrangle, a few small bodies of pre-Cretaceous metavolcanic (mv) rocks have been differentiated from the larger masses of pre-Cretaceous metasediments (ms). Because they have contributed only one hundred seventy-five samples, the metavolcanics (mv) are statistically unreliable, but nevertheless they show a restricted range of concentration in all three spectral windows and low mean elemental concentrations, indicating that they are likely to be basaltic in gross composition.

Mesozoic ultrabasic rocks (ub), intruding along a north-south fault system in the east central part of the map sheet, and in smaller bodies along the fracture zones in the Franciscan Formation (KJf), display lognormal distribution in all three spectral windows. The thorium and potassium histograms clearly show double peaks, and the uranium histogram shows tailing suggestive of multiple concentration components. The strongest peaks on all

three are very low in element concentration, indicating a truly ultrabasic component such as pyroxenite or peridotite. The secondary peaks are higher in concentration values, suggesting composition on the order of gabbro or diorite.

Volcanic rocks are not widely exposed on the Ukiah quadrangle. The only unit that outcrops significantly is the volcanic member of the Franciscan Formation (KJfv), present in one large zone in the central portion of the map sheet and in a few very small exposures interbedded with the undifferentiated Franciscan Formation (KJf). With only six hundred forty-four samples, the histogram distributions are irregular, with normal distribution on the potassium channel. The mean elemental concentrations suggest basaltic composition for most of the formation, but there is a suggestion of tailing and incipient secondary peaking in the higher elemental concentrations to suggest the presence of a minor amount of more felsic constituents.

The most widely exposed of all the rock units is the Franciscan Formation (KJf). It outcrops in a wide belt in the central part of the map sheet, striking northwest-southeast. The Franciscan is an undifferentiated rock system, including stratigraphic units ranging from the middle Jurassic to the upper Cretaceous. The histogram distribution curves are normal on all three spectral windows and show surprisingly well defined peaks and little dispersion, considering the diversity of rock types likely to be included in the formation and the number of samples (almost fifteen thousand). The mean elemental concentrations are moderately high, indicating a gross composition high in siliceous and feldspathic minerals.

In the eastern part of the quadrangle, the marine Cretaceous sediments along the western edge of the Sacramento Valley have been separated into upper Cretaceous (Ku) and lower Cretaceous (Kl) members. In the western part of the sheet, flanking the Coast Range thrust system, there is a wide belt of exposed undifferentiated Cretaceous marine sediments (K). These three stratigraphic units show similar characteristics in their histogram distributions, except that the differentiated upper and lower members (Ku and Kl) in the east are based on far fewer samples and therefore their curves are more irregular. However, all have normal distribution and moderate dispersion suggestive of a more or less uniform composition. The lower Cretaceous (Kl) has somewhat lower mean elemental concentrations, suggesting a greater proportion of

ferromagnesian minerals and correspondingly lower proportions of siliceous and feldspathic minerals than the upper member (Ku). The undifferentiated marine Cretaceous (K) outcropping west of the Coast Range thrust system are higher than either upper or lower Cretaceous (Kl and Ku) in mean uranium concentration, lower than both in mean potassium concentration, and intermediate in mean thorium concentration, suggesting a completely different mineralogical suite and depositional environment.

Upper Pliocene nonmarine sediments (Puc) are present in the eastern, and especially the northeastern, part of the map sheet, overlapping and resting unconformably on the marine Cretaceous rocks (Kl and Ku). The histogram traces are normal in their distribution, although the thorium and uranium spectral windows display slight tailing into higher concentrations and the potassium window includes at least three peaks. This suggestion of multiple compositional facies is consistent with a presumably poorly sorted nonmarine formation.

Pleistocene nonmarine sediments (Qc) outcrop in the extreme northeast, at the northern end of the Sacramento Valley, overlying the upper Pliocene nonmarine sediments (Puc) and overlapped unconformably by Quaternary fan deposits (Qf). The histogram distributions are erratic, but they are recognized as normal in all spectral channels.

All three display minor secondary peaks higher than the principal peaks. The mean elemental concentrations are very low. The overall aspect of the Pleistocene nonmarine sediments (Qc) suggests a main lithologic component derived from generally mafic rocks, with a less important member composed of more felsic mineral constituents.

Of the several Quaternary formations, the most frequently encountered are the Quaternary fan deposits (Qf) in the eastern part of the quadrangle, along the western edge of the Sacramento Valley. The histogram curves associated with this unit are normal in distribution and have modest dispersion and conventional mean elemental concentrations. However, the thorium spectral window indicates the extraordinary presence of a perceptible number of samples with concentrations ranging from fifteen to twenty-five parts per million; and perhaps higher than that, beyond the histogram range. The most probable explanation for this is the presence of small, localized, highly concentrated lenses of monazite-rich sands in the fan deposits. The sites of the high

concentrations were not manifested by anomalies on the individual profiles, so they must be very limited in areal extent. However, two uranium anomalies were detected over the Quaternary fan deposits (Qf).

The Quaternary basin (Qb) deposits are also present along the eastern edge of the quadrangle (the western side of the Sacramento Valley). The histogram distributions are normal on all three spectral channels, but they show minor secondary peaks in very low concentrations of the thorium and potassium channels, indicating that there is a minor facies derived from, and consisting of mafic rock minerals, possibly derived from the Mesozoic ultrabasic intrusives (ub).

The Quaternary stream channel deposits (Qsc) are exposed along the eastern sheet margin, along the Sacramento River banks. Only six hundred and eight samples were obtained, but the histogram distributions are normal and the curves are well defined and have slight dispersion, suggesting that the stream channel deposits are uniform in composition.

Quaternary alluvium (Qal) west of the Sacramento Valley is present in several relatively small intermontane valleys. The histogram curves are normal in distribution, but they show great dispersion and multiple peaks. The Quaternary terrace deposits (Qt) associated with them are similarly irregular and suggestive of multiple peaking. These two related formations are likely to be variegated in their compositions and depositional circumstances.

Remaining formations exposed on the Ukiah quadrangle were not sampled sufficiently for reliable analysis.

Computer Printer and Anomaly Map Analysis

Computer generated maps were prepared for the total magnetic intensity, the three diagnostic gamma radiation windows, and their comparative ratios at a scale of 1:500,000 to supplement the 1:250,000 standard deviation anomaly maps. The grid spacing of the 1:500,000 maps is one thousand two hundred seventy meters by two thousand one hundred seventeen meters. This coarseness of sampling precludes the possibility of detailed interpretation.

The total intensity magnetic map shows a clearly defined north-south trend conforming to the regional geologic strike. Positive anomalies are present in the extreme east and northeast, in the area of the Sacramento

TABLE III

LEGEND TO TOTAL FIELD MAP (GAMMA)

<u>CONTOUR VALUE</u>	<u>LOWER LIMIT</u>	<u>UPPER LIMIT</u>
-		52710.0
0	52710.0	52810.0
1	52810.0	52910.0
2	52910.0	53010.0
3	53010.0	53110.0
4	53110.0	53210.0
5	53210.0	53310.0
6	53310.0	53410.0
7	53410.0	53510.0
8	53510.0	53610.0
9	53610.0	53710.0
+	53710.0	

TABLE IV

LEGEND TO POTASSIUM AVERAGE MAP (PERCENT)

<u>CONTOUR VALUE</u>	<u>LOWER LIMIT</u>	<u>UPPER LIMIT</u>
-		0.30
0	0.30	0.42
1	0.42	0.54
2	0.54	0.66
3	0.66	0.78
4	0.78	0.90
5	0.90	1.02
6	1.02	1.14
7	1.14	1.26
8	1.26	1.38
9	1.38	1.50
+	1.50	

X4= 410000.0
Y4= 4435669.0

X3= 590000.0
Y3= 4435669.0

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+.....+
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.      88      555      66      33      11      33
. 46655 566666 6666554 578654 666 6666 7642 565443 467655 5 66 666665 66554 5654 766654442-- 386 6774 2 3 4 55 6410- 01 333 7444 5421 211
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. 00 01 2 3 4 5 5 5 5 6 65555555 5 67765 55 66665 5 55544444 4 5654432 23 4 5 78 9 9 876 5 5 666
. -0 012 3 4 55 5 6 66666665 56 655 67877 5 5 66 5 44 56777642 256665 689 9 9 87 6 5 5 6 6
. -20 012333 4555 5 6 77765 56 6 788765 5 5 5 567 88752 368876 679 99 887 6 5 5 6 777
. 100 12 34555 5 6 777 7 7765 5 5 6 78876655 55 555 67888752 256 65 6789 9 8 7 6 555 555 6 6
. 1111 1 2 3455 55 5 67 77 7 654 3 45 6 666 77 6 7776666 6666 7 88 7520 0123 45 6 8999 87 6 55 5 5 66
. 12221 122455 6655 5 6 7888 7 6542 2566 67777 6 67888777666 7 88 8752 135 6 79999876 5 5 555 5 665
. 12321 12245 6 65 5 6 789987 77 642 35776 67 76 5 6899 8 7 77 88 8752 0245 6789 98 76 5 5 6 5
. 13332 12245 6 6 6555 666 7 89987 77 6533 578766 77 765 578 8 7 7 88 887530 245 6789 998866 5 55 5 65
. 34222 34 5555 6 6666 78 8 77 7 6544 68887 7 8 765 566 7 888777 8 9 8 776420 00 12456789999987 666555 66 555 65
. 554444 55 4 56 7 8 8 7 654 5688 8 888 765 4 3 468998 7 8 9997 77543 431 02467999 877 77777766 6665
. 655555 54 467 7 8 88887 655 6788 8 8 76431 1479987 7899987 777666652 135799 8 87 7 8888766 6 64
. 6 6 54 4677 7 8 8 76 6 7 88 8 76420 147 7 6 789987 77 7 77630 135789 8 8 87 7 8 8766 6 64
. 6 666 54 456 6666 7 8 8 7 6 6 77 8 8 8 75420 134 4 578888 66 77 7885311 346788 8 87 7 8 8766 6 6
. 4566 666 54 5 555 6 7 8 8 7 6 666 7 98 7531 0 1 2457 76 5 666 68875432 3457 88 7 6 7 666 6 6
. 146 77 6 55 5 56 77 8 8 776665 567 7531 0246 65 5 5 566666542 2467 8 7 6 6 555 6 7
. -367 7 65 5 6 5 5 67 78 8 88 7 85 467 7 7 7631 1566 5 5 5 4 55 67642 368 7 87 6 5 5 6 77
. -387 8 7 4 5765 44 5686 888888 7 79888 7 47 7 77 787640 -- 00 --- 157 56 356 44 4 57 75 1 1697 89 66 5 64 4 5 6 6 77
+.....+

```

X1= 410000.0
Y1= 4215000.0

X2= 590000.0
Y2= 4315000.0

TABLE V

LEGEND TO URANIUM AVERAGE MAP (PPM)

<u>CONTOUR VALUE</u>	<u>LOWER LIMIT</u>	<u>UPPER LIMIT</u>
-		0.50
0	0.50	0.65
1	0.65	0.80
2	0.80	0.95
3	0.95	1.10
4	1.10	1.25
5	1.25	1.40
6	1.40	1.65
7	1.65	1.80
8	1.80	1.95
9	1.95	2.00
+	2.00	

```
X4= 410000.0
Y4= 4435669.0
```

```
X3= 590000.0
Y3= 4435669.0
```

	666	77	11		33
34 577553 775 677 58644 58633 4 5679 684 35 44 5 58985 345 54 45644 38754331 1234432 4531-- 253 6444 01442 565442 331 034 554 5332 20 22					
34 56 654 455 6 6 6 65 5664 3 467887 643 43 4 578753 3 4 4 5 5 4665432 23 443 34431 1344 5432 23 3 45 53 321 12 344 4 321 1 22					
456 65 456 6 654 4554 45777765 4 33 4 56776543 3 4 5 544 565432 23 4 3 310 01344 4321 2 34554 3 2 10 1 2 3 44 321 11					
45 6655555 6777 653 224 4 676 5 5 43 1 23456 643 3 3455 6665 4 543 2 2 344 3210 1344 4320 1 2345 432 11 00000 123 3 2 1 0					
24679986 678876410 123 4 54 456642 02456 5433 34666 77764 4 32 1 2344 44 321 0345554321 1234 432 1 0 0123 32 10-					
268 975 57898641 02344 334 44 67752 0345 54 3 34787 78864 3 32 1 12355554 320 0345 54 321 1234 43 221 0 0123 3210 -					
359 96 578 86410 134443 456787531 1245 54 3 34787 88643 332 1 1 345 54 4431 0245 543210 01344 3 333210 123444 32 10					
899865 5678765332 3455543 4 567887643 3 45 5432 23665 56654 3 43221 234 4 455430 145 5421 0233 2 3443210 023 4 3221					
776 5 6 6666 7766666565 568887543 4 566642 3553 3454 444431 234 4 466641 13566420 0122 234 4321 0123 4 333					
55 5 6 78 999877 7664 457987543 4 567752 23442 344 455531 23454 568752 13676420 01 1 234 43210 012 344 443					
4 5 5 6 7899 877 7 7754 57887544 55 567753 34 42 244 45 531 3454 5688530 14676420 0 1 1 1234 44310 0123 4 4 443					
3 4 5 678 8887 7765 567 76555 655 67654 4 432 3444 455 42 23 4 44 5678643 35666420 01211 00 123 3 321 123 33 32					
2 345 67 7777 666 55 6 76666 7766666554 4444 5 44 4 432 33 4 55 6776655 65431 355420 012 233211 2 22 3 332					
0 1235 5 6 6 6 55 57777 77 76 5 56655 55555 5 4 3322 35 67888876 53 3689620 011 123322 2 23 4 3 21					
- 13455 5 6 6 6 5 577 7 76 5 67765 5 6 5 4 3 2 3456 678 9876 542 3689730 011 12332 2 22 2 344 3 210					
-1234 5 66666 6 777665 67 88 7654 4567765 5 66 5 44 3 2 2345 66 788 876 542 24786310 121 12333 344433 444 3 210					
2 3 56777777777 6666 655 67898 7653 2 4554 4566 654 3 444 332 345677 7 8876 54 3578632 2331 2 3 3 455554 4 332					
43 357998 8 975 3 46 6 679 87532 13 31 14566 643 35554 33 346787 776 54 5799643 4442 0 122 3 4566554 4443					
532 2579 98 89975 356 6 67 97431 13320 05677 642 35654 4443 46887 6 54 579975 565420 012 33 345665 45544					
642 2579998 899863 46 6 67 975310 134311 5677 643 245664 444 43 347887 6 6 54 4788755 665310 123 3 346654 45544					
8643 57888 7 898643 456 6 79 9754432 3443 3566 7654 4566655 4 444 678876 6 6 543 34676 5 664210 123 3 345654 4553					
+755 66666 6776444 566 68 98 77754 333 45 6 6 5 6776 665 4 466 7777 6 542 2455 566642 12 3444444 554 4542					
+ 86 55 444 5665555 6 6 7 7 8 98532 2345 6 6 78987 655 4 6787766 6 55 6666652 234 567531 12345 65 444 5544 41					
+ 97 5 4 4 5 5 66 6 78753 3455 56 78987 65 55 6776 5 665 5 6 67653 34 5677631 13 456 53 34554 42-					
+ 97654 4 5 5 6 6 6 6 654 5 655 5 6 78876 66666 65 5665 5 677643 4 5677631 123455 542 234 42-					
9 987654 44 56 77766 6 6 6 55 66 7887643 3456 77666 7 8876 5 5665 44 55 5 54 4 567875422 345555432 234 42					
14677 65 4555 6899987 6 6 765 5677 8 9853 235 665 6 789876 5 56654 4 4 3 456 78875 44 5665 44 3333 3 4 43					
- 2356 654 456666 8 9987 6 67765 67877776521 1356					

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X1= 410000.0
Y1= 4215000.0

```

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34 230 987 .
.....+ Figure 9
X2= 590000.0 53/54
Y2= 4315000.0

```

TABLE VI

LEGEND TO THORIUM AVERAGE MAP (PPM)

<u>CONTOUR VALUE</u>	<u>LOWER LIMIT</u>	<u>UPPER LIMIT</u>
-		1.00
0	1.00	1.55
1	1.55	2.10
2	2.10	2.65
3	2.65	3.20
4	3.20	3.75
5	3.75	4.30
6	4.30	4.85
7	4.85	5.40
8	5.40	5.95
9	5.95	6.50
+	6.50	

X4= 410000.0

X3= 590000.0

Y4= 4435669.0

Y3= 4435669.0

.....

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-27777666 6 5 66 66 65 67766 987 77 67764 46764 5 686555 6655 555555 5554 4 55 565 55 4420- 364 5443 3 4 555 6532 3 4544 4655 65333 332

-2677 6 66 6 677 78 8 8977 76 4 6 65 5676 5 5 5 5 4 5 55 5 544221 135 4 4 3 4 5 53 3 4 4 4 5 54 3 32

567 6 6 6 55 6 78 9 8 7 65 5 55 56 66 5 5 6 55 5 5 4321 12455 4 33 4 5 5 43 3 4 55 4 3

6 6 6 6 54 56 7 8888 7 654 33 4 5 5 5 66666 6 5 4 5 5 4 31 0 245 554 3 3 4 5 5 43 3 33 3 4 4 3

6 6 6 6542 3567 7 77777 77531 1234 5 5 5 6 7777 65 4 4 5 4310 01456654 33 4 5665 433 33 3 4 4 3

6 6 6666 7 6542 2577 7 6 7 753 1234 5 5 5 67 765 4 4 5 554320 13566 54 4 5665 43 3 3 3 4 4 3

6 6 6 7 6542 2567 6 6 765322 345 55 56 7 77 65 4 4 5 5 54310 1356 654 333 45 55 44 33 3 33 4 4 3

6 6 66 77 65432 2567 6 6 6544 44 555555 5 5 6 6666 5 4 55 5 665431 12456 64 3 3 4 44 5 4 333 3 4 4 3

5 5 677 6 54 456 6 55 6 6 555 5 666 5 5 55555 555 44 5 5 5 6 6542 245776543 22 3 3 455 4 3 3 4 4443

45 5 67 6 55 6 6 56 665 567 6 5 566654 4 5 5 56 7 642 146776543 2 2 2 3 454 3 3 44 43

4 4 56 76 6 7 6 56 6 65 567 65 5 6654 455 56 776531 24677653 2 2 2 3454 3 455 4 43

23 4 56 6 6 65 6 6 7655 66 66665 5 654 33 4 4 56 77 7653 45676543 2222 23 44 44 44 4 43

123 45 6 6 6 777776 67765 666 5 6655 55555 5 543 3 3 45677 7655 66 6543 344332 23 3 44 44 4 43

01234 56 6 6 78886 78 75 6665 567766 666 5 5 5555 4 357 8888876 777654 56653 2 2 3 44 4 5543

01234 56 6 6 7 8 86 78 76 6665 57877 6 6 5 55 5 4 35678 8 8777 7654 4566643 22 3 44 4 4 5 5433

23 45 6 6 6 7 7 76 678 76 5554 45655 6 7 65 44444 4 3 356777 887 777 6543 34565433 3 4444 444 5 543

134 56 66 66666 677 765 443 3 3 345677654 333 44 3 33 4 566 7 77 6 5 43 4666544433333 33 4 55555 55 54

023456 677 76543 22 21 24688753 3 33 4 5 6 7 6 5 4 567766555444 3 34 5 55 665

-23456 677 7654 2 3331 14788753 3 4 5 6 6 5 67887 66 5 4 3 34 5 66 6 66

-23456 7766 6 7 765432 23 321 14688753 3 44 4 56 6 5 4 578877 6 5 4 3 3455 6 6 6 6

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024 56 7 666 76 6 5 567765 665 4 44 5 54 466666665 44 5 55 6 6 543 345 6 6 5 5555 6 5555 6

02345 6 6666 65 56776 6 65 44 5 55 4 45677 7 655 55 4 56 6 66 5433 45 6 6 55 5 5 5

02345 6 66 6 6 65 567666 765 4 5555 4 567 77 7 6 55 5 4 4 56 6 66 543 55 6 66 66 5 5 5

01234 5 555555 66 5 5676 6 7654 4 55 44 55 66 7 887766 54 45 66 6 6544 4566 77777 666 6 5 5 5 5

01234 44 5 55 5 5 567765 5676543 3443 345 666 6 7898876 5 44 5 55 6 65 4 4567 888 777 6 55555555 5 5

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-012344 4 55 67875 67654 32 23566 65 678999865 44444 55 4 5 6 6655 568 99 8 76 54 3 4 5 5 55

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1 2 2 3 4 55 5 5 66 6555 6 6543 2 34 56 6 6 7764 3333 222 3 3 22 4 5 5555 6 7 88 765432 2345 5 4

22 2 3 4 5 5 4 45 677 6 6 66543 34 5 6 6 6543 2 2332 1234 5 5 4 56 7 887654 333 4 5 5 4

22 23 4 45666665 4 5 6776 666 777643 345 67 6 6543 2 23321 123 3 4 4 467 8 8765 444 555 5 4

222 23 4 4 56 7776555 6776 6 788764 4 5 5 6 6 543 2 23 3211 2 22 2 2 35789988 765 444 5 5 4

22 23 44 4 56 7 655 6776 6 7 88654 555 56 6 5433333 2 2 3443222 2 1 1234689988 765 4 4 5 5 4

2 222 34 44 5 5 5 4 5 677 66 666655 555 5 6777766 66665444 332 345554332 222 3467888 7777 65 4 4 5 5 555

12 33 4 55 5 5 4 4 5 6 7 7777 6 55 5 5 44 57899876 77655 44 3 456666542 234443 467 7 76 5 4 4 5 5 5

033 3 44 5 5 4 4 5 6 77 77 765 66654 4578 976 7 76 55 444 56777642 246654 4567 7 666 5 44 5 5

33 444 5 5 4 5 6 7777 76 5 4 56665 44 568998 77 76 5 56 7 76421 13444 45677 6 5555 5555 5

23 4 5 5 5 67 8938 7654 4566 5555 6 7 77 88887666 55 6 77 6420 01 2 3 4677 6 5 5 54

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134 4 4 5 555 78 93 88644 577666 77 654 4578 8 7 66 7 8 7 65420 0123 4567 7 665 5 54

45 444 5 55 66 67899 8 87655 7888777 7 66 54 56 7 88887777 88876 54320 1111 2 345677 655 555 44 5 5

6555 5 5 56 6 66 78 8 88 766 8999 9987 5 6555 44 689998 88 875 554333332 1234567 6 6 5 5 5 4 4 5 5

6 555 665 56 6 6 7 8 8 76 799 9 975 56 66531 1479 988 8 99865 555555420 0124567 6 6 6 5 5 5 43 34 5 6 5

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456 777 7665 5 5 6 7 877 8999877 765431 012 34567 7 6 6776543222 45 6 5 59 85 56 6

14677 888 7 6666 5 5 6 7 8876 678 887765321 02356 666 5 5555543 1 245 5 5 7 7 66 7

-467 8998 7776 5 5 6 7 7 88 85 478 9 88765410 135 6 6 5 5531 2455 5 55 7 555 67 7

-497 8 9 7 6 7865 5 6 66666 7 88 89 97 399 99 886 51 -- 11 --- 046 5 6 7 65 444 654 0 1465 56 555555 9 55 6 7 7

.....

X1= 410000.0

X2= 590000.0

Y1= 4435669.0

Y2= 4315000.0

Figure 10

57/58

TABLE VII

LEGEND TO URANIUM/POTASSIUM RATIO MAP

<u>CONTOUR VALUE</u>	<u>LOWER LIMIT</u>	<u>UPPER LIMIT</u>
-		0.80
0	0.80	1.02
1	1.02	1.24
2	1.24	1.46
3	1.46	1.68
4	1.68	1.90
5	1.90	2.12
6	2.12	2.34
7	2.34	2.56
8	2.56	2.78
9	2.78	3.00
+	3.00	

X4= 410000.0

X3= 590000.0

Y4= 4435669.0

Y3= 4435669.0

44 333 22 11 00 22

3 233331 2322 33 24421 13321 01 2342 31 46 1 23 45531 12 2211 2311 1332111- 011 100 33 249 11 121 20 1331 232 358+ 61 33 4 2 42 1 42 45

3 23 321 122 3 2 332 1 2 210 1 2 3 2 2342 23 45431 1 22 1 232 10 01 1 12 2 553 1 1 1 222 2 359 732 3 333321 2 35

23 32 1 2 33 333 32 22 1 12 222 2332 234 54321 1 2 2 2 21 0 1 1 1 2 34432 222 2 368 974 34555421 2 3

2 33333 3 3 443 11 11 22 23 2 234 5432111 1 222 32 22 1 1 111 234432 11 1 2 34677543 2 3455432 221

134554322 34 45642 12 112 222 11 234554321111 33 3 32 11 1 1 11 2 3 32 1 1 22 1 1 2 222 345543 2 2455432 1

03567531 2344 56752 12 1 1 2221 12345542 1 12433 3 321 1 1 1 22 1 1 233 21 122 1 122 2344 432 2566532 1

02576531 2344 56752 12210 1 2 332 11 234 443 1 1 3443 3321 1 1 1 22 1 1 2332 1 11 00 122 2 344 432 2356654322 1

466432 2 3 466531 2321 01 2 33 32 2 3 33 3 1 12432 2 2 1 1 1 1 1 1 2 2 1 0 0122 2 3 455543 345 5 433 2 2

54 322 3 45654333 321122 2 34432 23 3 3321 12332 11 1 1 2221 1 1 12 2 11 1 0 1 22 2 3566543 3333 43 2 2

2 33 3 45554444 32223 2 234432 2332 2 3310 12331 11 123321 1 1 1232 1 1 1 0 01 2 2 3577643 3 3443 2 22

233 34 5 4 33343 2 34432 2332 2 3321 23321 11 123331 1 1 12 21 1 10 01 2 2 2577643 3 34432 2 2

233 34444444 433 22 3432 233 2 33221 23321 1 111 2 332111 1 122 111 1 0 01 11 2 346753 3 33 33 32 22

12 2 22 33 333322 1 23 3 22 33 3442 2 2 1 222 23 3322222 1 1 1 00 11 1 12333 466532222222 33 2 111

00 12 2 2 3 3 1 1 2 3 333 34442 1 233 22 23 33 21 1 22 1 12221 124 45642 1 1233 21 0

- 01 22 2 3 3 33332 1 2 333 3 34442 22 1 1 2333 222 3 3 2 1 1 22 1 1222 0 123 3 45542 1 2332 1 0-

-01 2 2 33 3 45543222 3 3 344433332 1 2333 2 3 3 2 1 1 1 22 1 1 21 1233 345422222222 332 1 0-

1 2344 4 4433 3 33 3 455432 2332 23333 3 3 2 221 2 1 1 211 122 23443 33333333 2 1 0

1 345544444 3 2 34 23 3444 3 34565432 2332 23443 22 2 1 2332 1 2221 1 1 123443333 4 32 10

2 34555 432 234 3 345 4 432 23455442 2332 245432 2 21 1 33322 1 2221 1 10 023443 2 3 32 2211

2 3455 4444 32 3444 23 45 4 432 23455443 2332 24553 22 2 1 1234 32 1 1 2 1 1 10 012343 11 2332 2211

1 234 44 333332 3444 45 4 432 23 4432 34432 34543 222 1 234 32 1 11 11 0 123321 12 332 2210

1 2 3333 2222222 2344 4 44 4 432 11 23 33 4433 455 433 2 2222 333 2 1 0 0 110 01 22 211 2 33 22 210

1 23332 2222 3 4 4 4 4321 123 44 44 554 443 2 233 2 22210 0 11 10 01 2 22222 333 21-

1 3 43 22 3 4 4 33 321 13 4 55544 3 2 33 3 2 2 2 32100 1 10 01 11 111 23 3321 -

123443 22 3 3 4 4 3 33 2222 3 33 4 44 55 4 33 3 33 32 2 2 1 11 23210 1 1 011 1 1 123 321 -

012355422 22222 3 44433 3 3 4 5433 22 3 4 4 3 2 3 33 4 32 2 2 1 11 1 110 1 1 0 0 11 11 12 3 3 210

012345553 3 4444 565554 33 44 3 3456664 2 2 3 44 32 2 3 33 432 2 2 1 0 0 111111 1 00 11 1 21 2 3 2 1

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- 9 87776554 44444 5 6655 4 4 5 5555 666 766554 4554 3 589 9633 3333210 0 111 0 013455543 222 10 0

15 9888765 444 566 6 5554 5666 67 777 654 456653 357898632 344432111 111 1 0 01244432 1 2 10 0

14 9 98765 44 566 6 5 444 67 6 66 7 654 45664 3 4577654 3 3 4554322 11 2222 10 01234431 1 11 10-

- 8887653 3 4 44 5 6 66 5555 77 6 6 666665 4 44 4 4 55 4 3 4555322 22 2 1 00 123332 0 11 1 0

2 9877 642 3 4 4 4 5 6 765 5666 55 4444 55 4 4 444 333 455421 2 2 1 1 2 210 0 1 0

4 976 66532 3 44 3 4 55 6 78875 3 4 5 5 4 3333333 4 5555544 3 2 3466421 22 2 1 1 221 0 111 0 11

+19 96 4 57765444 43 3 4 5 6788752 3 4 4 32 2 3 45 5554 4 333332 3466531 2 3 3 2 1 12 21 22 1 0 0 11

5 854 57876555 43 3 4 5 67775322 3 4 43 2 2 3 4 4 3 2 23554322 2 1 1 2 22 2 1 0 1 2

38 88865 3 467766 54 3 4 4 4 56654433 34 43 2 2 3 3 4 4 3 2 234 3333 22 2 1 1 2 3 2 111 2

1347 96 642 245666 654 4 3 45 6543 2 45432 1 233 3 4 44443 22 2 2 3 44432 2 22 1 00 1 2 33 2 22 2

11 5 95 4542 235656 654 3 3 467653 2455321 1 23 3 3333 432 2 2 2 3 4 432 2210 0 1 2 33 2 2 2

1 139 94 343 34 54 5 54 3 34665421 1354321 12344 443 22 3 32 2 2 1 23568753 2210 01 2 22 11 2

1 79 74 44 4 55 5 54 33 3 22 4566532 1 2443 1 1234567753 1 2 22 2 1 1 35899742 2220 01 1111 1 12

03775 4 56666666 5 4 3 3 32 3577643 22 2 21 1 2457 951 01 2 2 1 1 235665322222 210 0 11 1 221 00 1

264 5 577 66765 4 3 332 358865443 2 21 13 59 71 01 2 2 2 11 22 2 210 0 1 1 1 2210 012

25444 4 68765 54 4 4 3 332 35775 3 432 1 13 59 930 0 12 22 2 2 2100 1 1 1 2210 012

433 44 468876554 4 43 2 34654 344 22 111 2347 621 1 2 222222 2 3322 2 2 210 1 1 1 1 00 1

22 34 4677 65654 4 43 2 34 43 35764 2222 2 347 852 2 33333 3 432 3 33 2 11 2 10 1 11 1 111111 2

01 23 3 566 5 654 4553 2 3 32 248 964 3 22 4 953 23 44 455433 22 2 21 1 10 1 11 1 0 12222

-0133 35654 4554 3 4653 2 3 32 239 63 332 1 1 29 8532 234 4 4565332 1 221 1 10 1 2 2210 012 332

- 133 2 66542 44 32 3771 12 2 2531 1 26 4 3 3331 21 9 + 954321 145 553 695 4421 1 41 02 1 0 1 22 1 232 02 332

X1= 410000.0

X2= 590000.0

Y1= 4435000.0

Y2= 4435000.0

TABLE VIII

LEGEND TO URANIUM/THORIUM RATIO MAP

<u>CONTOUR VALUE</u>	<u>LOWER LIMIT</u>	<u>UPPER LIMIT</u>
-		0.200
0	0.200	0.242
1	0.242	0.284
2	0.284	0.326
3	0.326	0.368
4	0.368	0.410
5	0.410	0.452
6	0.452	0.494
7	0.494	0.536
8	0.536	0.578
9	0.578	0.620
+	0.620	

X4= 410000.0

X3= 590000.0

Y4= 4435669.0

Y3= 4435669.0

.....

55 333 22 00 -- 22

2 132220 4543 442 4322 13210- 011352 21 240 123 44 42 13 322 3411 2543 32-- 11 110 452 3444 3333 400 431 24311 4531- 23 42 2 12 21 23

2 12 21 123 3 33 32 1 2210 011233 2 221 12 34 4321 22 332 244 3320 0122 1 1343 344 3 311 22 2332 23431 01 2 21 1 23

12 2 123 3 2 111 0 0122222 2211 2 34 4321 2 332 234 3210 1 22 2 33 4 4 3 32 111 2 22 33210 01 2 21 1 2

12 32222 3 44 3321 0 00 1 1111 221 2 34 4321 2 3322 23 3 210 122222 3 45554 3 3 32 1 2 2 2 2 0 0 12 222 10

1245543 2 34 4 4 5310 0 1 12 21 2 34 43 2 1 233 3 32 2 210 0 12 3 22 4567543 22 3321 0 12 1 10 012 2 1 0

0256753 34 4 455420 1 0 111 2 21 23 4 43 21 12443 332 2 210 123 432 246776432 2 3210 0 12 1 1 1 0 023333 2 1 0

0257663 34 4 456520 0110 0 122 3333 2 23 4 4321 123443 332 2 210 0123 32 23566543 2 2210 012 1 22110 1344 3 2 10

56643 23 4565311 2110 2 3 44443 2 3 3333321 12432 2332 2 2 10 012332 23454 3 2 10 12 2 22 2210 1233333 221

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34 32 23456655 43 34 43 46653 2442 23321 2333 232 1 23 31 123321 123432 2 210 0123332 22 34431 1 22 33 2

44 3 22 45 544443 3 332 235542 23443 344322 3332 33 2 234432 2 3321 1 3 3 2 210 12 3222 2 3 310 022 22 33 222

33 2 22 34433 3 222 11 2343 2 3444 56542 23332 2 3 3 2 234544333 321 12 33 3 21 234321 12 3321 12 2 2333 2 11

11 12 2 23 32 3 3 2 12 33 344 567642 22 2 2344 3 2 23454 444 32 1 12 34 3 332 234432 233 2 2 21 1 123332 1 1

- 0122 23 32 3 3 2221 12 33 344 5776422 2 234443 2 3455 4 3 2 11 2 3443 3321 34432 2 2 2 222 1 233321 0

- 1 23 32 3 3 3 43321 2 33 3 44 5676544432 23454 3333 4555 43 2 22 3443 3 32 234431 2 2 1 2 3 32222 332 1 0

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210 0145 5 55420 01344 3 3455 432 34 43 32 3554 357874 4 432 24553 3 4 43 34432 23321 0123332 23 432 22 1

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21 0 234 4 4 4320 123 3 44 44 432 234 44432 4664 566543 44 33 2 34553 3 44 3 3 2 23320 0123321 1232 220

0 1 233 222 3 32 00 123 4444 4 5442 2 3 45665 4554 4 3 3333 4443 3 4 32 2 22 3210 012 332111 2 32 2 20

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- 123566642 345655 67876 443 2 45543 3579 976643 232 2 1 24554 443 3443 10 0235554 32 1 1 2 2 2222 1 123 3 22

- 234677753 456665 56654 432 245653 3467876 6532 2 3 3 21 23 3 34543 45 42 1 00 1345 4 321 1 2 3 2 333321 12 33 22

134577 765 67776 5 554 43 2 45653 34 567766 643333 4 3 22 2 3 3 3455 666653322 111 123 3 22 111 1 233 3 44442 1 23321

357888888 99997 66 5555 43 3455433 44 5 66 776555555444433 444 4 567899754 33333321 12 2 22 1 13 45555432 2 21-

579 9 9 87776 66665433 45543 44 44 57887777766 555555 5 6655 57 8654 4555421 22 2 22 21 124566543 22 2 21 0

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-58 88 8 8865 5676543 4555 554 3 4799999987 6666 6 5 6655 68 8655 4 56 6544433333 321 2455542 111 21-

58 99 8 8764 356 543 4555 55 555 6899 99876 55 66 5 54 5679 987655 566 43 44444 321 12345432 1 1 10

479 999 987 643 455 43 455 5 6 678888 8 87 5 444 5 4 555 6787 654444 665 4 4 321 1 234431 1 1

258 999 86 677543 4 4 3 4 5 66666 6 6 7 6 78764 3 22 3 4 566 55 6 5 4 3 4665 3 456655 444 311 13443 1111 1 2

8 37899 8 575 6898754 43 34 56 6 77654 44 4567753 2 2 3 45555 55 43 345653 3566 6 5 4 32 12343222 1 1 22

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134 5 67876 4 57888776 54 3 455 44 4 3 45665 3 2 3333 3 4 5 4 3 3 3 22 34 5 54 322 333 4444321 11 233

1 2 3 3 5675 4577 788765444 3 344 3 45554 2 3566542 2 344 33 4 4554 3 2 111 2 34554 3 22 33 4 4432 1 2 344

11 12 2 235653 4677 6789754 43 33 467753 2466532 234554 33 4554 3333 21 1 34554 32 1 23 333333 2 2344

1 22 3554 56 6 56787 5 43 33 467642 2355432 23455444 3 2 344 3 21 1233 3 4554 320 02 222 22 233

0 2 2 23554 467775 6776 54 3 3 2 356653 24 43 2 3455 65432 23 3 21 2455554 5 44420 012 2 2 22 1 23

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244 554 46788887 54 443 246643 3321 12 33 465 830 023 3 3 3 34566 5 4 4211 2 2 23444310 012

3 454 46788776 555 54 443 245532 2442 1 2 3 458 630 0 1233 3 3 3 45676 4 4 432 2 2 1 1 2332 10 2

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- 1332 135 43 3 3 44 5763 3 3 2652 0138 3 3 2331 32 - ++ 75432 2355 23 496 55 2221 5 24 4 3 2 33 22 342 133 432

.....

X1= 410000.0

X2= 590000.0

Y1= 4215000.0

Y2= 4315000.0

TABLE IX

LEGEND TO THORIUM/POTASSIUM RATIO MAP

<u>CONTOUR VALUE</u>	<u>LOWER LIMIT</u>	<u>UPPER LIMIT</u>
-		3.101
0	3.101	3.446
1	3.446	3.791
2	3.791	4.136
3	4.136	4.481
4	4.481	4.826
5	4.826	5.171
6	5.171	5.516
7	5.516	5.861
8	5.861	6.206
9	6.206	6.551
+	6.551	

X4= 410000.0

X3= 590000.0

Y4= 4435669.0

Y3= 4435669.0

.....+

22 333 44 44 66 44

755555542 3222 34543 3 45 764 43 4423 78544 45 673 23 33222 222 42 22111 23 331 2222 3 84210 1- 1355 43332 36+++++ 5433 34652 68 777

7 543333 3 34 4 3 4 5 6655543 4 4665 4 5 532 332 2 33 2 2 2 2 2 345431 00 134 4 3 469 85 6666653 5777 7

5 55544 3 3 4 4 45 6 55444 4565 44 55 5 3 2 2 2 2 22 34 42 1 0 1345 44 3 46 9 8 998753 46 7

5 5 5555 4 3 3 455444 566 5 555444 4 33 4 5543 3333333 222222 3 2 11 2 32 1 1235 55544 4 69 9 9998753 456 7

4 5 4 3 4 3 35665 5666 5 5 555 44432 23455543 3 4444 3 2 2 333 32 1 1 1 000 11 2345 5 4 5689 88 87653 4 67

34 4 3 34 43 35666 66 5 44 4444 32 23455543 3 4 432 2 3444321 1 10 0 1 1234 5 55 5678 98 8753 4567

34 4 3 4 43 35666 4 6654 3333 3 233 2 3 455 43 3 44 444 32 2 34554321 1 1 0 0 123 4 5 4 56789 9987543 3 46

4 444 4 5 43 45 54 456543 2 2 3 4 55 43 3 44 4 333 2 2 34 554321 1 11000 1 2 344 4566 79 9876 543 3 5

3 3 455 4 44 4 55432 2 3 4 43 2 3 443 2 22 3 4 44321 1 2222 111 1 2 34565 6 97 6 6543 4

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-02344 3 444 4 5 4 23 44 32 2 222 222 3 3 33 2 22 111 11 0 0 1 2 4565 68 97654 4333 2

-134 43 3 4 4 4 4 5665554 444 32 2 2 222 3 3 2 2 2 2 1 1 1 0 0 1 2 4566 8 853 3 3 3 2

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4 45677765 5 543 2 2322 1 2 3 3 4 42 245 5 543 4786 78 86432 23 7 6555543210 121 1342 00 1 2 3 3 2 33 3

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.....+

X1= 410000.0

X2= 590000.0

Y1= 4215000.0

Y2= 4215000.0

Valley, reaching maximum values in excess of 53,710 gammas along the east central sheet margin and between 53,510 gammas and 53,610 gammas in the northeast. These anomalies presumably arise from a deep seated source in the basement, as the Sacramento Valley is a broad geosynclinal basin.

A long, discontinuous chain of intense positive anomalies is present in the east center, trending north-south. It is correlated with the outcropping Mesozoic ultrabasic intrusive (ub) complex exposed along the Stony Creek fault system. Less intense positive anomalies in the central part of the map sheet are associated with a smaller complex of Mesozoic ultrabasic intrusives exposed south of Round Valley.

Elsewhere on the Ukiah quadrangle, the total magnetic intensity pattern has modest relief, indicating relatively deep seated basement.

A total of thirty-three anomalies arising from uranium radiation and fourteen from thorium radiation have been recognized and delineated in the study of the standard deviation anomaly maps and the individual radiometric profiles. Of the uranium features, most are correlated with exposures of the Franciscan Formation (KJf) or the marine Cretaceous sediments (K, Kl). The same is true of the thorium anomalies. No discrete thorium anomalies were observed over exposures of Quaternary fan deposits (Qf), despite the presence of extreme concentrations in the thorium spectral window, and it must be concluded that the thorium-rich zones inferred from the histogram studies are extremely small. There are, however, two uranium anomalies delineated over the Quaternary fan deposits (Qf), on line 790, fiducials 11290-11320 and fiducials 11450-11470, designated Anomalies 14 and 15 respectively. Both of these have modest gamma radiation expression.

Uranium Anomaly 1, line 690, fiducials 5250-5280, is located in the unmapped area in the north center. Extrapolation of the known geology suggests that the anomaly probably arises from rocks of the Franciscan Formation (KJf).

Throughout the survey, the atmospheric radon correction (BIAC) was extremely erratic. For this reason, some of the delineated anomalies may be unreliable.

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A P P E N D I X A

Geologic Legend

GEOLOGIC LEGEND

<u>Aero Symbol</u>	<u>Map Symbol</u>	<u>Unit Description</u>
---	Qs	Recent dune and coast sand
QAL	Qal	Recent alluvium
QSC	Qsc	Recent river and major stream channel deposits in the Great Valley
QF	Qf	Recent alluvial fan deposits in the Great Valley
QB	Qb	Recent basin deposits in the Great Valley
---	Qrv	Recent volcanic rocks, including:
---	Qrv ^r	rhyolite
---	Qrv ^a	andesite
---	Qrv ^b	basalt
QRVP	Qrv ^p	pyroclastic rocks
QT	Qt	Pleistocene to Recent nonmarine terrace deposits
QM	Qm	Pleistocene marine and marine terrace deposits
QC	Qc	Pleistocene nonmarine sedimentary deposits
---	Qpv	Pleistocene volcanic rocks, including:
---	Qpv ^r	rhyolite
---	Qpv ^a	andesite
---	Qpv ^b	basalt
---	Qpv ^p	pyroclastic rocks
QP	QP	Pliocene-Pleistocene nonmarine sedimentary deposits
---	*	Quaternary and/or Pliocene cinder cones
PUC	Puc	Upper Pliocene nonmarine sedimentary rocks
PML	Pml	Middle and/or lower Pliocene marine sedimentary rocks
---	Pv	Pliocene volcanic rocks, including:
---	Pv ^r	rhyolite
---	Pv ^a	andesite
---	Pv ^b	basalt
PVP	Pv ^p	pyroclastic rocks
---	Mm	Middle Miocene marine sedimentary rocks

<u>Aero Symbol</u>	<u>Map Symbol</u>	<u>Unit Description</u>
—	E	Eocene marine sedimentary rocks
EP	Ep	Paleocene marine sedimentary rocks
—	Tv	Tertiary volcanic rocks, including:
—	Tv ^r	rhyolite
—	Tv ^a	andesite
TVB	Tv ^b	basalt
—	Tv ^p	pyroclastic rocks
K	K	Undivided Cretaceous marine sedimentary rocks
KU	Ku	Upper Cretaceous marine sedimentary rocks
KL	Kl	Lower Cretaceous marine sedimentary rocks
KJF	KJf	Franciscan Formation
KJFV	KJfv	Franciscan volcanic and metavolcanic rocks
UB	ub	Mesozoic ultrabasic intrusive rocks
JK	JK	Knoxville Formation
MS	ms	Pre-Cretaceous metasedimentary rocks
MV	mv	Pre-Cretaceous metavolcanic rocks
U		Areas of unknown or incompletely mapped geology
W		Water

A P P E N D I X B

List of Geologic Units by Anomaly

List of Geologic Units by Anomaly

(Uranium Anomalies)

<u>Anomaly</u>	<u>Formation</u>	<u>Line</u>	<u>Fiducial Interval</u>	<u>Brief Description</u>
1	U	690	5250-5280	Moderate U, no perceptible Th, modest U/Th
2	Qc	690	6450-6470	Moderate U, slight Th, modest U/Th, modest U/K
3	KJf	3010	5260-5280	Strong U spike, minor Th, small U/Th
4	KJf	710	1710-1750	Strong U, slightly lower Th, no U/Th, U/K, Th/K
5	KJf	710	2010-2030	Moderate U, slight Th, slight U/Th, U/K
6	KJf	730	1990-2020	Strong U, slight Th, strong U/Th, slight U/K
7	KJf	750	18720-18750	Strong U spike, little Th, slight U/Th and U/K
8	KJf	3020	1540-1580	Regional strong U, smaller Th, small U/Th
9	Kl	3040	2180-2240	Strong irregular U peaks, minor Th, irregular U/Th and U/K
10	K KJf	770	14530-14560	Moderate U spike, slight Th, minor U/Th
11	KJf	770	14900-14930	Intense U spike, slight Th, strong U/Th, minor U/K
12	KJf	790	9630-9650	Strong U spike, no Th, good U/Th, slight U/K
13	KJf	790	9940-9990	Strong U anomaly, no Th or K, strong U/Th, minor U/K
14	Qf	790	11290-11320	Modest irregular U, no Th, strong U/Th
15	Qf	790	11450-11470	Modest U, no Th or K, strong U/Th and U/K
16	ms	3030	6380-6450	Moderate U, minor Th, irregular U/Th and U/K

<u>Anomaly</u>	<u>Formations</u>	<u>Line</u>	<u>Fiducial Interval</u>	<u>Brief Description</u>
17	ms	3030	6290-6320	U spike, no discrete Th, small U/Th, no U/K or Th/K
18	K	830	6400-6430	Strong U spike, modest Th, slight U/Th
19	Kl	830	7120-7210	Regional increase in U, no unusual Th, strong U/Th, U/K
20	Qm	850	3520-3560	Irregular U spike, no Th, strong U/Th, U/K
21	K	850	3620-3700	Irregular regional U, no Th, irregular strong U/Th, slight U/K
22	K	850	3840-3890	U peak, minimal Th, strong U/Th, smaller U/K
23	KJf ub	850	4200-4300	Regional irregular U, modest Th, irregular U/Th and U/K
24	KJf	3030	5900-5920	Regional increase in U, no Th, strong U/Th, moderate U/K
25	K	870	5750-5780	U spike, slight Th, moderate U/Th, slight U/K
26	K	890	3930-3980	Dual U spike, no Th, strong U/Th and U/K
27	K	890	4070-4090	Intense U spike, no Th, intense U/Th and U/K
28	K	890	4150-4220	Strong dual U anomalies, no Th, strong U/Th, moderate U/K
29	K	890	4270-4300	Moderate U peak, slight Th, moderate U/Th and U/K
30	KJf	890	4770-4820	Strong irregular U, comparable dual Th, moderate U/Th and moderate U/K
31	K	910	1400-1420	Strong U spike, weak Th, good U/Th and U/K
32	KJf	910	1980-2010	Strong U spike, weak Th, ratio anomalies obscured by adjacent anomaly
33	KJf	910	2770-2800	Strong U spike, no Th, strong U/Th, slight U/K

List of Geologic Units by Anomaly

(Thorium Anomalies)

<u>Anomaly</u>	<u>Formations</u>	<u>Line</u>	<u>Fiducial Interval</u>	<u>Brief Description</u>
I	KJf	690	4320-4520	Irregular regional Th, lower U, no U/Th, U/K, Th/K
II	JK	690	5800-5830	Strong Th peak, slightly lower U, no U/Th, U/K, Th/K
III	KJf	710	1200-1230	Strong Th, no U, no U/Th, U/K, Th/K
IV	KJf K	750	17480-17520	Strong irregular Th, modest U, no U/Th, U/K, Th/K
V	Ku Ep	750	17790-17840	Strong Th spike, modest U, no U/Th, U/K, Th/K
VI	KJf Qal	810	12150-12220	Dual peak Th, slight U, no U/Th, U/K, Th/K
VII	ms	850	5260-5300	Strong Th spike, comparable U, no U/Th, U/K, Th/K
VIII	K	870	5610-5690	Dual peak Th, lesser U, no U/Th, U/K, Th/K
IX	KJf ub	890	5760-5830	Regional irregular Th, smaller U, no U/Th, U/K, Th/K
X	K	910	1000-1050	Regional Th, slight U, no U/Th, U/K, Th/K
XI	K	910	1170-1200	Regional irregular Th, no U, no U/Th, U/K, Th/K
XII	KL	910	2960-3010	Irregular regional Th, minor U, no U/Th, U/K, Th/K
XIII	KL Ku	910	3130-3190	Irregular regional Th, lesser U, irregular slight U/Th, no U/K, Th/K
XIV	Ku Puc	910	3230-3280	Th spike, no U, no U/Th, U/K Th/K

A P P E N D I X C

List of Anomalies by Geologic Unit

List of Anomalies by Geologic Unit

<u>Aero Symbol</u>	<u>Formation</u>	<u>No. of Samples</u>	<u>No. of U. Anomalies</u>	<u>No. of Th. Anomalies</u>
QAL	Qal	1363	-	1
QF	Qf	3519	2	-
QM	Qm	221	1	-
QC	Qc	924	1	-
PUC	Puc	1589	-	1
EP	Ep	14	-	1
K	K	8665	10	4
KU	Ku	1310	-	3
KL	Kl	2291	2	2
KJf	KJf	14892	15	5
UB	ub	1300	1	1
JK	Jk	1141	-	1
MS	ms	2649	2	1
U	unmapped	522	1	-

ALL OTHER GEOLOGIC UNITS HAVE NO ASSOCIATED ANOMALIES

A P P E N D I X D

Mean Radiometric Values by Geologic Unit

MEAN VALUE BY GEOLCCIC MAP UNIT

UKIAH

QUAD

LINE 690

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
W	0.0	0.0	0.0	0.0	0.0	0.0
K	0.33	1.50	15.36	0.321	1.453	4.552
PML	0.29	1.23	14.52	0.311	1.277	4.176
KU	0.31	1.28	14.90	0.288	1.248	4.376
KJF	0.31	1.29	14.57	0.295	1.291	4.425
U	0.27	1.03	14.25	0.272	1.066	3.965
MS	0.19	0.57	9.88	0.349	1.328	3.876
UB	0.07	0.36	2.90	0.308	1.860	4.975

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
JK	0.27	1.24	16.52	0.323	1.074	3.344
KL	0.21	1.02	13.95	0.327	1.100	3.356
PUC	0.25	0.96	11.23	0.275	1.333	4.842
PVP	0.24	0.70	9.22	0.200	1.101	5.483
CC	0.23	0.94	8.74	0.290	1.851	6.154
CAL	0.23	0.64	6.63	0.193	1.377	7.418
CF	0.22	0.87	9.88	0.273	1.268	4.687
CSC	0.28	0.97	14.03	0.264	1.048	4.096

LINE 710

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
W	0.11	1.15	4.73	0.678	3.090	4.151
K	0.31	1.47	14.55	0.337	1.473	4.375
KU	0.25	1.16	10.75	0.321	1.546	4.837
UB	0.09	0.53	4.58	0.348	1.460	3.596
KJF	0.29	1.14	13.67	0.276	1.197	4.367
QAL	0.24	0.95	10.84	0.273	1.241	4.665
MS	0.22	0.94	13.52	0.301	0.983	3.311
QSC	0.23	0.58	13.25	0.301	1.063	3.583

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
MV	0.19	0.66	11.12	0.254	0.868	3.435
JK	0.26	1.28	17.03	0.359	1.109	3.092
KL	0.24	1.10	14.50	0.323	1.157	3.556
PUC	0.23	0.85	9.40	0.265	1.413	5.280
PVP	0.26	1.07	11.38	0.282	1.326	4.719
CC	0.18	0.66	5.13	0.257	1.967	8.099
CF	0.21	0.82	8.01	0.249	1.400	5.779

LINE 720

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
K	0.30	1.55	13.63	0.369	1.657	4.520
KJF	0.28	1.37	14.31	0.345	1.400	4.092
UB	0.16	0.99	8.84	0.326	1.062	3.227
PML	0.25	1.35	10.75	0.378	1.798	4.765
QAL	0.26	1.28	13.70	0.309	1.335	4.342
MS	0.30	1.54	16.52	0.360	1.355	3.812
KJFV	0.23	1.63	15.87	0.494	1.483	3.005
QSC	0.23	1.15	12.65	0.355	1.336	3.800

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
JK	0.31	1.37	19.13	0.301	0.987	3.347
KL	0.24	0.88	15.49	0.252	0.785	3.152
PUC	0.18	0.75	9.25	0.298	1.162	3.990
KU	0.20	0.98	10.54	0.340	1.372	4.247
TVE	0.36	1.20	16.89	0.234	1.027	4.419
CF	0.25	0.96	10.78	0.274	1.299	4.830
CC	0.20	0.94	5.23	0.324	2.498	8.391

LINE 750

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
W	0.22	1.56	9.56	0.398	1.251	3.066
K	0.29	1.33	13.37	0.319	1.432	4.565
KJF	0.31	1.43	16.20	0.331	1.323	4.046
QT	0.30	1.43	13.45	0.333	1.566	4.745
QAL	0.28	1.27	15.85	0.323	1.175	3.714
KJFV	0.29	1.38	15.70	0.333	1.302	3.932
PML	0.22	1.43	12.87	0.451	1.922	4.288
KU	0.37	1.84	21.84	0.345	1.211	3.581
EP	0.41	1.65	23.98	0.285	0.990	3.488

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
UB	0.24	1.03	12.37	0.339	1.358	3.842
MS	0.27	1.32	15.35	0.346	1.243	3.590
MV	0.18	1.06	9.55	0.417	1.592	3.893
JK	0.27	1.48	16.14	0.390	1.372	3.525
KL	0.25	0.96	16.29	0.267	0.839	3.179
PUC	0.16	0.68	7.37	0.282	1.366	4.689
CF	0.22	0.96	10.48	0.312	1.345	4.334
CC	0.22	0.58	6.62	0.307	2.119	7.145
CSC	0.29	0.84	14.52	0.202	0.850	4.192

QUAE

770

UNIT	E T/CR	E URN	POT PCT	U/TH	U/K	TH/K
MS	0.26	1.30	14.02	0.348	1.320	3.843
JK	0.27	1.44	16.40	0.391	1.283	3.378
KL	0.22	0.95	14.44	0.306	0.957	3.180
KU	0.35	1.45	21.73	0.283	0.950	3.397
PUC	0.26	0.93	14.26	0.241	0.905	3.846
CF	0.26	1.13	12.03	0.308	1.387	4.569

790

UNIT	E T/CR	E URN	POT PCT	U/TH	U/K	TH/K
KL	0.22	1.23	14.88	0.409	1.249	3.095
W	0.19	1.65	13.28	0.559	1.807	3.026
KU	0.31	1.43	19.57	0.322	1.056	3.326
FUC	0.27	0.83	14.40	0.222	0.901	3.964
CF	0.26	1.15	19.79	0.311	1.256	4.079
QB	0.29	1.10	11.63	0.267	1.404	5.291

£ 10

UNIT	E T/CR	E URN	POT PCT	U/TH	U/K	TH/K
MS	0.29	1.27	15.88	0.309	1.184	3.851
UE	0.28	0.80	17.56	0.206	0.661	3.329
JK	0.31	1.15	20.06	0.252	0.817	3.239
KU	0.40	1.60	23.05	0.284	0.999	3.603
CF	0.30	1.22	17.83	0.279	0.991	3.680
CE	0.25	1.20	11.54	0.344	1.524	4.522
CSC	0.26	1.28	13.27	0.345	1.419	4.114

-E-30-

UNIT	E TPCR	E URN	POT PCT	U/TH	U/K	TH/K
KJFV	0.14	1.05	8.00	0.554	2.030	3.623
CT	0.20	1.29	9.83	0.468	1.970	4.332
JK	0.26	1.28	16.17	0.333	1.139	3.424
KU	0.37	1.56	22.11	0.291	0.992	3.472
PUC	0.40	1.64	21.12	0.281	1.115	3.975
CF	0.32	1.92	16.64	0.419	1.653	3.956
CE	0.24	1.23	12.26	0.356	1.472	4.311
CSC	0.25	0.93	14.01	0.266	0.976	3.704

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QUAC

LINE 850

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K	UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
W	0.06	1.06	1.91	0.557	6.078	10.933	KJFV	0.13	1.48	9.44	0.864	2.275	2.721
QM	0.18	1.48	3.67	0.603	4.611	8.958	KL	0.23	1.41	14.70	0.439	1.406	3.234
K	0.27	1.83	12.37	0.494	2.386	4.796	MS	0.30	1.45	15.84	0.341	1.326	3.911
QAL	0.29	1.74	14.58	0.433	1.809	4.280	JK	0.29	1.28	18.27	0.305	0.999	3.273
KJF	0.32	1.69	14.75	0.373	1.701	4.616	KU	0.34	1.60	20.45	0.345	1.143	3.414
UB	0.10	0.70	5.29	0.410	1.736	4.252	CF	0.28	1.26	15.68	0.331	1.210	3.690
QT	0.26	1.70	9.99	0.461	2.483	5.346	PUC	0.33	1.30	17.83	0.271	1.046	3.872
QP	0.33	1.22	12.33	0.254	1.409	5.554	CB	0.27	1.10	13.57	0.291	1.198	4.178
QSC	0.28	0.99	15.68	0.249	0.926	3.719							

LINE 870

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K	UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
W	0.12	0.65	4.62	0.430	1.743	3.988	KL	0.24	1.22	14.71	0.360	1.225	3.409
K	0.29	1.56	13.64	0.382	1.793	4.848	UB	0.07	0.47	3.82	0.243	1.504	4.544
QAL	0.27	1.28	15.46	0.335	1.213	3.657	MS	0.29	1.40	17.85	0.336	1.137	3.482
QM	0.21	0.76	7.14	0.265	1.875	6.951	JK	0.16	0.48	9.33	0.194	0.679	4.093
KJF	0.35	1.66	17.51	0.333	1.373	4.186	KU	0.33	1.58	20.43	0.359	1.130	3.272
QP	0.27	1.36	12.33	0.349	1.593	4.562	CB	0.24	1.03	13.10	0.305	1.158	3.868
QT	0.23	1.45	12.77	0.472	2.055	4.622	CF	0.22	1.22	12.83	0.387	1.386	3.618
KJFV	0.25	1.26	19.74	0.358	0.942	2.642	CSC	0.25	1.40	14.09	0.398	1.441	3.728

LINE 890

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K	UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
W	0.07	0.64	2.30	0.561	3.705	6.536	KJFV	0.35	1.43	17.62	0.282	1.164	4.139
QM	0.30	1.80	12.92	0.422	2.275	5.157	UB	0.15	0.97	7.56	0.355	1.515	4.474
K	0.31	1.93	15.60	0.443	1.843	4.199	JK	0.12	0.75	4.91	0.546	2.777	5.423
QT	0.30	1.94	11.16	0.449	2.663	6.054	KL	0.27	1.34	16.79	0.355	1.169	3.306
QAL	0.29	1.54	13.82	0.360	1.633	4.624	KU	0.27	1.48	16.52	0.394	1.350	3.378
QP	0.44	1.67	17.44	0.267	1.419	5.280	CF	0.28	1.24	17.61	0.319	1.039	3.324
KJF	0.36	1.58	17.74	0.310	1.300	4.236	PUC	0.29	1.02	15.87	0.251	0.931	3.748
QB	0.28	0.85	14.81	0.218	0.843	3.890							

LINE 910

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K	UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
W	0.13	0.71	9.26	0.285	1.290	4.616	CP	0.25	1.28	11.56	0.364	1.632	4.562
K	0.35	1.67	16.37	0.340	1.527	4.519	UB	0.17	0.08	10.38	0.065	0.207	3.414
QM	0.41	1.04	20.17	0.178	0.744	4.237	JK	0.20	0.92	10.41	0.309	1.404	4.444
QAL	0.19	1.14	9.95	0.469	2.144	4.531	KL	0.21	1.06	12.92	0.330	1.196	3.506
QT	0.28	2.13	14.12	0.536	2.164	4.141	KU	0.29	1.39	18.68	0.332	1.064	3.243
KJFV	0.17	1.87	9.67	0.837	3.472	3.430	PUC	0.28	1.12	14.89	0.283	1.124	4.006
KJF	0.34	1.49	14.92	0.314	1.484	4.842	CF	0.26	1.21	13.28	0.336	1.352	4.112
QRVP	0.16	0.86	10.90	0.378	1.216	3.174	CB	0.36	1.96	16.27	0.382	1.740	4.572
QSC	0.34	1.78	16.94	0.367	1.522	4.182							

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LINE 3000

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
K	0.29	1.30	14.14	0.316	1.376	4.290
K	0.29	1.30	14.14	0.316	1.376	4.290

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
K	0.29	1.30	14.14	0.316	1.376	4.290

LINE 3010

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
K	0.27	1.75	13.22	0.457	1.962	4.353
KJF	0.35	1.51	15.26	0.314	1.449	4.747

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
QAL	0.31	0.92	13.80	0.210	1.022	4.784
CT	0.33	1.38	13.07	0.297	1.554	5.216

LINE 3020

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
UB	0.16	1.02	8.51	0.383	1.593	4.268
K	0.36	1.63	17.46	0.319	1.382	4.377
QC	0.37	2.12	17.97	0.356	1.712	4.337
QAL	0.34	1.24	15.92	0.260	1.134	4.444
QP	0.31	1.28	13.62	0.297	1.410	4.691

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
CT	0.19	1.14	8.10	0.332	1.465	5.380
W	0.11	0.82	4.87	0.469	2.447	4.543
KJF	0.25	1.28	12.53	0.359	1.531	4.272
KL	0.15	1.92	11.12	0.869	2.493	2.886
MS	0.23	1.32	11.98	0.379	1.481	4.165

LINE 3030

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
QAL	0.27	1.77	13.74	0.488	1.944	4.175
W	0.04	0.70	3.14	0.844	4.054	3.977
KJF	0.31	1.48	15.03	0.350	1.448	4.241
KJFV	0.17	1.11	9.07	0.473	1.822	3.955

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
MS	0.23	1.13	11.99	0.342	1.372	4.029
UB	0.24	1.10	11.06	0.319	1.423	4.470
MV	0.19	0.37	8.18	0.124	0.591	4.707
U	0.24	0.95	12.38	0.283	1.117	4.097

-90-

VOICE ELECTRONICS INC.

QUAE

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UNIT	E T/CR	E LRN	PCT PCT	U/TH	U/K	TH/K
CT	0.26	1.42	13.22	0.381	1.565	4.169
K	0.19	1.18	11.58	0.406	1.368	3.667
W	0.11	0.51	7.31	0.237	0.734	3.388
CAL	0.19	0.78	12.08	0.280	0.946	3.375
PUC	0.19	0.59	8.48	0.213	0.998	4.722

A P P E N D I X E

Standard Deviation Table

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QUAD

FORMATION

W

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	331	0.46	LEGNORMAL	0.02	0.06	0.17	1.22	3.27	8.78
E URANIUM	360	0.54	LEGNORMAL	0.08	0.15	0.28	1.04	2.01	3.87
POTASSIUM	265	0.07	LEGNORMAL	0.00	0.01	0.02	0.20	0.60	1.79
EU/K	129	0.62	LEGNORMAL	0.05	0.12	0.27	1.41	3.22	7.35
EU/ETH	126	0.15	LEGNORMAL	0.02	0.04	0.08	0.27	0.51	0.94
ETH/K	129	4.15	NORMAL	1.19	2.19	3.15	5.15	6.15	7.20

FORMATION

CAL

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	1320	4.40	NORMAL	0.43	1.76	3.08	5.72	7.05	8.37
E URANIUM	1273	1.26	NORMAL	-0.66	-0.02	0.62	1.90	2.54	3.18
POTASSIUM	1300	1.03	NORMAL	0.06	0.38	0.70	1.35	1.67	2.00
EU/K	1240	1.23	NORMAL	-0.24	0.25	0.74	1.72	2.20	2.69
EU/ETH	1241	0.23	LEGNORMAL	0.05	0.09	0.14	0.38	0.62	1.00
ETH/K	1240	4.32	NORMAL	1.29	2.30	3.31	5.33	6.34	7.35

FORMATION

QT

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	385	4.15	NORMAL	1.18	2.18	3.15	5.20	6.21	7.21
E URANIUM	369	1.35	LEGNORMAL	0.60	0.78	1.03	1.78	2.33	3.07
POTASSIUM	379	0.87	NORMAL	0.20	0.42	0.65	1.09	1.32	1.54
EU/K	359	1.51	LEGNORMAL	0.46	0.65	1.02	2.23	3.31	4.90
EU/ETH	359	0.30	LEGNORMAL	0.11	0.15	0.21	0.41	0.57	0.78
ETH/K	359	4.74	NORMAL	1.69	2.71	3.72	5.75	6.77	7.79

FORMATION

CC

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	924	3.28	NORMAL	1.01	1.77	2.52	4.03	4.79	5.54
E URANIUM	837	0.84	NORMAL	-0.24	0.12	0.48	1.15	1.55	1.91
POTASSIUM	924	0.51	NORMAL	-0.20	0.04	0.28	0.75	0.95	1.22
EU/K	837	1.36	LEGNORMAL	0.41	0.61	0.91	2.02	3.01	4.49
EU/ETH	837	0.24	NORMAL	-0.05	0.05	0.15	0.34	0.44	0.54
ETH/K	837	5.58	LEGNORMAL	1.76	2.55	3.80	8.15	12.03	17.66

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CLAD

FORMATION

QB

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	1805	3.86	NORMAL	1.57	2.33	3.09	4.62	5.38	6.15
E URANIUM	1769	1.01	NORMAL	-0.13	0.25	0.63	1.35	1.77	2.15
POTASSIUM	1800	0.93	NORMAL	0.40	0.58	0.75	1.11	1.29	1.47
EU/K	1756	1.06	NORMAL	-0.16	0.25	0.65	1.46	1.86	2.27
EU/ETH	1760	0.26	NORMAL	-0.03	0.06	0.16	0.35	0.45	0.54
ETH/K	1756	4.00	NORMAL	2.03	2.69	3.35	4.66	5.32	5.98

FORMATION

QF

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	3519	5.14	NORMAL	2.07	3.09	4.12	6.17	7.20	8.22
E URANIUM	3252	0.95	NORMAL	-0.15	0.23	0.61	1.37	1.74	2.12
POTASSIUM	3323	0.93	NORMAL	0.02	0.33	0.63	1.24	1.54	1.85
EU/K	3252	1.04	NORMAL	-0.24	0.19	0.61	1.46	1.89	2.31
EU/ETH	3252	0.24	NORMAL	-0.03	0.06	0.15	0.32	0.42	0.51
ETH/K	3252	4.24	NORMAL	1.54	2.44	3.34	5.14	6.04	6.94

FORMATION

QM

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	221	2.66	LCGNORMAL	0.84	1.23	1.81	3.92	5.77	8.49
E URANIUM	190	0.47	LCGNORMAL	0.09	0.16	0.27	0.81	1.40	2.41
POTASSIUM	209	0.55	NORMAL	-0.40	-0.08	0.24	0.87	1.19	1.51
EU/K	151	0.74	LCGNORMAL	0.03	0.09	0.26	2.07	5.78	16.17
EU/ETH	190	0.14	LCGNORMAL	0.02	0.04	0.08	0.26	0.48	0.89
ETH/K	151	4.72	LCGNORMAL	1.18	1.87	2.97	7.49	11.89	18.87

FORMATION

QP

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	408	4.77	NORMAL	1.65	2.69	3.73	5.81	6.85	7.89
E URANIUM	406	1.31	NORMAL	-0.01	0.43	0.87	1.75	2.19	2.63
POTASSIUM	408	0.97	NORMAL	0.41	0.59	0.78	1.16	1.35	1.54
EU/K	406	1.07	LCGNORMAL	0.39	0.54	0.76	1.50	2.11	2.96
EU/ETH	406	0.27	NORMAL	-0.02	0.07	0.17	0.37	0.46	0.56
ETH/K	406	4.68	NORMAL	2.34	3.12	3.90	5.46	6.24	7.02

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CUAD

FORMATION

QSC

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	608	4.05	NORMAL	2.07	2.74	3.42	4.77	5.45	6.12
E URANIUM	601	1.02	NORMAL	0.11	0.41	0.72	1.33	1.63	1.94
POTASSIUM	608	1.05	NORMAL	0.55	0.71	0.88	1.21	1.38	1.55
EU/K	601	0.93	NORMAL	-0.07	0.26	0.60	1.27	1.60	1.94
EU/ETH	601	0.24	NORMAL	-0.01	0.07	0.16	0.33	0.41	0.50
ETH/K	601	3.65	NORMAL	1.83	2.45	3.07	4.31	4.93	5.55

FORMATION

QRVP

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	26	2.04	LCGNORMAL	0.83	1.12	1.51	2.76	3.73	5.05
E URANIUM	26	0.46	LCGNORMAL	0.13	0.20	0.30	0.65	1.04	1.58
POTASSIUM	26	0.56	LCGNORMAL	0.21	0.29	0.40	0.75	1.10	1.54
EU/K	26	0.95	NORMAL	-0.14	0.24	0.62	1.37	1.75	2.13
EU/ETH	26	0.31	NORMAL	0.02	0.12	0.22	0.41	0.50	0.60
ETH/K	26	2.96	NORMAL	1.22	1.80	2.38	3.54	4.12	4.70

FORMATION

JK

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	1140	4.21	NORMAL	-0.07	1.36	2.78	5.64	7.06	8.49
E URANIUM	1103	1.18	NORMAL	-0.25	0.23	0.71	1.66	2.13	2.61
POTASSIUM	1139	1.24	NORMAL	0.14	0.51	0.87	1.60	1.97	2.33
EU/K	1056	0.91	NORMAL	0.02	0.32	0.61	1.20	1.50	1.79
EU/ETH	1056	0.27	NORMAL	0.03	0.11	0.15	0.35	0.43	0.51
ETH/K	1056	3.21	NORMAL	1.44	2.03	2.62	3.80	4.35	4.98

FORMATION

TVB

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	8	5.77	NORMAL	5.35	5.29	5.53	6.01	6.24	6.48
E URANIUM	8	1.12	NORMAL	0.51	0.78	0.95	1.25	1.46	1.63
POTASSIUM	8	1.26	NORMAL	0.33	1.04	1.15	1.37	1.48	1.58
EU/K	8	0.84	NORMAL	0.56	0.66	0.75	0.92	1.03	1.12
EU/ETH	8	0.15	NORMAL	0.14	0.15	0.17	0.20	0.22	0.24
ETH/K	8	4.20	NORMAL	3.48	3.72	3.96	4.44	4.68	4.91

UKIAH

QUAD

FORMATION

MS

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	2649	4.09	NORMAL	0.86	1.94	3.01	5.17	6.24	7.32
E URANIUM	2599	1.20	NORMAL	-0.15	0.30	0.75	1.65	2.09	2.54
POTASSIUM	2649	1.05	NORMAL	0.21	0.49	0.77	1.33	1.61	1.89
EU/K	2599	1.07	NORMAL	0.04	0.39	0.73	1.41	1.76	2.10
EU/ETH	2558	0.28	NORMAL	0.03	0.11	0.20	0.36	0.45	0.53
ETH/K	2559	3.68	NORMAL	1.80	2.42	3.05	4.31	4.94	5.57

FORMATION

MV

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	175	2.76	NORMAL	0.45	1.22	1.99	3.53	4.30	5.06
E URANIUM	162	0.90	NORMAL	0.08	0.36	0.63	1.18	1.45	1.73
POTASSIUM	175	0.70	NORMAL	0.22	0.38	0.54	0.86	1.02	1.18
EU/K	162	1.23	NORMAL	0.13	0.50	0.86	1.59	1.95	2.32
EU/ETH	162	0.32	NORMAL	-0.00	0.11	0.21	0.42	0.53	0.63
ETH/K	162	3.75	NORMAL	1.91	2.54	3.16	4.41	5.04	5.66

FORMATION

K

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	8649	4.65	NORMAL	1.44	2.51	3.58	5.72	6.80	7.87
E URANIUM	8591	1.54	NORMAL	-0.19	0.38	0.96	2.11	2.69	3.27
POTASSIUM	8654	1.03	NORMAL	0.28	0.53	0.78	1.28	1.53	1.77
EU/K	8583	1.31	LCGNORMAL	0.24	0.43	0.75	2.30	4.03	7.06
EU/ETH	8573	0.25	LCGNORMAL	0.08	0.12	0.15	0.45	0.69	1.07
ETH/K	8580	4.44	NORMAL	2.10	2.88	3.66	5.22	6.00	6.78

FORMATION

KJF

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	14881	4.77	NORMAL	0.91	2.20	3.49	6.06	7.35	8.63
E URANIUM	14604	1.34	NORMAL	-0.21	0.31	0.83	1.86	2.37	2.89
POTASSIUM	14857	1.08	NORMAL	0.24	0.52	0.80	1.35	1.63	1.91
EU/K	14580	1.20	NORMAL	-0.15	0.30	0.75	1.65	2.11	2.56
EU/ETH	14581	0.27	NORMAL	-0.01	0.08	0.18	0.37	0.46	0.56
ETH/K	14580	4.26	NORMAL	1.83	2.64	3.45	5.06	5.87	6.68

UKIAH

CUAD

FORMATION

KJFV

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	643	2.36	NORMAL	-0.60	0.39	1.37	3.34	4.33	5.31
E URANIUM	638	1.07	NORMAL	-0.25	0.19	0.63	1.51	1.95	2.39
POTASSIUM	644	0.56	LOGNORMAL	0.19	0.27	0.39	0.80	1.16	1.67
EU/K	637	1.27	LOGNORMAL	0.24	0.42	0.73	2.20	3.81	6.61
EU/ETH	623	0.31	LOGNORMAL	0.06	0.11	0.18	0.53	0.90	1.53
ETH/K	636	3.51	NORMAL	1.23	2.02	2.76	4.25	4.99	5.73

FORMATION

KL

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	2290	3.52	NORMAL	0.49	1.50	2.51	4.53	5.54	6.55
E URANIUM	2215	1.06	NORMAL	-0.38	0.10	0.58	1.54	2.02	2.50
POTASSIUM	2288	1.07	NORMAL	0.27	0.54	0.80	1.33	1.60	1.86
EU/K	2215	0.93	NORMAL	-0.24	0.15	0.54	1.32	1.71	2.10
EU/ETH	2209	0.25	LOGNORMAL	0.06	0.10	0.16	0.39	0.62	0.99
ETH/K	2214	3.09	NORMAL	1.28	1.89	2.49	3.70	4.30	4.91

FORMATION

KU

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	1310	5.41	NORMAL	1.51	2.81	4.11	6.70	8.00	9.30
E URANIUM	1296	1.44	NORMAL	-0.31	0.27	0.85	2.02	2.60	3.18
POTASSIUM	1310	1.51	NORMAL	0.44	0.80	1.16	1.87	2.22	2.58
EU/K	1296	0.88	NORMAL	-0.04	0.27	0.57	1.19	1.50	1.80
EU/ETH	1296	0.26	NORMAL	-0.02	0.07	0.17	0.35	0.44	0.53
ETH/K	1296	3.36	NORMAL	1.70	2.25	2.80	3.91	4.46	5.01

FORMATION

PVP

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	34	3.86	NORMAL	3.17	3.40	3.63	4.08	4.31	4.54
E URANIUM	34	0.86	NORMAL	0.26	0.46	0.66	1.06	1.26	1.46
POTASSIUM	34	0.72	NORMAL	0.47	0.55	0.64	0.80	0.88	0.97
EU/K	34	1.15	NORMAL	0.52	0.73	0.94	1.36	1.57	1.78
EU/ETH	34	0.21	NORMAL	0.09	0.13	0.17	0.25	0.29	0.33
ETH/K	34	5.15	NORMAL	3.77	4.25	4.72	5.66	6.14	6.61

UKIAH

CLAD

FORMATION

PUC

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	1589	3.63	NORMAL	0.26	1.38	2.51	4.75	5.67	6.99
E URANIUM	1500	0.80	NORMAL	-0.34	0.04	0.42	1.18	1.56	1.95
POTASSIUM	1589	0.82	NORMAL	-0.09	0.21	0.52	1.12	1.42	1.72
EU/K	1500	0.99	NORMAL	-0.19	0.20	0.60	1.38	1.78	2.17
EU/ETH	1500	0.21	NORMAL	-0.02	0.06	0.14	0.29	0.37	0.44
ETH/K	1500	4.48	NORMAL	1.68	2.61	3.54	5.41	6.34	7.27

FORMATION

PML

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	55	4.34	NORMAL	0.75	1.94	3.14	5.54	6.74	7.94
E URANIUM	55	1.20	NORMAL	0.56	0.78	0.99	1.42	1.63	1.84
POTASSIUM	55	1.00	NORMAL	0.20	0.47	0.73	1.26	1.53	1.80
EU/K	55	1.21	NORMAL	-0.11	0.33	0.77	1.65	2.09	2.53
EU/ETH	55	0.28	NORMAL	-0.04	0.07	0.18	0.39	0.50	0.60
ETH/K	55	4.10	NORMAL	2.72	3.18	3.64	4.56	5.02	5.47

FORMATION

EP

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	14	6.50	NORMAL	3.94	4.79	5.65	7.36	8.21	9.06
E URANIUM	14	1.57	NORMAL	0.93	1.14	1.36	1.79	2.01	2.22
POTASSIUM	14	1.74	LCGNORMAL	1.45	1.54	1.64	1.84	1.96	2.08
EU/K	14	0.77	NORMAL	0.51	0.60	0.68	0.85	0.94	1.02
EU/ETH	14	0.23	NORMAL	0.18	0.20	0.21	0.24	0.26	0.28
ETH/K	14	3.36	NORMAL	2.11	2.53	2.94	3.78	4.19	4.61

FORMATION

U

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	521	4.07	NORMAL	2.15	2.79	3.43	4.72	5.36	6.00
E URANIUM	518	0.92	NORMAL	0.06	0.35	0.63	1.21	1.50	1.78
POTASSIUM	521	1.01	NORMAL	0.55	0.70	0.86	1.17	1.33	1.48
EU/K	518	0.87	NORMAL	-0.09	0.23	0.55	1.19	1.51	1.83
EU/ETH	518	0.22	NORMAL	-0.00	0.07	0.15	0.30	0.37	0.45
ETH/K	518	3.85	NORMAL	2.24	2.78	3.31	4.39	4.92	5.46

DEL

UKIAH

CUAD

FORMATION

UB

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	1147	0.56	LEGNCRMAL	0.05	0.11	0.25	1.27	2.89	6.56
E URANIUM	797	0.30	LCGNCRMAL	0.03	0.07	0.14	0.63	1.31	2.74
POTASSIUM	1076	0.07	LCGNCRMAL	0.00	0.01	0.03	0.21	0.62	1.81
EU/K	639	0.71	LCGNORMAL	0.11	0.20	0.38	1.35	2.56	4.84
EU/ETH	617	0.22	LCGNCRMAL	0.06	0.09	0.14	0.35	0.55	0.87
ETH/K	627	3.77	NORMAL	0.94	1.88	2.83	4.72	5.66	6.60

A P P E N D I X F

Format, Single Record Data Listing

REC NO.	LAT	LONG	RESID MAG GAMMA	TERR CL FEET	FLG	GEOLOG UNIT	ATM COSM CPS	TOTAL U CPS	FLG	ETH PPM	FLG	EU PPM	FLG	K PCT	FLG	LU/ETH	EU/K	ETH/K	TEMP CELCIUS	BAKU PRES MMHG	
5079	64.0086	-160.9199	55305	703	MAR	W	31	1	-12	NAD	-1.1	NAD	-0.5	NAD	0.0	NAD	0.0	0.0	12.7	746.8	
5080	64.0087	-160.9189	55305	751	MAR	W	28	1	36	MAR	0.0	NAD	0.1	NAD	0.1	NAD	0.0	0.0	12.7	747.1	
5081	64.0087	-160.9176	55305	741	MAR	W	26	1	4	NAD	0.2	NAD	0.1	NAD	-0.1	NAD	0.0	0.0	12.7	747.4	
5082	64.0088	-160.9160	55305	730	MAR	W	35	1	-60	NAD	0.0	NAD	0.3	NAD	-0.1	NAD	0.0	0.0	12.7	747.7	
5083	64.0088	-160.9154	55305	722	MAR	W	26	1	-4	NAD	-2.7	NAD	2.3		-0.4	NAD	0.0	0.0	12.7	748.0	
5084	64.0089	-160.9144	55305	712	MAR	W	28	1	-12	NAD	0.5	NAD	-1.7	NAD	0.0	NAD	0.0	0.0	12.7	748.1	
5085	64.0089	-160.9131	55305	702	MAR	W	23	1	37	MAR	0.0	NAD	0.4	NAD	-0.3	NAD	0.0	0.0	12.7	748.5	
5086	64.0090	-160.9121	55305	691		W	22	1	50		0.3	NAD	-0.1	NAD	0.0	NAD	0.0	0.0	12.7	748.8	
5087	64.0091	-160.9109	55305	680		W	23	1	46		0.3	NAD	0.0	NAD	-0.0	NAD	0.0	0.0	12.7	749.1	
5088	64.0092	-160.9099	55305	673		W	17	1	72		0.6	MAR	0.3	NAD	-0.3	NAD	0.0	0.0	12.8	749.3	
5089	64.0092	-160.9087	55305	668		W	20	1	156		-1.6	NAD	0.7	MAR	-0.0	NAD	0.0	0.0	12.8	749.4	
5090	64.0093	-160.9075	55304	666		W	32	1	113		0.0	NAD	0.6	MAR	0.0	NAD	0.0	0.0	12.8	749.4	
5091	64.0093	-160.9064	55304	667		W	30	1	247		-0.2	NAD	0.6	MAR	0.1	NAD	0.0	0.0	12.8	749.3	
5092	64.0094	-160.9052	55304	671		W	29	1	343		0.2	NAD	1.1		0.3		4.0	0.0	12.8	749.2	
5093	64.0094	-160.9042	55304	679		W	23	1	659		2.9		-0.8	NAD	0.8		0.0	0.0	12.8	748.9	
5094	64.0095	-160.9030	55304	683		W	34	0	965		3.2		1.4		0.8		0.5	1.9	12.9	748.5	
5095	64.0096	-160.9017	55305	647		KS	24	0	1208		8.6		0.0	NAD	0.5		0.0	0.0	12.9	748.1	
5096	64.0096	-160.9007	55305	463		KS	12	0	945		2.5		1.7		0.5		0.7	3.5	12.9	747.8	
5097	64.0098	-160.8995	55305	455		KS	20	0	831		3.0		1.5		0.6		0.5	2.8	12.9	747.6	
5098	64.0098	-160.8985	55305	457		KS	22	0	759		2.2		1.4		0.3		0.8	5.1	12.9	747.1	
5099	64.0099	-160.8973	55305	465		KS	29	0	699		1.7		2.0		0.5		1.1	4.4	12.9	746.5	
5100	64.0100	-160.8962	55305	479		KS	28	0	610		0.5	NAD	1.3		0.4		0.0	3.7	12.9	746.1	
5101	64.0100	-160.8950	55305	497		KS	26	0	581		2.2		0.5	MAR	0.3		0.2	1.6	12.9	746.0	
5102	64.0101	-160.8940	55304	518		KS	35	0	512		1.3		-0.2	NAD	0.3		0.0	0.0	12.9	745.7	
5103	64.0101	-160.8928	55303	540		KS	20	0	677		2.1		1.0		0.2		0.5	5.6	12.8	745.5	
5104	64.0102	-160.8918	55303	569		KS	26	0	579		1.7		1.2		0.1	MAR	0.7	12.6	12.8	745.5	
5105	64.0103	-160.8905	55304	608		KS	21	-1	611		3.2		3.1		0.0	NAD	1.0	0.0	12.8	745.6	
5106	64.0103	-160.8895	55303	614		KS	16	-1	551		3.7		0.2	NAD	0.3		0.0	0.0	12.8	745.5	
5107	64.0104	-160.8883	55304	595		KS	37	-1	488		1.6		2.4		0.7	MAR	1.5	18.6	12.5	745.4	
5108	64.0105	-160.8873	55302	575		KS	22	-1	510		0.2	NAD	1.3		0.3		0.0	5.1	0.0	12.8	745.3
5109	64.0106	-160.8860	55304	552		KS	28	-1	437		0.0	NAD	1.0		0.1	MAR	0.0	9.0	0.0	12.8	745.2
5110	64.0107	-160.8848	55305	532		KS	25	-1	405		0.5	NAD	1.1		0.3		0.0	4.0	0.0	12.8	745.1
5111	64.0107	-160.8838	55305	514		KS	25	-1	379		1.0	MAR	-0.1	NAD	0.3		0.0	0.0	3.0	12.8	744.7
5112	64.0108	-160.8826	55305	501		KS	35	-1	325		0.5	MAR	1.4		0.1	MAR	2.5	13.6	5.5	12.8	744.5
5113	64.0108	-160.8816	55305	490		KS	20	-1	411		0.0	NAD	1.1		0.0	NAD	0.0	0.0	0.0	12.8	744.3
5114	64.0109	-160.8803	55305	481		KS	22	-1	417		1.0		1.0		0.1	MAR	1.0	12.7	12.9	12.8	744.3
5115	64.0110	-160.8791	55305	477		KS	28	-1	517		0.8	MAR	1.1		0.3		1.3	4.0	3.1	12.8	744.1
5116	64.0110	-160.8781	55304	479		KS	17	0	616		1.4		0.7		0.5		0.5	1.4	2.8	12.8	744.0
5117	64.0111	-160.8769	55304	486		KS	23	0	623		4.3		0.8		0.6		0.2	1.4	7.0	12.8	743.9
5118	64.0111	-160.8759	55303	493		KS	22	0	607		2.5		1.5		0.1		0.6	10.2	17.5	12.8	744.0
5119	64.0112	-160.8746	55303	500		KS	21	0	693		3.5		0.5	MAR	0.5		0.2	1.1	7.4	12.8	744.2
5120	64.0113	-160.8734	55303	509		KS	22	-1	633		2.2		2.6		0.3		1.2	8.6	7.2	12.8	744.2
5121	64.0113	-160.8724	55302	516		KS	30	-1	636		3.7		0.2	NAD	0.3		0.0	0.0	10.9	12.8	744.5
5122	64.0113	-160.8712	55302	519		KS	25	-2	777		5.1		1.5		0.3		0.3	9.9	20.2	12.8	744.9
5123	64.0113	-160.8701	55302	518		KS	26	-2	658		3.8		0.9		0.4		0.2	2.2	9.0	12.8	745.1
5124	64.0113	-160.8689	55302	517		KS	32	-2	718		0.8	MAR	1.9		0.7		2.1	2.8	1.3	12.8	745.6
5125	64.0113	-160.8677	55302	523		KS	32	-2	763		2.7		2.2		0.2		0.8	13.0	16.0	12.8	746.1
5126	64.0114	-160.8667	55302	541		KS	25	-1	781		3.2		1.3		0.6		0.4	2.4	5.9	12.8	746.4
5127	64.0114	-160.8654	55301	559		KS	26	-1	736		1.1	MAR	2.6		0.3		2.2	8.2	3.8	12.9	746.8
5128	64.0114	-160.8644	55300	574		KS	23	-1	668		3.2		0.2	NAD	0.4		0.0	0.0	7.4	12.9	747.1
5129	64.0114	-160.8632	55300	592		KS	21	0	640		2.4		3.5		-0.0	NAD	1.4	0.0	0.0	12.9	747.3
5130	64.0113	-160.8620	55300	606		KS	14	0	696		1.9		1.9		0.3		1.0	7.1	6.9	12.9	747.3
5131	64.0113	-160.8609	55302	617		KS	27	0	595		1.4		0.7	MAR	0.3		0.5	2.4	4.4	13.0	747.7

SINGLE RECORD DATA LINE 240 PAGE 1

FINISHED OUTPUTTING LINE 240

LINE 220 FIDS 2935 TO 4865 OUTPUT TO SRRO TAPE

A P P E N D I X G

Format, Average Record Data Listing

RECORD NUMBER	LATITUDE	LONGITUDE	RESID TOTAL FIELD GAMMA	GEHL UNIT	COSM CPS	ATM. DEAN CPS	TOTAL COUNT CPS	ETH PPM	STD FLG	STD DEV	ETH PPM	STD FLG	STD DEV	POT PCT	STD FLG	STD DEV	EU LTH RATIO	STD DEV	EU POTA RATIO	STD DEV	ETH POTA RATIO	STD DEV
5238	64.0098	-160.7455	55295	W	33	-6	980	3.7	1	1.9	2	0.7	1	0.5	0	2.8	0	5.2	0			
5239	64.0098	-160.7444	55293	KS	43	-6	952	3.7	0	1.9	0	0.7	0	0.5	1	2.9	0	5.3	0			
5240	64.0099	-160.7434	55285	KS	27	-5	998	3.7	0	2.1	0	0.7	0	0.6	2	3.1	1	5.3	0			
5241	64.0098	-160.7422	55287	KS	33	-5	1047	3.5	0	2.2	0	0.7	0	0.6	2	3.2	1	5.2	0			
5242	64.0098	-160.7412	55298	KS	31	-5	1083	3.5	0	2.1	0	0.7	0	0.6	2	2.9	0	4.8	0			
5243	64.0097	-160.7399	55287	KS	30	-4	1156	3.7	0	1.9	0	0.7	0	0.5	1	2.7	0	5.0	0			
5244	64.0097	-160.7389	55287	KS	31	-4	1182	4.1	0	1.9	0	0.8	0	0.5	1	2.5	0	5.3	0			
5245	64.0097	-160.7379	55286	KS	26	-4	1245	4.0	0	1.7	0	0.8	0	0.4	0	2.1	0	4.9	0			
5246	64.0096	-160.7366	55285	KS	38	-4	1148	3.8	0	1.6	0	0.8	0	0.4	0	2.1	0	4.8	0			
5247	64.0097	-160.7356	55285	KS	30	-3	1211	3.7	0	1.5	0	0.8	0	0.4	0	1.9	0	4.5	0			
5248	64.0096	-160.7344	55295	KS	30	-3	1076	3.8	0	1.5	0	0.8	0	0.4	0	1.9	0	4.7	0			
5249	64.0096	-160.7334	55284	KS	29	-3	1016	3.7	0	1.3	0	0.8	0	0.4	0	1.6	0	4.6	0			
5250	64.0096	-160.7324	55283	KS	33	-3	975	3.7	0	1.2	0	0.8	0	0.3	0	1.6	0	4.8	0			
5251	64.0095	-160.7311	55283	KS	23	-3	976	3.5	0	1.2	0	0.7	0	0.3	0	1.7	0	5.0	0			
5252	64.0095	-160.7301	55283	KS	30	-3	948	3.7	0	1.1	0	0.7	0	0.3	0	1.6	0	5.1	0			
5253	64.0095	-160.7299	55284	KS	33	-3	921	3.8	0	1.0	-1	0.7	0	0.3	0	1.4	-1	5.2	0			
5254	64.0095	-160.7278	55284	KS	37	-2	803	4.0	0	1.0	-1	0.7	0	0.3	0	1.5	-1	5.6	0			
5255	64.0095	-160.7266	55283	KS	23	-2	954	4.1	0	1.0	-1	0.7	0	0.3	-1	1.4	-1	5.5	0			
5256	64.0094	-160.7256	55293	KS	29	-1	1006	4.3	0	1.0	-1	0.7	0	0.2	-1	1.3	-1	5.8	0			
5257	64.0094	-160.7244	55283	KS	37	-1	1133	4.0	0	1.0	-1	0.7	0	0.2	-1	1.3	-1	5.5	0			
5258	64.0094	-160.7233	55284	KS	23	0	1106	4.1	0	1.0	-1	0.7	0	0.2	-1	1.4	-1	5.9	0			
5259	64.0094	-160.7221	55285	KS	28	0	1034	4.1	0	0.8	-1	0.7	0	0.2	-1	1.2	-1	6.1	0			
5260	64.0094	-160.7211	55284	KS	21	0	963	4.1	0	0.8	-1	0.7	0	0.2	-1	1.3	-1	6.2	0			
5261	64.0093	-160.7199	55294	KS	27	0	840	3.7	0	0.8	-1	0.6	0	0.2	-1	1.3	-1	6.1	0			
5262	64.0093	-160.7188	55294	KS	29	0	718	3.2	0	0.9	-1	0.5	-1	0.3	0	1.7	0	6.0	0			
5263	64.0092	-160.7176	55284	KS	33	0	605	2.5	-1	0.9	-1	0.5	-1	0.4	0	1.8	0	5.2	0			
5264	64.0092	-160.7166	55294	KS	32	0	635	2.1	-1	0.8	-1	0.4	-1	0.4	0	1.9	0	5.2	0			
5265	64.0093	-160.7156	55283	KS	35	0	507	1.7	-1	0.7	-1	0.3	-1	0.4	0	2.2	0	5.3	0			
5266	64.0092	-160.7143	55283	KS	26	-1	521	1.6	-1	0.7	-1	0.3	-1	0.5	1	2.5	0	5.4	0			
5267	64.0092	-160.7133	55283	KS	19	-1	465	1.4	-1	0.8	-1	0.3	-1	0.6	2	2.9	1	5.1	0			
5268	64.0091	-160.7121	55283	W	34	-1	287	1.3	0	0.9	1	0.3	1	0.7	1	3.1	0	4.6	-1			
5269	64.0091	-160.7110	55282	KS	29	-1	398	1.3	-1	1.0	-1	0.3	-1	0.8	3	3.4	1	4.4	0			
5270	64.0092	-160.7100	55282	KS	42	-1	516	1.7	-1	1.1	0	0.3	-1	0.6	2	3.2	1	5.1	0			
5271	64.0092	-160.7090	55283	KS	29	0	716	1.9	-1	1.0	-1	0.4	-1	0.6	2	2.8	0	5.1	0			
5272	64.0092	-160.7078	55283	KS	25	0	781	2.1	-1	1.1	0	0.4	-1	0.5	1	2.9	0	5.2	0			
5273	64.0092	-160.7068	55282	KS	32	0	738	2.4	-1	1.1	0	0.4	-1	0.5	1	2.7	0	6.0	0			
5274	64.0091	-160.7057	55281	KS	25	0	853	2.5	-1	1.1	0	0.4	-1	0.5	1	2.7	0	5.9	0			
5275	64.0091	-160.7047	55282	KS	22	0	796	2.5	-1	1.1	0	0.5	-1	0.4	0	2.4	0	5.8	0			
5276	64.0091	-160.7037	55281	KS	21	0	804	2.9	-1	1.0	-1	0.5	-1	0.4	0	2.2	0	6.1	0			
5277	64.0092	-160.7025	55281	KS	37	1	810	2.9	-1	1.0	-1	0.4	-1	0.4	0	2.3	0	6.5	0			
5278	64.0092	-160.7014	55280	KS	27	2	764	3.0	0	0.9	-1	0.5	-1	0.3	0	1.9	0	6.3	0			
5279	64.0092	-160.7004	55292	KS	31	1	750	2.9	-1	0.9	-1	0.5	-1	0.3	0	2.0	0	6.0	0			
5280	64.0092	-160.6994	55283	KS	33	1	790	2.9	-1	1.0	-1	0.5	-1	0.3	0	2.1	0	6.2	0			
5281	64.0092	-160.6984	55283	KS	32	1	745	3.3	0	0.8	-1	0.5	-1	0.2	-1	1.7	0	7.1	0			
5282	64.0092	-160.6973	55283	KS	36	1	779	3.7	0	0.8	-1	0.5	0	0.2	-1	1.5	-1	6.5	0			
5283	64.0092	-160.6963	55283	KS	31	1	821	3.8	0	0.8	-1	0.6	0	0.2	-1	1.4	-1	6.6	0			
5284	64.0092	-160.6951	55283	KS	31	1	858	3.8	0	1.0	-1	0.6	0	0.3	0	1.8	0	6.5	0			
5285	64.0092	-160.6941	55284	KS	30	1	948	3.7	0	1.2	0	0.6	0	0.3	0	2.0	0	6.0	0			
5286	64.0093	-160.6931	55284	KS	26	0	1054	3.7	0	1.3	0	0.6	0	0.3	0	2.1	0	6.0	0			
5287	64.0093	-160.6920	55282	KS	32	0	963	3.3	0	1.5	0	0.6	0	0.4	0	2.4	0	5.7	0			
5288	64.0093	-160.6910	55281	KS	30	0	1040	3.3	0	1.3	0	0.6	0	0.4	0	2.1	0	5.5	0			
5289	64.0093	-160.6900	55281	KS	25	0	997	3.3	0	1.3	0	0.6	0	0.4	0	2.2	0	5.5	0			
5290	64.0093	-160.6890	55281	KS	32	0	944	3.0	0	1.5	0	0.6	0	0.5	1	2.5	0	5.0	0			

A P P E N D I X H

Format, DOE SINGLE RECORD REDUCED DATA TAPE

DOE SINGLE RECORD REDUCED DATA TAPE

Line	Character Number											
Number	12345678901	2345678901	2345678901	2345678901	2345678901	2345678901	2345678901	2345678901	2345678901	2345678901	2345678901	2
1	02 0978 (DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODES)											
2												
3	SINGLE RECORD REDUCED DATA TAPE											
4												
5	FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK)											
6												
7	ITEM	FORMAT	DESCRIPTION									
8	1	A40	QUADRANGLE NAME AS PROJECT IDENTIFICATION									
9	2	A20	NAME OF SUBCONTRACTOR									
10	3	I4	APPROXIMATE DATE OF SURVEY (MONTH, YEAR)									
11	4	I1	NUMBER OF AERIAL SYSTEMS USED TO COLLECT DATA FOR									
12			THIS QUADRANGLE									
13	5	I1	AERIAL SYSTEM IDENTIFICATION CODE FOR FIRST SYSTEM									
14	6	A20	AIRCRAFT IDENTIFICATION BY TYPE AND FAA NUMBER FOR									
15			FIRST SYSTEM									
16	7	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO									
17			TERRESTRIAL POTASSIUM (K-40) TO ONE DECIMAL PLACE									
18			IN CPS PER PERCENT K FOR FIRST SYSTEM									
19	8	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO									
20			TERRESTRIAL URANIUM (BI-214) TO ONE DECIMAL PLACE									
21			IN CPS PER PPM EQUIVALENT U									
22	9	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO									
23			TERRESTRIAL THORIUM (TL-208) TO ONE DECIMAL PLACE									
24			IN CPS PER PPM EQUIVALENT TH									
25	10	I6	BLANK FIELD (999999)									
26	11	F6.3	4PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL									
27			PLACES IN SECONDS FOR FIRST SYSTEM									
28	12	F6.3	2PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL									
29			PLACES IN SECONDS FOR FIRST SYSTEM									
30	13	I3	NUMBER OF CHANNELS (0-3 MEV) IN 4 PI SYSTEM FOR FIRST									
31			AERIAL SYSTEM									
32	14	I3	NUMBER OF CHANNELS (0-3 MEV) IN 2 PI SYSTEM FOR FIRST									
33			AERIAL SYSTEM									
34	15-24	(SAME)	REPEAT OF ITEMS 5-14 FOR SECOND AERIAL SYSTEM									
35	*	*	*									
36	*	*	*									
37	*	*	*									
38	85-94	(SAME)	REPEAT OF ITEMS 5-14 FOR NINTH AERIAL SYSTEM									
39	95	I3	NUMBER OF FLIGHT LINES ON THIS TAPE									
40	96	I4	FIRST FLIGHT LINE NUMBER ON THIS TAPE									
41	97	I6	FIRST RECORD NUMBER OF FIRST FLIGHT LINE									
42	98	I3	JULIAN DATE (DAY OF YEAR) FIRST FLIGHT-LINE DATA WAS									
43			COLLECTED									
44	99-101	I4,6, &3	REPEAT OF ITEMS 96-98 FOR SECOND FLIGHT LINE ON THIS									
45			TAPE									
46	*	*	*									
47	*	*	*									
49	390-392	I4,6, &3	REPEAT OF ITEMS 96-98 FOR 99TH FLIGHT LINE ON THIS									
50			TAPE									
51												

Line	Character Number																															
Number	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2

52	FORMAT FOR SINGLE RECORD REDUCED DATA RECORD (THIRD THRU LAST BLOCK)																													
53																														
54	ITEM	FORMAT	DESCRIPTION																											
55	1	I1	AERIAL SYSTEM IDENTIFICATION CODE																											
56	2	I4	FLIGHT LINE NUMBER																											
57	3	I6	RECORD IDENTIFICATION NUMBER																											
58	4	I6	GMT TIME OF DAY (HHMMSS)																											
59	5	F8.4	LATITUDE TO FOUR DECIMAL PLACES IN DEGREES																											
60	6	F8.4	LONGITUDE TO FOUR DECIMAL PLACES IN DEGREES																											
61	7	F6.1	TERRAIN CLEARANCE TO ONE DECIMAL PLACE IN METERS																											
62	8	F7.1	RESIDUAL (IGRF REMOVED) MAGNETIC FIELD INTENSITY																											
63			TO ONE DECIMAL PLACE IN GAMMAS																											
64	9	A8	SURFACE GEOLOGIC MAP UNIT CODE																											
65	10	I4	QUALITY FLAG CODES																											
66	11	F6.1	APPARENT CONCENTRATION OF TERRESTRIAL POTASSIUM																											
67			(K-40) TO ONE DECIMAL PLACE IN PERCENT K																											
68	12	F4.1	UNCERTAINTY IN TERRESTRIAL POTASSIUM TO ONE DECIMAL																											
69			PLACE IN PERCENT K																											
70	13	F6.1	APPARENT CONCENTRATION OF TERRESTRIAL URANIUM																											
71			(BI-214) TO ONE DECIMAL PLACE IN PPM EQUIVALENT U																											
72	14	F4.1	UNCERTAINTY IN TERRESTRIAL URANIUM TO ONE DECIMAL																											
73			PLACE IN PPM EQUIVALENT U																											
74	15	F6.1	APPARENT CONCENTRATION OF TERRESTRIAL THORIUM																											
75			(TL-208) TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH																											
76	16	F4.1	UNCERTAINTY IN TERRESTRIAL THORIUM TO ONE DECIMAL																											
77			PLACE IN PPM EQUIVALENT TH																											
78	17	F6.1	URANIUM-TO-THORIUM RATIO TO ONE DECIMAL PLACE IN																											
79			PPM EQUIVALENT U PER PPM EQUIVALENT TH																											
80	18	F6.1	URANIUM-TO-POTASSIUM RATIO TO ONE DECIMAL PLACE IN																											
81			PPM EQUIVALENT U PER PERCENT K																											
82	19	F6.1	THORIUM-TO-POTASSIUM RATIO TO ONE DECIMAL PLACE IN																											
83			PPM EQUIVALENT TH PER PERCENT K																											
84	20	F8.1	GROSS GAMMA (0.4-3.0 MEV) COUNT RATE TO ONE DECIMAL																											
85			PLACE IN COUNTS PER SECOND																											
86	21	F6.1	UNCERTAINTY IN GROSS GAMMA COUNT RATE TO ONE DECIMAL																											
87			PLACE IN COUNTS PER SECOND																											
88	22	F5.1	ATMOSPHERIC BI-214 4PI CORRECTION TO ONE DECIMAL																											
89			PLACE IN PPM EQUIVALENT U																											
90	23	F4.1	UNCERTAINTY IN ATMOSPHERIC BI-214 4PI CORRECTION																											
91			TO ONE DECIMAL PLACE IN PPM EQUIVALENT U																											
92	24	F4.1	OUTSIDE AIR TEMPERATURE TO ONE DECIMAL PLACE IN																											
93			DEGREES CELSIUS																											
94	25	F5.1	OUTSIDE AIR PRESSURE TO ONE DECIMAL PLACE IN MMHG																											

A P P E N D I X I

Format, DOE RAW SPECTRAL DATA TAPE

DOE RAW SPECTRAL DATA TAPE

Line Character number
Number 12345678901234567890123456789012345678901234567890123456789012

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1 01 0978 (DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODES)
2
3 RAW SPECTRAL DATA TAPE
4
5 FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK ON TAPE)
6
7 ITEM      FORMAT  DESCRIPTION
8 1         A40     QUADRANGLE NAME AS PROJECT IDENTIFICATION
9 2         A20     NAME OF SUBCONTRACTOR
10 3        I4      APPROXIMATE DATE OF SURVEY (MONTH, YEAR)
11 4        I1      AERIAL SYSTEM IDENTIFICATION CODE
12 5        A20     AIRCRAFT IDENTIFICATION BY TYPE AND FAA NUMBER
13 6        I3      BFEC CALIBRATION REPORT NUMBER
14 7        F6.3    4PI SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL
15                PLACES IN SECONDS
16 8        F6.3    2PI SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL
17                PLACES IN SECONDS
18 9        I3      NUMBER OF CHANNELS (0-3 MEV) FOR 4PI SYSTEM
19 10       I3      NUMBER OF CHANNELS (0-3 MEV) FOR 2PI SYSTEM
20 11       I3      NUMBER OF FLIGHT LINES ON THIS TAPE
21 12       I4      FIRST FLIGHT LINE NUMBER ON THIS TAPE
22 13       I6      FIRST RECORD NUMBER OF FIRST FLIGHT LINE
23 14       I3      JULIAN DATE (DAY OF YEAR) FIRST FLIGHT LINE WAS
24                COLLECTED
25 15-17    I4,6 &3 REPEAT OF ITEMS 12-14 FOR SECOND FLIGHT LINE ON THIS
26                TAPE
27 *        *              *
28 *        *              *
29 *        *              *
30 306-308  I4,6 &3 REPEAT OF ITEMS 12-14 FOR 99TH FLIGHT LINE ON THIS
31                TAPE
32
33 FORMAT FOR RAW SPECTRAL DATA RECORD (THIRD THRU LAST BLOCK ON TAPE)
34
35 ITEM      FORMAT  DESCRIPTION
36 1         I1      AERIAL SYSTEM IDENTIFICATION CODE
37 2         I4      FLIGHT LINE NUMBER
38 3         I6      RECORD IDENTIFICATION NUMBER
39 4         I6      GMT TIME OF DAY (HHMMSS)
40 5         F8.4    LATITUDE TO FOUR DECIMAL PLACES IN DEGREES
41 6         F8.4    LONGITUDE TO FOUR DECIMAL PLACES IN DEGREES
42 7         F6.2    TERRAIN CLEARANCE TO ONE DECIMAL PLACE IN METERS
43 8         F7.1    TOTAL MAGNETIC FIELD INTENSITY TO ONE DECIMAL PLACE
44                IN GAMMAS
45 9         A8      SURFACE GEOLOGIC MAP UNIT CODE
46 10        I4      QUALITY FLAG CODES
47 11        F4.1    OUTSIDE AIR TEMPERATURE TO ONE DECIMAL PLACE IN
48                DEGREES CELSIUS
49 12        F5.1    OUTSIDE AIR PRESSURE TO ONE DECIMAL PLACE IN MMHG
50 13        F5.3    LIVE TIME COUNTING PERIOD TO THREE DECIMAL PLACES IN
51                SECONDS

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Line	Character Number																					
Number	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2
52	14		I4	SUMMED RAW OUTPUT FROM COSMIC CHANNELS (3-6 MEV) IN																		
53				COUNTS																		
54	15		I4	RAW OUTPUT FROM CHANNEL 1 IN COUNTS																		
55	16		I4	RAW OUTPUT FROM CHANNEL 2 IN COUNTS																		
56	*		*	*																		
57	*		*	*																		
58	*		*	*																		
59	270		I4	RAW OUTPUT FROM CHANNEL 256 IN COUNTS																		

A P P E N D I X J

Format, DOE STATISTICAL ANALYSIS DATA TAPE

DOE STATISTICAL ANALYSIS DATA TAPE

Line	Character Number											
Number	1	2	3	4	5	6	7	8	9	10	11	12
1	03 0978 (DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODES)											
2												
3	STATISTICAL ANALYSIS DATA TAPE											
4												
5	FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK)											
6												
7	ITEM	FORMAT	DESCRIPTION									
8	1	A40	QUADRANGLE NAME AS PROJECT IDENTIFICATION									
9	2	A20	NAME OF SUBCONTRACTOR									
10	3	I4	APPROXIMATE DATE OF SURVEY (MONTH, YEAR)									
11	4	I1	NUMBER OF AERIAL SYSTEMS USED TO COLLECT DATA FOR									
12			THIS QUADRANGLE									
13	5	I1	AERIAL SYSTEM IDENTIFICATION CODE FOR FIRST SYSTEM									
14	6	A20	AIRCRAFT IDENTIFICATION BY TYPE AND FAA NUMBER FOR									
15			FIRST SYSTEM									
16	7	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO									
17			TERRESTRIAL POTASSIUM (K-40) TO ONE DECIMAL PLACE									
18			IN CPS PER PERCENT K									
19	8	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO									
20			TERRESTRIAL URANIUM (B1-214) TO ONE DECIMAL PLACE									
21			IN CPS PER PPM EQUIVALENT U									
22	9	F6.1	NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO									
23			TERRESTRIAL THORIUM (TL-208) TO ONE DECIMAL PLACE									
24			IN CPS PER PPM EQUIVALENT TH									
25	10	I6	BLANK FIELD (999999)									
26	11	F6.3	4PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL									
27			PLACES IN SECONDS FOR FIRST SYSTEM									
28	12	F6.3	2PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL									
29			PLACES IN SECONDS FOR FIRST SYSTEM									
30	13	I3	NUMBER OF CHANNELS (0-3 MEV) IN 4 PI SYSTEM FOR FIRST									
31			AERIAL SYSTEM									
32	14	I3	NUMBER OF CHANNELS (0-30 MEV) IN 2 PI SYSTEM FOR FIRST									
33			AERIAL SYSTEM									
34	15-24	(SAME)	REPEAT OF ITEMS 5-14 FOR AERIAL SYSTEM									
35	*	*	*									
36	*	*	*									
37	*	*	*									
38	85-94	(SAME)	REPEAT OF ITEMS 5-14 FOR NINTH AERIAL SYSTEM									
39	95	I3	NUMBER OF FLIGHT LINES ON THIS TAPE									
40	96	I4	FIRST FLIGHT LINE NUMBER ON THIS TAPE									
41	97	I6	FIRST RECORD NUMBER OF FIRST FLIGHT LINE									
42	98	I3	JULIAN DATE (DAY OF YEAR) FIRST FLIGHT LINE DATA WAS									
43			COLLECTED									
44	99-101	I4,6 &3	REPEAT OF ITEMS 96-98 FOR SECOND FLIGHT LINE ONE THIS									
45			TAPE									
46	*	*	*									
47	*	*	*									
48	*	*	*									
49	390-392	I4,6 &3	REPEAT OF ITEMS 96-98 FOR 99TH FLIGHT LINE ON THIS									
50			TAPE									
51												

Line	Character Number
Number	12345678901234567890123456789012345678901234567890123456789012

52	FORMAT FOR STATISTICAL ANALYSIS DATA RECORD (THIRD THRU LAST BLOCK)		
53			
54	ITEM	FORMAT	DESCRIPTION
55	1	I1	AERIAL SYSTEM IDENTIFICATION CODE
56	2	I4	FLIGHT LINE NUMBER
57	3	I6	RECORD IDENTIFICATION NUMBER
58	4	I6	GMT TIME OF DAY (HHMMSS)
59	5	F.84	LATITUDE TO FOUR DECIMAL PLACES IN DEGREES
60	6	F8.4	LONGITUDE TO FOUR DECIMAL PLACES IN DEGREES
61	7	F6.1	TERRAIN CLEARANCE TO ONE DECIMAL PLACE IN METERS
62	8	F7.1	RESIDUAL (IGRF REMOVED) MAGNETIC FIELD INTENSITY
63			TO ONE DECIMAL PLACE IN GAMMAS
64	9	A8	SURFACE GEOLOGIC MAP UNIT CODE
65	10	I5	QUALITY FLAG CODES
66	11	F6.1	AVERAGED CONCENTRATION OF TERRESTRIAL POTASSIUM
67			(K-40) TO ONE DECIMAL PLACE IN PERCENT K
68	12	F4.1	UNCERTAINTY IN TERRESTRIAL POTASSIUM TO ONE DECIMAL
69			PLACE IN PERCENT K
70	13	F5.1	POTASSIUM STANDARD DEVIATION FROM THE MEAN TO ONE
71			DECIMAL PLACE AND ALGEBRAICALLY SIGNED
72	14	F6.1	AVERAGED CONCENTRATION OF TERRESTRIAL URANIUM
73			(BI-214) TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
74	15	F4.1	UNCERTAINTY IN TERRESTRIAL URANIUM TO ONE DECIMAL
75			PLACE IN PPM EQUIVALENT U
76	16	F5.1	URANIUM STANDARD DEVIATION FROM THE MEAN TO ONE
77			DECIMAL PLACE AND ALGEBRAICALLY SIGNED
78	17	F6.1	AVERAGED CONCENTRATION OF TERRESTRIAL THORIUM
79			(TL-208) TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
80	18	F4.1	UNCERTAINTY IN TERRESTRIAL THORIUM TO ONE DECIMAL
81			PLACE IN PPM EQUIVALENT TH
82	19	F5.1	THORIUM STANDARD DEVIATION FROM THE MEAN TO ONE
83			DECIMAL PLACE AND ALGEBRAICALLY SIGNED
84	20	F8.1	GROSS GAMMA (0.4-3.0 MEV) COUNT RATE TO ONE DECIMAL
85			PLACE IN COUNTS PER SECOND
86	21	F6.1	UNCERTAINTY IN GROSS GAMMA COUNT RATE TO ONE DECIMAL
87			PLACE IN COUNTS PER SECOND
88	22	F5.1	ATMOSPHERIC BI-214 4PI CORRECTION TO ONE DECIMAL
89			PLACE IN PPM EQUIVALENT U
90	23	F4.1	UNCERTAINTY IN ATMOSPHERIC BI-214 4PI CORRECTION
91			TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
92	24	F6.1	AVERAGED URANIUM-TO-THORIUM RATIO TO ONE DECIMAL
93			PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT TH
94	25	F5.1	URANIUM-TO-THORIUM RATIO STANDARD DEVIATION FROM THE
95			MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY SIGNED
96	26	F6.1	AVERAGED URANIUM-TO-POTASSIUM RATIO TO ONE DECIMAL
97			PLACE IN PPM EQUIVALENT U PER PERCENT K
98	27	F5.1	URANIUM-TO-POTASSIUM RATIO STANDARD DEVIATION FROM
99			THE MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY
100			SIGNED
101	28	F6.1	AVERAGE THORIUM-TO-POTASSIUM RATIO TO ONE DECIMAL
102			PLACE IN PPM EQUIVALENT TH PER PERCENT K
103	29	F5.1	THORIUM-TO-POTASSIUM RATIO STANDARD DEVIATION FROM
104			THE MEAN TO ONE DECIMAL PLACE AND ALGEBRAICALLY
105			SIGNED

A P P E N D I X K

Format, DOE STATISTICAL ANALYSIS SUMMARY DATA TAPE

DOE STATISTICAL ANALYSIS SUMMARY DATA TAPE

Line	Character Number
Number	12345678901234567890123456789012345678901234567890123456789012

1 05 0978 (DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODE)

2

3 STATISTICAL ANALYSIS SUMMARY TAPE (OR FILE)

4

5 FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK)

6

ITEM	FORMAT	DESCRIPTION
8 1	A40	QUADRANGLE NAME AS PROJECT IDENTIFICATION
9 2	A20	NAME OF SUBCONTRACTOR
10 3	I4	APPROXIMATE DATE OF SURVEY (MONTH, YEAR)
11 4	I6	NUMBER OF GEOLOGIC MAP UNITS USED FOR THIS QUADRANGLE

12

13
14 FORMAT FOR STATISTICAL ANALYSIS SUMMARY DATA RECORD (THIRD THRU LAST BLOCK)

15

16

ITEM	FORMAT	DESCRIPTION
18 1	A8	SURFACE GEOLOGIC MAP UNIT IDENTIFYING CODE
19 2	I6	TOTAL RECORDS FOR GEOLOGIC MAP UNIT
20 3	I6	NUMBER OF POTASSIUM RECORDS COMPUTED FOR GEOLOGIC UNITS
22 4	F6.1	POTASSIUM CONCENTRATION MEAN TO ONE DECIMAL PLACE IN PERCENT K
24 5	F6.1	POTASSIUM CONCENTRATION STANDARD DEVIATION TO ONE DECIMAL PLACE IN PERCENT K
26 6	A3	POTASSIUM CONCENTRATION DISTRIBUTION CODE
27 7	I6	NUMBER OF URANIUM RECORDS COMPUTED FOR GEOLOGIC UNIT
28 8	F6.1	URANIUM CONCENTRATION MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
30 9	F6.1	URANIUM CONCENTRATION STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
32 10	A3	URANIUM CONCENTRATION DISTRIBUTION CODE
33 11	I6	NUMBER OF THORIUM RECORDS COMPUTED FOR GEOLOGIC UNIT
34 12	F6.1	THORIUM CONCENTRATION MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
36 13	F6.1	THORIUM CONCENTRATION STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
38 14	A3	THORIUM CONCENTRATION DISTRIBUTION CODE
39 15	I6	NUMBER OF URANIUM-TO-THORIUM RATIO RECORDS COMPUTED FOR GEOLOGIC UNIT
41 16	F6.1	URANIUM-TO-THORIUM RATIO MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT TH
43 17	F6.1	URANIUM-TO-THORIUM RATIO STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT TH
46 18	A3	URANIUM-TO-THORIUM RATIO DISTRIBUTION CODE
47 19	I6	NUMBER OF URANIUM-TO-POTASSIUM RATIO RECORDS COMPUTED FOR GEOLOGIC UNIT
49 20	F6.1	URANIUM-TO-POTASSIUM RATIO MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PERCENT K

50

Line	Character Number																															
Number	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2
51	21		F6.1	URANIUM-TO-POTASSIUM RATIO STANDARD DEVIATION TO ONE																												
52				DECIMAL PLACE IN PPM EQUIVALENT U PER PERCENT K																												
53	22		A3	URANIUM-TO-POTASSIUM RATIO DISTRIBUTION CODE																												
54	23		I6	NUMBER OF THORIUM-TO-POTASSIUM RATIO RECORDS																												
55				COMPUTED FOR GEOLOGIC UNIT																												
56	24		F6.1	THORIUM-TO-POTASSIUM RATIO MEAN TO ONE DECIMAL PLACE																												
57				IN PPM EQUIVALENT TH PER PERCENT K																												
58	25		F6.1	THORIUM-TO-POTASSIUM RATIO STANDARD DEVIATION TO ONE																												
59				DECIMAL PLACE IN PPM EQUIVALENT TH PER PERCENT K																												
60	26		A3	THORIUM-TO-POTASSIUM RATIO DISTRIBUTION CODE																												

A P P E N D I X L

Format, DOE MAGNETIC DATA TAPE

DOE MAGNETIC DATA TAPE FORMAT

Line Character Number
 Number 12345678901234567890123456789012345678901234567890123456789012

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1  04 0978 (DATA TAPE TYPE AND FORMAT SPECIFICATION DATE CODES)
2
3  MAGNETIC DATA TAPE
4
5  FORMAT FOR TAPE IDENTIFICATION BLOCK (SECOND BLOCK)
6
7  ITEM      FORMAT  DESCRIPTION
8  1         A40     QUADRANGLE NAME AS PROJECT IDENTIFICATION
9  2         A20     NAME OF SUBCONTRACTOR
10 3         I4      APPROXIMATE DATE OF SURVEY (MONTH, YEAR)
11 4         I3      NUMBER OF FLIGHT LINES ON THIS TAPE
12 5         I4      FIRST FLIGHT LINE OF THIS TAPE
13 6         I6      FIRST RECORD NUMBER OF FIRST FLIGHT LINE
14 7         I3      JULIAN DATE (DAY OF YEAR) FIRST FLIGHT LINE DATA WAS
15                        COLLECTED
16 8         F8.4    LATITUDE OF GROUND BASE STATION TO FOUR DECIMAL
17                        PLACES IN DEGREES FOR FIRST FLIGHT LINE
18 9         F8.4    LONGITUDE OF GROUND BASE STATION TO FOUR DECIMAL
19                        PLACES IN DEGREES FOR FIRST FLIGHT LINE
20 10-14     (SAME)  REPEAT OF ITEMS 5-9 FOR SECOND FLIGHT LINE ON THIS
21                        TAPE
22 *         *              *
23 *         *              *
24 *         *              *
25 495-499   (SAME)  REPEAT OF ITEMS 5-9 FOR 99TH FLIGHT LINE ON THIS
26                        TAPE
27
28 FORMAT FOR MAGNETIC DATA RECORD (THIRD THRU LAST BLOCK)
29
30 ITEM      FORMAT  DESCRIPTION
31 1         I1      AERIAL SYSTEM IDENTIFICATION CODE
32 2         I4      FLIGHT LINE NUMBER
33 3         I6      RECORD IDENTIFICATION NUMBER
34 4         I6      GMT TIME OF DAY (HHMMSS)
35 5         F8.4    LATITUDE TO FOUR DECIMAL PLACES IN DEGREES
36 6         F8.4    LONGITUDE TO FOUR DECIMAL PLACES IN DEGREES
37 7         F6.1    TERRAIN CLEARANCE TO ONE DECIMAL PLACE IN METERS
38 8         F5.1    OUTSIDE AIR PRESSURE TO ONE DECIMAL PLACE IN MMHG
39 9         A8      SURFACE GEOLOGIC MAP UNIT CODE
40 10        F7.1    TOTAL MAGNETIC FIELD INTENSITY TO ONE DECIMAL PLACE
41                        IN GAMMAS
42 11        F7.1    RESIDUAL (IGRF REMOVED) MAGNETIC FIELD INTENSITY
43                        TO ONE DECIMAL PLACE IN GAMMAS
44 12        F7.1    DIURNAL MAGNETIC INTENSITY VARIATION TO ONE DECIMAL
45                        PLACE IN GAMMAS
46 13        F7.1    MAGNETIC DEPTH-TO-BASEMENT TO ONE DECIMAL PLACE
47                        IN METERS (IF REQUIRED)

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A P P E N D I X M

Reduced Calibration and Test Line Data

Reduced Calibration and Test Line Data

<u>Date</u>	<u>Flight</u>	<u>Res. Thor.</u>	<u>Res. Thor.</u>	<u>Low Preflight</u>			<u>Low Postflight</u>		
		<u>583</u>	<u>2615</u>	<u>Alt.</u>	<u>T.C.</u>	<u>2π</u>	<u>Alt.</u>	<u>T.C.</u>	<u>2π</u>
08/11/80	12	6.3%	8.8%	400'	1125	N/A	400'	1145	N/A
09/22/80	95	6.3%	8.5%	400'	1150	7	No Test		
09/24/80	105	5.4%	8.8%	400'	1150	9	400'	1150	7
09/25/80	108	5.2%	8.6%	400'	1200	12	400'	1175	9
09/25/80	109	5.2%	8.6%	400'	1200	12	400'	1175	9
09/25/80	110	5.2%	8.6%	400'	1200	12	400'	1175	9
09/26/80	112	6.1%	9.3%	400'	1200	12	400'	1150	10
09/26/80	114	6.1%	9.3%	400'	1200	12	400'	1150	10
10/01/80	129	5.5%	8.5%	400'	1175	9	No Test		
10/01/80	130	5.5%	8.5%	400'	1175	9	No Test		
10/08/80	148	5.5%	8.0%	400'	1225	13	400'	1225	12
10/08/80	149	5.5%	8.0%	400'	1225	13	400'	1225	12
10/08/80	150	5.5%	8.0%	400'	1225	13	400'	1225	12
10/08/80	151	5.5%	8.0%	400'	1225	13	400'	1225	12

N/A = NOT AVAILABLE

A P P E N D I X N

Renumbered to Original Fiducial Correlations

UKIAH QUADRANGLE

LINE 690 FLOWN AS LINE 690 AND 693 AND 694
MAP FIDUCIALS 3510 TO 5880 CORRESPOND TO ORIGINAL FIDUCIALS 5880 TO 3510
MAP FIDUCIALS 5881 TO 6493 CORRESPOND TO ORIGINAL FIDUCIALS 83 TO 1001
MAP FIDUCIALS 6494 TO 6753 CORRESPOND TO ORIGINAL FIDUCIALS 4483 TO 4742

LINE 710 FLOWN AS LINE 710
MAP FIDUCIALS 132 TO 3130 CORRESPOND TO ORIGINAL FIDUCIALS 3130 TO 132
MAP FIDUCIALS 3131 TO 3359 CORRESPOND TO ORIGINAL FIDUCIALS 6855 TO 7084

LINE 730 FLOWN AS LINE 732 AND 733
MAP FIDUCIALS 1286 TO 2389 CORRESPOND TO ORIGINAL FIDUCIALS 2389 TO 1286
MAP FIDUCIALS 2390 TO 3930 CORRESPOND TO ORIGINAL FIDUCIALS 8527 TO 8289

LINE 750 FLOWN AS LINE 750
MAP FIDUCIALS 16872 TO 19921 CORRESPOND TO ORIGINAL FIDUCIALS 19921 TO 16872

LINE 770 FLOWN AS LINE 770
MAP FIDUCIALS 14208 TO 16765 CORRESPOND TO ORIGINAL FIDUCIALS 16795 TO 14208
MAP FIDUCIALS 16766 TO 17005 CORRESPOND TO ORIGINAL FIDUCIALS 8619 TO 8859

LINE 790 FLOWN AS LINE 791 AND 792
MAP FIDUCIALS 8815 TO 11373 CORRESPOND TO ORIGINAL FIDUCIALS 11373 TO 8815
MAP FIDUCIALS 11374 TO 11617 CORRESPOND TO ORIGINAL FIDUCIALS 10250 TO 10494

LINE 810 FLOWN AS LINE 810 AND 811
MAP FIDUCIALS 11428 TO 14046 CORRESPOND TO ORIGINAL FIDUCIALS 14046 TO 11428
MAP FIDUCIALS 14047 TO 14284 CORRESPOND TO ORIGINAL FIDUCIALS 11822 TO 11584

LINE 830 FLOWN AS LINE 830 AND 831
MAP FIDUCIALS 6008 TO 8621 CORRESPOND TO ORIGINAL FIDUCIALS 8621 TO 6008
MAP FIDUCIALS 8622 TO 8852 CORRESPOND TO ORIGINAL FIDUCIALS 12005 TO 12236

LINE 850 FLOWN AS LINE 850 AND 851
MAP FIDUCIALS 3457 TO 5937 CORRESPOND TO ORIGINAL FIDUCIALS 5937 TO 3457
MAP FIDUCIALS 5938 TO 6167 CORRESPOND TO ORIGINAL FIDUCIALS 13597 TO 13368

LINE 870 FLOWN AS LINE 873 AND 874
MAP FIDUCIALS 4956 TO 7792 CORRESPOND TO ORIGINAL FIDUCIALS 7792 TO 4956
MAP FIDUCIALS 7793 TO 7539 CORRESPOND TO ORIGINAL FIDUCIALS 15289 TO 15520

LINE 890 FLOWN AS LINE 893 AND 894 AND 890
MAP FIDUCIALS 3779 TO 5241 CORRESPOND TO ORIGINAL FIDUCIALS 5241 TO 3779
MAP FIDUCIALS 5242 TO 6344 CORRESPOND TO ORIGINAL FIDUCIALS 9078 TO 7975
MAP FIDUCIALS 6345 TO 6557 CORRESPOND TO ORIGINAL FIDUCIALS 16973 TO 17185

LINE 910 FLOWN AS LINE 911
MAP FIDUCIALS 1000 TO 3704 CORRESPOND TO ORIGINAL FIDUCIALS 3704 TO 1000

LINE 3000 FLOWN AS LINE 3002
MAP FIDUCIALS 2580 TO 3127 CORRESPOND TO ORIGINAL FIDUCIALS 3127 TO 2580

UKIAH QUADRANGLE

LINE 3010 FLOWN AS LINE 3011 AND 3012

MAP FIDUCIALS 3306 TO 4831 CORRESPOND TO ORIGINAL FIDUCIALS 4831 TO 3306

MAP FIDUCIALS 4832 TO 5406 CORRESPOND TO ORIGINAL FIDUCIALS 14613 TO 15187

LINE 3020 FLOWN AS LINE 3022 AND 3020

MAP FIDUCIALS 105 TO 1097 CORRESPOND TO ORIGINAL FIDUCIALS 1097 TO 105

MAP FIDUCIALS 1098 TO 2168 CORRESPOND TO ORIGINAL FIDUCIALS 3821 TO 4892

LINE 3030 FLOWN AS LINE 3034 AND 3035

MAP FIDUCIALS 5343 TO 6284 CORRESPOND TO ORIGINAL FIDUCIALS 6284 TO 5343

MAP FIDUCIALS 6285 TO 7444 CORRESPOND TO ORIGINAL FIDUCIALS 3595 TO 2435

LINE 3040 FLOWN AS LINE 3044

MAP FIDUCIALS 1102 TO 2762 CORRESPOND TO ORIGINAL FIDUCIALS 2762 TO 1102

LINE 3050 FLOWN AS LINE 3051

MAP FIDUCIALS 3070 TO 5155 CORRESPOND TO ORIGINAL FIDUCIALS 5155 TO 3070