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National Uranium Resource Evaluation

**Airborne Gamma-Ray Spectrometer
And Magnetometer Survey:
Susanville 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

SUSANVILLE QUADRANGLE
CALIFORNIA

FINAL REPORT
VOLUME I

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AERO SERVICE DIVISION
WESTERN GEOPHYSICAL COMPANY
OF AMERICA
HOUSTON, TEXAS

MAY, 1981

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ASSISTANT SECRETARY FOR RESOURCE APPLICATIONS
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SUBCONTRACT NO. 80-460
PROJECT NO. IGO205

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Figure 1
SUSANVILLE 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 Susanville, California, map area.

Traverse lines were flown in an east-west direction at a line spacing of six (6) miles. Tie 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 1642.8 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.

AERO SERVICE
HOUSTON, TEXAS 77001

..... FILM IDENTIFIED TRAVERSE/TIE LINE INTERSECTION
..... FILM IDENTIFIED GROUND CONTROL
..... INDEX FIDUCIAL 1100 FIDUCIAL INTERVALS
..... FLOWN 1980

FLIGHT PATH
SUSANVILLE
NK 10-12
DOE/NURE

FIGURE 2
9/10

DATA ACQUISITION

Aircraft

The survey was conducted using a Sikorsky S-58T helicopter, registration N94523, owned and operated by Carson Helicopters, Inc., Perkasié, 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

8-17-88 JWL

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HOUSTON TEXAS

DWN
CHKD
DATE
TITLE

BLOCK DIAGRAM
HISENS AGNS 2000R SYSTEM

SIZE
DRAWING NO
REV
SHEET

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 Susanville, 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 1,642.8 miles are in the Susanville 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 Susanville 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 400 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.

AERO SERVICE
QUAD - SUSANVILLE

TERRAIN CLEARANCE HISTOGRAM
J08 627

3 POINTS GREATER THAN 1000 FEET

AERC SERVICE
QUAD SUSANVILLE

GROUND SPEED
JOB 627

HISTOGRAM

NUMBER OF DATA POINTS

1360 2600 3900 5200 6500 7800 9100 10400 11700 13000 14300

21/22

Figure 5

MILES
PER
HOUR

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

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.

$$\begin{aligned}T/U &= \tau = 0.08 \\U/T &= \alpha = 0.30 + 0.02 + 0.000076H \\K/T &= \beta = 0.37 \\K/U &= \gamma = 0.90\end{aligned}$$

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 Biair 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 Susanville quadrangle is located in northern California and occupies the area between 40° and 41° north latitude and 120° to 122° west longitude. Drainage in the area forms a dendritic pattern with most of the water being drained into the Pit River and the tributaries of the Sacramento River. Many small streams drain inward toward the center of the quadrangle filling lakes, among which Honey Lake, Lake Almanor and Eagle Lake are the most prominent.

Topography varies greatly over the map area and portions of five northern California geomorphic provinces are contained within the borders of the quadrangle. The west and central portions include part of the Cascade Range Province where elevations reach over 10,000 feet at Lassen Peak, an active volcano. Deep canyons also accent the topography in this province, especially along the course of the Pit River to the north.

The Modoc Plateau comprises a broad northeastern swath across the Susanville quadrangle. With elevations from 4000 to 6000 feet, this southern extension of an Oregonian lava field is characterized by sluggish interior drainage, small lakes and marshlands.

Catching just the north and southeastern corners of the map area, the Basin-Ranges Province is a network of alternating ridges and valleys typical of a step-faulted structural terrane.

The central southern border of the quadrangle includes the northern extent of the Sierra Nevada Province, a vast tilted fault block, which presents a formidable escarpment to the west and a gradual sediment collecting slope to the east. Topography in the Sierra Nevada is very rugged due to severe canyon-forming river erosion and glacial sculpturing.

A very small portion of the Great Valley Province crosses the southwestern corner of the quadrangle contributing little to the geology of the map area. The broad sedimentary basin overlies a deeply buried synclinorium formed by eastward dipping Cenozoic metasediments on the west and the westward dipping sediments of the Sierra Nevadas.

Stratigraphy

Stratigraphy in the Susanville quadrangle is most conveniently viewed

with regard to sections occurring in the various geomorphic provinces. Rocks of the Cascade Range include mostly Pliocene volcanics, andesite, basalt and pyroclastics. Miocene, Pleistocene and Recent volcanics comprise a lesser constituency. Some upper Cretaceous metasediments are exposed along dissecting river channels. Quaternary fluvial deposits occur throughout the area.

Similar to the Cascade Range lithologies, the rocks of the Modoc Plateau Province are predominantly young volcanics and volcanoclastics from Miocene to Recent volcanism. Tertiary lacustrine deposits occur within many of the shallow regional basins and Quaternary fluvial sediments and nonmarine terraces line most of the drainage system.

Tertiary and Quaternary lacustrine, alluvial, terrace and pyroclastic deposits are mapped over much of the surface in the Basin-Ranges area as it occurs within the Susanville quadrangle. Intrusives and volcanics from the Mesozoic through the upper Tertiary interrupt the section locally.

A variety of metasediments and metavolcanics of Triassic and Jurassic age comprise the bulk of the lithologies in the map area. To a lesser extent Silurian, Mississippian and Permian marine metasediments and metavolcanics occur locally. Mesozoic granites and ultrabasic plutons intrude the sequence.

The geologic map of California, Westwood sheet, was used here in the correlation of the geologic and radiometric data. A brief description follows for each stratigraphic unit occurring within the Susanville quadrangle, beginning with the oldest.

Silurian Marine Sedimentary and Metasedimentary Rocks (S)

The marine sediments and metasediments of Silurian age consist chiefly of slate, graywacke, mudstone and siltstone. Locally, there occur gritty to conglomeratic beds and also metamorphosed dikes and sills of undifferentiated rock types.

Mississippian Marine Sedimentary and Metasedimentary Rocks (Cm)

The marine sediments and metasediments of Mississippian age are comprised of metamorphosed shale, chert, mudstone and sandstone which are often characterized by conglomeratic or tuffaceous beds. Metavolcanic flows of undifferentiated type occur locally throughout the area.

Permian Volcanic Rocks (P_v)

A variety of Permian age volcanic rocks occur in the area. They generally consist of augite-andesite, metabreccia, metatuff, keratophyre porphyry sills or flows and diabase and amphibolitic rocks. This section is further characterized by locally interbedded carbonates.

Permian Marine Sedimentary and Metasedimentary Rocks (P_m)

The Permian marine sediments consist typically of locally fossiliferous limestones, mudstone and chert. The rocks of this section occurring in the Susanville quadrangle also include tuff, slate, quartzite and some metavolcanic breccia and conglomerate.

Paleozoic Metavolcanic Rocks (P_v)

The Paleozoic metavolcanics of the area include metakeratophyre, metamorphosed tuff, augite-andesite breccia with locally occurring undifferentiated volcanic sills and flows.

Paleozoic Marine Sedimentary and Metasedimentary Rocks (P)

Interbedded phyllite, argillite, slate, quartzite, metagraywacke, metachert and chlorite or hornblend schists comprise the Paleozoic marine sediments. Also occurring very locally are beds of crystalline limestone and dolomite (ls).

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 Metamorphic Rocks, Undifferentiated (m-ls)

The undifferentiated metamorphic rocks of pre-Cretaceous age consist of chert, metaquartzite, locally graphitic and micaceous phyllites and schists. Also occurring more rarely are beds of dolomite and limestone (ls).

Jurassic and/or Triassic Metavolcanic Rocks (J_Tv)

These metavolcanic rocks include metadacites and meta-andesites which occur as sills and flows. Also occurring are volcanic breccias and locally fossiliferous tuff. In the Chico quadrangle to the south, the metavolcanics

are comprised of amphibolites, metabasalt and rhyolite, quartz and hornblende porphyries.

Triassic Marine Sedimentary and Metasedimentary Rocks (T)

The Triassic marine sediments consist of interbedded limestone, sandstone and shale with locally occurring hornfels, quartzite and volcanic conglomerate.

Mesozoic Ultrabasic Intrusives (ub)

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

Middle and Lower Jurassic Marine Sedimentary and Metasedimentary Rocks (Jml)

Middle and lower Jurassic marine sediments include argillites, tuffaceous sandstone and shale, along with locally fossiliferous limestone. Slates and metaconglomerates generally comprise the metamorphic rocks.

Upper Jurassic Marine Sedimentary and Metasedimentary Rocks (Ju)

The upper Jurassic marine unit consists largely of shale and slate, phyllite, bedded to massive sandstone and graywacke interbedded with locally fossiliferous tuff.

Mesozoic Granitic Rocks (gr)

Granitic rocks of the Mesozoic include varying sized pods and plugs of gabbro, diorite, trondhjemite, granodiorite, tonalite and quartz monzonite.

Upper Cretaceous Marine Sedimentary Rocks (Ku)

The marine sediments of upper Cretaceous age consist of interbedded sandstone, shale and locally massive conglomerate. The sequence is locally fossiliferous in the Susanville quadrangle.

Tertiary Volcanic Rocks (Tv)

The volcanics of the Tertiary period in the area are comprised of light colored andesite flows (Tv^a), basaltic flows and plugs (Tv^b), and locally pyroclastic tuffs and breccias (Tv^p) and rhyolitic rocks (Tv^r).

Tertiary Intrusive Rocks (Ti)

Intrusives include rhyolite plugs (Ti^r), andesitic breccias (Ti^a) along with basaltic dikes and plugs (Ti^b).

Tertiary Lake Deposits (Tl)

The Tertiary lake deposits in the area include argillaceous to arenaceous sandstones with local volcanic ash or tuff.

Tertiary Nonmarine Sedimentary Rocks (Tc)

Nonmarine sediments are characterized by auriferous gravel deposits which are locally interbedded with sandstone and conglomerate.

Eocene Volcanic Rocks (Ev)

Black olivine columnar basalt flows (Ev^b) comprise most of the Eocene volcanics. In the Chico quadrangle to the south, however, rhyolite and andesite tuff and breccia occur locally, associated with volcanic sandstone and conglomerate.

Eocene Nonmarine Sedimentary Rocks (Ec)

Arkosic sandstones, quartzomaceous sandstones, shales and conglomerates comprise the bulk of the Eocene nonmarine sediments. In the Susanville and Chico quadrangles auriferous gravel deposits occur locally. Thin coal veins make up part of the section in the Redding quadrangle, locally.

Oligocene Volcanic Rocks (ϕv)

Oligocene volcanic rocks vary in composition and include rhyolites (ϕv^r), andesites (ϕv^a), basalts (ϕv^b) and pyroclastics (ϕv^p).

Miocene Volcanic Rocks (Mv)

Rhyolite (Mv^r) and andesite (Mv^a) flows with local thin layers of tuff and obsidian, often associated with pyroclastic breccias and mudflows (Mv^p), make up the section of Miocene volcanic rocks throughout most of the area. In addition, extensive black basaltic flows (Mv^b) occur in the Susanville and Alturas quadrangles.

Pliocene Volcanic Rocks (Pv)

The Pliocene volcanics in the Chico, Susanville and Alturas quadrangles consist of rhyolites (Pv^r), andesites (Pv^a), basaltic flows and breccias

(Pv^b), along with pyroclastic tuffs and mudflows (Pv^P).

Undivided Pliocene Nonmarine Sedimentary Rocks (Pc)

Undivided nonmarine sediments in this quadrangle are comprised generally of sandstones, siltstones and gravel.

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.

Pleistocene Volcanic Rocks (Qpv)

Basaltic flows (Qpv^b) and pyroclastic (Qpv^P) 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 (Qpv^a) and rhyolites (Qpv^r).

Pleistocene Nonmarine Sedimentary Deposits (Qc)

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

Recent Volcanic Rocks (Qrv)

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.

Quaternary Nonmarine Terrace Deposits (Qt)

The Quaternary nonmarine terraces include river, stream and lake terrace deposits, along with some fanglomerates, deltaic and slopewash deposits.

Quaternary Glacial Deposits (Qg)

Terminal and lateral moraines, till and fluvoglacial deposits along with later associated accumulations, such as bog and soil, make up the major Quaternary glacial deposits throughout the area.

Quaternary Lake Deposits (Q1)

The Quaternary lake deposits include sand, silt, ash and local diatomaceous earth in playa-like deposits in scattered basins of interior drainage. This part of the section in the Weed and Redding quadrangles also includes predominant glacial lake deposits.

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 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 Susanville and Weed quadrangles also includes areas of local glacial outwash.

Recent Dune and Coast Sand (Qs)

Well sorted dune sand and older eolian sand occur along coastal areas.

Structure

Fault lineation in the Susanville quadrangle indicates a north-northwest, south-southeast structural trend. Among many of the major faults are the recently active Likely Fault, which traces a linear pattern northeastward, the Honey Lake Fault, southwest of Honey Lake, and the Fort Sage Fault, located southwest of Honey Lake, which was active as recently as 1950.

Many volcanic cones are distributed over the north central portion of the quadrangle in the Cascade Range Province; the most prominent of these being Lassen Peak and Crater Lake Mountain. Hot springs associated with modern thermal activity are located primarily in the southwestern part of the Susanville quadrangle, especially in the vicinity and south of Lassen Peak.

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

Forty-seven recognized rock units were encountered and sampled in the course of the Susanville quadrangle survey. Most of these are rocks of volcanic origin, which are by far the most widely exposed rocks in the map sheet area.

Pliocene basalts (Pv^b) are exposed in broad, irregular outcrop areas across the quadrangle. They constitute approximately forty percent of the surficial rocks, and they were sampled extensively (11,400 samples). The histogram curves are normal in their distribution in all three spectral windows; however, the potassium histogram indicates at least two peaks, and the thorium histogram suggests an incipient second peak at a concentration of about 2.0 ppm. Inasmuch as there were more than eleven thousand samples, it may be concluded that there are two or more compositional facies comprising the Pliocene basalts.

The Pleistocene basalts (Qpv^b) are also very widely exposed, mainly in a broad irregular zone in the north center, west of Eagle Lake and north of Lake Almanor. The histogram curves are narrow and well defined in all three spectral windows. The thorium and potassium curves have normal distribution and the uranium curve has lognormal distribution. The singularity of the peaks and the low order of dispersion indicates that the Pleistocene basaltic extrusives (Qpv^b) are reasonably uniform in their composition, in contrast to the Pliocene basalts (Pv^b).

The Pliocene pyroclastics (Pv^P) are characterized by sharply defined histogram distributions, with normal distribution in the uranium and potassium spectral channels and lognormal in the thorium channel. The mean elemental concentrations are relatively low, suggesting andesitic or basaltic general composition.

The Pliocene andesites (Pv^A) are mainly exposed in irregular areas in the western part of the Susanville quadrangle. The histogram distribution curves are lognormal in all three spectral channels and display extensive tailing

into higher concentrations. The thorium and uranium windows have dual peaks; the potassium window has three, and possibly four peaks. Clearly the Pliocene andesites (Pv^a) are composed of several compositional types, possibly ranging from basaltic members to rhyolitic members.

The Pleistocene andesites, (Qpv^a), despite the fact that they have been sampled only seven hundred six times and therefore show much more erratic histogram curves, are normal in their distributions in all three spectral channels and they have considerably less dispersion than the Pliocene andesites (Pv^a). It can be concluded that this rock unit is essentially composed of a single, more or less uniform, compositional type.

Tertiary pyroclastics (Tv^P) outcrop in the southeastern part of the map sheet, south of Honey Lake and Tertiary andesites (Tv^a) in the center, west of Susanville. The former displays an interesting set of histograms, lognormal in all three spectral channels, with unusually lengthy tailing into the higher concentrations. The lower concentrations show well defined peaks. The Tertiary andesites (Tv^a), although they were not sampled extensively (three hundred forty-five samples), have generally well defined peaks, normal in distribution, closely resembling the lower concentrations of the pyroclastics in mean elemental concentration and dispersion. This implies that the Tertiary pyroclastics are mainly andesitic in their composition, with minor components of dacite and rhyolite.

Only one Holocene volcanic member was surveyed sufficiently for discussion, the Recent basaltic extrusions (Qrv^b) associated with the active volcanoes and cinder cones of the Mount Lassen area in the north center and northwest. The thorium and uranium channel histograms have normal distribution, with the low mean elemental concentrations characteristic of mafic rocks. The potassium spectral channel is extremely irregular, and it suggests multiple peaks.

Only two intrusive rock types are recognized as being exposed in the Susanville quadrangle, the Mesozoic granitic rocks (gr) and the Mesozoic ultrabasic rocks (ub).

The Mesozoic granitic rocks (gr) outcrop in a large faulted plug south and west of Honey Lake, in the southeastern part of the quadrangle. It is part of the Sierran batholith. The histogram curves show great irregularity

and lognormal distribution on all three spectral channels. All three curves display tailing into unusually high concentrations. The general aspect of the histograms suggests that the granitic body is extremely heterogeneous in composition, with much magmatic differentiation having taken place. However, the mean elemental concentrations are very high, indicating that the bulk of the exposed granitic plug is, indeed, felsic in composition.

The Mesozoic ultrabasic intrusives (ub) are mainly exposed along the south central margin of the map sheet and they were not encountered for many samples. Nevertheless, they show the low mean elemental concentrations typical of mafic and ultramafic composition. The uranium and potassium histogram distributions are lognormal and display modest tailing into relatively higher concentrations, suggesting that components of the rock mass are present that are less mafic than the bulk of the outcrop; possibly the talc schists.

The metamorphic basement is not widely exposed in the Susanville quadrangle. A few small areas of outcropping pre-Cretaceous metavolcanics (mv) were encountered near Lake Almanor in the south center. The resulting histograms are erratic, but they suggest that the source rocks are homogeneous and moderately mafic in composition. The thorium and uranium spectral channels are normal in distribution and the potassium channel is lognormal. All three have fairly low mean elemental concentrations and modest dispersion.

The Jurassic/Triassic metavolcanics (JTv) are also exposed in the south center, in an irregularly shaped belt trending northwest-southeast between Lake Almanor and Honey Lake. The histogram traces are extremely erratic, with great dispersion on all three spectral channels. The indication is that this mapped unit includes a wide range of rock types, with andesitic components predominating. This is consistent with the petrologic description of the unit.

Sedimentary rocks are not widely exposed in the Susanville quadrangle. The most abundantly sampled are the Quaternary lake deposits (Q1), which outcrop in a large area in the northeast across the Madeline Plains, and in the southeast in Honey Lake Valley. The histogram distributions are normal on all three channels, showing very broad dispersion, erratic curve traces and high mean elemental concentrations. It indicates that the lake deposits include many sedimentary facies of variable composition.

The Quaternary alluvium (Qal) is exposed in many restricted patches throughout the quadrangle area. Histogram distribution is normal on the thorium spectral window and lognormal on the uranium and potassium windows. Dispersion is less than that of the lake deposit (Ql) curves, and the individual histogram curves are much less erratic. There is a hint of a secondary peak in the relatively high concentrations on the thorium and potassium histogram curves. Mean elemental concentrations are lower than those of the Quaternary lake deposits (Ql). The alluvial deposits are interpreted as being generally homogeneous, although the incipient secondary peak in the higher concentrations suggests a minor included sedimentary facies. The overall composition of the Quaternary alluvium (Qal) is likely to be less felsic than that of the bulk of the Quaternary lake deposits.

Other, generally older sedimentary formations are present in very restricted areas, but their sampling frequency is not sufficient to permit reliable evaluation.

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 generalized total intensity magnetic map indicates an overall ill-defined northwest-southeast magnetic trend in the central, northwestern and southeastern parts of the quadrangle. The most intense anomalies are in the south center, and are correlated with the complex of metamorphosed volcanic rocks exposed southeast of Lake Almanor. Other areas characterized by extreme levels of magnetic intensity are the Pleistocene basaltic volcanics (Qpv^b) exposed in the northwestern and northeastern parts of the map sheet. Over these three zones, the strength of the Earth's field exceeds 54,100 gammas. The local magnetic relief on the Susanville quadrangle exceeds on thousand eight hundred gammas.

Study of the standard deviation anomaly maps supplemented by the individual profiles indicates the presence of seventeen anomalies where

TABLE III

LEGEND TO TOTAL FIELD MAP (GAMMA)

<u>CONTOUR VALUE</u>	<u>LOWER LIMIT</u>	<u>UPPER LIMIT</u>
-		52300.0
0	52300.0	52480.0
1	52480.0	52660.0
2	52660.0	52840.0
3	52840.0	53020.0
4	53020.0	53200.0
5	53200.0	53380.0
6	53380.0	53560.0
7	53560.0	53740.0
8	53740.0	53920.0
9	53920.0	54100.0
+	54100.0	

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X3= 760000.0
Y3= 4545669.0
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.....+ Figure 7
X2= 760000.0 47/48
Y2= 4425000.0

```


TABLE IV

LEGEND TO POTASSIUM AVERAGE MAP (PERCENT)

<u>CONTOUR VALUE</u>	<u>LOWER LIMIT</u>	<u>UPPER LIMIT</u>
-		0.20
0	0.20	0.40
1	0.40	0.60
2	0.60	0.80
3	0.80	1.00
4	1.00	1.20
5	1.20	1.40
6	1.40	1.60
7	1.60	1.80
8	1.80	2.00
9	2.00	2.20
+	2.20	

```
X3= 760000.0
Y3= 4545669.0
```

```
X3= 760000.0
Y3= 4545669.0
```

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.....V
X2=  760000.0
Y2=  4425000.0

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TABLE V

LEGEND TO URANIUM AVERAGE MAP (PPM)

CONTOUR VALUE	LOWER LIMIT	UPPER LIMIT
-		0.30
0	0.30	0.55
1	0.55	0.80
2	0.80	1.05
3	1.05	1.30
4	1.30	1.55
5	1.55	1.80
6	1.80	2.05
7	2.05	2.30
8	2.30	2.55
9	2.55	2.80
+	2.80	

URANIUM AVERAGE

```
X3= 760000.0
Y3= 4545669.0
```

Figure 9

```
X2= 760000.0
Y2= 4425000.0
```


TABLE VI

LEGEND TO THORIUM AVERAGE MAP (PPM)

CONTOUR VALUE	LOWER LIMIT	UPPER LIMIT
-		1.00
0	1.00	1.80
1	1.80	2.60
2	2.60	3.40
3	3.40	4.20
4	4.20	5.00
5	5.00	5.80
6	5.80	6.60
7	6.60	7.40
8	7.40	8.20
9	8.20	9.00
+	9.00	

```

X2= 760000.0
Y2= 4425000.0

```

TABLE VII

LEGEND TO URANIUM/POTASSIUM RATIO MAP

<u>CONTOUR VALUE</u>	<u>LOWER LIMIT</u>	<u>UPPER LIMIT</u>
-		0.60
0	0.60	0.90
1	0.90	1.20
2	1.20	1.50
3	1.50	1.80
4	1.80	2.10
5	2.10	2.40
6	2.40	2.70
7	2.70	3.00
8	3.00	3.30
9	3.30	3.60
+	3.60	

SUSANVILLE CALIFORNIA URANIUM/POTASSIUM RATIO

X4= 580000.0

X3= 760000.0

Y4= 4545669.0

Y3= 4545669.0

.....+
.
.
.
11 -- 33 2574210 2 432 3 44443210 330--- 000 22221110000 232 2100---- 31-
10-+++ 8531 4 58 9542 25522 22- 0000000 21 222 341 3 42210 24320 21 36 4 42 1 23 3 3 4 4321 1221 00 12 2 1 12 221 0 0110
1 26 9753 34589864 3443 22100 11 1 2 3322 3 2 1 12332111 2 33 3222 3 33 4 432 1 2 10 0 1 1 12 2 1 0 0 110
-258 9643 45788643 3 43 2 11 2221 1 22 3 2 1 2 2 1 1 2 3 32 23444 4432 1 11 00 111 11 111 2 2 1 00 1 21
-2479 9753 46665433 4433 2222 2 11 22 3 22 3332 2 2 1 1 2 344322 45554 3 44321 0000 11 11 1 1 22 2 1 12222
-1356787644 3 4 5 54 4 4 3333 22 111 2 333 3 2 23332 2 2 1 1 235543 346654 3 3 43210 0 1 1 1 1 2 2 1 1 2 2
-12345 543 3 2 345544 5444 32 1 1233 32 23332 2 2 1 1 235553 345554 3 3 33210 0 1 11 111 1 2 22 1 11 22
-1 234 5544432 234554 55 4 33 2 1 1233 3 2 2 333 2 2 2 1 1 234543 34 44 3 22222 10 0 11 0 111 1 111 2
1 2 3567776544 55 54444 4 3 2 2 1 1 23 3 2 3 32 1 1 23 443 2 3 3 2 1 11 0 0 11 0 0 11 1 1 22 2
1221 246788877 88764 44 32 1 11 1 23 33 3 32 2221 1 2 3 322 2 3 3 2 1 11 0 0 111 0 0 11 11 1 2 2 23
12221 1 345677 9 964 3 321 1 12 3 333 3 2 2 21 12 3 322 2 3 3 2 1 00 11 1 0 11 1 1 1 11 22 23
122 21 123567 9 964 3 3 321 22 1 123 33 3 3 2 2 21 1 2 33 3333 32 1 11 1 1 1 1 11 1 1111 2
333321 12356 899864 3 2 2211 1 1 2 3 2 3 3333 22 21 00 12 2 33 444 332 1 11111 0 1 2 111 222 1 00 1 1 12
44444311 23 456764 3 2 2 3332222 11 2 2 2 3 3 210 01 2 3 3333 2 1 1 10 02 2 2 33 2 1 0 0 1 1 1 2
5 66653 1 1 1 2344 4 3 1 23 33 222 2 2 11 2 3 2 10 1 22 22 2 2 1 1 2210 012 2 2 333 2 1 0 0 1 1 1 2
56 77642 11 12 3 31 12 2 1 1 222 21 12 2 222 3 2 1 0 01 222 2 2 1 1 2 210 01 2 2 3 22 1 0 0 1 1 1 2
66 77642 1 12 3 321 0 01 2 21 12 22 2 2 2 110 1 2 2 1 1 2 2100 1 11111 2 2 11 000 1 1 11
6 7 6543 4321 1 2 22 1 00 1 2 3332 1 1 2 2 22 11 22222 2 3321 1 2 21111 1 111 1 1 1
45 55 5 66642 12 2 1 11 22 3 3 2 1 2 333 22222 2 2222 33321 1 2 2221 1 111 111 111 1 12
35 4 4 6777631 12321 111 1 22 3 4432 22 3 444332 2 333 2 23333 3 431 1 2 332 1 1 1 1 11 1 1 12
3 4 33 456776311 2331 1 1 1 122 344432 222 2 3 4433 2 3 32 233 3 33331 1 2 3 32 11 1 1 1 1 1222 1 1 1 1
3 43 3 45 66433 333211 2222 1 2333 4443 22 33222 111 23 332 2 2 454322 33 222221 1 2 3 2 1 1 1 11 1 2 1 1 11
133 3 356665444322 3 4332 2 3 3 3 4443 21 1233 2 1 2 3466542 1 2 111111 1 2 2 1 11 1 1 1 111 1 10
2 2 357777654 33 455432 23 44 33 33 4555432 11 23 321 12 35787421 11 1 2 3 21 11 1 1 1 1 1 1 1
22 2 35687 7754 45543 2 223 4 3 3 4 555432 2344321 12 35898521 1 1 2 333211 1 1 22 1 1 1 111 11 0
22 2 24679 8 754 45542 2 3 33 3 3 44444 32 233 2 11 2 346898532111 1111 1 2333222 111 1 22 11 11 0
33 44 4567897 7654 4443 22 3 33333 2 3 33 2 22 2222 3469985322 33332 1 11 1 2 2 33 2 222 11 1 0
4 566 77 887777654 22 33 22 2 3 33 2 111 2 2 3333 357 853333 44 321 11 1 23 32 2222 11111 1 0
25 6777666665 6 54 3 344 32 2 3 22 3 21 1 2 2 2 344 3 258 8633 3 33332 1 11 1 2 332 2 2 1 1 1 0
25 67653 345 54 3 3 322 11 2 23 2 1 1 2 234 443 68 8533 22 2 111 1 1 2 2 2 2 1 1 1 0
66 643 344 5 5 4 44 3 3 32 2 1 2 333 2 11 1 22 234 55 568886533 2 2 2 1 1 11 11 2 33 2 111 1 0
66 65 43 4 4 5 44 443 211 12 33 33 2 111 22 2 35 67 877643 3 2 2 2221 1 222 1 1 1 1 1 2 2 22 1 1
77 65 44 3 4 55555543 221111 23 44 3 2 2 1 23567898764 3 443 22 2 21 1 2 22 1 1 1 1 1 2 111 2 2 1 111
8776 5 4 3 34 555 666543 333332222 3444 3 2 2222 1 1 23457898753 34 433 2 3321 1 2 2 11 122 221 12 222 11 1
87765 4 3 4 5 6 6543 444 4443 3444 33 22 344432 2 3 456787653 34 54 33 3 3211111 22 111 1234432 21 12 22 1
7 6 5554444 566666 5555544 45554 55443 45544 4444 589976433 45 6554 3 345 54 33 34 322 2 1 0 3576543 21 1 2 333322 1
76 6655 678888765 444 5677655 6654 56654 4577 78 8654 44444443 46654 33 4432 2 222 1 1 0 03799753 2111 2 3 3 21
66 5 6 65 5689 98754 3 4 689976 677655 6664 468999 75 54 3 3 43 46764 44 3 4432 2 1 1 1 0 0379975 321 2 3 4 32 2
665 5654 4589 987543 3 46799766 77655 6654 469 6 5 5 3 2 343 4677655543 34 3 2 1 1 13688753 21 2 3 3 22
5 44 5 4 4578 9987543 3 4567766 66 5 5 54 689 95 66654 32 233 456665 543 3 3 222222 1 12455533 21 2 3 3 2
43 3 333 46 6 7 7754 2 233 4555 5 55 44 33333 468 85 788754432 2 345 4 5 43 33 33 333221 2333 2 2 3 33 2
32 2 2 45 44 56654 2 3 3 44444 32 2 2 24799 76 865432 2 3 333 443 33 3 321 22 2 222 2
42 1 1 123 22 4565 4 3 2 2 23 4221 1 3689 8 865432 2 3333 3 3 222 3 3321 111 2 2 3
42 1 1 122 235 5 4 32 2 3 321 1 2 368 9 788876443 3454 3 3 3 2 2 2 2222221 1 1 2 33
2 1 1 1 2 22 3455 444 3222 444444 321 22 3578 9 8 5787643 358 8543 3 3 2 2 2 111 2 2 22222 1 1 2 34
22222 1 22 33 4 555555444 4 45 665 43 2 33 4578986 6775 5798632 37 843 22222 2 2 3321 1 2 2 2 333 2 1 1 2354
33332222 3 4 55 66 5 5554 5 6766 433 44 57899743 4 569 9631 38 943 2 2 234432 1 2333332 2 3 3 2 1 1 2344
23 3333 3 4 55 66 5 55 5 5677654 44 579 9643 44 46898631 38 943 2 2 24564321 12 3 4 5432 2 33 2 111 11 1 234
23 3 2 3 4 555 5 55 566654 44 4 68996 4 54 457 753 1 36 74322222 332 1 35654321 2 3555543222 2 1 1 1 2 3
3 333333 2 23 4 5 5 4 5 567665 4 444 5788 789974 5543 22 345654 333333 321 1234543222 34 4443333 22 2 1 1 2222 2
443 222 2 2 34 4 456654 45567765 4 333 34787 79 6 4 3 2 2 3 3 3 34421 1 2344322 3 33 3 432 22 1 1 2 2 1
453 2 1 2 2222 34 4 3 346764 345 55 43 22 3798 69 6 3 2 23 342 23 33332 2552 12 34542 23 32 2 2 5 33 22 11 0000 1 22 2 22 111
012 22 234 4 3 468632 23 4 432 2 26 9 3 ++ 7 2 2 22 22
11 45 53 3 36982 1 233 354 42 0 33 11

X1= 580000.0

X2= 760000.0

Y1= 4545669.0

Y2= 4425000.0

Figure 11

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TABLE VIII

LEGEND TO URANIUM/THORIUM RATIO MAP

<u>CONTOUR VALUE</u>	<u>LOWER LIMIT</u>	<u>UPPER LIMIT</u>
-		0.15
0	0.15	0.20
1	0.20	0.25
2	0.25	0.30
3	0.30	0.35
4	0.35	0.40
5	0.40	0.45
6	0.45	0.50
7	0.50	0.55
8	0.55	0.60
9	0.60	0.65
+	0.65	

URANIUM/THORIUM RATIO

```
X4= 580001.1
Y4= 4545669.0
```

```
X3= 760000.0
Y3= 4545669.0
```

.....

	22	--	00	77	10-
10	333 4331 2 8752 110 2200 23- 200- 0 133 3 22 31 1 10 0- 3110- 21 120 12 3 32 3 2 3 33 2 1 220 0 1234322 1 12 21 10 0 122-			-02 3 553 32 2443 3222 1 33----	0 23441 21000 231 11-- 00- 52-
1	123 4332 246642111 12 1 1210 1 00 1232 2 2 1 11 12 1 0 1 1 10 1 2 2 2 3 3 2 11110 0 1 2 3 322 111 2 221000 0 1220				
012	34 4322 355431 1 1 11 1 1 23333 2 1 12 1 1 10 1 2 23 3 43321 0000 01 2222 3322 22 33 21 0 12 2				
012	3 4432 23 32111 2222 1 1 233 3 2 11 2221 12 2 1 1 221 22 2 23 333 44 43210 0 1222 2 2 1 2 33 3 211 12 33				
02	33211 1 2 1 222 2 3322111 2 344321 12 21 12 2 1 1221 23332 33 3 3 45 4210 0 11 111 22 1 12 3 3 211 1 2 33				
02	2 2 21 1 2 2 2 344432 234 321 1 232 11 2 2 1 12 22 3432 3 33 3 4 4321 0 1 11 1 1 1 23 3 22111 2 3				
0332	221 1 2 322 234 5432 2333 2 1 1 2 2 1 22 1 12 3 322 2 2 3 3210 0111 000 1 1 1 2 3 33332 2 3				
332	22111111111 2 33 3 2 3 3 322 1 22 2 1 2 2 1 1 1 1 123 3 2 2 2 22 22 1110 012210 0 1 1 1 23 33 3 322 3				
52 2	22222222 344 33 2 11 3321 122 222222 1 0 0 1221 0 123 2 1 0 012332 0 0111 11 1 23 2 2 3 2 2 4				
8532	22 333333 344 4 3 21 3 4321 1 2 2 2 1 0 12210 0123 2 2 222 1 0 0123321 0 11 1 123 2 2 22 2 4				
8532	1 2 3 3 3 4 4 3 21 3 321 0 1 22 1 12210 0123 2 22 22 3 2 1 0000 123332111 1 12 2 22 3				
52 2	1 1 2 3 3 22 3 32 2 3221 33210 1 1111 2 1 1 1 2210 02 2 222 333 21 11 123 32222 3221 0 12 22 2				
42	2 1 1 2 22222 1 2 2 1 344433 2 1 1 1 0 1 1 1 11 110 12 11 2 1 2 2 1 1 2210 0134 3 3 43210 0 12 32 2 3				
32	21 1 2 111 1 00 124554 222 1 1 0 0 11 0 1 1 0 01 1 1 1 12 2 1 1 2210 12343 3 444310 0 0 1 23322 2 3				
22	21 1 1 1 1 00 0123321 1 222 10 011 0 0 1 1 0 01 1 1 1 122 1 1 2220 0123 3444310 0 0 0 12 22 222222 3				
22	21 1 1 11 0 0110 012 2 10 0 1 0 0 011 000 1 1 11 1 2 21 1222100 1 2 3 321 0 0 11 22 2 33 3				
2	21 1 22221 12 10 0 0 0 1 23 21 000 00 01 11111111 11 1 1 2 21 00 122 2111 2 2 2 21111111 222 2 33 3				
23 2	12333211 2321 00000 0 1111 233332 1 0 1 222222222 2 1 1111 2 3 210 0 12 22 2 21 12 2 2 32 2 222 3 3 34				
23 2	12 3 21 23332 0 01 23 43 2 11111 11 22 3333 2 22 23322 33210 0 2 3332 2 2 1 2 2 33 2 3 22 3 34				
2 3320	0 1 1 23 421 1 0 012222 3 443 2 22 1 111111 2 3 3 2 222 233 222 210 0 2 3 3 2 2 2 11111 22 3333332 1 2 3				
2 33210	0 1 233321 1 110 1 22 33 4443 22 33333221 00 12 222 22 2 321 1 1111 22 1 00 123 22 2 11 0 1 2 22 3 3321 12 2				
2332 10	1 23321 122 11 2 344 4 3 3 456654310 012 1 00 1 23331 00 1 11 122 2 2 22 1 0 0123 2 233 221 12 21				
33 322211	1 22 2111 2 2222 234 4 3 46788753210 12210 01 23431 0 0 01 11 222 23432 1 0 012332 23 2 1 12 2 2				
43	432 1 1 22 21 2 1 22 3 4 4 3 456888754211 23310 01 23432 0 00 01 222 1 23454321 0 012332 2 2 1 12 210				
44	3 1 1 222 1 1 2 3 3444 3 3 4 5677 65432 233320 0 1 23332 0 0000 1 2221 124443321 1 2333 22 2 2 1 1 10				
3	4 321 11 222 111 22 1 2 3 3 44 3 34 555 4333 3 4332100 0 1 233211 11111 222 1 1 2 333211 2 33 3 2 2 1 10 0				
23 4	432222222 2 1 0 12 3332 22 2 3 32 4 443 2 2 34555 321100 0 122 2 11 2 322 2 2 1 1 2322 234444 3 2 1 0 -				
02 34	4322 3 332 10 0123 4432 2 2 3 3 33 32 1 1 23444 32210 0 1 22 222 22 2 2 2 111 12 2 2345 4 33 2 1 0 -				
02 344321	1233 321 0 123 4432 11 1 2 33 321 12 3 3 22 1 1 22 2 2 2 1 12 2 23444 3333 2 1100				
13	4321 123 32 1 1 2 3 332 11 1 2 3 3 21 134432 11 1111 2 3333 2 22 2222211 23 2 2 33 2 3 2 22221				

```
X1= 580000.0
Y1= 4425000.0
```

```
X2= 760000.0
V2= 4425000.0
```

TABLE IX

LEGEND TO THORIUM/POTASSIUM RATIO MAP

<u>CONTOUR VALUE</u>	<u>LOWER LIMIT</u>	<u>UPPER LIMIT</u>
-		2.50
0	2.50	3.35
1	3.35	4.20
2	4.20	5.05
3	5.05	5.90
4	5.90	6.75
5	6.75	7.60
6	7.60	8.45
7	8.45	9.30
8	9.30	10.15
9	10.15	11.00
+	11.00	

THORIUM/POTASSIUM RATIO

X3= 760000.0

Y3= 4545669.0

```

+-----+
X1= 580000.0                                X2= 760000.0
Y1= 4425000.0                                Y2= 4425000.0

```

• + Figure 13

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X2= 760000.0

Y2= 4425000.0

0 10 20
STATUTE MILES

AERO SERVICE

LEGEND

URANIUM ANOMALY NO. 3

THORIUM ANOMALY NO. 4

INTERPRETATION MAP
SUSANVILLE QUADRANGLE
U.S. DEPARTMENT OF ENERGY

FIGURE 14
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thorium radiation is sufficiently intense to be singled out and four anomalies attributable to uranium radiation. In addition, five of the thorium radiation anomalies are accompanied by comparably intense radiation in the uranium channel.

No single formation or geologic unit appears to be a preferential host for deposits of radioactive elements on the Susanville quadrangle. A preponderance of the twenty-one anomalous features is correlated with volcanic formations, but this is presumably because volcanics cover, by far, most of the map sheet area.

Uranium anomaly 1, in the central part of the map sheet, is associated with Quaternary alluvium (Qal) in a small valley west of Crater Lake Mountain. It is on line 610, fiducials 2680-2700. It is a sharply differentiated uranium radiation spike, accompanied by a thorium radiation spike. The atmospheric bismuth count is very low at this fiducial interval, so that there is a possibility of incorrect atmospheric absorption.

Anomaly 2, on line 3100, fiducials 17770-17790, also displays an isolated uranium radiation peak, a comparable thorium peak, and modest U/Th and U/K anomalies. Its source is in the Pleistocene basalts (Qpv^b) and/or the Quaternary alluvium (Qal) south of Horse Lake in the northeast.

Uranium anomalies 3 and 4 are in the south center, on line 680, fiducials 3840-3860 and 3980-4000. Anomaly 3 is associated with Paleozoic sedimentary rocks (P) and Anomaly 4 with Mesozoic ultrabasic intrusives (ub). Both have isolated uranium radiation spikes and correspondingly strong U/Th and U/K ratio anomalies.

Most of the anomalies attributable to increased thorium radiation are irregular increases over broad intervals, and they have the aspect of disseminated formational enrichment rather than potentially economic localized deposits. However, Anomaly XIII, on line 670, fiducials 5280-5400 and Anomaly XV, on line 680, fiducials 4550-4580, are so intense that they warrant further attention. Anomaly XIII, in the southeast, is correlated with Tertiary pyroclastics (Tv^P) and it has a comparably strong uranium radiation peak. Anomaly XV is in the south center and it is correlated with Mississippian marine sediments (CM). No appreciable uranium radiation is present.

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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	Qs	Recent dune and coast sand
QAL	Qal	Recent alluvium
---	Qf	Recent alluvial fan deposits in the Great Valley
QL	Ql	Quaternary lake deposits
QG	Qg	Quaternary glacial deposits
QT	Qt	Quaternary nonmarine terrace deposits
---	Qrv	Recent volcanic rocks, including: rhyolite andesite basalt pyroclastic rock
---	Qrv ^r	
---	Qrv ^a	
QRVB	Qrv ^b	
QRPV	Qrv ^p	
QC	Qc	Pleistocene nonmarine sedimentary deposits
QPV	Qpv	Pleistocene volcanic rocks, including rhyolite andesite basalt pyroclastic rocks
QPVR	Qpv ^r	
QPVA	Qpv ^a	
QPVB	Qpv ^b	
QRPV	Qpv ^p	
---	*	Quaternary and/or Pliocene cinder cones
PC	Pc	Pliocene nonmarine sedimentary rocks, undivided
---	Pv	Pliocene volcanic rocks, including: rhyolite andesite basalt pyroclastic rocks
PVR	Pv ^r	
PVA	Pv ^a	
PVB	Pv ^b	
PVP	Pv ^p	
---	Mv	Miocene volcanic rocks, including: rhyolite andesite basalt pyroclastic rocks
MVR	Mv ^r	
MVA	Mv ^a	
---	Mv ^b	
MVP	Mv ^p	
---	Φv	Oligocene volcanic rocks, including: rhyolite andesite basalt pyroclastic rocks
---	Φv ^r	
---	Φv ^a	
---	Φv ^b	
ΦVP	Φv ^p	

<u>Aero Symbol</u>	<u>Map Symbol</u>	<u>Unit Description</u>
EC	Ec	Eocene nonmarine sedimentary rocks
—	Ev	Eocene volcanic rocks, including:
—	Ev ^r	rhyolite
—	Ev ^a	andesite
EVB	Ev ^b	basalt
—	Ev ^p	pyroclastic rocks
TC	Tc	Tertiary nonmarine sedimentary rocks
TL	Tl	Tertiary lake deposits
TI	Ti	Tertiary intrusive (hypabyssal) rocks, including:
TIR	Ti ^r	rhyolite
—	Ti ^a	andesite
—	Ti ^b	basalt
TV	Tv	Tertiary volcanic rocks, including:
TVR	Tv ^r	rhyolite
TVA	Tv ^a	andesite
TVB	Tv ^b	basalt
TVP	Tv ^p	pyroclastic rocks
KU	Ku	Upper Cretaceous marine sedimentary rocks
GR	gr	Mesozoic granitic rocks
JU	Ju	Upper Jurassic marine sedimentary and metasedimentary rocks
JML	Jml	Middle and lower Jurassic marine sedimentary and metasedimentary rocks
UB	ub	Mesozoic ultrabasic intrusives
TR	tr	Triassic marine sedimentary and metasedimentary rocks
JTRV	Jtrv	Jurassic and/or Triassic metavolcanic rocks
M	m	Pre-Cretaceous metamorphic rocks, and,
—	ls	limestone or dolomite
MV	mv	Pre-Cretaceous metavolcanic rocks
PZ	P	Paleozoic marine sedimentary and metasedimentary rocks, and,
—	ls	limestone or dolomite

<u>Aero Symbol</u>	<u>Map Symbol</u>	<u>Unit Description</u>
PZV	Pv	Paleozoic metavolcanic rocks
PM	P _m	Permian marine sedimentary and metasedimentary rocks
—	P _m v	Permian volcanic rocks
CM	CM	Mississippian marine sedimentary and metasedimentary rocks
S	S	Silurian marine sedimentary and metasedimentary rocks
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>Formations</u>	<u>Line</u>	<u>Fiducial Interval</u>	<u>Brief Description</u>
1	Qal	610	2680-2700	isolated U spike, smaller Th, modest U/Th
2	Qpv ^b Qal	3100	17770-17790	abrupt U spike, similar Th spike, no U/Th, U/K, Th/K
3	P	680	3840-3860	abrupt U spike, no Th; strong U/Th
4	ub	680	3980-4000	abrupt U spike, no Th, strong U/Th

(Thorium Anomalies)

I	Pv ^b	570	6250-6270	Th spike, smaller U spike, no U/Th, U/K, Th/K
II	Qpv ^b Pv ^b	580	2950-3120	regional irregular Th, comparable U, no U/Th, U/K Th/K. low BIAC
III	Qpv ^b	590	18450-18670	minor regional Th, smaller U, no U/Th, U/K, Th/K
IV	Qpv ^b	590	19690-19750	regional irregular Th, smaller U, no U/Th, U/K, Th/K
V	gr Pv ^a	630	12260-12350	modest regional Th, small irregular U, no U/T, U/K, Th/K
VI	Qpv ^r	640	1190-1390	strong regional Th and U, no U/Th, U/K, Th/K
VII	Pv ^r	650 3070	20250-20560 4610-4720	strong irregular Th and U, no U/Th, U/K, Th/K
VIII	Ec	650	21340-21390	increased Th, smaller U, no U/Th, U/K, Th/K
IX	Pv ^a	660	1240-1380	irregular Th, smaller U, no U/Th, U/K, Th/K
X	JTv gr	660	2880-3020	strong irregular Th, smaller U, no U/Th, U/K, Th/K

<u>Anomaly</u>	<u>Formations</u>	<u>Line</u>	<u>Fiducial Interval</u>	<u>Brief Description</u>
XI	Qal Qt Ql	660	3450-3540	irregular Th, slight U, no U/Th, U/K, Th/K
XII	Pv Pm	670	4180-4270	irregular Th with spike, no U, no U/Th, U/K, Th/K
XIII	Tv ^P	670	5280-5400	extreme irregular Th, strong irregular U, no U/Th, U/K, Th/K
XIV	P	680	4180-4430	irregular Th, little U, no U/Th, U/K, Th/K
XV	CM	680	4550-4580	extreme Th spike, slight U, no U/Th, U/K, Th/K
XVI	Pv	680	4760-4810	regional Th, slight U, no U/Th, U/K Th/K
XVII	Qal Tv ^P gr	680 3110	5660-5810 7350-7400	strong irregular Th, minor irregular 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	2888	2	2
QL	Ql	3102	-	1
QT	Qt	936	-	1
QPVR	Qpv ^r	192	-	1
QFVB	Qpv ^b	8390	1	3
PVR	Pv ^r	437	-	1
PVA	Pv ^a	3487	-	2
PVB	Pv ^b	11400	-	2
EC	Ec	145	-	1
TVP	Tv ^p	1042	-	2
GR	gr	1790	-	3
UB	ub	350	1	-
JTRV	Jrv	608	-	1
PZ	P	906	1	1
PZV	Pv	675	-	2
PM	Pm	144	-	1
CM	CM	28	-	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 GEOLOGIC MAP UNIT

SUSANVILLE QUAD

LINE 570

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
PVB	0.23	0.81	7.95	0.248	1.686	6.750	QRVB	0.20	0.92	12.35	0.326	1.081	3.379
JTRV	0.17	0.61	15.29	0.237	0.803	2.565	PVP	0.27	0.68	11.84	0.161	0.793	4.730
EC	0.07	0.54	4.64	0.438	0.0	4.639	W	0.19	0.50	7.84	0.140	0.813	5.553
PVA	0.13	0.73	4.84	0.383	2.215	5.708	MVR	0.46	1.98	19.13	0.300	1.494	5.045
QPVV	0.20	0.63	7.17	0.216	1.308	6.018	MVP	0.38	1.54	14.90	0.272	1.470	5.449
PC	0.20	0.84	8.61	0.287	1.346	4.935	TIR	0.60	2.57	27.21	0.300	1.364	4.569
QAL	0.22	0.84	11.10	0.232	1.046	4.423	QL	0.28	0.58	12.62	0.159	0.753	4.641
QC	0.18	0.75	9.00	0.283	1.170	4.154	QT	0.27	0.95	13.75	0.246	0.989	4.142

LINE 580

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
JML	0.19	0.55	8.34	0.352	0.949	2.368	QPVV	0.65	3.57	24.93	0.382	2.071	5.420
JTRV	0.11	0.85	9.43	0.520	1.310	2.514	PC	0.26	0.99	13.03	0.241	1.004	4.178
EC	0.13	0.59	4.92	0.356	1.967	6.682	PVP	0.28	0.78	11.62	0.145	0.702	5.140
PVB	0.26	1.04	9.96	0.261	1.451	5.902	MVR	0.34	1.34	13.14	0.274	1.563	5.744
QPVV	0.24	1.08	8.84	0.282	1.806	6.906	PVA	0.27	1.14	10.87	0.296	1.456	4.988
QL	0.33	1.06	15.13	0.222	1.004	4.660	MVP	0.26	0.97	11.70	0.267	1.233	4.600
QAL	0.31	1.28	14.27	0.288	1.306	4.663	QT	0.27	1.03	13.44	0.278	1.217	4.339
QRVB	0.30	1.32	14.10	0.282	1.227	4.649	QS	0.28	1.15	15.29	0.289	1.090	3.779

LINE 590

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
JTRV	0.19	0.75	7.55	0.303	1.450	5.451	QL	0.33	0.92	16.20	0.199	0.849	4.278
PVA	0.21	0.94	6.86	0.303	2.376	7.781	QAL	0.27	1.17	11.25	0.286	1.569	5.336
EC	0.26	1.41	12.46	0.360	1.558	4.394	QRVB	0.17	0.71	9.07	0.315	1.143	3.776
PVB	0.27	0.98	12.78	0.248	1.142	4.704	W	0.14	0.42	6.34	0.230	1.515	6.354
QPVV	0.31	1.15	11.79	0.252	1.386	5.672	PVP	0.33	1.01	13.26	0.207	1.080	5.158
PVR	0.16	0.61	3.79	0.262	2.568	9.384	QT	0.27	1.11	16.70	0.288	0.961	3.361

LINE 600

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
PVB	0.26	0.88	12.12	0.241	1.199	5.085	QPVV	0.26	0.75	5.52	0.210	2.025	10.039
PVA	0.16	0.58	6.16	0.249	1.605	5.799	QG	0.16	0.71	8.27	0.298	1.218	4.716
QPVV	0.25	0.70	8.44	0.197	1.225	6.483	PVR	0.25	0.96	10.46	0.264	1.342	5.090
QRVB	0.20	0.67	9.58	0.266	1.164	4.457	W	0.07	0.38	3.68	0.256	0.975	3.839
QAL	0.22	0.71	7.08	0.222	1.444	6.841	PVP	0.19	0.60	11.90	0.239	0.730	3.223

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LINE 610

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
PVP	0.26	1.02	10.77	0.280	1.464	5.181
QPVR	0.24	0.84	9.41	0.239	1.383	6.488
PVA	0.19	0.77	8.41	0.269	1.296	4.923
W	0.07	0.29	5.02	0.287	0.998	3.670
TL	0.25	1.12	17.10	0.311	0.945	3.056

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
PVB	0.27	0.97	15.53	0.247	0.895	3.778
QAL	0.26	1.00	9.87	0.251	1.383	5.744
QVRB	0.23	0.97	9.82	0.290	1.474	5.015
QRVP	0.18	0.41	9.36	0.166	0.676	4.037

LINE 620

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
PVP	0.27	1.24	12.85	0.329	1.412	4.351
KU	0.32	1.62	19.49	0.359	1.235	3.511
QPVR	0.24	0.76	8.22	0.227	1.535	6.775
PVA	0.23	0.82	6.87	0.262	2.345	10.661
QAL	0.28	0.95	12.41	0.233	1.134	5.544
TL	0.29	0.94	15.14	0.235	0.925	4.016

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
QPVA	0.36	1.54	12.63	0.308	1.804	6.269
QVRB	0.29	0.95	8.22	0.218	1.669	7.723
PVB	0.24	0.79	14.97	0.241	0.805	3.389
QG	0.18	0.68	9.72	0.266	1.083	3.975
GR	0.30	1.02	17.74	0.239	0.848	3.552

LINE 630

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
QRVP	0.15	0.47	4.77	0.220	1.414	6.459
QVRB	0.24	0.83	7.29	0.244	1.820	7.738
KU	0.15	0.89	7.43	0.387	1.755	4.550
PVP	0.24	1.07	7.59	0.275	1.803	6.490
EC	0.14	0.0	3.93	0.0	0.0	7.436
QC	0.41	1.61	12.71	0.271	1.837	6.804
QPVA	0.26	1.15	11.46	0.303	1.541	5.091
PVB	0.28	0.88	12.08	0.271	1.081	4.336
QPVP	0.39	1.18	16.86	0.216	1.029	4.774

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
QG	0.15	0.50	6.91	0.245	1.065	4.505
QAL	0.24	0.68	13.95	0.199	0.707	3.669
CL	0.23	0.66	7.75	0.212	1.318	6.188
W	0.07	0.38	1.57	0.363	4.508	13.636
GR	0.44	1.74	22.64	0.276	1.106	4.030
PVA	0.30	0.93	13.00	0.216	1.116	5.209
PVR	0.26	0.53	17.09	0.141	0.436	3.196
TL	0.34	1.15	15.82	0.237	1.089	4.629

LINE 640

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
PVB	0.26	1.01	10.87	0.255	1.422	5.748
QVRB	0.13	0.61	3.43	0.326	2.608	8.262
PVP	0.25	1.20	11.56	0.331	1.633	5.020
QPVR	0.90	4.71	31.53	0.362	2.160	6.036
QPVR	0.25	1.20	7.83	0.309	2.348	7.492
QPVA	0.22	0.82	6.90	0.248	1.818	7.492
QPV	0.34	1.43	12.27	0.288	1.667	5.866
QAL	0.33	1.32	17.55	0.281	1.141	4.052
PVA	0.36	1.50	16.89	0.294	1.380	4.702
QT	0.32	1.09	20.18	0.236	0.781	3.335

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
GR	0.42	1.86	18.98	0.312	1.538	4.846
EC	0.35	1.29	17.09	0.260	1.110	4.247
JTRV	0.33	1.20	11.20	0.251	1.569	6.231
TVR	0.27	1.59	13.43	0.402	1.690	4.177
TVA	0.28	1.24	11.80	0.321	1.565	5.019
TVB	0.35	0.92	17.76	0.184	0.758	4.119
TVP	0.36	0.99	12.32	0.199	1.218	6.077
QL	0.30	1.38	19.19	0.322	1.066	3.418
W	0.23	0.87	8.46	0.272	1.512	5.581

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LINE 650

UNIT	E THOR	F URN	POT PCT	U/TH	U/K	TH/K
PVP	0.23	1.23	7.70	0.408	2.348	6.255
PVB	0.26	1.25	7.04	0.320	2.608	8.445
PVA	0.25	1.33	8.64	0.340	2.015	6.181
PVR	0.88	4.41	25.67	0.352	2.501	7.175
QPV	0.30	1.52	10.48	0.334	1.949	5.805
QAL	0.29	1.55	19.20	0.367	1.302	3.794
PC	0.63	3.30	21.34	0.363	2.238	6.163
QC	0.31	1.84	13.92	0.409	2.176	5.446
QL	0.39	2.10	21.61	0.413	1.627	3.939

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
W	0.18	1.14	11.58	0.439	1.761	4.261
MV	0.31	1.07	11.67	0.228	1.311	5.624
JTRV	0.28	1.70	13.86	0.435	2.112	4.760
TVP	0.28	1.48	12.58	0.372	1.773	4.727
EC	0.27	1.32	11.02	0.331	1.658	5.114
GR	0.31	1.69	16.46	0.410	1.521	4.132
TVA	0.14	0.43	5.91	0.215	1.041	4.868
TVB	0.23	1.20	10.93	0.355	1.606	4.547
QT	0.43	2.26	21.20	0.384	1.570	4.275

LINE 660

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
PVP	0.16	0.78	7.29	0.336	1.463	4.430
PVA	0.21	1.00	7.31	0.328	1.872	5.837
PVR	0.17	0.91	5.68	0.419	2.928	6.908
QAL	0.47	2.53	29.81	0.339	1.301	4.400
QL	0.50	2.34	27.36	0.330	1.297	3.990
W	0.29	1.97	26.64	0.453	1.278	3.004
TVB	0.24	1.03	6.81	0.302	2.238	7.453
QC	0.27	1.26	8.45	0.348	2.181	6.705
PZ	0.25	1.04	11.18	0.311	1.445	5.001
PZV	0.27	1.05	11.02	0.284	1.426	5.177

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
MV	0.39	1.39	13.62	0.252	1.476	5.951
JU	0.28	1.32	13.94	0.328	1.407	4.268
JTRV	0.42	2.32	22.15	0.380	1.484	3.889
GR	0.45	2.16	22.85	0.343	1.355	4.089
TV	0.25	1.15	9.73	0.322	1.746	5.520
TC	0.22	0.91	8.65	0.290	1.541	5.351
EV	0.27	1.75	14.01	0.454	1.837	4.022
MVP	0.40	1.84	17.44	0.327	1.536	4.785
QT	0.62	2.85	42.97	0.319	0.961	3.907
QS	0.38	2.46	39.96	0.456	0.899	1.971

LINE 670

UNIT	E THOR	F URN	POT PCT	U/TH	U/K	TH/K
PVP	0.13	0.78	5.96	0.470	1.919	4.887
PVR	0.21	0.95	4.89	0.319	2.893	9.417
PVA	0.23	0.90	6.20	0.262	1.974	7.681
QAL	0.39	1.52	19.78	0.288	1.222	4.442
MVA	0.20	1.03	4.63	0.355	3.276	9.182
PZ	0.19	1.22	7.00	0.521	3.019	6.502
QPV	0.25	0.90	3.09	0.260	4.404	16.901
TR	0.26	1.88	14.74	0.507	1.930	3.777
MV	0.21	1.31	10.88	0.430	1.828	4.257
TVB	0.22	1.37	5.44	0.438	4.110	9.990
PZV	0.37	1.47	15.53	0.288	1.305	4.631
QS	0.55	2.35	30.51	0.300	1.128	3.731

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
CM	0.63	1.29	15.34	0.143	1.220	8.555
PM	0.32	1.62	17.27	0.350	1.368	3.939
UB	0.11	0.59	2.14	0.368	3.333	10.043
GR	0.45	1.70	20.43	0.309	1.586	4.855
JU	0.38	2.11	20.90	0.378	1.446	3.825
JTRV	0.30	1.99	22.70	0.518	1.492	3.366
TC	0.41	2.44	25.03	0.417	1.417	3.417
QL	0.50	2.01	27.29	0.275	1.120	4.112
OVP	0.28	1.22	11.87	0.311	1.508	4.835
TVP	0.84	3.68	34.25	0.304	1.525	5.005
QT	0.58	2.07	32.65	0.256	0.921	3.685

LINE 680

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
QC	0.25	1.19	9.94	0.338	1.734	5.247
PVP	0.15	0.64	4.97	0.307	1.992	7.000
TVB	0.48	1.57	20.37	0.213	1.088	4.878
PVA	0.13	0.43	4.73	0.232	1.550	6.456
PVB	0.25	0.94	7.94	0.270	1.879	7.276
MV	0.17	0.84	9.64	0.335	1.391	3.860
W	0.12	0.80	5.53	0.513	2.215	4.513
PZ	0.35	1.64	14.26	0.377	1.902	5.154
UR	0.07	0.91	2.57	0.696	3.040	5.216
TR	0.21	1.71	11.57	0.598	2.290	3.667
PZV	0.32	1.29	13.30	0.305	1.473	5.035
TVP	0.30	1.24	15.92	0.336	1.239	3.776

UNIT	E THOR	F URN	POT PCT	U/TH	U/K	TH/K
CM	0.97	2.29	22.67	0.158	1.429	8.959
PM	0.35	1.28	17.26	0.251	1.091	4.332
S	0.22	1.17	11.04	0.380	1.548	4.118
QAL	0.46	1.70	23.12	0.243	1.030	4.160
JU	0.34	1.56	22.05	0.324	1.054	3.240
JTRV	0.29	1.41	20.38	0.338	1.016	3.011
MVP	0.22	1.22	10.45	0.384	1.898	4.834
GR	0.63	2.55	29.23	0.312	1.496	4.711
CVP	0.28	1.08	11.27	0.276	1.369	5.974
FVB	0.25	1.16	11.95	0.322	1.415	4.410
QL	0.28	1.04	11.46	0.252	1.265	5.209

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LINE 3060

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
PVP	0.19	0.83	7.49	0.302	1.608	5.588
TVR	0.24	0.89	5.12	0.248	2.634	12.158
KU	0.29	1.13	12.07	0.287	1.429	5.097
PVR	0.28	1.45	13.62	0.357	1.545	4.547

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
QAL	0.26	0.95	5.21	0.195	1.612	13.250
QPVR	0.19	0.60	3.82	0.228	2.444	11.604
EC	0.28	0.97	12.34	0.237	1.210	5.128
PVA	0.15	0.63	4.51	0.270	1.896	7.496

LINE 3070

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
PVB	0.23	0.97	7.42	0.290	2.153	7.565
MV	0.24	0.84	7.39	0.245	1.771	7.022
PZ	0.36	1.11	12.95	0.215	1.278	5.901
M	0.40	0.90	6.89	0.159	1.963	12.608
PVA	0.21	0.87	7.87	0.247	1.541	7.161
PVP	0.12	0.54	5.63	0.266	1.317	4.586
PVR	0.77	3.86	22.16	0.340	2.458	7.212

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
QAL	0.29	1.19	12.17	0.274	1.402	5.053
QPVR	0.24	0.86	8.96	0.239	1.364	5.771
QPVA	0.26	0.78	9.77	0.207	1.142	5.577
CPV	0.25	1.30	11.91	0.357	1.582	4.442
QPVR	0.26	0.66	11.68	0.177	0.813	4.607
QRVB	0.27	1.02	15.00	0.269	0.987	3.753
PC	0.26	0.47	10.87	0.122	0.596	4.976

LINE 3080

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
UB	0.05	1.10	1.98	0.249	1.012	4.463
TR	0.21	1.47	9.75	0.400	1.931	5.032
TVR	0.24	1.46	10.46	0.417	2.044	5.054
MV	0.19	1.28	9.80	0.498	1.965	4.091
W	0.10	0.62	5.02	0.461	2.920	6.739
PZ	0.45	1.82	18.59	0.293	1.452	5.040

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
QAL	0.31	0.86	9.52	0.206	1.332	6.907
PVB	0.22	0.75	8.35	0.247	1.372	5.761
QL	0.06	0.27	1.10	0.0	0.0	11.175
CG	0.15	0.76	7.77	0.372	1.450	4.031
CPVR	0.28	0.79	9.42	0.200	1.215	6.270
PVP	0.34	0.81	9.10	0.164	1.272	7.812

LINE 3090

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
PZV	0.20	1.00	11.81	0.379	1.235	3.627
CM	0.13	0.33	5.39	0.183	0.893	4.878
PM	0.14	0.59	6.23	0.294	1.415	4.677
S	0.22	1.12	8.02	0.368	2.078	5.704
GR	0.24	0.92	10.12	0.267	1.300	4.922
QAL	0.29	1.13	12.99	0.261	1.212	5.288
JU	0.38	2.22	19.55	0.423	1.678	4.111
JTRV	0.37	2.07	20.75	0.411	1.481	3.703
EC	0.31	1.38	13.35	0.308	1.537	5.042
TIR	0.25	1.75	62.09	0.497	0.410	0.839

UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
TVP	0.29	1.30	12.63	0.320	1.522	4.849
TVA	0.26	1.23	11.43	0.323	1.525	4.829
TVR	0.36	1.55	15.28	0.300	1.508	5.100
QPVR	0.21	0.61	7.43	0.206	1.215	6.099
PVB	0.27	0.94	9.09	0.243	1.541	6.440
QRVB	0.15	0.40	3.97	0.156	1.280	7.858
PVA	0.38	1.34	14.22	0.252	1.383	5.761
MVR	0.43	1.72	18.55	0.274	1.352	5.038
MVP	0.34	1.22	21.94	0.235	0.828	4.147

MEAN VALUE BY GEOLOGIC MAP UNIT

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LINE 3100

UNIT	F THOR	E URN	POT PCT	U/TH	U/K	TH/K	UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
OVP	0.32	1.36	14.50	0.307	1.366	4.468	TVA	0.30	1.33	21.11	0.311	0.913	2.960
QL	0.31	1.05	14.73	0.232	0.997	4.701	QT	0.25	0.84	11.25	0.236	1.123	4.869
TVP	0.48	2.30	17.59	0.334	2.042	6.086	QPVB	0.27	1.08	11.49	0.269	1.298	5.001
EVB	0.49	1.80	23.74	0.267	1.151	4.404	PVP	0.27	1.12	12.87	0.262	1.134	4.401
GR	0.37	1.81	20.40	0.348	1.352	3.917	PVA	0.20	1.09	12.08	0.375	1.319	3.511
TVB	0.27	1.45	20.96	0.372	1.000	2.691	PVB	0.29	0.94	15.07	0.228	0.897	4.120
QAL	0.32	1.26	22.18	0.278	0.859	3.302	W	0.17	0.75	12.36	0.325	0.881	2.736

LINE 3110

UNIT	F THOR	E URN	POT PCT	U/TH	U/K	TH/K	UNIT	E THOR	E URN	POT PCT	U/TH	U/K	TH/K
TVP	0.56	2.25	25.14	0.283	1.291	4.691	PVB	0.28	1.02	14.52	0.252	1.031	4.143
GR	0.90	3.54	46.26	0.276	1.111	4.043	QPVB	0.27	0.96	13.17	0.249	1.101	4.496
QAL	0.47	1.93	26.77	0.279	1.026	3.715	TI	0.26	0.90	14.88	0.245	0.879	3.612
QL	0.47	2.21	29.65	0.329	1.125	3.443	QS	0.15	0.79	10.38	0.395	1.118	2.884
QT	0.33	1.36	19.57	0.301	1.033	3.501	MVP	0.26	0.98	12.36	0.255	1.144	4.476
PVA	0.46	2.34	23.90	0.356	1.422	4.081	W	0.27	0.79	12.54	0.207	0.928	4.493

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	724	0.51	LOGNORMAL	0.03	0.07	0.19	1.36	3.59	9.50
E URANIUM	684	0.51	LOGNORMAL	0.09	0.16	0.29	0.92	1.65	2.96
POTASSIUM	634	0.10	LOGNORMAL	0.00	0.01	0.03	0.33	1.08	3.52
EU/K	541	1.01	LOGNORMAL	0.16	0.29	0.54	1.87	3.48	6.47
EU/ETH	570	0.33	NORMAL	-0.08	0.06	0.19	0.46	0.59	0.73
ETH/K	541	2.56	LOGNORMAL	0.32	0.65	1.29	5.10	10.16	20.25

FORMATION QAL

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	2859	4.91	NORMAL	-0.06	1.59	3.25	6.57	8.22	9.88
E URANIUM	2729	0.88	LOGNORMAL	0.19	0.32	0.53	1.45	2.40	3.98
POTASSIUM	2868	0.83	LOGNORMAL	0.20	0.32	0.52	1.33	2.13	3.42
EU/K	2718	0.95	NORMAL	-0.18	0.21	0.60	1.39	1.78	2.17
EU/ETH	2717	0.21	NORMAL	-0.05	0.04	0.12	0.30	0.39	0.48
ETH/K	2718	3.79	LOGNORMAL	1.17	1.73	2.56	5.51	8.30	12.29

FORMATION QT

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	936	4.52	LOGNORMAL	1.66	2.32	3.24	6.31	8.81	12.29
E URANIUM	930	1.02	LOGNORMAL	0.31	0.46	0.68	1.52	2.27	3.38
POTASSIUM	936	1.10	LOGNORMAL	0.36	0.52	0.76	1.60	2.33	3.39
EU/K	930	0.88	NORMAL	-0.07	0.25	0.57	1.20	1.52	1.84
EU/ETH	930	0.21	NORMAL	-0.04	0.05	0.13	0.30	0.38	0.46
ETH/K	930	4.10	NORMAL	1.58	2.42	3.26	4.94	5.78	6.62

FORMATION QL

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	3061	6.07	NORMAL	0.08	2.08	4.07	8.07	10.07	12.06
E URANIUM	2984	1.48	NORMAL	-1.07	-0.22	0.63	2.33	3.18	4.04
POTASSIUM	3139	1.52	NORMAL	-0.19	0.38	0.95	2.09	2.66	3.23
EU/K	2952	0.90	NORMAL	-0.14	0.20	0.55	1.24	1.59	1.93
EU/ETH	2955	0.22	NORMAL	-0.05	0.04	0.13	0.31	0.39	0.48
ETH/K	2952	4.15	NORMAL	1.09	2.11	3.13	5.17	6.19	7.21

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FORMATION

QC

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	131	4.49	NORMAL	0.20	1.63	3.06	5.92	7.35	8.79
E URANIUM	131	1.36	NORMAL	-0.14	0.36	0.86	1.85	2.35	2.85
POTASSIUM	131	0.60	LCGNORMAL	0.26	0.34	0.45	0.80	1.06	1.41
EU/K	130	1.75	NORMAL	0.43	0.87	1.31	2.19	2.63	3.06
EU/ETH	131	0.25	NORMAL	0.05	0.13	0.21	0.36	0.44	0.52
ETH/K	130	4.58	LCGNORMAL	1.11	1.78	2.86	7.35	11.78	18.88

FORMATION

QS

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	103	6.03	NORMAL	-5.69	-1.78	2.12	9.94	13.85	17.76
E URANIUM	103	0.73	LCGNORMAL	0.15	0.26	0.43	1.23	2.07	3.48
POTASSIUM	103	1.66	NORMAL	-0.77	0.04	0.85	2.47	3.27	4.08
EU/K	103	0.89	NORMAL	0.12	0.37	0.63	1.15	1.41	1.67
EU/ETH	103	0.26	NORMAL	0.03	0.11	0.18	0.34	0.41	0.49
ETH/K	103	3.44	NORMAL	0.93	1.76	2.60	4.28	5.12	5.95

FORMATION

QG

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	424	2.35	NORMAL	0.87	1.36	1.86	2.84	3.34	3.83
E URANIUM	401	0.61	NORMAL	-0.17	0.09	0.35	0.86	1.12	1.38
POTASSIUM	424	0.58	NORMAL	0.26	0.36	0.47	0.68	0.79	0.90
EU/K	401	1.04	NORMAL	-0.32	0.13	0.59	1.50	1.95	2.40
EU/ETH	401	0.25	NORMAL	-0.11	0.01	0.13	0.37	0.49	0.61
ETH/K	401	4.17	NORMAL	1.76	2.56	3.36	4.97	5.78	6.58

FORMATION

QPV

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	125	4.08	LCGNORMAL	1.95	2.49	3.19	5.21	6.66	8.52
E URANIUM	125	0.88	LCGNORMAL	0.32	0.45	0.63	1.23	1.72	2.41
POTASSIUM	125	0.90	NORMAL	0.44	0.59	0.75	1.05	1.20	1.35
EU/K	125	1.35	NORMAL	0.22	0.61	1.00	1.78	2.17	2.56
EU/ETH	125	0.24	NORMAL	0.08	0.13	0.19	0.30	0.36	0.41
ETH/K	125	4.64	LCGNORMAL	2.21	2.83	3.62	5.94	7.60	9.72

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FORMATION

QPVA

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	706	4.12	NORMAL	0.40	1.64	2.88	5.37	6.61	7.85
E URANIUM	689	0.94	NORMAL	-0.53	-0.04	0.45	1.43	1.92	2.41
POTASSIUM	706	0.70	NORMAL	-0.29	0.04	0.37	1.03	1.35	1.68
EU/K	689	1.36	NORMAL	-0.45	0.15	0.76	1.96	2.57	3.17
EU/ETH	689	0.21	NORMAL	-0.04	0.04	0.12	0.29	0.37	0.45
ETH/K	689	4.79	LOGNORMAL	1.55	2.25	3.29	6.98	10.17	14.83

FORMATION

QPVR

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	8390	3.90	NORMAL	0.33	1.52	2.71	5.09	6.28	7.47
E URANIUM	7566	0.61	LOGNORMAL	0.09	0.17	0.32	1.15	2.18	4.14
POTASSIUM	8390	0.64	NORMAL	-0.20	0.08	0.36	0.93	1.21	1.49
EU/K	7549	1.24	NORMAL	-0.47	0.10	0.67	1.80	2.37	2.94
EU/ETH	7562	0.18	NORMAL	-0.07	0.02	0.10	0.26	0.34	0.42
ETH/K	7549	5.79	LOGNORMAL	1.70	2.56	3.85	8.70	13.08	19.67

FORMATION

QPVP

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	37	5.53	NORMAL	2.39	3.23	4.38	6.67	7.82	8.96
E URANIUM	37	1.02	NORMAL	0.10	0.40	0.71	1.33	1.64	1.95
POTASSIUM	37	0.95	NORMAL	-0.50	-0.02	0.46	1.43	1.91	2.39
EU/K	37	0.96	LOGNORMAL	0.36	0.50	0.69	1.33	1.85	2.56
EU/ETH	37	0.17	NORMAL	0.01	0.06	0.11	0.22	0.28	0.33
ETH/K	37	5.28	LOGNORMAL	2.23	2.97	3.96	7.04	9.38	12.51

FORMATION

QPVR

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	192	14.23	NORMAL	8.91	10.68	12.45	16.00	17.77	19.55
E URANIUM	192	4.47	NORMAL	0.89	2.08	3.27	5.66	6.86	8.05
POTASSIUM	192	2.30	NORMAL	0.87	1.35	1.82	2.78	3.26	3.74
EU/K	192	1.81	NORMAL	1.19	1.40	1.61	2.02	2.23	2.44
EU/ETH	192	0.28	NORMAL	0.14	0.19	0.24	0.33	0.38	0.42
ETH/K	192	6.05	NORMAL	3.81	4.57	5.33	6.85	7.61	8.37

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FORMATION QRVB

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	1376	3.65	NORMAL	-0.27	1.04	2.35	4.96	6.27	7.57
E URANIUM	1252	0.90	NORMAL	-0.40	0.03	0.47	1.33	1.76	2.19
POTASSIUM	1376	0.80	NORMAL	-0.48	-0.05	0.37	1.23	1.65	2.08
EU/K	1252	1.10	NORMAL	-0.45	0.17	0.58	1.62	2.14	2.66
EU/ETH	1247	0.22	NORMAL	-0.04	0.05	0.14	0.31	0.39	0.48
ETH/K	1252	3.77	LOGNORMAL	1.18	1.73	2.56	5.55	8.18	12.05

FORMATION QRVB

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	29	2.44	NORMAL	1.36	1.72	2.08	2.80	3.16	3.52
E URANIUM	29	0.36	NORMAL	0.08	0.18	0.27	0.46	0.55	0.65
POTASSIUM	29	0.36	LOGNORMAL	0.15	0.20	0.27	0.47	0.63	0.83
EU/K	29	0.88	NORMAL	-0.52	-0.05	0.41	1.34	1.81	2.28
EU/ETH	29	0.15	NORMAL	-0.02	0.04	0.09	0.20	0.26	0.31
ETH/K	29	5.56	NORMAL	1.24	2.68	4.12	7.00	8.44	9.88

FORMATION JTRV

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	608	4.91	NORMAL	-2.08	0.25	2.58	7.23	9.56	11.89
E URANIUM	592	1.72	NORMAL	-0.48	0.25	0.99	2.45	3.18	3.91
POTASSIUM	608	1.37	NORMAL	-0.36	0.22	0.79	1.95	2.52	3.10
EU/K	592	1.05	LOGNORMAL	0.27	0.43	0.67	1.65	2.58	4.05
EU/ETH	592	0.34	NORMAL	-0.03	0.10	0.22	0.46	0.59	0.71
ETH/K	592	3.19	LOGNORMAL	0.96	1.43	2.14	4.76	7.11	10.61

FORMATION JML

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	44	1.38	NORMAL	-0.84	-0.10	0.64	2.12	2.86	3.59
E URANIUM	25	0.31	LOGNORMAL	0.11	0.15	0.22	0.45	0.64	0.91
POTASSIUM	46	0.50	LOGNORMAL	0.23	0.30	0.39	0.65	0.84	1.08
EU/K	25	0.36	LOGNORMAL	0.08	0.14	0.23	0.67	1.13	1.92
EU/ETH	25	0.17	LOGNORMAL	0.04	0.07	0.11	0.28	0.46	0.75
ETH/K	25	2.55	NORMAL	1.60	1.92	2.23	2.87	3.19	3.51

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FORMATION JU

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	169	5.55	NORMAL	2.19	3.31	4.43	6.67	7.79	8.91
E URANIUM	169	1.59	LOGNORMAL	0.76	0.98	1.25	2.03	2.60	3.32
POTASSIUM	169	1.41	NORMAL	0.43	0.76	1.08	1.73	2.06	2.38
EU/K	169	1.20	NORMAL	0.33	0.42	0.81	1.60	1.99	2.38
EU/ETH	169	0.30	NORMAL	0.11	0.17	0.23	0.36	0.42	0.48
ETH/K	169	3.91	NORMAL	1.35	2.20	3.06	4.77	5.63	6.48

FORMATION TV

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	48	3.97	NORMAL	2.48	2.98	3.47	4.47	4.96	5.46
E URANIUM	48	1.37	NORMAL	0.47	0.67	0.87	1.27	1.47	1.67
POTASSIUM	48	0.71	NORMAL	0.38	0.49	0.60	0.83	0.94	1.05
EU/K	48	1.47	NORMAL	0.49	0.81	1.14	1.79	2.12	2.45
EU/ETH	48	0.25	NORMAL	0.03	0.10	0.18	0.33	0.40	0.48
ETH/K	48	5.51	NORMAL	2.61	3.61	4.61	6.61	7.60	8.60

FORMATION TVA

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	345	4.29	NORMAL	1.92	2.71	3.50	5.08	5.87	6.66
E URANIUM	345	1.15	NORMAL	0.17	0.49	0.82	1.47	1.80	2.13
POTASSIUM	345	0.89	NORMAL	0.39	0.56	0.72	1.06	1.22	1.39
EU/K	345	1.26	NORMAL	0.05	0.45	0.86	1.67	2.07	2.48
EU/ETH	345	0.25	NORMAL	-0.02	0.07	0.16	0.34	0.43	0.52
ETH/K	345	4.91	NORMAL	1.89	2.89	3.90	5.92	6.93	7.94

FORMATION TVB

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	194	3.96	LOGNORMAL	1.02	1.60	2.52	6.23	9.81	15.44
E URANIUM	182	1.29	NORMAL	-0.35	0.19	0.74	1.83	2.38	2.93
POTASSIUM	194	0.83	LOGNORMAL	0.23	0.35	0.54	1.27	1.95	2.98
EU/K	182	0.46	LOGNORMAL	0.16	0.29	0.53	1.76	3.22	5.90
EU/ETH	182	0.22	NORMAL	-0.05	0.04	0.13	0.31	0.40	0.49
ETH/K	182	5.86	NORMAL	1.24	2.78	4.32	7.40	8.95	10.49

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FORMATION TVP

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	1042	4.06	LOGNORMAL	0.72	1.28	2.28	7.22	12.85	22.85
E URANIUM	1074	1.28	LOGNORMAL	0.26	0.45	0.76	2.17	3.67	6.21
POTASSIUM	1042	0.68	LOGNORMAL	0.13	0.22	0.39	1.19	2.07	3.61
EU/K	1024	1.22	NORMAL	-0.21	0.26	0.74	1.70	2.18	2.65
EU/ETH	1024	0.26	NORMAL	-0.00	0.08	0.17	0.34	0.43	0.51
ETH/K	1024	4.19	LOGNORMAL	1.23	1.85	2.78	6.30	9.47	14.25

FORMATION TVR

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	75	5.06	NORMAL	1.27	2.53	3.80	6.32	7.59	8.85
E URANIUM	75	1.49	NORMAL	-0.10	0.43	0.96	2.02	2.55	3.08
POTASSIUM	75	1.07	NORMAL	0.20	0.49	0.78	1.36	1.65	1.94
EU/K	75	1.33	NORMAL	0.09	0.51	0.92	1.75	2.16	2.58
EU/ETH	75	0.28	NORMAL	-0.05	0.36	0.17	0.39	0.49	0.60
ETH/K	75	4.71	NORMAL	2.05	2.94	3.82	5.59	6.48	7.36

FORMATION TC

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	27	5.84	NORMAL	1.32	2.83	4.33	7.35	8.85	10.36
E URANIUM	27	2.02	NORMAL	-0.65	0.24	1.13	2.91	3.81	4.70
POTASSIUM	27	1.60	NORMAL	-0.51	0.19	0.90	2.30	3.01	3.71
EU/K	27	1.15	NORMAL	0.54	0.75	0.97	1.41	1.62	1.84
EU/ETH	27	0.32	NORMAL	0.10	0.17	0.24	0.39	0.46	0.54
ETH/K	27	3.85	NORMAL	0.68	1.74	2.79	4.90	5.95	7.01

FORMATION TI

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	26	4.02	NORMAL	2.70	3.14	3.58	4.47	4.91	5.35
E URANIUM	26	0.82	NORMAL	0.29	0.46	0.64	0.99	1.17	1.34
POTASSIUM	26	1.11	NORMAL	0.80	0.90	1.00	1.21	1.31	1.41
EU/K	26	0.68	NORMAL	0.03	0.24	0.46	0.90	1.11	1.33
EU/ETH	26	0.19	NORMAL	0.08	0.11	0.15	0.22	0.26	0.30
ETH/K	26	3.30	LOGNORMAL	2.11	2.45	2.84	3.84	4.46	5.18

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FORMATION TL

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	377	4.73	NORMAL	1.76	2.75	3.74	5.72	6.71	7.70
E URANIUM	374	3.91	NORMAL	0.11	0.38	0.64	1.18	1.44	1.71
POTASSIUM	377	1.14	NORMAL	0.66	0.82	0.98	1.30	1.46	1.62
EU/K	374	0.76	NORMAL	-0.03	0.23	0.49	1.02	1.28	1.54
EU/ETH	374	0.18	NORMAL	-0.03	0.04	0.11	0.26	0.33	0.40
ETH/K	374	4.08	NORMAL	1.81	2.56	3.32	4.33	5.59	6.35

FORMATION TR

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	268	3.62	NORMAL	-0.55	0.84	2.23	5.00	6.39	7.78
E URANIUM	244	1.61	NORMAL	-0.05	0.51	1.06	2.16	2.72	3.27
POTASSIUM	257	0.89	NORMAL	-0.13	0.21	0.55	1.24	1.58	1.92
EU/K	239	1.71	NORMAL	-0.03	0.55	1.13	2.28	2.86	3.44
EU/ETH	237	0.39	NORMAL	0.01	0.13	0.26	0.52	0.65	0.78
ETH/K	239	4.18	NORMAL	1.06	2.10	3.14	5.22	6.27	7.31

FORMATION TIR

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	58	8.38	NORMAL	-2.15	1.35	4.86	11.89	15.41	18.92
E URANIUM	58	2.31	NORMAL	0.58	1.16	1.73	2.89	3.47	4.05
POTASSIUM	58	2.26	LOGNORMAL	1.02	1.33	1.73	2.94	3.83	4.99
EU/K	58	0.93	NORMAL	-3.37	0.07	3.50	1.37	1.80	2.24
EU/ETH	58	0.27	NORMAL	0.04	0.12	0.20	0.35	0.42	0.50
ETH/K	58	3.71	NORMAL	-2.47	-0.41	1.65	5.77	7.84	9.90

FORMATION GR

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	1793	5.32	LOGNORMAL	1.39	2.13	3.27	7.72	11.85	18.21
E URANIUM	1790	1.39	LOGNORMAL	0.31	0.51	0.84	2.30	3.80	6.30
POTASSIUM	1790	1.29	LOGNORMAL	0.44	0.63	0.90	1.85	2.66	3.81
EU/K	1783	1.17	NORMAL	0.17	0.50	0.84	1.51	1.84	2.18
EU/ETH	1789	0.26	NORMAL	-0.02	0.08	0.17	0.35	0.44	0.53
ETH/K	1783	4.36	NORMAL	1.02	2.13	3.25	5.47	6.58	7.70

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QUAD

FORMATION

M

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	10	6.38	NORMAL	3.53	4.48	5.43	7.33	8.28	9.23
E URANIUM	10	0.82	NORMAL	0.46	0.58	0.70	0.94	1.07	1.19
POTASSIUM	10	0.50	NORMAL	0.26	0.34	0.42	0.58	0.66	0.75
EU/K	10	1.67	NORMAL	0.32	0.77	1.22	2.12	2.57	3.02
EU/ETH	10	0.11	NORMAL	0.02	0.05	0.08	0.14	0.17	0.19
ETH/K	10	13.10	NORMAL	0.35	4.60	8.85	17.35	21.60	25.85

FORMATION

MV

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	506	3.19	NORMAL	-1.15	0.29	1.74	4.64	6.09	7.54
E URANIUM	460	0.95	NORMAL	-0.52	-0.03	0.46	1.45	1.94	2.43
POTASSIUM	505	0.52	LOGNORMAL	0.15	0.23	0.35	0.78	1.17	1.76
EU/K	457	1.35	NORMAL	-0.51	0.11	0.73	1.97	2.60	3.22
EU/ETH	447	0.23	LOGNORMAL	0.05	0.08	0.14	0.39	0.66	1.11
ETH/K	457	3.76	LOGNORMAL	1.17	1.72	2.55	5.56	8.21	12.13

FORMATION

MVA

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	17	3.12	NORMAL	2.38	2.63	2.88	3.37	3.62	3.86
E URANIUM	17	0.82	LOGNORMAL	0.42	0.52	0.65	1.02	1.27	1.58
POTASSIUM	17	0.32	NORMAL	0.23	0.26	0.29	0.35	0.38	0.41
EU/K	17	2.35	LOGNORMAL	1.08	1.40	1.81	3.05	3.96	5.13
EU/ETH	17	0.28	NORMAL	0.10	0.16	0.22	0.35	0.41	0.47
ETH/K	17	9.47	NORMAL	5.66	6.93	8.20	10.74	12.00	13.27

FORMATION

MVP

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	393	4.35	LOGNORMAL	1.79	2.41	3.24	5.85	7.87	10.58
E URANIUM	389	1.31	NORMAL	-0.56	0.06	0.68	1.93	2.55	3.17
POTASSIUM	393	0.80	LOGNORMAL	0.16	0.28	0.47	1.36	2.31	3.93
EU/K	389	1.21	NORMAL	-0.32	0.19	0.70	1.72	2.22	2.73
EU/ETH	389	0.23	NORMAL	-0.01	0.07	0.15	0.31	0.39	0.47
ETH/K	389	5.08	NORMAL	1.48	2.68	3.88	6.28	7.48	8.68

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QUAD

FORMATION MVR

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	333	6.80	NORMAL	3.84	4.83	5.81	7.78	8.76	9.75
E URANIUM	333	1.65	NORMAL	0.28	0.74	1.20	2.11	2.56	3.02
POTASSIUM	333	1.31	NORMAL	0.43	0.72	1.01	1.60	1.90	2.19
EU/K	333	1.21	NORMAL	0.39	0.66	0.94	1.48	1.75	2.03
EU/ETH	333	0.22	NORMAL	0.07	0.12	0.17	0.27	0.33	0.38
ETH/K	333	5.26	NORMAL	2.87	3.67	4.46	6.05	6.84	7.64

FORMATION KU

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	109	4.58	NORMAL	0.20	1.66	3.12	6.05	7.51	8.97
E URANIUM	109	1.34	NORMAL	0.03	0.46	0.90	1.78	2.22	2.66
POTASSIUM	109	1.23	NORMAL	-0.19	0.28	0.75	1.70	2.17	2.64
EU/K	109	1.11	NORMAL	0.01	0.38	0.75	1.48	1.85	2.22
EU/ETH	109	0.28	NORMAL	0.07	0.14	0.21	0.35	0.42	0.49
ETH/K	109	3.94	NORMAL	-0.22	1.17	2.55	5.32	6.71	8.09

FORMATION PVA

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	3487	2.17	LOGNORMAL	0.35	0.64	1.18	4.00	7.39	13.64
E URANIUM	2946	0.47	LOGNORMAL	0.04	0.09	0.21	1.06	2.38	5.34
POTASSIUM	3477	0.32	LOGNORMAL	0.04	0.08	0.16	0.64	1.28	2.56
EU/K	2919	1.44	NORMAL	-0.58	0.10	0.77	2.11	2.78	3.45
EU/ETH	2936	0.23	NORMAL	-0.06	0.03	0.13	0.32	0.42	0.52
ETH/K	2919	4.46	LOGNORMAL	0.93	1.57	2.65	7.53	12.69	21.41

FORMATION PVB

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	11396	3.98	NORMAL	-0.29	1.13	2.55	5.40	6.82	8.24
E URANIUM	10544	0.86	NORMAL	-0.35	0.05	0.46	1.26	1.66	2.07
POTASSIUM	11313	0.78	NORMAL	-0.47	-0.05	0.37	1.20	1.62	2.04
EU/K	10485	0.84	LOGNORMAL	0.10	0.21	0.42	1.68	3.39	6.81
EU/ETH	10500	0.21	NORMAL	-0.05	0.04	0.12	0.29	0.37	0.46
ETH/K	10485	3.90	LOGNORMAL	0.66	1.19	2.16	7.05	12.74	23.02

SUSANVILLE

QUAD

FORMATION PVP

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	4328	2.28	LOGNORMAL	0.61	0.95	1.47	3.53	5.48	8.48
E URANIUM	3563	0.84	NORMAL	-0.45	-0.02	0.41	1.27	1.70	2.13
POTASSIUM	4328	0.58	NORMAL	-0.06	0.16	0.37	0.79	1.01	1.22
EU/K	3557	1.43	NORMAL	-0.56	0.10	0.77	2.09	2.75	3.42
EU/ETH	3562	0.26	NORMAL	-0.08	0.04	0.15	0.38	0.49	0.60
ETH/K	3557	4.65	LOGNORMAL	0.96	1.63	2.76	7.97	13.52	22.96

FORMATION PVR

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	407	12.44	NORMAL	-5.71	0.34	6.39	18.49	24.54	30.59
E URANIUM	402	3.71	NORMAL	-2.11	-3.17	1.77	5.66	7.60	9.54
POTASSIUM	407	1.70	NORMAL	0.10	0.64	1.17	2.23	2.76	3.29
EU/K	402	2.03	NORMAL	0.88	1.26	1.64	2.41	2.80	3.18
EU/ETH	402	0.26	NORMAL	0.12	0.17	0.22	0.31	0.36	0.40
ETH/K	402	7.16	NORMAL	4.00	5.06	6.11	8.21	9.26	10.32

FORMATION PM

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	144	4.45	NORMAL	-2.18	0.04	2.27	6.71	8.93	11.15
E URANIUM	140	1.12	NORMAL	-0.84	-0.18	0.47	1.77	2.42	3.07
POTASSIUM	144	1.05	NORMAL	-0.59	-0.05	0.50	1.60	2.15	2.70
EU/K	140	1.03	NORMAL	0.07	0.39	0.71	1.35	1.67	1.99
EU/ETH	140	0.23	NORMAL	0.05	0.11	0.17	0.29	0.34	0.40
ETH/K	140	4.10	LOGNORMAL	1.84	2.41	3.14	5.35	6.98	9.11

FORMATION PC

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	140	3.27	LOGNORMAL	0.97	1.45	2.18	4.90	7.34	11.00
E URANIUM	121	0.71	LOGNORMAL	0.13	0.23	0.41	1.23	2.15	3.73
POTASSIUM	140	0.58	LOGNORMAL	0.20	0.28	0.40	0.83	1.19	1.70
EU/K	121	0.87	NORMAL	-0.36	0.05	0.46	1.28	1.69	2.10
EU/ETH	121	0.18	NORMAL	-0.07	0.01	0.10	0.27	0.35	0.43
ETH/K	121	4.65	NORMAL	2.14	2.98	3.81	5.48	6.32	7.15

SUSANVILLE

QUAD

FORMATION

PZ

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	906	3.91	LOGNORMAL	1.13	1.71	2.58	5.91	8.94	13.51
E URANIUM	885	1.12	LOGNORMAL	0.31	0.47	0.73	1.72	2.65	4.07
POTASSIUM	906	0.95	NORMAL	-0.71	-0.16	0.40	1.51	2.06	2.62
EU/K	872	1.12	LOGNORMAL	0.17	0.32	0.60	2.08	3.87	7.20
EU/ETH	864	0.23	LOGNORMAL	0.04	0.07	0.12	0.43	0.81	1.51
ETH/K	872	4.70	LOGNORMAL	1.21	1.90	2.99	7.39	11.63	18.30

FORMATION

PZV

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	671	2.34	LOGNORMAL	0.40	0.72	1.30	4.21	7.58	13.63
E URANIUM	651	1.14	NORMAL	-0.63	-0.04	0.55	1.73	2.32	2.91
POTASSIUM	675	0.69	LOGNORMAL	0.23	0.33	0.48	1.01	1.46	2.13
EU/K	651	1.14	NORMAL	-0.26	0.20	0.67	1.61	2.08	2.55
EU/ETH	644	0.25	NORMAL	-0.02	0.07	0.16	0.33	0.42	0.51
ETH/K	650	4.78	NORMAL	-1.71	0.45	2.62	6.95	9.12	11.28

FORMATION

S

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	78	3.42	NORMAL	0.47	1.46	2.44	4.41	5.39	6.37
E URANIUM	78	1.05	NORMAL	-0.06	0.31	0.68	1.42	1.79	2.16
POTASSIUM	78	0.62	NORMAL	0.17	0.32	0.48	0.78	0.94	1.09
EU/K	78	1.68	NORMAL	-0.32	0.35	1.01	2.34	3.01	3.68
EU/ETH	78	0.30	NORMAL	0.04	0.13	0.21	0.33	0.47	0.55
ETH/K	78	5.47	NORMAL	1.15	2.61	4.04	6.90	8.33	9.76

FORMATION

OVP

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	205	3.61	LOGNORMAL	1.07	1.60	2.41	5.43	8.15	12.24
E URANIUM	205	1.09	NORMAL	-0.00	0.36	0.73	1.46	1.83	2.19
POTASSIUM	205	0.82	LOGNORMAL	0.29	0.41	0.58	1.17	1.66	2.37
EU/K	205	1.15	NORMAL	0.38	0.63	0.89	1.40	1.66	1.92
EU/ETH	205	0.23	NORMAL	0.05	0.11	0.17	0.29	0.35	0.41
ETH/K	205	4.93	NORMAL	2.31	3.18	4.05	5.80	6.67	7.54

SUSANVILLE

QUAD

FORMATION EVB

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	145	4.80	LOGNORMAL	1.92	2.61	3.54	6.52	8.84	11.99
E URANIUM	145	1.69	NORMAL	0.51	0.90	1.30	2.09	2.48	2.88
POTASSIUM	145	1.16	LOGNORMAL	0.50	0.66	0.88	1.54	2.04	2.70
EU/K	145	1.14	NORMAL	-0.19	0.76	3.70	1.59	2.03	2.48
EU/ETH	145	0.20	LOGNORMAL	0.08	0.11	0.14	0.27	0.37	0.50
ETH/K	145	4.30	NORMAL	1.35	2.33	3.31	5.28	6.26	7.25

FORMATION EC

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	430	4.46	NORMAL	0.03	1.51	2.99	5.94	7.42	8.89
E URANIUM	404	1.19	NORMAL	-0.41	0.12	0.66	1.73	2.27	2.80
POTASSIUM	430	0.93	NORMAL	-0.17	0.20	0.56	1.29	1.66	2.02
EU/K	432	1.23	NORMAL	-0.29	0.21	0.72	1.74	2.24	2.75
EU/ETH	404	0.24	NORMAL	0.00	0.08	0.16	0.32	0.40	0.48
ETH/K	402	4.95	NORMAL	1.97	2.97	3.96	5.95	6.94	7.93

FORMATION UB

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	253	0.81	NORMAL	-0.88	-0.32	0.24	1.37	1.94	2.50
E URANIUM	255	0.30	LOGNORMAL	0.03	0.06	0.13	0.67	1.50	3.38
POTASSIUM	228	0.08	LOGNORMAL	0.01	0.01	0.03	0.19	0.45	1.07
EU/K	75	1.05	LOGNORMAL	0.10	0.22	0.48	2.33	5.14	11.38
EU/ETH	94	0.25	LOGNORMAL	0.04	0.08	0.14	0.45	0.80	1.42
ETH/K	75	5.68	NORMAL	-1.97	0.58	3.13	8.24	10.79	13.34

FORMATION CM

DATA	SAMPLES	MEAN		-3	-2	-1	+1	+2	+3
E THORIUM	28	11.45	NORMAL	-17.46	-7.81	1.84	21.14	30.79	40.43
E URANIUM	28	1.58	NORMAL	-2.62	-1.22	0.18	2.98	4.38	5.78
POTASSIUM	28	1.28	NORMAL	-1.27	-0.42	0.43	2.13	2.98	3.83
EU/K	28	1.05	NORMAL	-0.44	0.05	0.55	1.55	2.04	2.54
EU/ETH	28	0.12	NORMAL	0.00	0.04	0.08	0.16	0.20	0.24
ETH/K	28	7.99	NORMAL	-3.21	0.52	4.26	11.73	15.47	19.20

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A P P E N D I X F

Format, Single Record Data Listing

REC NO.	LAT	LONG	RESID MAG	FLRR CL	FLC	GEOL UNIT	CUSM CPS	U CPS	AIM TOTAL COUNT CPS	FLG	ETH PPM	FLG	EU PPM	FLG	K PCT	FLG	LU/ETH	EU/K	ETH/K	TEMP CELCIUS	BARO PRES MMHG
5079	64.0086	-160.9199	55305	763	MAR	W	31	1	-12	NAD	-1.1	NAD	-0.5	NAD	0.0	NAD	0.0	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	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	0.0	12.7	747.4
5082	64.0088	-160.9166	55305	730	MAR	W	35	1	-60	NAD	0.0	NAD	0.3	NAD	-0.1	NAD	0.0	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	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	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	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	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	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	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	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	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	0.0	12.8	749.3
5092	64.0094	-160.9052	55304	671		W	29	1	343		0.2	NAD	1.1		0.3		0.0	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	3.5	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	4.1	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	18.3	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	5.2	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	5.5	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	8.1	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	4.1	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	0.0	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	7.0	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	4.2	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	11.2	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	17.6	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	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	11.1	12.8	745.5
5107	64.0104	-160.8883	55304	595		KS	37	-1	488		1.6		2.4		0.1	MAR	1.5	18.6	12.5	12.8	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	5.9	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		0.5	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	55303	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 SRDD TAPE

A P P E N D I X G

Format, Average Record Data Listing

RECORD NUMBER	LATITUDE	LONGITUDE	REL ID		COSM CPS	ATM. TRAN CPS	TOTAL COUNT CPS	ETH PPM	STD FLG	STD DEV	STD FLG	STD DEV	POT PCT	STD FLG	STD DEV	FU		FU		ETH	
			TOTAL FIELD GAMA	GENL UNIT												LTH RATIO	STD DEV	POTA RATIO	STD DEV	POTA RATIO	STD DEV
5238	64.0098	-160.7455	55295	M	33	-6	790	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	55286	KS	29	-3	1216	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	-160.7256	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	M	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	904	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	55282	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	740	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	2345678901234567890123456789012
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	12345678901234567890123456789012345678901234567890123456789012

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-POSTASSIUM 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 1234567890123456789012345678901234567890123456789012

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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

```

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																		
53																						
54	15			I4																		
55	16			I4																		
56	*			*																		
57	*			*																		
58	*			*																		
59	270			I4																		

A P P E N D I X J

Format, DOE STATISTICAL ANALYSIS DATA TAPE

DOE STATISTICAL ANALYSIS DATA TAPE

Line Number	Character Number	
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 THIS QUADRANGLE
12		
13	5	I1 AERIAL SYSTEM IDENTIFICATION CODE FOR FIRST SYSTEM
14	6	A20 AIRCRAFT IDENTIFICATION BY TYPE AND FAA NUMBER FOR FIRST SYSTEM
15		
16	7	F6.1 NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL POTASSIUM (K-40) TO ONE DECIMAL PLACE IN CPS PER PERCENT K
17		
18	8	F6.1 NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL URANIUM (B1-214) TO ONE DECIMAL PLACE IN CPS PER PPM EQUIVALENT U
19		
20	9	F6.1 NOMINAL ALTITUDE SYSTEM SENSITIVITY RELATIVE TO TERRESTRIAL THORIUM (TL-208) TO ONE DECIMAL PLACE IN CPS PER PPM EQUIVALENT TH
21		
22	10	I6 BLANK FIELD (999999)
23	11	F6.3 4PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL PLACES IN SECONDS FOR FIRST SYSTEM
24		
25	12	F6.3 2PI-SYSTEM DATA COLLECTION INTERVAL TO THREE DECIMAL PLACES IN SECONDS FOR FIRST SYSTEM
26		
27	13	I3 NUMBER OF CHANNELS (0-3 MEV) IN 4 PI SYSTEM FOR FIRST AERIAL SYSTEM
28		
29	14	I3 NUMBER OF CHANNELS (0-30 MEV) IN 2 PI SYSTEM FOR FIRST AERIAL SYSTEM
30		
31	15-24	(SAME) REPEAT OF ITEMS 5-14 FOR AERIAL SYSTEM
32	*	*
33	*	*
34	*	*
35		
36	85-94	(SAME) REPEAT OF ITEMS 5-14 FOR NINTH AERIAL SYSTEM
37	95	I3 NUMBER OF FLIGHT LINES ON THIS TAPE
38	96	I4 FIRST FLIGHT LINE NUMBER ON THIS TAPE
39	97	I6 FIRST RECORD NUMBER OF FIRST FLIGHT LINE
40	98	I3 JULIAN DATE (DAY OF YEAR) FIRST FLIGHT LINE DATA WAS COLLECTED
41		
42	99-101	I4,6 &3 REPEAT OF ITEMS 96-98 FOR SECOND FLIGHT LINE ONE THIS TAPE
43		
44	*	*
45	*	*
46	*	*
47		
48	390-392	I4,6 &3 REPEAT OF ITEMS 96-98 FOR 99TH FLIGHT LINE ON THIS TAPE
49		
50		
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 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 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 1234567890123456789012345678901234567890123456789012

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

12

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

16

ITEM	FORMAT	DESCRIPTION
1	A8	SURFACE GEOLOGIC MAP UNIT IDENTIFYING CODE
2	I6	TOTAL RECORDS FOR GEOLOGIC MAP UNIT
3	I6	NUMBER OF POTASSIUM RECORDS COMPUTED FOR GEOLOGIC UNITS
4	F6.1	POTASSIUM CONCENTRATION MEAN TO ONE DECIMAL PLACE IN PERCENT K
5	F6.1	POTASSIUM CONCENTRATION STANDARD DEVIATION TO ONE DECIMAL PLACE IN PERCENT K
6	A3	POTASSIUM CONCENTRATION DISTRIBUTION CODE
7	I6	NUMBER OF URANIUM RECORDS COMPUTED FOR GEOLOGIC UNIT
8	F6.1	URANIUM CONCENTRATION MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
9	F6.1	URANIUM CONCENTRATION STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U
10	A3	URANIUM CONCENTRATION DISTRIBUTION CODE
11	I6	NUMBER OF THORIUM RECORDS COMPUTED FOR GEOLOGIC UNIT
12	F6.1	THORIUM CONCENTRATION MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
13	F6.1	THORIUM CONCENTRATION STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT TH
14	A3	THORIUM CONCENTRATION DISTRIBUTION CODE
15	I6	NUMBER OF URANIUM-TO-THORIUM RATIO RECORDS COMPUTED FOR GEOLOGIC UNIT
16	F6.1	URANIUM-TO-THORIUM RATIO MEAN TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT TH
17	F6.1	URANIUM-TO-THORIUM RATIO STANDARD DEVIATION TO ONE DECIMAL PLACE IN PPM EQUIVALENT U PER PPM EQUIVALENT TH
18	A3	URANIUM-TO-THORIUM RATIO DISTRIBUTION CODE
19	I6	NUMBER OF URANIUM-TO-POTASSIUM RATIO RECORDS COMPUTED FOR GEOLOGIC UNIT
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	3	4	5	6	7	8	9	0
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 1234567890123456789012345678901234567890123456789012

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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>583</u>	<u>Res. Thor.</u> <u>2615</u>	<u>Low Preflight</u>			<u>Low Postflight</u>		
				<u>Alt.</u>	<u>T.C.</u>	<u>2π</u>	<u>Alt.</u>	<u>T.C.</u>	<u>2π</u>
09/11/80	69	6.0%	9.3%	400'	1225	11	No Test		
09/11/80	70	6.0%	9.3%	400'	1225	11	No Test		
09/11/80	71	6.0%	9.3%	400'	1225	11	No Test		
09/25/80	111	5.2%	8.6%	400'	1200	12	400'	1175	9
09/27/80	117	5.3%	8.9%	400'	1225	14	400'	1175	9
09/27/80	119	5.3%	8.9%	400'	1225	14	400'	1175	9
09/28/80	120	5.3%	8.7%	400'	1150	10	No Test		
09/28/80	121	5.3%	8.7%	400'	1150	10	No Test		
09/29/80	122	5.8%	8.3%	400'	1175	9	400'	1175	7
09/29/80	123	5.8%	8.3%	400'	1175	9	400'	1175	7
09/29/80	124	5.8%	8.3%	400'	1175	9	400'	1175	7
09/29/80	125	5.8%	8.3%	400'	1175	9	400'	1175	7
09/30/80	126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/01/80	127	5.6%	8.5%	400'	1175	9	No Test		
10/06/80	139	6.0%	8.0%	400'	1275	13	400'	1250	11

N/A = NOT AVAILABLE

A P P E N D I X N

Renumbered to Original Fiducial Correlations

SUSANVILLE QUADRANGLE

LINE 570 FLOWN AS LINE 571 AND 572
MAP FIDUCIALS 3579 TO 4334 CORRESPOND TO ORIGINAL FIDUCIALS 4334 TO 3579
MAP FIDUCIALS 4335 TO 6570 CORRESPOND TO ORIGINAL FIDUCIALS 12771 TO 15013

LINE 580 FLOWN AS LINE 581 AND 582
MAP FIDUCIALS 1998 TO 2773 CORRESPOND TO ORIGINAL FIDUCIALS 2773 TO 1998
MAP FIDUCIALS 2774 TO 5378 CORRESPOND TO ORIGINAL FIDUCIALS 17738 TO 15133

LINE 590 FLOWN AS LINE 594 AND 593
MAP FIDUCIALS 17941 TO 18882 CORRESPOND TO ORIGINAL FIDUCIALS 18882 TO 17941
MAP FIDUCIALS 18883 TO 21104 CORRESPOND TO ORIGINAL FIDUCIALS 7315 TO 4921

LINE 600 FLOWN AS LINE 603 AND 604
MAP FIDUCIALS 975 TO 1763 CORRESPOND TO ORIGINAL FIDUCIALS 1763 TO 975
MAP FIDUCIALS 1764 TO 4062 CORRESPOND TO ORIGINAL FIDUCIALS 7518 TO 9817

LINE 610 FLOWN AS LINE 611
MAP FIDUCIALS 1375 TO 4336 CORRESPOND TO ORIGINAL FIDUCIALS 4336 TO 1375

LINE 620 FLOWN AS LINE 622 AND 620
MAP FIDUCIALS 1697 TO 1908 CORRESPOND TO ORIGINAL FIDUCIALS 1908 TO 1697
MAP FIDUCIALS 1909 TO 4387 CORRESPOND TO ORIGINAL FIDUCIALS 22355 TO 19487

LINE 630 FLOWN AS LINE 632 AND 630
MAP FIDUCIALS 12525 TO 13209 CORRESPOND TO ORIGINAL FIDUCIALS 13209 TO 12525
MAP FIDUCIALS 13210 TO 15246 CORRESPOND TO ORIGINAL FIDUCIALS 12000 TO 9963

LINE 640 FLOWN AS LINE 643 AND 641
MAP FIDUCIALS 866 TO 2396 CORRESPOND TO ORIGINAL FIDUCIALS 866 TO 2396
MAP FIDUCIALS 2397 TO 4242 CORRESPOND TO ORIGINAL FIDUCIALS 5207 TO 7053

LINE 650 FLOWN AS LINE 653 AND 652
MAP FIDUCIALS 19593 TO 20837 CORRESPOND TO ORIGINAL FIDUCIALS 20837 TO 19593
MAP FIDUCIALS 20838 TO 22467 CORRESPOND TO ORIGINAL FIDUCIALS 19469 TO 17839

LINE 660 FLOWN AS LINE 663 AND 661
MAP FIDUCIALS 863 TO 2391 CORRESPOND TO ORIGINAL FIDUCIALS 2391 TO 863
MAP FIDUCIALS 2392 TO 4036 CORRESPOND TO ORIGINAL FIDUCIALS 15457 TO 17719

LINE 670 FLOWN AS LINE 672 AND 671
MAP FIDUCIALS 2733 TO 3974 CORRESPOND TO ORIGINAL FIDUCIALS 3974 TO 2733
MAP FIDUCIALS 3975 TO 5843 CORRESPOND TO ORIGINAL FIDUCIALS 15247 TO 13379

LINE 680 FLOWN AS LINE 682 AND 681
MAP FIDUCIALS 2581 TO 4014 CORRESPOND TO ORIGINAL FIDUCIALS 4014 TO 2581
MAP FIDUCIALS 4015 TO 6015 CORRESPOND TO ORIGINAL FIDUCIALS 11308 TO 13309

LINE 3060 FLOWN AS LINE 3061 AND 3062
MAP FIDUCIALS 848 TO 1876 CORRESPOND TO ORIGINAL FIDUCIALS 1846 TO 848
MAP FIDUCIALS 1877 TO 2729 CORRESPOND TO ORIGINAL FIDUCIALS 41 TO 894

SUSANVILLE QUADRANGLE

LINE 3070 FLOWN AS LINE 3071 AND 3072

MAP FIDUCIALS 4018 TO 4938 CORRESPOND TO ORIGINAL FIDUCIALS 4938 TO 4018

MAP FIDUCIALS 4939 TO 5775 CORRESPOND TO ORIGINAL FIDUCIALS 7305 TO 6468

LINE 3080 FLOWN AS LINE 3080 AND 3081

MAP FIDUCIALS 2616 TO 3777 CORRESPOND TO ORIGINAL FIDUCIALS 3777 TO 2616

MAP FIDUCIALS 3778 TO 4663 CORRESPOND TO ORIGINAL FIDUCIALS 7536 TO 8422

LINE 3090 FLOWN AS LINE 3090 AND 3091

MAP FIDUCIALS 9901 TO 11050 CORRESPOND TO ORIGINAL FIDUCIALS 11050 TO 9901

MAP FIDUCIALS 11051 TO 11931 CORRESPOND TO ORIGINAL FIDUCIALS 13296 TO 12461

LINE 3100 FLOWN AS LINE 3100 AND 3101 AND 3102

MAP FIDUCIALS 16496 TO 16851 CORRESPOND TO ORIGINAL FIDUCIALS 16851 TO 16496

MAP FIDUCIALS 16852 TO 17519 CORRESPOND TO ORIGINAL FIDUCIALS 9035 TO 9703

MAP FIDUCIALS 17520 TO 18378 CORRESPOND TO ORIGINAL FIDUCIALS 13477 TO 14335

LINE 3110 FLOWN AS LINE 3111 AND 3112

MAP FIDUCIALS 7314 TO 8383 CORRESPOND TO ORIGINAL FIDUCIALS 8383 TO 7314

MAP FIDUCIALS 8384 TO 9210 CORRESPOND TO ORIGINAL FIDUCIALS 19308 TO 18481