OPTIONAL FORM NO. 10
5010-103

UNITED STATES GOVERNMENT

Memorandum

TO :

DATE:

FROM :

SUBJECT:

Enclosed is a copy of the text of the SMEAT final report for your information. Thank-you very much for your help and interest. Please call Dr. Vogel or myself if you have any questions on the report. We'll be happy to scan you again (In San Francisco, of course) anytime you're in the area.

I hope you and your family are having an excellent Christmas, and best wishes for the New Year.

John Ullmann.

John Ullmann
USPHS Hospital
San Francisco

BONE MINERAL MEASUREMENT

SKYLAB MEDICAL EXPERIMENTS ALTITUDE TEST (SMEAT)

M - 078

December 20, 1972

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Supported by NASA Contract T-81073

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ACKNOWLEDGMENTS

We wish to gratefully acknowledge the kind assistance of the employees of the Manned Spacecraft Center, and especially Dr. Carter Alexander, Dr. Charles Ross and Dr. Charles LaPinta for serving as control subjects; and the SMEAT crew, Dr. William Thornton, Lt Cdr Robert L. Crippen and Lt Col Karol J. Bobko for their continued interest, patience and assistance in our experiment.

We would also like to acknowledge the following for their contributions: Mr. John Fasal and NASA for photographs, Miss Edna Indritz for illustrations, Mr. Alan Silverstein for computer programs, Mrs. Vivian Kite and Mrs. Betty Vogel for typing this report, and Miss Dee O'Hara and Miss Josie Ames for their assistance at Manned Spacecraft Center.

ABSTRACT

Results of bone mineral measurement (Experiment M078) on the SMEAT crew are reported and the methods described in detail. No mineral change was observed in the right radius, but one astronaut gained mineral in the right ulna and another possibly lost mineral from the left os calcis. Results of the control scans are compared to past data.

FIGURES

TABLES

INTRODUCTION

The effect of short periods of weightlessness on bone mineral has been documented (1,2,3). The bone mineral losses observed have been most evident in the lower extremities, especially the os calcis. It is seen in some astronauts and not in others. When the mineral content of upper extremity bones (radius and ulna) were measured with the precise gamma ray absorptiometry technique, no losses were observed. The reason for the variability of mineral loss in the os calcis is not clear. In bed rest (simulated weightlessness) studies the degree of os calcis mineral loss has been shown to be dependent upon the initial mineral content and the initial daily hydroxyproline excretion rate (4). The lack of hydroxyproline data has not allowed us to apply the prediction term $\frac{\text{initial bone mineral}}{\text{initial OHproline excretion/24 hrs}}$ to the astronaut data. It is possible that the variability observed could be resolved in this way.

As we approach the SKYLAB mission with its 28 and 56 day periods of weightlessness, losses of bone mineral in line with those seen in the prolonged bed rest subject can be anticipated.

The effects of confinement and cabin environment probably contributed little to the shorter Apollo missions and the short stays in the 1/6 G lunar gravity may have ameliorated some of these effects. The SKYLAB mission with its longer duration may result in some bone mineral losses mediated by these conditions.

It was therefore necessary that a study of bone mineral be carried out on the subjects confined for 56 days in an environment similar to that during

the SKYLAB mission (SMEAT). By observing the variability in mineral content under SMEAT conditions, it may be possible to subsequently derive the effects of weightlessness alone. Furthermore, by studying a group of control subjects not subjected to the SMEAT conditions the effects of confinement and cabin environment can be calculated. We may therefore be able to separate the effects of weightlessness from other factors and assess the magnitude of these factors.

The application of the Bone Mineral Measurement experiment (M-078) to the SMEAT mission involved the measurement of pre and post chamber mineral content of the left central os calcis, and right distal radius and ulna of the three crewmen and five controls.

BONE MINERAL MEASUREMENT SCANNING SYSTEM

The equipment used for the measurements was essentially the same as that used for Apollo 14, 15 and 16. The scanning unit was built at the U.S. Public Health Service Hospital, San Francisco, and was specifically designed to meet the requirements of the Apollo 14 post mission quarantine program. The scanner is compact, can easily be disassembled (Fig. 1) and has the capacity for operation in two configurations: heel scanning (Fig. 2) and arm scanning (Fig. 3). The unit consists of a scanning yoke (Fig. 4), apparatus for moving the yoke, and devices for positioning the limb to be scanned.

The scanning yoke holds a collimated ^{125}I source (Fig.3S) and a collimated detector 13 cm. apart (Fig.3D) with the collimators aligned in direct opposition. The source contains 300 - 400 mCi ^{125}I and is shielded, except for a 3 mm diameter collimator output hole. The detector is a 10 mm diameter by 3 mm thick thallium activated sodium iodide crystal coupled with a ruggedized photomultiplier tube mounted in a 3 mm collimated housing. The part to be scanned is placed between the source and detector.

In order to accomplish rectilinear scans, the yoke must have two separate motions. The ram (Fig. 4) and Y axis unit (Fig.5A) accomplish these motions. The yoke is attached to the ram by means of a special mounting stud which allows mounting in arm or heel configurations. The ram sits in the Y axis unit which is supported by a frame. This frame can sit either horizontally or vertically in the scanner base to allow for heel (vertical) or arm (horizontal) configurations (see Fig.2,3).

Scanning is accomplished by the yoke's motion in the two separate axes First, a traverse by the x axis ram (into or out of its housing) constitutes a row during which data are collected. Second, a movement by the y axis unit in between rows constitutes an increment, during which no data are collected. With respect to a three dimensional coordinate system, the beam of radiation is taken as parallel to the z axis (Fig. 6).

Rows of data collected during the x axis traverse contain 256 separate data points. Each point represents an x axis traverse of 0.3969 mm (0.0156 in.) for a total row of 10.16 cm (4.0 in.). Then, in the y direction, the ram and yoke are moved incrementally by the y axis unit after the completion of each x axis row. The standard y increment is 3.0 mm. A full scan is completed when 16 rows of data have been collected.

The yoke is driven on both axes by means of precision stepping motors. Each stepping impulse turns the motor through 1.8° of arc or 200 steps per revolution. Using 16 pitch screws, this is the equivalent of 126.0 steps per mm or 3200.0 steps per inch of linear motion on either axis. A repositioning accuracy of better than $\pm$ 0.01 mm is thereby achieved on a particular scanner. At one extreme of each axis a microswitch is mounted to determine an exact reference point for repositioning. The scanner is "zeroed" once each day to assure that the Scanner Control registers agree with the yoke's physical position. An absolute dimensional accuracy of $\pm$ 0.035 mm is achieved with this method.

The devices which hold the limbs stable and in position for scanning consist of two interchangeable tables on a common base that slides on the

scanner base to permit positioning. The base is locked into position by locking thumb screws (see Scanning Procedure).

The conversion of the scanner from one configuration to the other requires a 90° rotation of the frame with respect to the base and a 90° rotation of the yoke with respect to its mounting stud.

SCANNER CONTROL

The scanner's stepper motors are accurately controlled by a miniaturized Scanner Control instrument (Fig. 7). The Scanner Control module weighs seven pounds (3.2 kg.) and is housed in a single modular nuclear instrument bin along with the data collection electronics (Fig. 8). This instrument was designed and built in-house for the Apollo 16 mission.

The Scanner Control is a precise digital instrument which provides for a high degree of accuracy to the scanner yoke's motion and position as mentioned. The motion of the yoke along the x axis is controlled by a quartz crystal oscillator and digital frequency synthesizer that provide for a velocity accuracy $\pm$ 0.15% of the indicated value. Variation of velocity with age and temperature is less than 10 ppm or 0.001% velocity change.

This device has a front panel control lock-out which prevents a change in scan velocity, format and positioning during a particular scan. Although complex, the instrument is small and is designed for ease of use in the field. Three push buttons control all major scanner functions: Zero; Stop: Scan/ Initialize (Fig. 7). The Zero push button synchronizes the yoke's position with the internal position registers by moving each axis to its reference point where a microswitch is tripped. A Stop push-button stops all operations and strobes all front panel settings (x velocity, scan format, initial y position,

number of rows, increment in mm) into the memory. The third push button, Scan/Initialize starts a scan if the y axis position equals that selected and if the x axis register indicates zero. If either of these conditions is not met, the yoke will move to the selected initial position on the y axis (in mm from the reference point) and it will move to the Zero (reference point) on the x axis. It is then possible to start an automatic scan by simply pressing this Scan/Initialize button a second time. A block diagram of this instrument's function (page A-26) can be found in the appendix.

DATA COLLECTION ELECTRONICS

An extremely thin (3 x 10 mm) NaI (th) crystal is used in the detection of the low energy 27.5 Kev photons from the ^{125}I source. This thin crystal is necessary to ensure a high signal to noise ratio as background is generally of a much higher order of energy.

A preamplifier of high linearity in combination with a single channel analyzer produce the standardized pulses necessary for digital processing. These pulses are then digitally counted by a scaler for an interval determined by the time required for the yoke to traverse a single channel width of 0.03936 mm. on the x axis. At the termination of each channel, the Scanner Control signals the scaler to dump its contents into a buffer register and continues counting. The buffer then retains the count for a period long enough for the paper tape formatter to strobe the number in ASCII code to the paper tape punch where the data are permanently stored for later calculation.

The SCA's output is also connected to a linear ratemeter in order to constantly monitor the count rate through the system.

A block diagram of the data collection electronics is in Figure 9.

THE TEST PROCEDURE:

The scan procedure was essentially the same as used on Apollo 14, 15 and 16 (5). Simultaneous area scans of the left os calcis and the right arm were performed on each subject over a period of four months. An impression of each subject's foot was made prior to the study from which a plastic foot mold was fashioned. During scanning of the os calcis the heel rests in this foot mold which is mounted in a plastic box (Fig.2). The box is fitted on the heel table top and is filled with water to provide a constant tissue equivalent path. The scan was started at a point 4.5 cm. from the bottom of the heel as determined by an initial x-ray photograph. Sixteen parallel rows, each spaced three millimeters apart were scanned.

During arm scanning the arm lays horizontally between two plastic vertical uprights on the arm table top (Fig.3). The planar sections are vertical and perpendicular to the long bones of the arm. A peg in a movable hand rest is positioned to hold the arm with the ulnar styloid opposite a reference in the upright. In order that a constant path length tissue equivalent may be obtained, the arm is surrounded by Superstuff (*) and covered with a thin sheet of plexiglass. Sixteen rows were scanned at three millimeter intervals.

DATA REDUCTION:

Data on punched paper tape were entered into a time sharing computer by means of a remote teletype terminal.

The basic algorithm for determining bone mineral content is

$$BMC = K \Sigma \ln (I_o^*/I)$$

where K is a constant, I is the count rate in bone, and I_o^* is the count rate through soft tissue surrounding bone (Fig.10)There are two problems involved in the calculation.

*WHAM-O Corp., San Gabriel, California

1. Definition of the bone edge and therefore bone width.

2. Calculation of the I_o^* to minimize the effect of fat.

Two basic programs were used specific to the pecularities of the bones. The geometry of the arm is basically simple, although the effects of fat may present a problem. We assume that fat remains constant throughout the test. I_o^* is defined by taking all points within 20% of an estimated I_o^*, through an interative process a self-consistent I_o^* is obtained. Bone edge is defined by a point 85% below I_o^*.

The heel however, is an irregular trabecular bone with more poorly defined edges set in a fat pad on one side. It demands a more precise algorithm. Because the fat significantly increased I_o^* on one side of the bone, an 85% edge is not satisfactory and I_o^* must be chosen carefully. To determine the edge, the slope of the scan is calculated at 26 points along the approximate edge of each side of the bone and the channel of the maximum slope assigned as the edge. I_o^* is determined by skipping 5 channels outside the bone and averaging the next 8. This gives a different I_o^* for the lean and the fat side of the bone. Bone mineral content is then calculated in two ways using the lean I_o^* only and the mean of the lean and fat I_o^*. The answers using the lean I_o^* appear to be more valid (6). The slope edge criterion seems to give more consistent edges resulting in smoother bone profiles. A description of the slope program is in the Appendix.

A third program, using the same algorithm as the arm program is used for calculating standards but produces a different printout.

SCAN MATCHING:

Although the heel is positioned in a custom fitted foot mold and the

ulnar styloid is carefully positioned opposite the mark on the arm holder, differences in positioning do occur. The final alignment of the scans is done using bone widths calculated by the analysis programs.

Heels are positioned by plotting a graph of bone width vs. scan row location and some landmark, such as a maximum or a minimum is used as a reference point. Nine rows in the central os calcis that give minimum variation in the average if the positioning is off by one row are usually chosen. Figure 12 shows three heel profiles and the chosen rows.

Arm scans are matched by comparing widths of the radius, the interbone gap, and the ulna. Usually the distal most seven rows (in the more trabecular region) are chosen.

As a final check on the row matching, the selected rows are marked on a contour display of the bone and positions compared. The contour displays for SMEAT are in Figures 16 and 17.

Because of occasional errors in determining the location of the ulnar styloid and possible movement of the subject, SMEAT selected arm rows do not always match with rows selected on previous missions. Control subjects can be followed through several missions by comparing those rows that do match. This comparison is shown in the Appendix.

CALIBRATION:

In the basic equation

$$BMC = K \Sigma \ln (I_o^*/I)$$

K is a highly energy-dependent constant. The ^{125}I source used in scanning produces a spectrum of energies (principally 27, 31 and 35 KEV, although the 31 and 35 KEV peaks are attenuated by a tin filter) and compton scatter in the subject degrades the beam. We must therefore insure that the character of the

detected beam remains constant for every measurement. To do this, a single channel analyzer is set to a 27.5 $\pm$ 8 KEV window. Energy calibrations of the S.C.A. were performed daily using the 27.5 KEV peak of ^{125}I and the 22 and 88 KEV peaks of ^{109}Cadmium.

The entire system is calibrated by scanning four passes of the Cameron Standard (13). immediately before and after each scan. The standard consists of three "bones"; this is, chambers containing dipotassium hydrogen phosphate to simulate bone attenuation. The pre and post scan computer unit values ($\sum \ln I_o^*/I$) are averaged for each "bone" and a calibration curve of actual bone mineral content (the known values of the standard) vs. computer units were made. This calibration is then used to calculate the bone mineral content of the actual bone. Tables of the calibration equations used are in the Appendix.

TABLE I

Values of The Cameron Standard

Bone	Mg/cm^2	g/cm
1	311.56	.331
2	351.91	.568
3	671.31	1.278

The values of the Cameron Standard in g/cm have been determined by Witt (7) and the values in mg/cm^2 were determined by comparison with a hydroxyapatite step wedge. (Hueck) (8)

RESULTS AND DISCUSSION:

HEEL:

Heel data obtained from crew and controls is presented in Table 2 . These numbers represent nine-row averages matched as described above, with the exception of Thornton. Because of improper toe peg placement in the heel mold, Thornton's first scan was malpositioned. This was corrected for the second measurement. Due to the malpositioning, however, only 7 rows from the 6-13-72 study matched subsequent scans and therefore only 7 row averages are presented.

By comparing contour displays of the heels (see the Appendix), Thornton's heel of 6-13 does not seem to be rotated from the other measurements, an observation born out by the heel profile; thus its results are comparable with other scans.

Table 3 shows the percent change from baseline of crew and controls. The raw data used for the table is tabulated in the Appendix. The data is graphed in Fig. 14 .

Note that the crew measurements performed on 10-10-72 in San Francisco are all substantially higher (3% to 5%) than baseline. Since the control on that day also measured higher (8.7%), this cannot be considered a real increase and must be attributed to instrumental variation. Although the scanner, drive electronics, phototubes and sources were the same as those used at MSC, the data acquisition electronics was different. It is interesting to note that the scans were performed in the order - Crippen, Bobko, Thornton - and that the percentages increase monotonically in the same order. Ullmann was scanned later in the day. This is the first time a variation like this has been observed and it is currently under careful investigation.

It must also be noted that Crippen on R+0 and R+2 is 3.1% and 2.7% respectively below baseline. This trend may be significant. Since the results of a measurement process are assumed to be distributed in a gaussian fashion about a mean, we can define a measured mean and standard deviation based on a large number of measurements. A logical significance level for a "mineral loss" criterion would be two standard deviations from the baseline mean. However, the choice of the standard deviation to be applied is problematic. If we calculate the standard deviation from the experimental data, the variance will be different for each individual since it depends in part on the uniformity of his bones. Moreover, the standard deviation for the crew will be based on only four measurements and for the controls at most 8 measurements. On the other hand, data based on several subjects measured many times over a period of months show an average 2 standard deviation of 3% (5). The true limits probably lie between these two values.

If we apply the 2 standard deviation crew baseline limits for Crippen (i.e., 2 x 0.7% or 1.4%), the -3.1% measurement would be considered significant. If on the other hand we apply the 2 standard deviation limit obtained from subjects measured over a long period of time (3%) Crippen's losses would be of borderline significance. We must conclude that Crippen may have had some os calcis mineral loss. Note that Thornton also had negative percentages on R+0 and R+2 but that his baseline standard deviation is 2.2%, implying that there is no apparent loss.

ARM:

The seven-row matched averages of the right radius of crews and controls is presented in Table 5 , with their percent deviation from baseline in Table 6 .

The matched seven-row averages of the right ulna (at the same location as in the radius) are presented in Table 7 , with their percentage deviations from baseline in Table 8 . The radius data are graphed in Figure 15.

No significant variation from baseline is observed in post-test radius measurements. It is interesting, however, that the post-test ulna measurements on Thornton were substantially above the baseline mean, while no change was evidenced in the remainder of the crew and controls. Although ulna measurements in the past have had a larger variance than radius measurements, if we apply the two standard deviations criterion, we feel this observation indicates a real gain. Its significance is not clear, but may be attributed to the heavy exercise routine in which Thornton was apparently engaged.

PROBLEMS:

Two problems continued to plague us during SMEAT while several others were solved.

1) Noise of the scanners' paper tape punch unit continued to be a problem. Physical examinations, originally performed in an area adjacent to the scanners, had to be moved to another area because the noise interferred with auscultation.

2) The non-availability of a phone with which to connect to a time sharing computer remained a problem. The teletype we use is too noisy to be used in offices where other people are working; it had to be moved from room to room depending upon their use.

These problems can be resolved by quieter scan output and computer input devices. We hope to be able to acquire such a system before SKYLAB missions.

3) There were recurring mechanical problems with the scanners. These were finally solved to a large extent by replacing the drive mechanism of the scanners with stainless steel drive screws and Delrin drive nuts. The scanners also have been torn down and the bearing surfaces cleaned. A modified scanner has been designed to eliminate many of these problems. It is hoped that it will be available for SKYLAB use.

4) Using battery X power supplies, a drift in calibration has been noted on several occasions. This has been rectified by using a precision high voltage power supply. Furthermore, a constant countrate through the counting system has been maintained between scans.

5) The heel mold for Thornton had a badly positioned toe peg causing discomfort to the astronaut; this was corrected on subsequent scans.

6) On the 10-10-72 measurement in San Francisco, we experienced some electronic problems resulting in the measured heel mineral content values to be 3 to 8% higher. We are currently investigating this problem carefully to prevent its recurrence.

The equipment and procedures were thoroughly tested during SMEAT and necessary modifications identified. For the most part, these have been improved and all will be corrected before the SKYLAB mission. With the addition of faster and quieter data handling equipment data acquisition should be significantly improved on the SKYLAB mission.

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Fig. 1 Scanner Disassembled

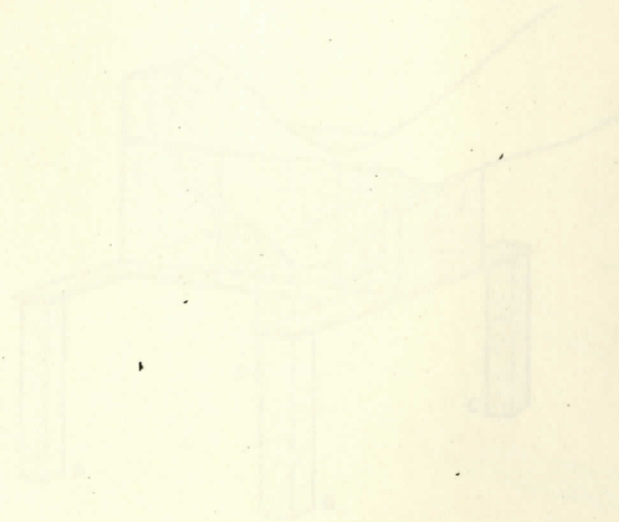


Fig. 2a Heel Scanning Configuration

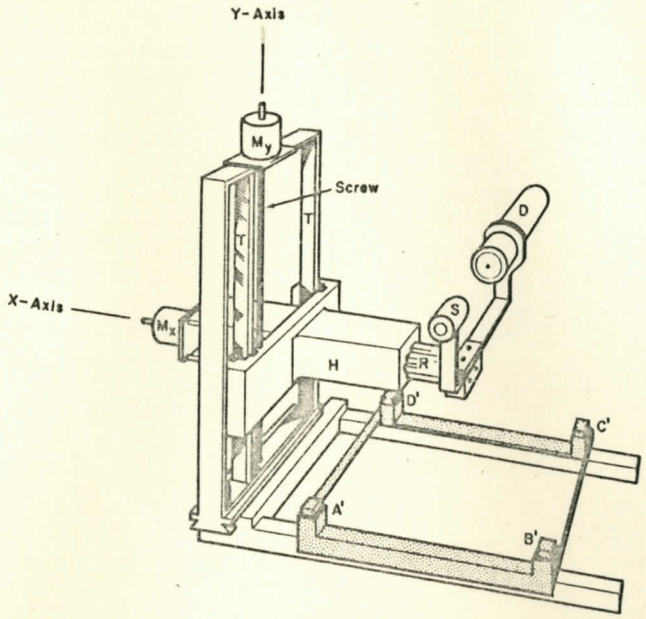


Fig. 2b

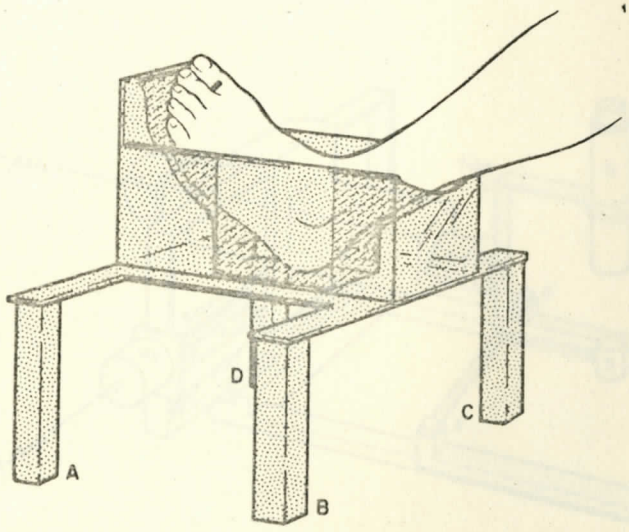


Fig. 2c

Fig. 3a Arm Scanning Configuration

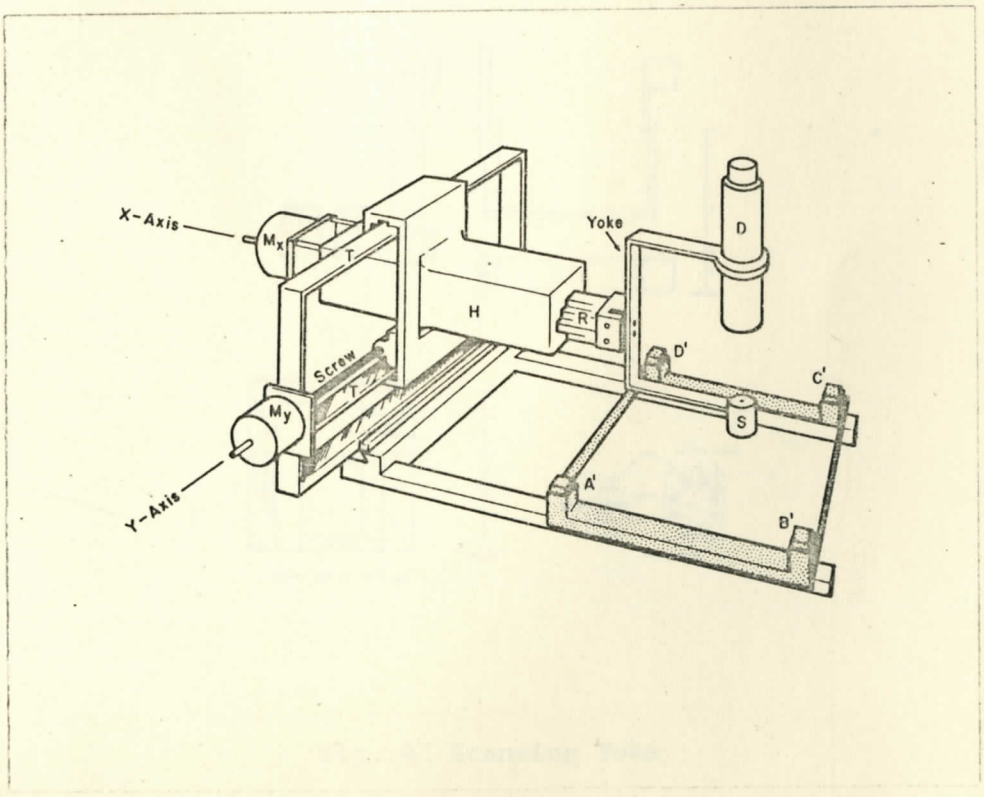


Fig. 3b

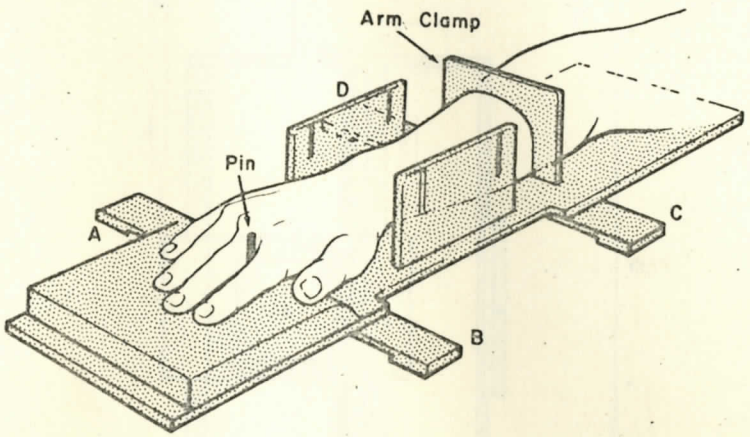


Fig. 3c

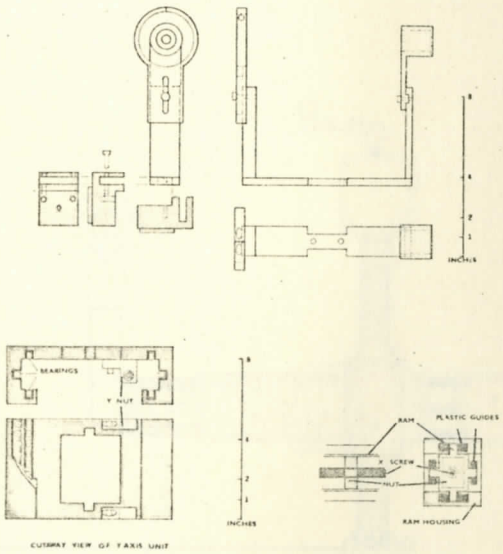


Fig. 4 Scanning Yoke

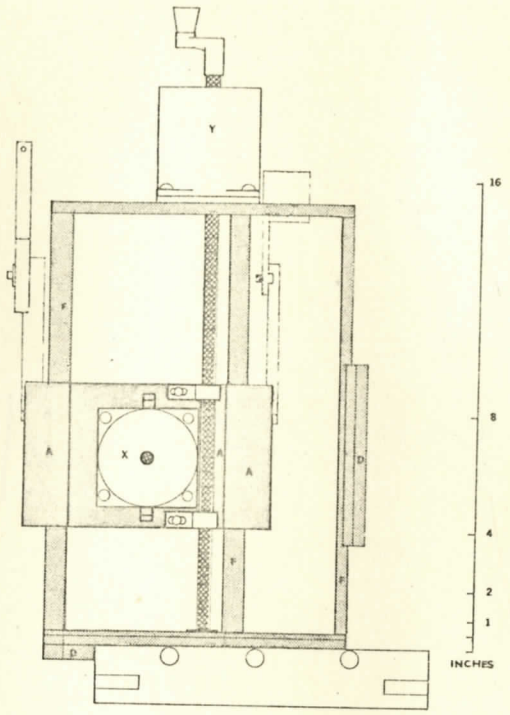


Fig. 5 Rear View of Scanner
Showing Y-axis Unit

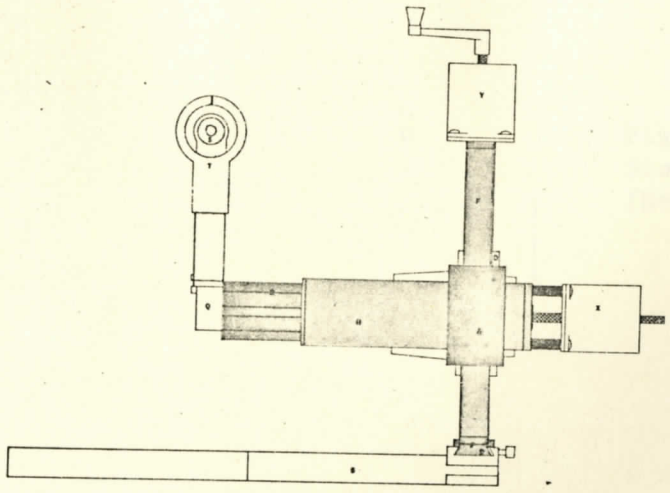


Fig. 6 Lateral View of Scanner

Fig. 7a
Scanner Control
(Front)

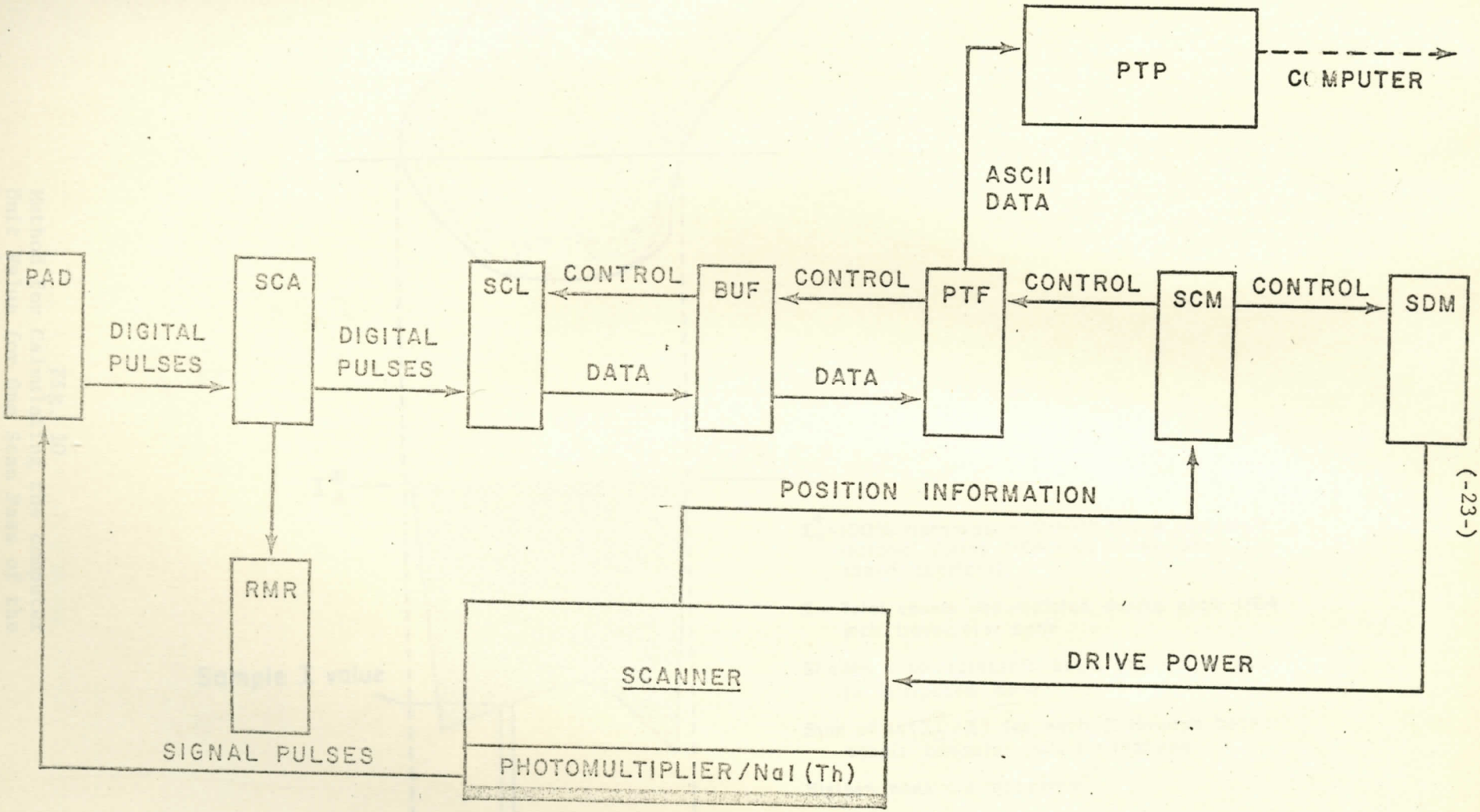
c

Fig. 7b
Scanner Control
(Rear)

FIGURE 8

Scanner Electronics

DATA COLLECTION ELECTRONICS



PAD – preamplifier
SCA – single channel analyzer
RMR – ratemeter
SCL – scaler
PTP – paper tape punch
BUF – buffer
PTF – paper tape formatter
SCM – scanner control module
SDM – scanner driver module

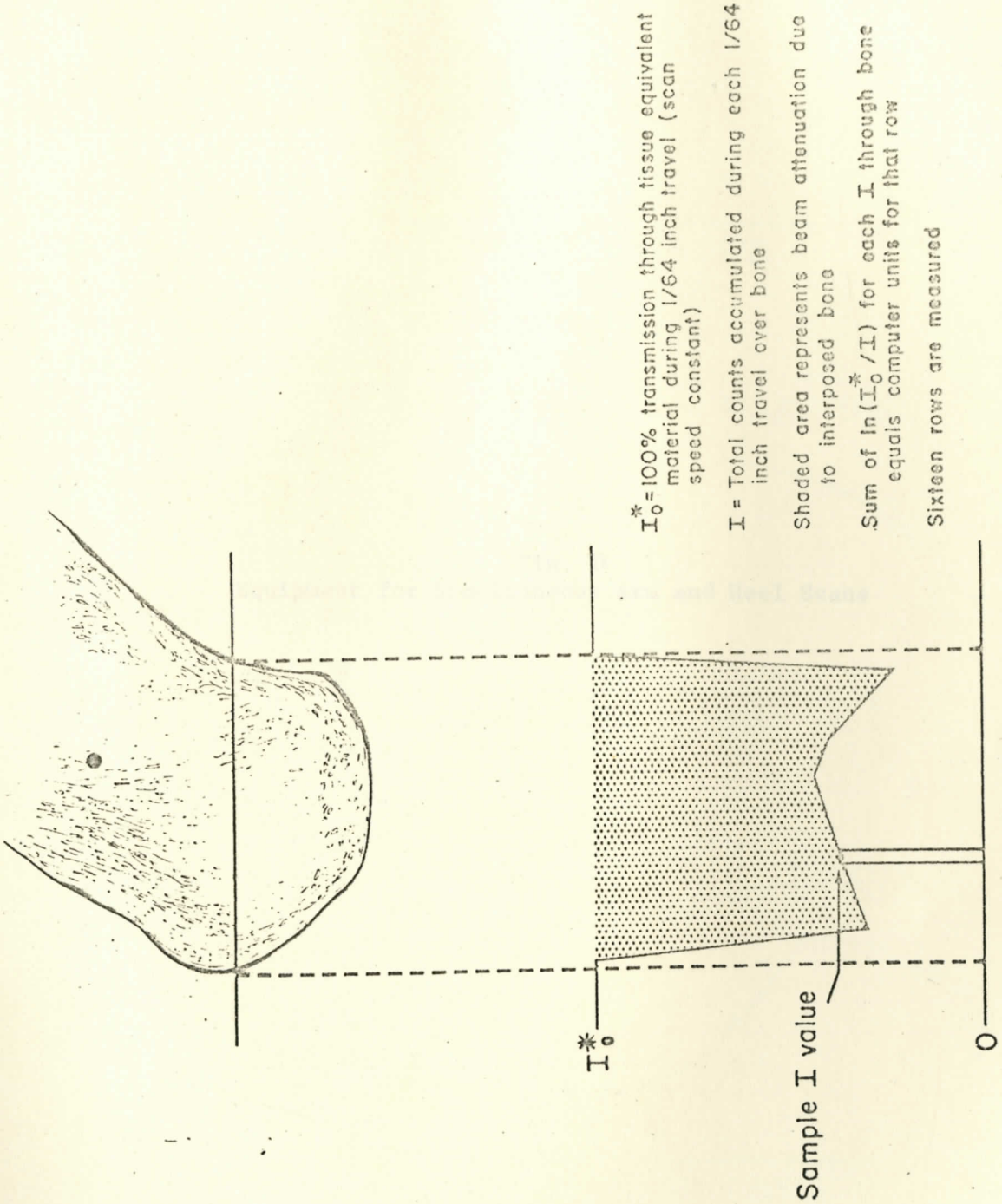


Fig. 10
Method for Calculating the computer Unit Value for One Scan Pass of the Os Calcis.

Fig. 11
Equipment for Simultaneous Arm and Heel Scans

Fig. 13
Cameron Standard and Heuck Wedge

EXAMPLE OF HEEL WIDTH PROFILES
(BOSKO)
Fig. 12

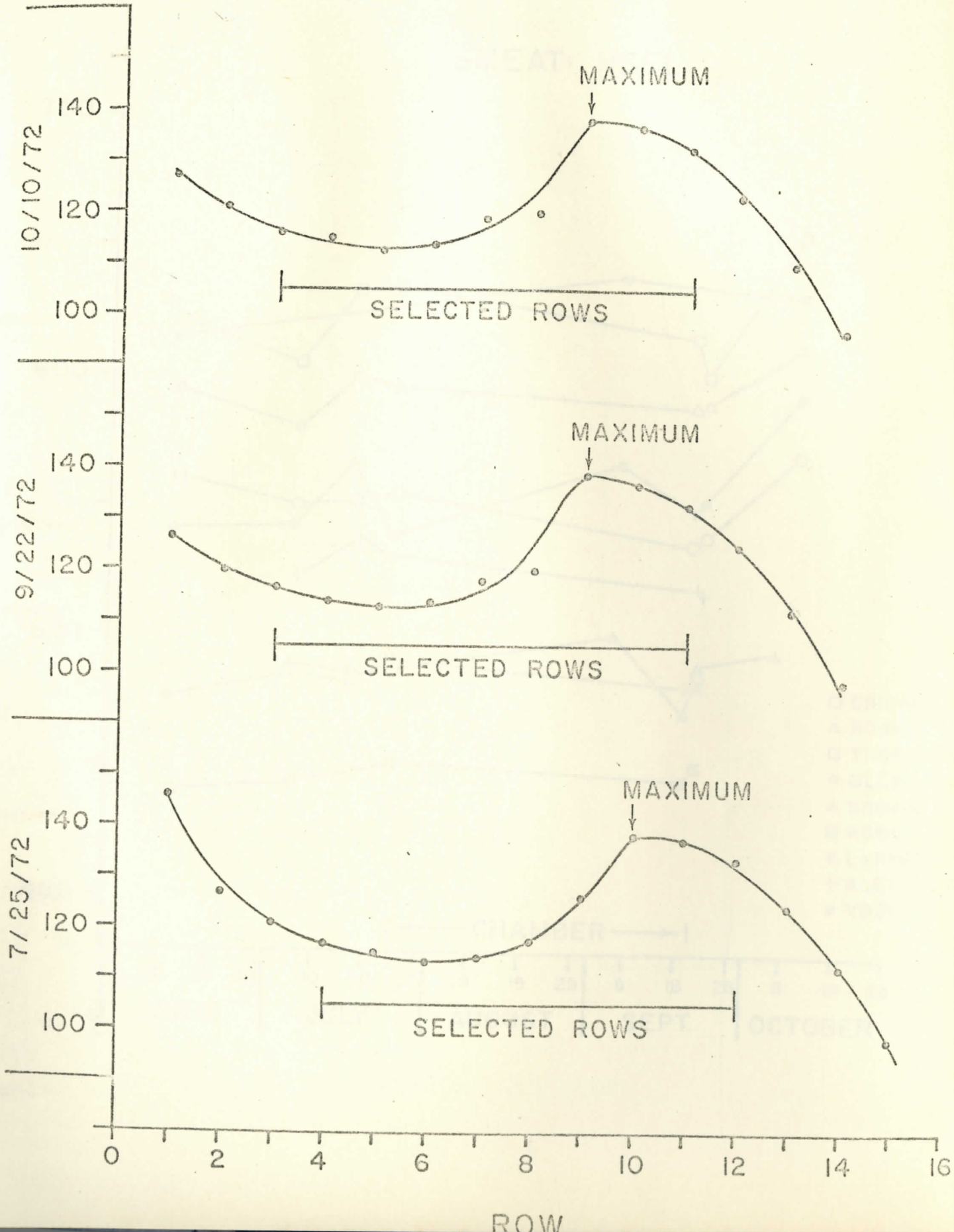


Fig. 14

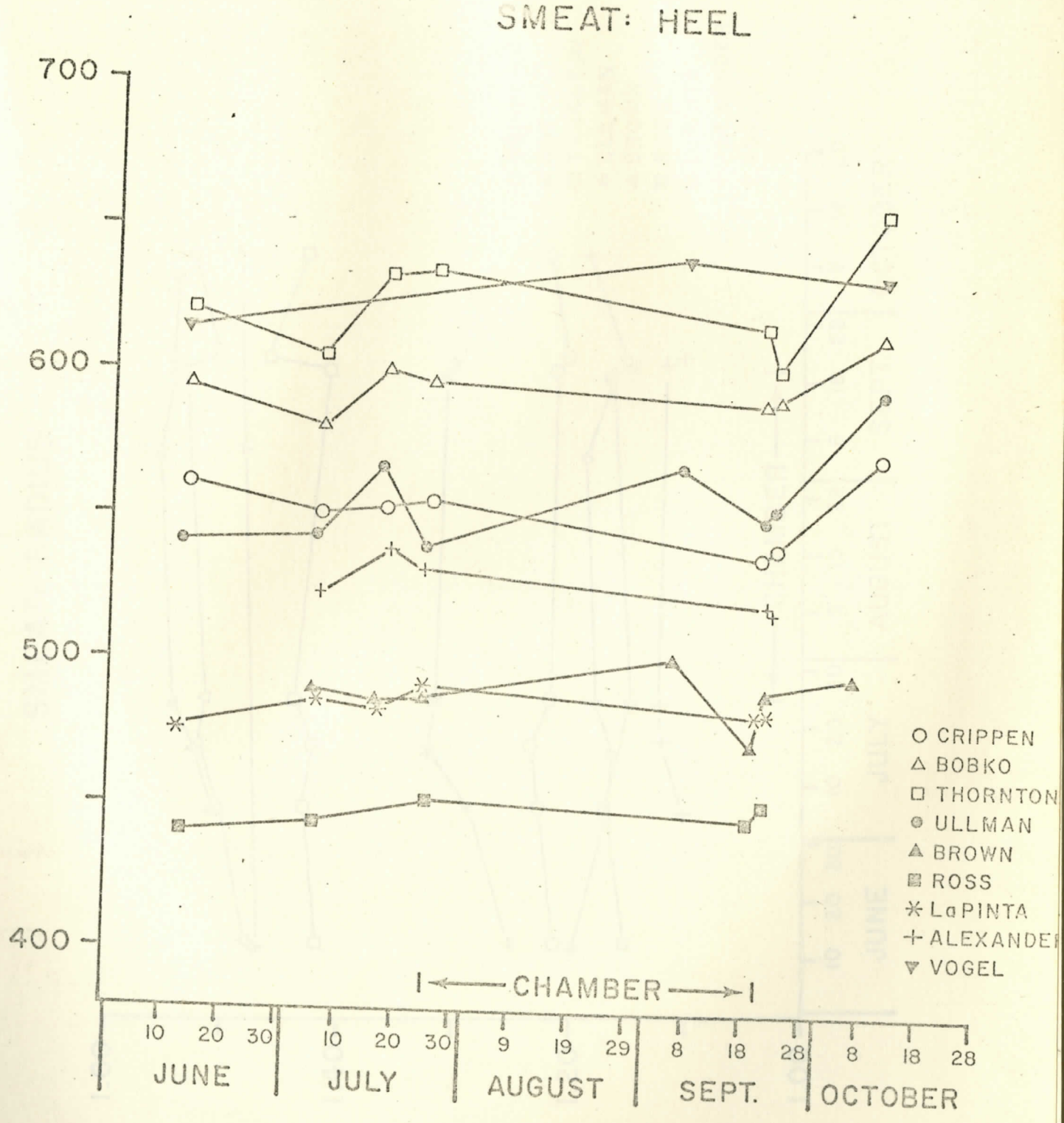

SMEAT: HEEL
700
600
500
400
MINERAL CONTENT (mg./cm²)
CHAMBER
10 20 30
JUNE
10 20 30
JULY
9 19 29
AUGUST
8 18 28
SEPT.
8 18 28
OCTOBER
CRIPPEN
BOBKO
THORNTON
ULLMAN
BROWN
ROSS
LaPINTA
ALEXANDE
VOGEL

Fig. 15

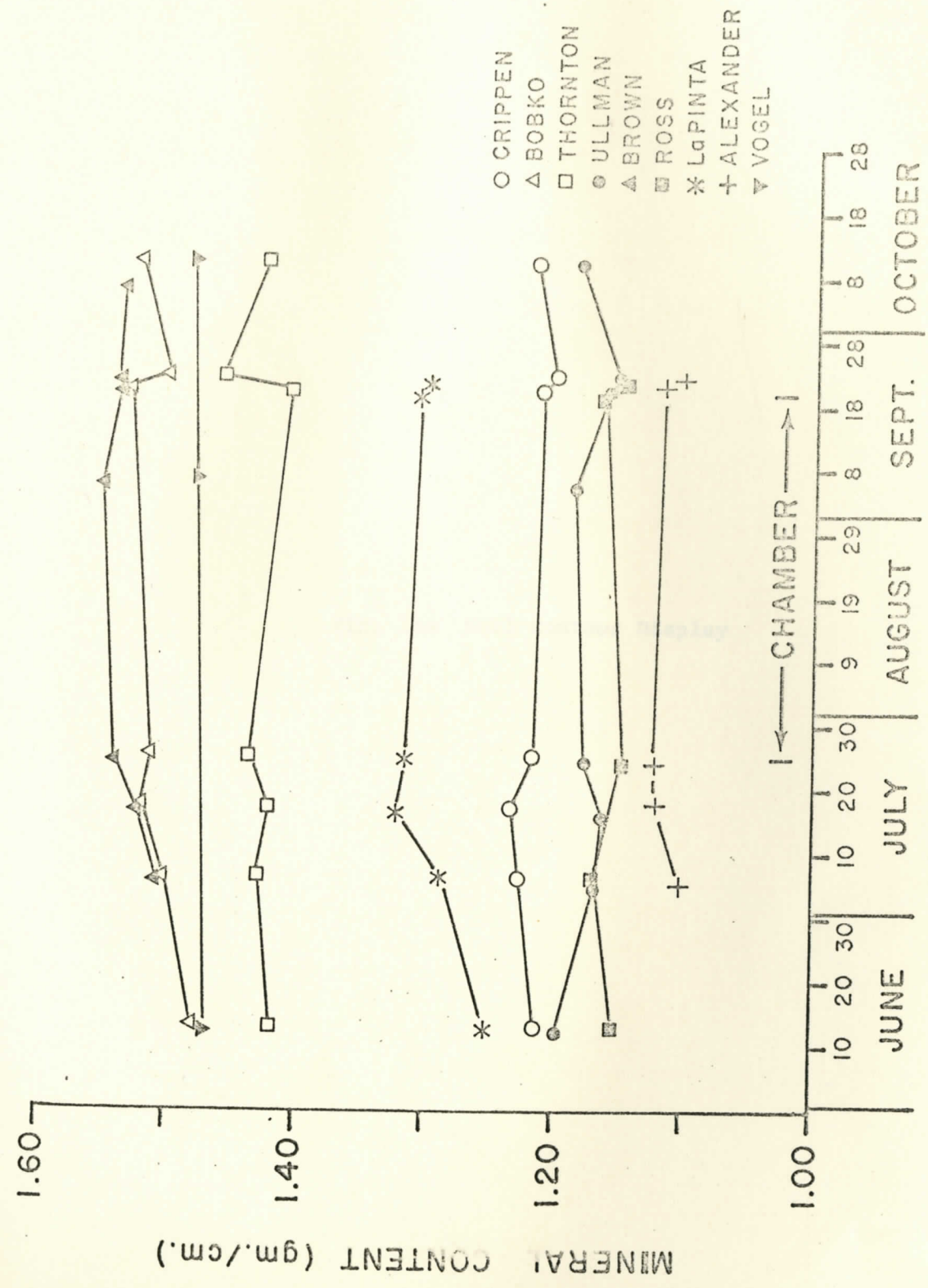

SMEAT: RADIUS
MINERAL CONTENT (gm./cm.)
1.60
1.40
1.20
1.00
CRIPPEN
BOBKO
THORNTON
ULLMAN
BROWN
ROSS
LaPINTA
ALEXANDER
VOGEL
CHAMBER
10 20 30
JUNE
10 20 30
JULY
9 19 29
AUGUST
8 18 28
SEPT.
8 18 28
OCTOBER

Fig. 16a Heel Contour Display

Fig. 16b

Fig. 16c

Fig. 16d.

Fig. 16e

Fig. 16f

Fig. 16g

Fig. 16h

Fig. 16i

Fig. 17a Arm contour display

Fig. 17b

Fig. 17c

Fig. 17d

Fig. 17e

Fig. 17f

Fig. 17g

Fig. 17h

SMEAT

BONE MINERAL MEASUREMENTS (M-078)

LEFT CENTRAL OS CALCIS

Mean mg/cm^2

	Crew			Controls				
	Crippen	Thornton	Bobko	Brown	Ullmann	LaPinta	Ross	Alexander
T - 44	560.6	621.1	595.0	--	541.7	476.8	442.0	--
T - 20	551.4	606.7	581.8	491.6	543.6	486.3	--	524.4
T - 9	552.8	634.7	600.6	487.3	567.8	486.5	443.9	539.8
T - 1	555.9	636.6	597.2	488.2	540.2	491.6	451.9	532.4
Baseline Ave	555.2 ± 4.1	624.8 ±13.9	593.7 ± 8.2	489.0 ± 2.3	548.3 ±13.0	485.3 ± 6.2	445.9 ± 5.2	532.2 ± 7.7
T + 41	--	--	--	502.6	569.3	--	--	--
R - 1	--	--	--	473.1	--	482.5	446.9	--
R + 0	537.9	618.8	591.3	--	551.3	--	--	--
R + 1	--	--	--	490.6	--	483.9	451.6	520.8
R + 2	540.5	603.3	592.4	--	554.7	--	--	519.1
R + 16	--	--	--	496.5	--	--	--	--
R + 20	572.6	658.5	615.4	--	596.2	--	--	--
SMEAT Ave				490.0 ± 9.1	558.1 ±19.1	484.6 ± 4.9	447.3 ± 4.5	527.3 ± 8.7

Table 2

SMEAT

BONE MINERAL MEASUREMENTS (M-078)

OS CALCIS

Percent change from mean baseline

	Crew			Controls				
	Crippen	Thornton	Bobko	Brown	Ullmann	LaPinta	Ross	Alexander
T - 44	+1.0	-0.6	+0.2	--	-1.2	-1.8	-0.9	--
T - 20	-0.7	-2.9	-2.0	+0.5	-0.9	+0.2	---	-1.5
T - 9	-0.4	+1.6	+1.2	-0.4	+3.5	+0.2	-0.5	+1.4
T - 1	+0.1	+1.9	+0.6	-0.2	-1.5	+1.3	+1.3	0.0
T + 41	--	--	--	+2.8	+3.8	--	--	--
R - 1	--	--	--	-3.3	--	-0.6	+0.2	--
R + 0	-3.1	-1.0	-0.4	--	+0.5	--	--	--
R + 1	--	--	--	+0.3	--	-0.3	+1.3	-2.1
R + 2	-2.7	-3.4	-0.2	--	+1.2	--	--	-2.5
R + 16	--	--	--	+1.5	--	--	--	--
R + 20	+3.1	+5.4	+3.6	--	+8.7	--	--	--

Table 3

STANDARD DEVIATIONS OF ARM AND HEEL DATA

	Os Calcis (mg/cm^2)	Radius (mg/cm^2)	Ulna (mg/cm)
CREW (Baseline only)			
Bobko	593.7 ±8.2 (1.4%)	1.503 ±.017 (1.1%)	0.833 ±.015 (1.8%)
Crippen	555.2 ±4.1 (.7%)	1.223 ±.009 (.7%)	0.566 ±.015 (2.6%)
Thornton	624.8 ±13.9 (2.2%)	1.427 ±.008 (.6%)	0.697 ±.016 (2.3%)
CONTROLS (All measurements)			
Ullmann	558.1±19.1 (3.4%)	1.175 ±.015 (1.3%)	0.653 ±.012 (1.8%)
Brown	490.9 ±9.1 (1.9%)	1.535 ±.016 (1.0%)	0.773 ±.012 (1.5%)
LaPinta	484.6 ±4.9 (1.0%)	1.298 ±.025 (1.9%)	0.667 ±.012 (1.8%)
Ross	447.3 ±4.5 (1.0%)	1.159 ±.008 (.7%)	0.569 ±.007 (1.2%)
Alexander	527.3 ±8.7 (1.6%)	1.114 ±.011 (1.0%)	0.569 ±.006 (1.0%)

TABLE IV

SMEAT

BONE MINERAL MEASUREMENTS (M-078)

RIGHT RADIUS

Mean g/cm

	Crew			Controls				
	Crippen	Thornton	Bobko	Brown	Ullmann	LaPinta	Ross	Alexander
T - 44	1.215	1.419	1.480	--	1.199	1.252	1.153	--
T - 20	1.226	1.429	1.502	1.507	1.169	1.289	--	1.102
T - 9	1.235	1.422	1.518	1.521	1.165	1.323	1.169	1.123
T - 1	1.216	1.438	1.513	1.541	1.179	1.316	1.149	1.123
Baseline Ave	1.223 ±0.009	1.427 ±0.008	1.503 ±0.017	1.523 ±0.017	1.178 ±0.015	1.295 ±0.032	1.157 ±0.011	1.116 ±0.012
T + 41	--	--	--	1.553	1.189	--	--	--
R - 1	--	--	--	1.542	--	1.306	1.163	--
R + 0	1.214	1.409	1.532	--	1.161	--	--	--
R + 1	--	--	--	1.544	--	1.301	1.160	1.119
R + 2	1.204	1.460	1.503	--	1.154	--	--	1.103
R + 16	--	--	--	1.540	--	--	--	--
R + 20	1.220	1.428	1.526	--	1.186	--	--	--
SMEAT Ave				1.535 ±0.016	1.175 ±0.015	1.298 ±0.025	1.159 ±0.008	1.114 ±0.011

Table 5

SMEAT

BONE MINERAL MEASUREMENTS (M-078)

RIGHT RADIUS

Percent change from mean baseline

	Crew			Controls				
	Crippen	Thornton	Bobko	Brown	Ullmann	LaPinta	Ross	Alexander
T - 44	-0.7	-0.6	-1.5	--	+1.8	-3.3	-0.3	--
T - 20	+0.2	+0.1	-0.1	-1.1	-0.8	-0.5	--	-1.3
T - 9	+1.0	-0.4	+1.0	-0.1	-1.1	+2.2	+1.0	+0.6
T - 1	-0.6	+0.8	+0.7	+1.2	+0.1	+1.6	-0.7	+0.6
T + 41	--	--	--	+2.0	+0.9	--	--	--
R - 1	--	--	--	+1.2	--	+0.8	+0.5	--
R + 0	-0.7	-1.3	+1.9	--	-1.4	--	--	--
R + 1	--	--	--	+1.4	--	+0.5	+0.3	+0.3
R + 2	-1.6	+2.3	0.0	--	-2.0	--	--	-1.1
R + 16	--	--	--	+1.1	--	--	--	--
R + 20	-0.2	-0.1	+1.5	--	+0.7	--	--	--

Table 6

SMEAT

BONE MINERAL MEASUREMENTS (M-078)

RIGHT ULNA

Mean g/cm

	Crew			Controls				
	Crippen	Thornton	Bobko	Brown	Ullmann	LaPinta	Ross	Alexander
T - 44	0.554	0.699	0.846	--	0.658	0.650	0.563	--
T - 20	0.558	0.705	0.812	0.760	0.665	0.671	--	0.565
T - 9	0.587	0.674	0.835	0.762	0.638	0.674	0.568	0.577
T - 1	0.567	0.710	0.839	0.772	0.651	0.659	0.573	0.567
Baseline Ave	0.566 ±0.015	0.697 ±0.016	0.833 ±0.015	0.765 ±0.007	0.653 ±0.011	0.663 ±0.011	0.568 ±0.005	0.570 ±0.007
T + 41	--	--	--	0.795	0.635	--	--	--
R - 1	--	--	--	0.778	--	0.664	0.563	--
R + 0	0.581	0.728	0.840	--	0.664	--	--	--
R + 1	--	--	--	0.771	--	0.685	0.578	0.564
R + 2	0.585	0.770	0.841	--	0.666	--	--	0.573
R + 16	--	--	--	0.775	--	--	--	--
R + 20	0.552	0.740	0.840	--	0.651	--	--	--
SMEAT Ave				0.773 ±0.012	0.653 ±0.012	0.667 ±0.012	0.569 ±0.007	0.569 ±0.006

Table 7

SMEAT

BONE MINERAL MEASUREMENTS (M-078)

RIGHT ULNA

Percent change from mean baseline

	Crew			Controls				
	Crippen	Thornton	Bobko	Brown	Ullmann	LaPinta	Ross	Alexander
T - 44	-2.2	+0.3	+1.5	--	+0.8	-2.1	-0.9	--
T - 20	-1.6	+1.1	-2.6	-0.7	+1.7	+1.1	--	-0.8
T - 9	+3.6	-3.2	+0.3	-0.3	-2.3	+1.6	0.0	+1.3
T - 1	+0.1	+1.8	+0.8	+1.0	-0.4	-0.6	+0.9	-0.5
T - 41	--	--	--	+3.9	-2.7	--	--	--
R - 1	--	--	--	+1.8	--	+0.1	-1.0	--
R + 0	+2.5	+4.5	+0.9	--	+1.7	--	--	--
R + 1	--	--	--	+0.8	--	+3.2	+1.8	-0.9
R + 2	+3.3	+10.5	+0.9	--	+2.0	--	--	+0.7
R + 16	--	--	--	+1.4	--	--	--	--
R + 20	-2.5	+6.2	+0.8	--	-0.3	--	--	--

Table 8

BONE MINERAL CHANGES DURING FLIGHT

Photon absorptiometric technique

% change from mean baseline

Central Left Os Calcis

	Cdr	LMP	CMP
Apollo 14	-0.4	+3.7	+0.5
Apollo 15	-6.6	-0.5	-7.3
Apollo 16	+1.2	+0.4	+0.4

Distal Right Radius

Apollo 14	-0.1	+1.5	+1.5
Apollo 15	-1.1	-1.0	-2.3
Apollo 16	+1.0	+1.5	+2.1

Distal Right Ulna

Apollo 14	-1.6	-0.3	+0.3*
Apollo 15	-1.4	-1.8	-3.6
Apollo 16	-2.2	-3.3	-3.5

* R + 1 measurement

Table 9

APPENDIX A

SMEAT MEASUREMENT SCHEDULE

All measurements performed at Manned Spacecraft Center unless noted

T - 45	6/12/72	Vogel, Ullmann, LaPinta, Ross
T - 44	6/13/72	Bobko, Crippen, Thornton
T - 21	7/5/72	Ullmann, Alexander, Brown
T - 20	7/6/72	Bobko, Crippen, Thornton, Ross, LaPinta
T - 10	7/16/72	Brown, Ullmann, LaPinta
T - 9	7/17/72	Bobko, Crippen, Thornton
T - 8	7/18/72	Alexander
T - 2	7/24/72	Alexander, Ullmann, Ross, Brown, LaPinta
T - 1	7/25/72	Crippen, Bobko, Thornton
T - 0	7/26/72	TEST COMMENCEMENT
T + 41	9/5/72	Vogel, Ullmann, Brown - at USPHS Hospital, San Francisco.
R - 1	9/19/72	LaPinta, Ross, Brown
R + 0	9/20/72	TEST COMPLETION Ullmann, Bobko, Crippen, Thornton
R + 1	9/21/72	Ross, LaPinta, Alexander, Brown
R + 2	9/22/72	Ullmann, Crippen, Thornton, Bobko, Alexander
R + 16	10/6/72	Brown - at USPHS Hospital, San Francisco
R + 20	10/10/72	Bobko, Crippen, Thornton, Vogel, Ullmann - at USPHS Hospital, San Francisco.

BONE MINERAL CONTENT - LEFT OS CALCIS

VOGEL

Date	Mineral Content
1/4/71	634.68
1/15/71	610.30
1/24/71	639.77
2/18/71	621.27
2/27/71	622.12
Apollo 14 mean ± S.D.	625.63 ± 11.71(1.87%)
6/27/71	632.03
7/12/71	633.73
7/19/71	630.16
8/5/71	625.81
8/9/71	614.26
8/12/71	616.69
8/20/71	635.17
Apollo 15 mean ± S.D.	626.83 ± 8.3(1.32%)
3/16/72	631.03
3/30/72	611.61
4/9/72	614.42
4/25/72	618.43
4/26/72	616.96
4/30/72	611.95
5/4/72	620.87
Apollo 16 mean ± S.D.	617.90 ± 6.7(1.08%)
6/12/72	615.4
9/6/72	641.4
10/10/72	635.5
SMEAT mean ± S.D.	630.8 ± 13.64(2.2%)
ALL MEASUREMENTS: mean ± S.D.	624.3 ± 9.9(1.5%)

BONE MINERAL CONTENT - LEFT OS CALCIS

LaPINTA

Date	Mineral Content
1/4/71	493.74
1/15/71	483.29
1/24/71	495.37
2/2/71	495.39
2/27/71	475.69
Apollo 14 mean ± S.D.	488.70 ± 8.8(1.8%)
6/27/71	476.45
7/13/71	493.93
7/20/71	482.95
8/5/71	478.88
8/9/71	483.61
8/12/71	478.12
8/19/71	493.86
Apollo 15 mean ± S.D.	483.89 ± 7.1(1.47%)
3/16/72	486.49
3/30/72	493.58
4/9/72	480.22
4/25/72	488.39
4/26/72	483.82
4/30/72	483.35
5/4/72	498.59
Apollo 16 mean ± S.D.	487.74 ± 6.4(1.31%)
6/12/72	476.8
7/6/72	486.3
7/16/72	486.5
7/24/72	491.6
9/19/72	482.5
9/21/72	483.9
SMEAT mean ± S.D.	484.6 ± 4.9(1.0%)
ALL MEASUREMENTS: mean ± S.D.	486.1 ± 6.7(1.3%)

BONE MINERAL CONTENT - LEFT OS CALCIS

ALEXANDER

6/27/71	564.1
7/12/71	563.2
7/19/71	565.2
8/5/71	529.3
8/9/71	543.0
8/12/71	541.5
8/19/71	572.2
Apollo 15 average	554.1 $\pm$ 15.6 (2.8%)
3/16/72	523.1
3/30/72	535.1
4/ 9/72	520.8
4/25/72	525.9
4/26/72	539.3
4/30/72	528.7
5/ 4/72	538.6
Apollo 16 Average	530.2 $\pm$ 7.15 (1.4%)
7/ 6/72	524.4
7/18/72	539.8
7/24/72	532.4
9/21/72	520.7
9/22/72	519.1
SMEAT Average	527.3 $\pm$ 8.7 (1.6%)
All Measurements	538.2 $\pm$ 16.6 (3.0%)

BONE MINERAL CONTENT LEFT OS CALCIS

ULLMANN

3/22/71	546.1
4/19/71	541.3
5/3/71	543.3
5/17/71	540.5
5/24/71	538.2
6/ 7/71	534.4
6/14/71	544.9
6/21/71	549.5
6/28/71	526.7
7/12/71	537.4
7/19/71	547.7
8/ 9/71	538.6
8/30/71	529.4
MEAN	539.8 ± 6.8 (1.3%)
6/12/72	541.7
7/5/72	543.6
7/16/72	567.8
7/24/72	540.2
9/ 5/72	569.3
9/20/72	551.3
9/22/72	554.7
11/8 /72	543.1
SMEAT MEAN	551.5 ± 11.6 (2.1%)
ALL MEASUREMENTS	544.3 ± 10.4 (1.9%)

VOGEL - ARM

7 Row Averages

(g/cm)

DATE	RADIUS	ULNA
6/27/71	1.547	.726
7/12/71	1.519	.703
7/19/71	1.494	.723
8/ 5/71	1.503	.717
8/ 9/71	1.522	.710
8/12/71	1.501	.729
8/20/71	1.482	.731
Apollo 15 Average	1.510±.021	.720±.010
3/16/72	1.534	.715
3/30/72	1.483	.683
4/19/72	1.464	.695
4/25/72	1.495	.692
4/26/72	1.493	.679
4/30/72	1.512	.716
5/ 4/72	1.489	.715
Apollo 16 Average	1.496±.022	.699±.016
6/12/72	1.471	.689
9/ 6/72	1.489	.720
SMEAT Average	1.480	.704
11 Measurements, Average	1.500±.022	.709±.017

LAPINTA - ARM

9 Row Averages

(g/cm)

DATE	RADIUS	ULNA
6/27/71	1.372	.699
7/13/71	1.316	.679
7/20/71	1.323	.675
8/ 5/71	1.285	.665
8/ 9/71	1.327	.684
8/12/71	1.312	.650
Apollo 15 Average	1.313±.017	.675±.017
3/16/72	1.316	.678
3/30/72	1.321	.670
4/ 9/72	1.317	.670
4/25/72	1.312	.651
4/26/72	1.319	.653
4/30/72	1.331	.680
5/ 4/72	1.325	.676
Apollo 16 Average	1.320±.006	.668±.012
6/12/72	1.252	.650
7/ 6/72	1.289	.671
7/16/72	1.323	.674
7/24/72	1.316	.659
9/19/72	1.306	.664
9/21/72	1.301	.685
SMEAT Average	1.298±.025	.667±.012
All Measurements, Average	1.313±.023	.670±.013

ALEXANDER - ARM

7 Row Averages

(g/cm)

DATE	RADIUS	ULNA
3/16/72	1.140	.552
3/30/72	1.134	.555
4/ 9/72	1.119	.542
4/25/72	1.113	.559
4/26/72	1.136	.547
4/30/72	1.118	.557
5/ 4/72	1.138	.567
Apollo 16 Mean	1.128 ± .011	.554±.008
7/ 5/72	1.102	.565
7/18/72	1.123	.577
7/24/72	1.123	.567
9/21/72	1.119	.564
9/22/72	1.103	.573
SMEAT Mean	1.114±.011	.569±.006
All measurements, mean	1.122±.013	.558±.015

ROSS - ARM

9 Row Averages

(g/cm)

DATE	RADIUS	ULNA
4/ 9/72	1.192	.610
4/25/72	1.161	.580
4/26/72	1.187	.576
4/30/72	1.171	.608
5/ 4/72	1.167	.610
Apollo 16 Average	1.176±.013	.597±.017
6/13/72	1.153	.563
7/6/72	1.169	.568
7/24/72	1.149	.573
9/19/72	1.163	.563
9/21/72	1.160	.578
SMEAT average	1.159±.008	.569±.007
All Measurements, Average	1.167±.014	.583±.019

REGRESSION EQUATION FOR THE ARM STANDARD

$$y = ax + b$$

where x = computer units ($\Sigma \log I_o^*/I$) per channel

y = grams/cm

Date	Subject	a	b
6/12/72	LaPinta	.01601	.04811
	Ullmann	.01689	.03523
	Vogel	.01679	.03963
6/13/72	Crippen	.01589	.019346
	Bobko	.01717	.02436
	Thornton	.1690	.02368
	Ross	.01573	.02139
7/5/72	Alexander	.01733	.03323
	Ullmann	.01727	.03624
7/6/72	Bobko	.01746	.03075
	Crippen	.01749	.03045
	Thornton	.01755	.02995
	Ross	.01735	.03651
	LaPinta	.01743	.03187
7/16/72	LaPinta	.01758	.03704
	Ullmann	.01703	.04318
	Brown	.01725	.01158
7/17/72	Crippen	.01767	.03151
	Bobko	.01756	.03549
	Thornton	.01759	.03089
7/18/72	Alexander	.01770	.03723
7/24/72	Alexander	.01753	.03579
	Ullmann	.01770	.03112
	Ross	.01775	.03506
	Brown	.01769	.02817
	LaPinta	.01780	.02763

REGRESSION EQUATION FOR THE ARM STANDARD

(continued)

Date	Subject	a	b
7/25/72	Crippen	.01749	.03729
	Bobko	.017390	.040869
	Thornton	.01739	.041587
9/5/72	Brown	.017046	.03909
	Ullmann	.01727	.02684
9/6/72	Vogel	.017130	.03231
9/19/72	Brown	.01763	.03577
	LaPinta	.01766	.03211
	Ross	.01766	.034189
9/20/72	Ullmann	.017648	.03344
	Bobko	.01767	.03389
	Crippen	.01764	.03167
	Thornton	.01773	.03333
9/21/72	Ross	.01777	.03513
	LaPinta	.01766	.02153
	Alexander	.01767	.02410
	Brown	.01764	.03653
9/22/72	Ullmann	.017625	.032985
	Crippen	.01762	.033071
	Thornton	.017641	.032482
	Bobko	.017612	.033183
	Alexander	.017508	.037736
10/6/72	Brown	.016911	.037506
10/10/72	Vogel	.017274	.025590
	Ullmann	.017315	.019499
	Crippen	.017044	.032817
	Thornton	.017189	.031844
	Bobko	.017046	.033180

REGRESSION EQUATION FOR THE HEEL STANDARD

$$y = ax + b$$

where y = computer units ($\Sigma \log I_o^*/I$) per channel

x = bone mineral content in gram/cm^2

Date	Subject	a	b
6/12/72	LaPinta	2.5501	.03405
	Ullmann	2.5242	.03979
	Vogel	2.5279	.03687
6/13/72	Crippen	2.5287	.02747
	Thornton	2.5698	.02270
	Bobko	2.5551	.01561
	Ross	2.5101	.03671
7/5/72	LaPinta	2.5139	.04723
	Alexander	2.6447	-.02223
	Ross	2.5111	.04791
	Ullmann	2.5761	.04217
	Brown	2.5927	.03041
7/6/72	Bobko	2.5334	.02901
	Crippen	2.6238	.04423
	Thornton	2.6750	.01714
7/16/72	LaPinta	2.6145	.01352
	Ullmann	2.5536	.03127
	Brown	2.5391	.03936
7/17/72	Crippen	2.5863	.02026
	Bobko	2.5549	.03117
	Thornton	2.4818	.03840
7/18/72	Alexander	2.6003	.004271
7/24/72	Alexander	2.5757	.02155
	Ullmann	2.6023	.01362
	Ross	2.6039	.05721
	Brown	2.6076	.00395
	LaPinta	2.5382	.03489

REGRESSION EQUATION FOR THE HEEL STANDARD

(continued)

Date	Subject	a	b
7/25/72	Crippen	2.5721	.01887
	Bobko	2.5329	.05169
	Thornton	2.5841	.02814
9/5/72	Ullmann	2.5250	.01009
	Brown	2.5358	.02855
9/6/72	Vogel	2.4747	.02671
9/19/72	Brown	2.6239	.03155
	LaPinta	2.5844	.035207
	Ross	2.6673	.006313
9/20/72	Ullmann	2.5029	.05711
	Bobko	2.4968	.04507
	Crippen	2.5177	.04178
	Thornton	2.5213	.03074
9/21/72	Ross	2.5856	.01903
	LaPinta	2.5639	.02618
	Alexander	2.5786	.01916
	Brown	2.5971	.02163
9/22/72	Ullmann	2.5561	.04268
	Crippen	2.5847	.02943
	Thornton	2.5911	.03374
	Bobko	2.5668	.04505
	Alexander	2.5701	.03742
10/6/72	Brown	2.4851	.02960
10/10/72	Vogel	2.5327	.03194
	Ullmann	2.4668	.05230
	Crippen	2.5679	.01783
	Thornton	2.5958	.007244
	Bobko	2.5596	.017007

X-ray of left os calcis - William Thornton

X-ray of left os calcis - Robert Crippen

X-ray of left os calcis Karol Bobko

THE SLOPE METHOD OF BONE EDGE DETERMINATION

Alan Silverstein, John Ullmann and John M. Vogel, M.D.

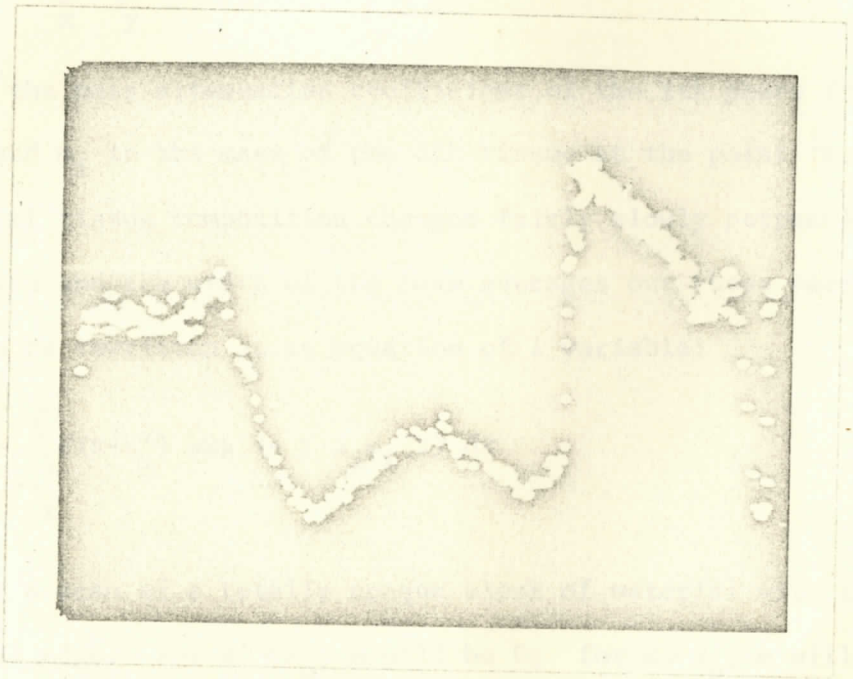
A basic problem in using gamma-ray absorption scans to measure bone mineral content is defining the bone edge. A common method of determining the bone edge, the "cut-off method", is to measure the transmission of the X-ray beam through tissue (I_o^*) and to define the bone edge as the first consistent string of points which transmit less than X% of the I_o^*. In cortical bones like the radius, where the tissue composition surrounding the bone is relatively uniform and the shape of the bone approaches a regular cylinder, the problem is slight to moderate. However, even for cortical bones there remains the question of what cut-off percentage to choose. A high value would ensure the inclusion of all bone points but might cause an erroneous definition of bone edge if a sudden change in tissue composition from fat to lean were encountered. A low value of X would insure that the bone edge chosen was within the physical dimensions of the bone, but may fail to include valid bone points near the edge. The effect of a finite width beam on determining bone width by the cut-off method has been studied extensively by Judy (1).

The problems involved in using the cut-off method are greatly amplified in determining the edge of irregular and highly trabecular bones such as the os calcis (heel bone). The contrast difference in bulk X-ray attenuation between bone and tissue is less than for cortical bone, and the tissue composition can vary significantly from one side of the bone to the other.

Therefore the calculation of the appropriate I_o^* to be used in determining the bone edge also becomes a problem. This is illustrated in Figure A-1, a scan of an irregularly shaped bone (os calcis). The points are total counts accumulated during a 1/64" travel of the scanner and are a measure of the X-ray absorption of the bone and tissue.

Figure A-1

OS CALCIS SCAN



Many schemes to get around these problems have been devised but the problem remains. This paper describes a method of calculating bone edges that is independent of the tissue composition and not limited by bone irregularities.

The shape of the scan at a bone edge - an interface between tissue and bone - depends both on the profile of the scanning beam and the shape of the bone. The count rate at a point (x', y') on an area scan can be calculated from the normalized beam profile P:

$$I(x', y) = \int_x dx \int_y dy \quad P(x-x', y-y') \exp(- \Sigma u_i m_i(x, y) \qquad \text{(Eq. A-1)}$$

where u_i is the mass attenuation coefficient of the ith phase (bone, tissue, fat, etc.) and m_i is the mass of the ith tissue at the point (x, y) (2). If we assume that tissue composition changes fairly slowly perpendicular to the scan direction and the width of the beam averages out these variations, this equation can be rewritten as an equation of 1 variable:

$$I(x') = \int_x P(x-x') \exp\ (- \Sigma u_i m_i(x)\ dx$$

Now consider a scan of a totally opaque block of material with its edge at x_o - an ideal edge. For $x' \leq x_o$, m will be 0; for $x > x_o$, m will be infinite:

$$I(x') = \int_{-\infty}^{+\infty} P(x-x') \begin{cases} 1 & x' < x_o \\ 0 & x' \geq x_o \end{cases} dx$$

Differentiating,

$$\frac{dI(x')}{dx'} = \frac{d}{dx'} \int_{-\infty}^{x_o} P(x-x')\ dx$$

$$= - P(x_o-x') \qquad \text{(Eq. A-2)}$$

Equation A-2 shows that the shape of the derivative of a scan of an ideal edge at x_o is exactly the beam profile centered about x_o. For a beam profile symmetric about its center, the maximum of the derivative of the scan occurs at the edge. The logical extension of this idea to edges that are not infinitely sharp and attenuating forms the basis for the slope method.

The beginning bone edge is defined as the point on the scan which has the greatest negative slope and the ending bone edge as the point with the greatest positive slope. The slope of the scan at a given point is calculated by fitting a straight line through this point and the two adjacent points on each side. This is accomplished by a least-squares fit to the five points.

Consider n sets of data points (x_1, y_1), (X_2, Y_2). . . (X_n, Y_n) and a first order equation Y = A*X which passes as near as possible to these points. The slope, A, that accomplishes this is determined by minimizing the residual equation:

$$\min f(a) = \sum_{i=1}^{n} (AX_i - Y_i)^2$$

To find the minimum of f(A), it is differentiated and the derivative set equal to zero:

$$\frac{d\ f(A)}{dA} = \sum_{i=1}^{n} [2X_i(AX_i - Y_i)] = 0$$

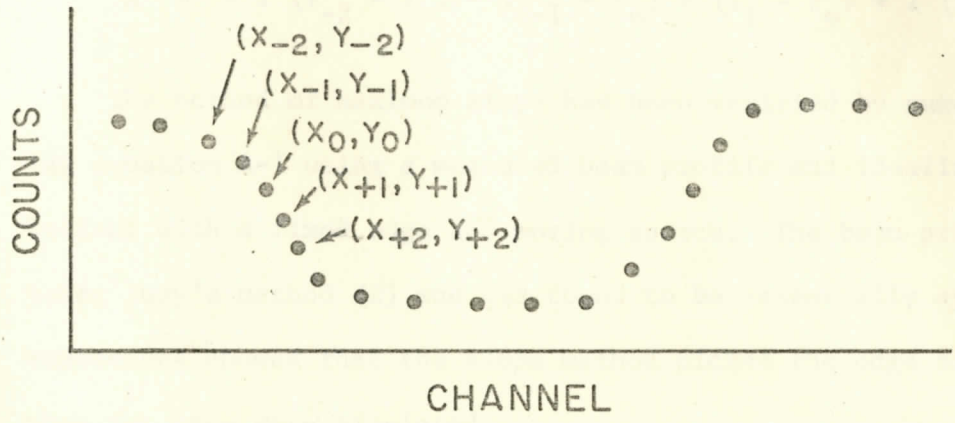
$$\sum_{i=1}^{n} [\ 2\ A\ X_i^2 - 2\ X_i\ Y_i] = 0$$

$$2\ A \sum_{i=1}^{n} X_i^2 - 2 \sum_{i=1}^{n} X_i\ Y_i = 0$$

$$A = \frac{\sum_{i=1}^{n} X_i\ Y_i}{\Sigma\ X_i^2}$$

Figure A-2

POINTS FOR SLOPE CALCULATION



To use this theory in calculating the slope of the bone profile, consider the hypothetical set of points in Figure A-2. The values of X_i and Y_i are calculated with respect to the midpoint of the equation (X_o, Y_o):

$$A = \frac{(Y_{-2} - Y_o)(X_{-2} - X_o) + (Y_{-1} - Y_o)(X_{-1} - X_o) + (Y_o - Y_o) \cdot (X_o - X_o) + (Y_1 - Y_o)(X_1 - X_o) + (Y_{+2} - Y_o)(X_{+2} - X_o)}{\Sigma X_i^2}$$

Since the data points are equally spaced, ΣX_1^2 is constant for all points. Furthermore, it is the relative value of the slope that is of importance. Therefore ΣX_1^2 is of no importance and the calculation of A is simplified as follows:

$$A = -2(Y_{-2} - Y_o) - (Y_{-1} - Y_o) + (Y_1 - Y_o) + 2(Y_2 - Y_o)$$

The method of maximum slope has been verified by numerically integrating equation A-1 using a measured beam profile and idealized tissue distributions with a fixed edge and moving source. The beam profile was measured using Judy's method (2) and was found to be essentially symmetric. The integrations showed that the slope method picked the edge of the bone, even when fat pads were simulated.

A method of determining bone edge independent of soft tissue distribution has been developed. It has been implemented on the calculation of all os calcis scans performed by our department in the last year (3) and has produced more consistent bone profiles than the cut-off method. The slope method is also applicable to other edge-finding problems.

REFERENCES

1. Judy, Phillip F., "Theoretical Accuracy and Precision in the Photon Attenuation Measurement of Bone Mineral", Proceedings of Bone Measurement Conference. Edited by Cameron. USAEC Conf 700515, 1970.

2. Judy, Phillip F., unpublished doctoral thesis, University of Wisconsin, Department of Radiological Sciences, Madison, Wisconsin, 1971.

3. Vogel, John M. Final Report, Apollo Experiment M 078, Apollo XIV, XV. NASA Contract T-93591.

OS CALCIS MINERAL LOSS PREDICTION

Efforts have been directed towards developing an empirical equation to predict the amount of bone mineral a subject might lose when placed on absolute bedrest or during weightlessness for varying periods of time.

Os calcis mineral loss during 110 to 150 days of bedrest has been studied in 15 subjects. The data from each subject has been smoothed by a second-order polynomial fit which produced good results. (Correlation coefficient >0.95 for 13 of the subjects and >0.90 for all 15). Using the smoothed data, bone mineral as a percentage of baseline was determined at 10-day intervals for each subject. At each time t_i, the data for the subjects was fitted to a first order function of the prediction term h:

$$\%\ BMC(t)\Big|_{t=t_i} = A(t)\Big|_{t=t_i} + h\ B(t)\Big|_{t=t_i}$$

The resulting set of parameters $\{A(t_1).....A(t_n)\}$, $\{B(t_1)....B(t_n)\}$ were then each fitted to an exponential.

The resulting equation is:

$$\%\ BMC = 103.56e^{-.00401t} + (10.8-123.03e^{-.01435t})_h$$

where:

% BMC = bone mineral content of the os calcis expressed as percentage of the average baseline value

t = time in days from commencement of bed rest

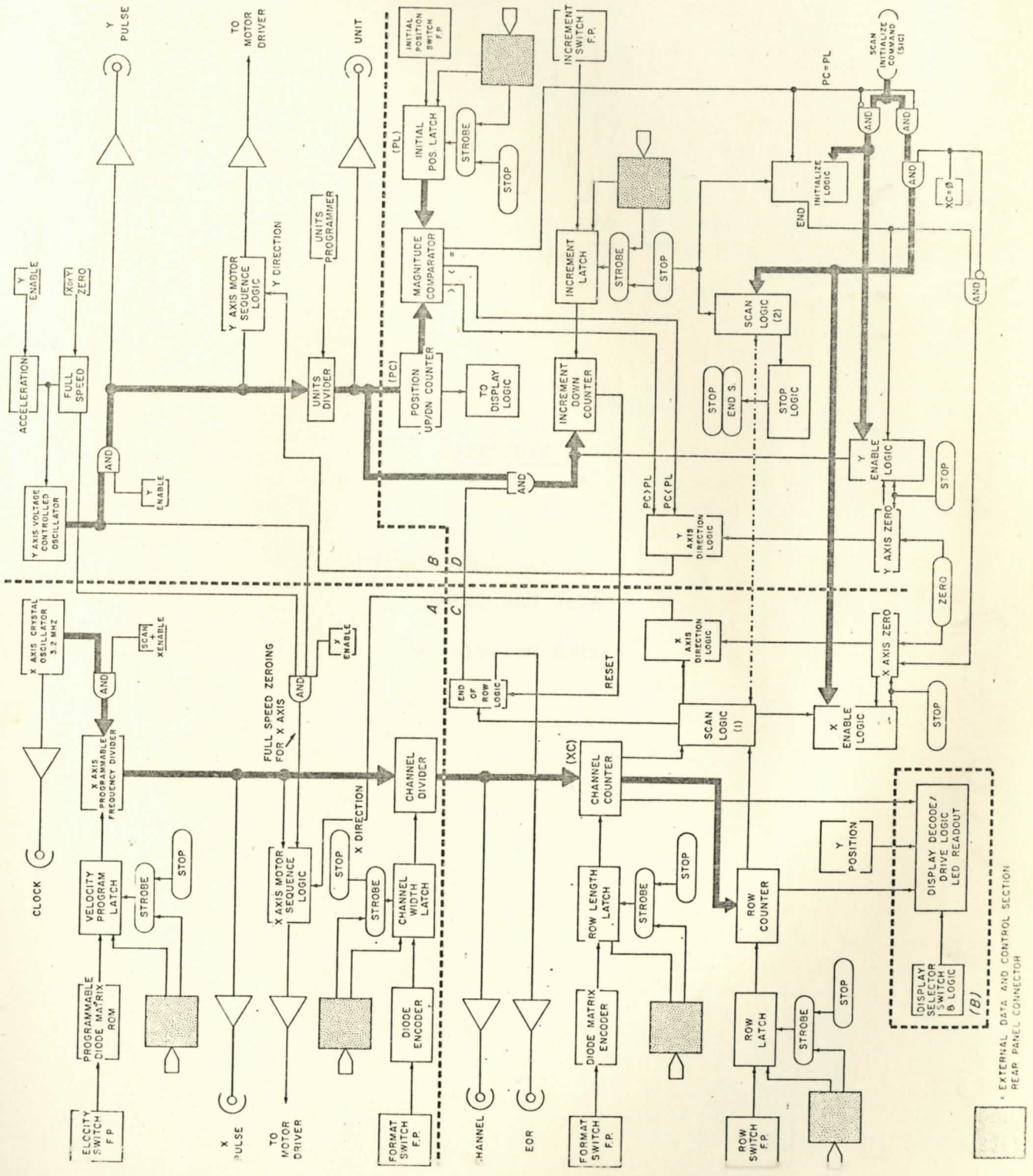
$$h = \frac{\text{Ave baseline BMC in gm/cm*}}{\dfrac{\text{24-hr hydroxyproline excretion (mg)}}{\text{(Creatinine) (gm) (Body Surface Area) (meter}^2\text{)}}}$$

This equation predicts % BMC to within 6% of the smoothed data up to 100 days from the beginning of bed rest in 13 of the 15 subjects.

* BMC in gm/cm may be determined from BMC in gm/cm^2 by multiplying by the bone width.

Work is now focusing on improving this predictability by recalculating older data using new analysis programs. A program to fit data to the sum of two exponentials will also be tried.

SCANNER CONTROL ELECTRÓNIC MODULE - BLOCK DIAGRAM



APPENDIX B

SMEAT RAW DATA

- Selected Rows -

BØBKØ ARM 6/13/72
SLØPE, INTERCEPT MG/SQCM: 2.57031E-3 5.27721E-2
SLØPE, INTERCEPT G/CM : 1.71722E-2 0.024359

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
6	80.868	416.45	1.4130	72	18	38	42.983	419.54	.7625
7	80.410	426.39	1.4052	70	20	38	43.833	428.25	.7771
8	84.144	468.08	1.4693	67	23	36	47.569	493.55	.8412
9	89.808	525.41	1.5666	64	20	41	50.440	458.10	.8905
10	83.816	532.17	1.4637	59	30	33	47.197	535.90	.8348
11	83.391	548.66	1.4564	57	29	34	54.119	598.75	.9537
12	90.869	568.69	1.5848	60	27	33	48.674	553.32	.8602
MEAN	84.758	497.98	1.4798				47.831	498.20	.8457

BØBKØ ARM 7/6/72
SLØPE, INTERCEPT MG/SQCM: 2.54791E-3 2.51277E-2
SLØPE, INTERCEPT G/CM : 1.74588E-2 3.07515E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
8	79.989	438.62	1.4273	70	17	40	40.644	388.94	.7403
9	82.173	457.55	1.4654	69	20	38	44.053	445.13	.7999
10	83.430	478.86	1.4873	67	24	35	44.596	490.22	.8093
11	85.999	525.90	1.5322	63	27	34	45.597	516.49	.8268
12	85.319	548.24	1.5203	60	29	33	45.197	527.68	.8198
13	85.460	568.43	1.5228	58	32	32	45.299	545.73	.8216
14	87.352	591.61	1.5558	57	32	32	47.691	575.07	.8634
MEAN	84.246	515.60	1.5016				44.725	498.46	.8116

BØBKØ ARM 7/17/72
SLØPE, INTERCEPT MG/SQCM: 2.53503E-3 -5.60341E-3
SLØPE, INTERCEPT G/CM : 1.75596E-2 3.54863E-2
IZERØ= 400

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
6	81.003	452.26	1.4579	71	17	37	43.190	462.68	.7939
7	82.007	477.94	1.4755	68	21	36	44.506	489.89	.8170
8	85.092	526.68	1.5297	64	25	34	44.901	523.15	.8239
9	86.334	551.50	1.5515	62	27	33	45.858	550.38	.8407
10	85.450	564.01	1.5360	60	28	32	45.548	563.69	.8353
11	85.601	584.41	1.5386	58	30	31	46.676	596.16	.8551
12	85.510	604.56	1.5370	56	32	32	48.117	595.37	.8804
MEAN	84.428	537.34	1.5180				45.542	540.19	.8352

BØBKØ ARM 7/25/72
SLØPE, INTERCEPT MG/SQCM: 2.54693E-3 1.14658E-2
SLØPE, INTERCEPT G/CM : 1.73902E-2 4.08683E-2
IZERØ= 462

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
7	80.796	455.24	1.4459	69	19	38	43.736	447.90	.8023
8	83.736	493.63	1.4971	66	23	36	44.838	484.50	.8206
9	85.670	529.40	1.5307	63	27	35	44.801	498.07	.8200
10	83.893	544.47	1.4998	60	29	34	44.565	510.12	.8159
11	84.851	560.15	1.5164	59	31	33	46.691	551.01	.8528
12	86.957	584.14	1.5531	58	31	32	47.581	579.29	.8683
13	86.507	602.01	1.5452	56	34	32	49.146	598.49	.8955
MEAN	84.630	538.43	1.5126				45.915	524.20	.8393

BØBKØ ARM 9/20/72
SLØPE, INTERCEPT MG/SQCM: 2.50656E-3 1.94722E-2
SLØPE, INTERCEPT G/CM : 1.76702E-2 3.38935E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
7	81.868	458.82	1.4805	70	19	37	43.982	466.47	.8111
8	83.373	503.95	1.5071	65	24	35	45.632	512.38	.8402
9	87.267	544.86	1.5759	63	26	34	44.990	520.14	.8289
10	84/313	552.85	1.5237	60	28	33	43.872	522.62	.8091
11	85.037	577.16	1.5365	58	31	32	45.695	561.92	.8413
12	86.108	584.53	1/5554	58	31	31	47.002	597.12	.8644
13	85.624	613.32	1.5469	55	33	31	48.299	613.81	.8873
MEAN	84.799	547.93	1.5323				45.639	542.07	.8403

BØBKØ ARM 9/22/72
SLØPE, INTERCEPT MG/SQCM: 2.51666E-3 2.05178E-2
SLØPE, INTERCEPT G/CM : 1.76118E-2 3.31825E-2
IZERØ= 500

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
5	79.511	443.19	1.4335	70	17	39	44.052	440.67	.8090
6	81.377	474.47	1.4664	67	21	36	43.153	468.15	.7932
7	84.000	513.37	1.5126	64	25	34	44.203	508.43	.8117
8	84.884	544.78	1.5281	61	28	33	46.011	545.86	.8435
9	83.627	564.77	1.5060	58	30	32	47.307	579.27	.8663
10	84.320	579.65	1.5182	57	31	32	47.498	581.65	.8697
11	86.375	593.97	1.5544	57	31	32	48.772	597.47	.8922
MEAN	83.442	530.60	1.5027				45.857	531.64	.8408

BØBKØ ARM 10/10/72
SLØPE, INTERCEPT MG/SQCM: 2.59028E-3 0.027781
SLØPE, INTERCEPT G/CM : 1.70456E-2 3.31307E-2
IZERØ= 500

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
3	82.838	446.13	1.4452	70	17	40	45.133	424.88	.8025
4	84.738	463.67	1.4784	69	20	37	46.240	471.75	.8214
5	87.626	509.72	1.5268	65	25	35	47.270	510.68	.8389
6	89.647	538.62	1.5613	63	28	33	45.617	522.94	.8108
7	87.745	563.42	1.5288	59	30	33	46.710	535.72	.8294
8	89.844	577.16	1.5646	59	30	33	50.323	577.99	.8910
9	90.421	601.69	1.5745	57	32	32	49.895	591.23	.8837
MEAN	87.558	528.63	1.5257				47.313	519.31	.8397

CRIPPEN ARM 6/13/72
SLØPE, INTERCEPT MG/SQCM: 2.75156E-3 0.062528
SLØPE, INTERCEPT G/CM : 1.58883E-2 1.93459E-2
IZERØ= 520

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
6	74.857	389.47	1.2087	66	9	41	29.544	239.16	.4888
7	77.115	444.38	1.2446	60	17	35	31.995	309.51	.5277
8	76.786	484.66	1.2393	55	24	32	32.520	346.61	.5360
9	73.932	484.24	1.1940	53	29	29	34.519	409.87	.5678
10	75.068	534.05	1.2120	49	33	27	35.852	459.85	.5890
11	74.371	528.88	1.2010	49	35	26	34.526	459.88	.5679
12	74.830	543.85	1.2083	48	37	26	36.472	487.09	.5988
MEAN	75.280	487.08	1.2154				33.633	387.43	.5537

CRIPPEN ARM 7/6/72
SLØPE, INTERCEPT MG/SQCM: 2.53226E-3 1.71053E-2
SLØPE, INTERCEPT G/CM : 1.74932E-2 3.04499E-2
IZERØ= 410

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
5	68.317	394.23	1.2255	66	9	41	25.163	231.05	.4706
6	70.270	446.92	1.2597	60	17	36	27.066	284.53	.5039
7	68.353	474.65	1.2262	55	23	33	29.515	339.73	.5468
8	67.115	483.77	1.2045	53	27	30	30.365	391.79	.5704
9	71.373	550.04	1.2377	50	32	23	31.442	428.24	.5805
10	65.796	535.51	1.1814	47	36	27	33.624	475.64	.6136
11	68.325	543.93	1.1994	47	33	26	33.282	439.10	.6127
MEAN	68.364	439.87	1.2264				30.137	377.16	.5576

CRIPPEN ARM 7/17/72
SLØPE, INTERCEPT MG/SQCM: 2.4747E-3 1.73625E-2
SLØPE, INTERCEPT G/CM : 1.76688E-2 3.15143E-2
IZERØ= 400

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
4	71.083	421.70	1.2875	67	9	41	26.572	254.87	.5010
5	70.446	475.47	1.2762	59	18	36	28.443	312.24	.5341
6	70.632	502.65	1.2795	56	22	33	32.308	388.60	.6024
7	66.917	513.00	1.2139	52	28	31	32.207	412.80	.6006
8	66.587	531.13	1.2080	50	31	30	33.036	437.96	.6152
9	65.602	545.26	1.1906	48	35	28	33.917	482.47	.6308
10	65.534	556.43	1.1894	47	37	27	33.578	495.40	.6247
MEAN	68.115	506.52	1.2350				31.436	397.77	.5870

CRIPPEN ARM 7/25/72
SLØPE, INTERCEPT MG/SQCM: 2.54612E-3 4.9134E-3
SLØPE, INTERCEPT G/CM : 1.74862E-2 3.72927E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
4	67.232	398.16	1.2129	66	7	44	26.485	234.48	.5004
5	69.347	437.37	1.2499	62	15	37	27.995	295.24	.5268
6	67.250	461.45	1.2132	57	20	34	29.612	340.14	.5551
7	66.789	493.01	1.2052	53	26	31	30.206	380.77	.5655
8	66.249	518.46	1.1957	50	30	30	31.455	409.87	.5873
9	67.629	540.14	1.2199	49	34	28	33.342	465.76	.6203
10	67.418	549.71	1.2162	48	37	26	33.017	496.82	.6146
MEAN	67.416	485.47	1.2161				30.302	374.72	.5672

CRIPPEN ARM 9/20/72
SLØPE, INTERCEPT MG/SQCM: 2.52227E-3 1.51085E-2
SLØPE, INTERCEPT G/CM : 1.76393E-2 3.61727E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
5	67.892	421.26	1.2337	63	9	42	27.528	253.87	.5217
6	68.870	456.80	1.2510	59	16	36	28.100	303.48	.5318
7	68.790	489.88	1.2496	55	22	33	30.657	362.33	.5769
8	67.217	506.50	1.2218	52	26	31	31.245	393.61	.5873
9	65.232	511.26	1.1868	50	31	28	31.791	444.16	.5969
10	64.616	539.08	1.1760	47	34	28	33.465	467.36	.6265
11	64.917	541.62	1.1813	47	36	28	33.287	465.34	.6233
MEAN	66.791	495.20	1.2143				30.868	384.38	.5807

CRIPPEN ARM 9/22/72
SLØPE, INTERCEPT MG/SQCM: 2.45512E-3 4.51081E-2
SLØPE, INTERCEPT G/CM : 0.017616 3.30705E-2
IZERØ= 500

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
5	66.971	394.93	1.2128	66	5	44	26.589	227.76	.5015
6	70.115	457.61	1.2682	60	16	37	27.900	288.76	.5246
7	68.903	474.00	1.2469	57	20	35	31.062	343.11	.5803
8	65.697	496.23	1.1904	52	27	31	32.439	407.85	.6045
9	66.316	521.85	1.2013	50	30	30	33.380	434.83	.6211
10	64.249	526.82	1.1649	48	34	28	33.675	471.55	.6264
11	63.091	540.28	1.1445	46	37	27	34.213	497.75	.6358
MEAN	66.478	487.39	1.2041				31.323	381.66	.5849

CRIPPEN ARM 10/10/72
SLØPE, INTERCEPT MG/SQCM: 2.58649E-3 2.59634E-2
SLØPE, INTERCEPT G/CM : 0.017044 3.28169E-2
IZERØ= 510

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
3	68.325	384.23	1.1973	67	8	42	26.637	235.16	.4868
4	71.306	427.56	1.2482	63	15	36	26.809	277.87	.4897
5	72.156	488.13	1.2626	56	22	33	29.351	333.84	.5331
6	69.758	489.41	1.2218	54	27	29	30.513	396.76	.5529
7	69.868	530.22	1.2236	50	31	28	32.641	440.67	.5892
8	68.958	534.06	1.2081	49	34	27	33.649	471.79	.6063
9	67.370	556.20	1.1811	46	37	26	33.733	491.58	.6078
MEAN	69.677	487.11	1.2204				30.476	378.24	.5523

THØRNTØN ARM 6/13/72
SLØPE, INTERCEPT MG/SQCM: 2.59863E-3 4.78773E-2
SLØPE, INTERCEPT G/CM : 1.69002E-2 2.36732E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
7	80.479	411.71	1.3838	72	17	47	33.456	255.50	.5391
8	79.427	412.07	1.3660	71	22	42	35.264	304.68	.6196
9	79.628	425.67	1.3694	69	25	39	40.176	378.00	.7027
10	84.722	461.03	1.4555	68	26	39	40.993	386.06	.7165
11	83.571	476.34	1.4360	65	28	38	40.101	387.67	.7014
12	85.178	485.85	1.4632	65	30	36	41.948	429.97	.7326
13	85.004	492.69	1.4603	64	30	38	47.640	464.02	.8288
MEAN	82.573	452.19	1.4192				39.940	372.27	.6987

THØRNTØN ARM 7/6/72
SLØPE, INTERCEPT MG/SQCM: 2.5685E-3 2.15932E-2
SLØPE, INTERCEPT G/CM : 1.75482E-2 2.99501E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
4	80.574	421.32	1.4439	73	19	47	31.139	249.54	.5764
5	76.685	412.10	1.3756	71	23	43	35.990	317.46	.6615
6	77.774	436.89	1.3947	68	28	40	38.593	367.23	.7072
7	80.037	464.02	1.4353	66	31	38	38.444	385.47	.7046
8	82.739	487.48	1.4827	65	32	37	40.339	416.06	.7378
9	80.009	478.31	1.4340	64	33	38	41.583	417.64	.7597
10	80.134	494.80	1.4362	62	33	39	43.006	420.92	.7846
MEAN	79.722	456.42	1.4289				38.442	367.76	.7045

THØRNTØN ARM 7/17/72
SLØPE, INTERCEPT MG/SQCM: 2.48543E-3 1.94419E-2
SLØPE, INTERCEPT G/CM : 1.75975E-2 3.08886E-2
IZERØ= 396

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
6	79.387	429.73	1.4279	73	16	48	28.423	230.43	.5311
7	75.836	415.96	1.3654	72	20	45	31.144	270.64	.5789
8	77.825	445.98	1.4004	69	25	41	36.584	351.19	.6747
9	79.105	467.21	1.4229	67	28	38	37.384	388.00	.6888
10	79.335	475.82	1.4270	66	29	38	38.497	399.79	.7083
11	81.165	502.43	1.4592	64	31	38	41.637	433.03	.7636
12	80.529	506.47	1.4480	63	31	39	42.238	427.93	.7742
MEAN	79.026	463.37	1.4215				36.558	357.29	.6742

THØRNTØN ARM 7/25/72
SLØPE, INTERCEPT MG/SQCM: 2.56835E-3 1.09031E-3
SLØPE, INTERCEPT G/CM : 1.73902E-2 0.041587

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
5	78.858	426.02	1.4129	72	20	46	31.307	264.57	.5860
6	77.486	430.57	1.3891	70	22	42	34.482	319.24	.6412
7	79.098	459.24	1.4171	67	27	39	38.709	386.03	.7147
8	81.936	482.94	1.4665	66	29	37	39.083	410.85	.7212
9	81.686	488.88	1.4621	65	30	37	40.094	421.49	.7388
10	81.104	492.99	1.4520	64	30	37	41.751	438.93	.7676
11	81.751	496.92	1.4633	64	31	38	43.476	445.04	.7976
MEAN	80.274	468.22	1.4376				38.415	383.73	.7096

THØRNTØN ARM 9/20/72
SLØPE, INTERCEPT MG/SQCM: 2.50805E-3 8.89211E-3
SLØPE, INTERCEPT G/CM : 1.77305E-2 3.33337E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
6	76.346	419.24	1.3870	72	18	45	32.727	286.43	.6136
7	72.970	418.11	1.3271	69	23	42	36.724	345.08	.6845
8	76.774	433.76	1.3946	70	23	41	38.360	369.50	.7135
9	78.721	472.02	1.4291	66	27	39	40.160	407.03	.7454
10	79.013	473.78	1.4343	66	26	39	40.154	406.97	.7453
11	80.607	490.91	1.4625	65	29	39	42.081	426.67	.7795
12	78.781	495.05	1.4302	63	31	38	44.182	460.04	.8167
MEAN	77.602	457.55	1.4093				39.198	385.96	.7233

THØRNTØN ARM 9/22/72
SLØPE, INTERCEPT MG/SQCM: 2.47719E-3 3.50377E-2
SLØPE, INTERCEPT G/CM : 1.76405E-2 3.24828E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
9	78.700	453.06	1.4208	68	18	42	38.766	358.46	.7163
10	81.928	486.96	1.4777	66	22	39	40.018	400.08	.7384
11	82.071	487.34	1.4803	66	22	41	41.589	395.34	.7661
12	81.936	494.72	1.4779	65	24	39	41.343	413.79	.7618
13	79.376	502.67	1.4327	62	27	38	41.757	429.45	.7691
14	81.333	507.01	1.4672	63	26	38	44.526	458.87	.8179
15	80.983	513.14	1.4611	62	27	38	44.599	459.64	.8192
MEAN	80.904	492.20	1.4597				41.800	416.52	.7699

THØRNTØN ARM 10/10/72
SLØPE, INTERCEPT MG/SQCM: 2.59543E-3 2.09407E-2
SLØPE, INTERCEPT G/CM : 1.71837E-2 3.18444E-2
IZERØ= 530

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
1	79.044	414.92	1.3905	72	20	44	34.819	296.83	.6303
2	78.717	419.10	1.3849	71	23	42	37.829	338.96	.6821
3	77.259	436.22	1.3598	67	27	39	41.046	397.44	.7374
4	83.076	476.91	1.4598	66	28	39	42.376	410.58	.7602
5	83.505	479.42	1.4672	66	29	37	42.189	431.26	.7570
6	83.978	497.50	1.4753	64	31	37	43.652	446.49	.7822
7	83.175	508.81	1.4615	62	32	37	46.444	475.56	.8302
MEAN	81.251	461.84	1.4284				41.194	399.59	.7399

ALEX ARM 7/5/72
SLØPE, INTERCEPT MG/SQCM: 2.58594E-3 1.68969E-2
SLØPE, INTERCEPT G/CM : 1.73283E-2 3.32306E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
6	61.500	328.43	1.0989	71	12	44	28.136	240.75	.5208
7	63.609	366.16	1.1355	66	18	40	27.969	263.86	.5179
8	62.174	394.13	1.1106	60	25	35	29.494	319.34	.5443
9	61.816	412.85	1.1044	57	29	32	31.303	371.75	.5757
10	59.496	427.57	1.0642	53	31	32	32.791	389.73	.6014
11	60.803	454.50	1.0863	51	34	30	31.869	404.26	.5855
12	62.359	475.76	1.1138	50	36	29	33.166	435.72	.6079
MEAN	61.680	408.49	1.1020				30.675	346.49	.5648

ALEXANDER ARM 7/18/72
SLØPE, INTERCEPT MG/SQCM: 2.47585E-3 8.30142E-3
SLØPE, INTERCEPT G/CM : 1.76981E-2 3.72276E-2
IZERØ= 400

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
7	62.278	350.93.	1.1394	71	14	41	27.268	265.27	.5198
8	63.707	380.70	1.1647	67	19	37	27.998	302.28	.5327
9	64.231	408.44	1.1740	63	23	35	30.888	353.10	.5839
10	60.756	419.74	1.1125	58	27	33	31.585	383.22	.5962
11	58.549	434.57	1.0734	54	32	31	31.792	410.87	.5999
12	59.978	462.51	1.0987	52	34	29	30.598	422.81	.5788
13	59.967	481.07	1.0985	50	36	29	33.346	461.08	.6274
MEAN	61.352	419.71	1.1230				30.496	371.23	.5770

ALEXANDER ARM 7/24/72
SLØPE, INTERCEPT MG/SQCM: 2.49324E-3 2.50664E-2
SLØPE, INTERCEPT G/CM : 1.75289E-2 0.035788

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
6	63.066	346.21	1.1413	71	11	45	26.626	227.26	.5025
7	64.825	383.89	1/1721	66	17	41	28.901	272.67	.5424
8	63.197	405.48	1.1436	61	23	36	29.271	316.06	.5489
9	61.688	424.02	1/1171	57	27	35	32.160	358.49	.5995
10	60.633	440.30	1.0986	54	31	32	31.586	385.84	.5895
11	59.809	451.26	1.0842	52	33	31	31.418	396.44	.5865
12	61.086	479.96	1/1066	50	34	30	32/131	419.52	.5990
MEAN	62.043	418.73	1.1233				30.299	339.47	.5669

ALEXANDER ARM 9/21/72
SLØPE, INTERCEPT MG/SQCM: 2.48835E-3 2.40959E-2
SLØPE, INTERCEPT G/CM : 1.[illegible] 3.64139E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
5	60.693	329.08	1.1088	72	10	46	26.852	224.91	.5109
6	62.714	355.58	1.1445	69	14	42	28.099	259.18	.5329
7	63.143	386.81	1.1521	64	20	37	28.389	298.66	.5380
8	61.161	421.53	1.1171	57	27	34	30.690	353.07	.5787
9	60.562	432.83	1.1065	55	30	32	31.707	388.51	.5967
10	60.514	457.99	1.1057	52	33	31	31.356	396.80	.5905
11	60.126	473.58	1.0988	50	35	30	32.081	420.07	.6033
MEAN	61.273	408.20	1.1191				29.882	334.46	.5644

ALEXANDER ARM 9/22/72
SLØPE, INTERCEPT MG/SQCM: 2.52608E-3 0.016897
SLØPE, INTERCEPT G/CM : 1.75079E-2 3.77359E-2
IZERØ= 500

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
5	60.384	325.32	1.0949	72	11	44	27.804	243.46	.5245
6	62.226	355.57	1.1272	68	17	39	27.945	276.97	.5270
7	62.206	384.19	1.1268	63	23	36	30.845	332.50	.5778
8	62.013	409.40	1.1234	59	27	33	31.897	375.95	.5962
9	59.351	420.50	1.0768	55	31	32	31.610	384.36	.5912
10	59.193	427.25	1.0741	54	32	31	31.216	391.94	.5843
11	60.574	463.49	1.0983	51	34	30	32.848	426.76	.6128
MEAN	60.849	397.96	1.1031				30.595	347.42	.5734

LAPINTA ARM 6/12/72
SLØPE, INTERCEPT MG/SQCM: 2.72524E-3 -3.98862E-3
SLØPE, INTERCEPT G/CM : 1.60103E-2 4.81078E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
6	74.817	417.42	1.2460	66	21	32	30.634	352.74	.5386
7	75.792	457.38	1.2616	61	25	29	35.642	452.45	.6187
8	74.330	479.97	1.2382	57	28	27	38.044	518.50	.6572
9	73.632	501.81	1.2270	54	31	26	37.438	529.83	.6475
10	75.290	532.75	1.2535	52	31	27	36.626	499.22	.6345
11	76.412	551.24	1.2715	51	31	27	37.574	512.11	.6497
12	73.754	542.73	1.2289	50	32	26	38.526	545.18	.6649
13	78.154	575.02	1.2994	50	30	28	41.576	546.32	.7138
14	74.464	570.71	1.2403	48	32	28	42.154	553.89	.7230
MEAN	75.183	514.34	1.2518				37.579	501.14	.6498

LA PINTA ARM 7/6/72
SLØPE, INTERCEPT MG/SQCM: 2.51336E-3 4.07147E-2
SLØPE, INTERCEPT G/CM : 1.74274E-2 3.13733E-2
IZERØ= 410

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
6	72.951	423.50	1.3032	66	21	34	31.069	347.30	.5733
7	72.153	454.33	1.2393	61	26	30	35.056	443.64	.6428
8	71.355	481.73	1.2754	57	29	23	36.913	503.23	.6752
9	71.241	503.61	1.2734	54	31	27	36.681	524.22	.6711
10	71.570	531.31	1.2791	52	33	26	36.649	544.53	.6706
11	72.557	561.06	1.2964	50	33	26	36.933	548.87	.6755
12	72.196	569.91	1.2901	49	33	27	36.271	513.19	.6640
13	72.914	563.90	1.3026	50	32	27	38.347	556.14	.7039
14	72.135	582.03	1.2399	48	32	29	41.633	554.95	.7575
MEAN	72.125	519.60	1.2833				36.673	505.68	.6710

LA PINTA ARM 7/16/72
SLØPE, INTERCEPT MG/SQCM: 2.50501E-3 -5.21373E-3
SLØPE, INTERCEPT G/CM : 1.75806E-2 3.70417E-2
IZERØ= 400

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
6	75.178	450.00	1.3587	67	19	33	30.342	369.13	.5705
7	72.280	475.10	1.3078	61	24	30	34.480	460.90	.6432
8	72.276	499.54	1.3077	58	27	28	36.173	517.80	.6730
9	74.414	532.55	1.3453	56	28	26	36.653	564.85	.6814
10	73.384	565.45	1.3272	52	31	26	37.472	577.41	.6958
11	72.782	571.78	1.3166	51	31	26	35.482	546.86	.6603
12	72.279	579.16	1.3078	50	31	27	37.399	555.04	.6945
13	73.192	598.37	1.3238	49	31	27	38.675	573.90	.7170
14	72.344	603.75	1.3089	48	32	27	39.282	582.87	.7276
MEAN	73.125	541.74	1.3226				36.218	527.64	.6738

LA PINTA ARM 7/24/72
SLØPE, INTERCEPT MG/SQCM: 2.45178E-3 0.027883
SLØPE, INTERCEPT G/CM : 0.017799 2.76259E-2

		RADIUS						ULNA	
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
6	74.446	441.82	1.3527	67	20	34	29.376	341.02	.5505
7	71.780	460.83	1.3052	62	24	31	32.897	421.45	.6132
8	69.966	472.30	1.2730	59	28	28	35.813	510.30	.6651
9	71.793	521.03	1.3055	55	31	27	35.919	531.23	.6669
10	71.668	540.16	1.3032	53	32	26	35.779	549.90	.6645
11	74.309	582.91	1.3503	51	32	27	35.001	517.36	.6506
12	72.523	580.22	1.3135	50	31	27	36.820	544.84	.6830
13	72.359	578.88	1.3155	50	32	28	38.533	549.93	.7135
14	72.556	613.27	1.3191	47	33	28	39.164	559.12	.7247
MEAN	72.378	532.94	1.3159				35.478	502.79	.6591

LA PINTA ARM 9/19/72
SLØPE, INTERCEPT MG/SQCM: 2.48219E-3 3.45763E-2
SLØPE, INTERCEPT G/CM : 1.76628E-2 0.032107

		RADIUS						ULNA	
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
4	73.556	428.36	1.3313	67	20	34	29.922	340.62	.5606
5	72.135	462.48	1.3062	61	25	31	34.225	430.85	.6366
6	73.142	494.12	1.3240	58	28	29	36.411	491.89	.6752
7	71.191	517.19	1.2895	54	32	26	36.304	548.60	.6733
8	73.086	541.62	1.3230	53	33	25	35.154	552.57	.6530
9	71.324	538.65	1.2919	52	33	26	35.659	538.61	.6619
10	72.460	569.91	1.3120	50	33	27	35.550	516.52	.6600
11	71.401	573.12	1.2932	49	33	28	39.065	548.15	.7221
12	70.994	581.93	1.2861	48	34	28	39.866	559.67	.7363
MEAN	72.143	523.04	1.3064				35.795	503.05	.6643

LA PINTA ARM 9/21/71
SLØPE, INTERCEPT MG/SQCM: 2.51157E-3 0.021534
SLØPE, INTERCEPT G/CM : 1.76616E-2 3.45827E-2

		RADIUS						ULNA	
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
5	72.097	439.96	1.3079	64	24	31	32.129	404.08	.6020
6	70.679	468.40	1.2829	59	28	29	35.920	484.59	.6690
7	72.164	513.84	1.3091	55	30	27	36.100	523.78	.6722
8	70.179	518.64	1.2741	53	32	26	35.786	539.44	.6666
9	71.392	538.07	1.2955	52	32	27	36.513	529.87	.6795
10	72.594	558.17	1.3167	51	31	27	36.658	532.01	.6820
11	71.159	569.64	1.2914	49	32	27	38.450	558.43	.7137
12	72.957	584.25	1.3231	49	32	27	39.472	573.50	.7317
13	72.258	603.55	1.3108	47	32	29	40.373	545.73	.7476
MEAN	71.720	532.72	1.3013				36.822	521.27	.6849

RØSS ARM 6/13/72
SLØPE, INTERCEPT MG/SQCM: 2.74934E-3 6.76881E-2
SLØPE, INTERCEPT G/CM : 1.57285E-2 0.021392

RØW	RADIUS C.U.	RADIUS MG/SQCM	RADIUS GM/CM	WIDTH			ULNA C.U.	ULNA MG/SQCM	ULNA G/CM
8	70.100	329.51	1.1240	72	17	40	32.368	269.71	.5305
9	72.982	371.58	1.1693	67	23	37	34.761	317.09	.5681
10	71.690	395.95	1.1490	62	29	34	32.519	323.26	.5329
11	70.606	418.16	1.1319	58	34	32	34.256	364.75	.5602
12	72.142	443.95	1.1561	56	36	30	34.848	397.88	.5695
13	72.833	457.04	1.1669	55	38	30	35.967	411.45	.5871
14	73.063	486.43	1.1706	52	40	28	36.267	446.49	.5918
MEAN	71.917	414.66	1.1525				34.427	361.52	.5629

RØSS ARM 7/6/72
SLØPE, INTERCEPT MG/SQCM: 2.54834E-3 2.48687E-2
SLØPE, INTERCEPT G/CM : 1.73463E-2 3.65068E-2

RØW	RADIUS C.U.	RADIUS MG/SQCM	RADIUS GM/CM	WIDTH			ULNA C.U.	ULNA MG/SQCM	ULNA G/CM
4	65.262	331.64	1.1686	75	13	43	28.558	250.81	.5319
5	65.142	360.64	1.1665	69	21	38	29.592	295.77	.5498
6	65.958	388.36	1.1806	65	27	35	30.274	329.60	.5616
7	67.294	423.06	1.2038	61	31	33	31.027	359.12	.5747
8	65.177	431.13	1.1671	58	34	32	30.107	359.37	.5533
9	63.633	444.52	1.1412	55	37	31	32.047	395.83	.5924
10	64.604	468.48	1.1571	53	38	29	32.879	435.06	.6068
MEAN	65.303	406.83	1.1693				30.641	346.51	.5680

RØSS ARM 7/24/72
SLØPE, INTERCEPT MG/SQCM: 2.45473E-3 3.50639E-2
SLØPE, INTERCEPT G/CM : 0.017749 2.78989E-2

RØW	RADIUS C.U.	RADIUS MG/SQCM	RADIUS GM/CM	WIDTH			ULNA C.U.	ULNA MG/SQCM	ULNA G/CM
6	63.839	341.97	1.1610	73	15	41	29.070	274.56	.5439
7	62.252	358.66	1.1328	68	22	37	28.883	303.72	.5405
8	62.107	393.80	1.1302	62	28	35	31.610	353.64	.5889
9	63.107	421.45	1.1480	59	32	32	30.580	375.02	.5707
10	62.814	434.64	1.1428	57	34	31	31.667	401.86	.5900
11	63.335	463.52	1.1520	54	38	28	29.840	419.86	.5575
12	64.678	482.82	1.1758	53	40	28	33.440	472.24	.6214
MEAN	63.161	413.84	1.1489				30.727	371.56	.5733

RØSS ARM 9/19/72
SLØPE, INTERCEPT MG/SQCM: 2.48237E-3 2.68233E-2
SLØPE, INTERCEPT G/CM : 0.017656 3.41839E-2

	RADIUS			WIDTH			ULNA		
RØW	C.U.	MG/SQCM	GM/CM				C.U.	MG/SQCM	G/CM
6	61.781	321.03	1.1250	75	11	44	28.630	251.32	.5397
7	63.981	352.21	1.1638	71	19	38	28.229	288.45	.5326
8	63.167	374.74	1.1495	66	25	35	30.572	341.07	.5740
9	63.559	402.16	1.1564	62	31	33	30.410	360.42	.5711
10	64.014	433.81	1.1644	58	34	31	32.690	414.00	.6114
11	64.826	455.53	1.1788	56	36	30	32.019	419.15	.5995
12	65.118	466.14	1.1839	55	38	29	33.158	449.79	.6196
MEAN	63.778	400.80	1.1603				30.815	360.60	.5783

RØSS ARM 9/21/72
SLØPE, INTERCEPT MG/SQCM: 2.47996E-3 3.51251E-2
SLØPE, INTERCEPT G/CM : 1.77734E-2 2.81312E-2

	RADIUS			WIDTH			ULNA		
RØW	C.U.	MG/SQCM	GM/CM				C.U.	MG/SQCM	G/CM
6	63.835	338.44	1.1627	73	13	43	29.579	263.21	.5539
7	63.616	363.07	1.1588	68	21	38	28.872	292.21	.5413
8	61.478	373.13	1.1208	64	26	36	30.417	326.53	.5687
9	63.307	418.50	1.1533	59	33	33	29.774	349.65	.5573
10	64.194	432.13	1.1691	58	35	31	30.101	377.37	.5631
11	65.254	464.25	1.1879	55	37	30	30.579	396.85	.5716
12	65.200	481.89	1.1870	53	39	29	31.234	420.13	.5833
MEAN	63.841	410.21	1.1628				30.079	346.57	.5627

BRØWN ARM 7/5/72
SLØPE, INTERCEPT MG/SQCM: 2.56249E-3 2.28073E-2
SLØPE, INTERCEPT G/CM : 1.74262E-2 3.30275E-2

	RADIUS			WIDTH			ULNA		
RØW	C.U.	MG/SQCM	GM/CM				C.U.	MG/SQCM	G/CM
8	84.874	543/13	1.5121	60	28	34	40.344	454.16	.7361
9	82.473	555.74	1.4702	57	33	31	41.397	512.23	.7544
10	83/740	574.66	1.4923	56	34	31	42.569	526.98	.7748
11	84.922	593.65	1.5129	55	36	29	42.093	557.53	.7665
12	86.052	612.98	1.5326	54	37	30	41.475	530.61	.7558
13	84.301	623.75	1.5021	52	39	29	41.171	545.13	.7505
14	85.713	646.96	1.5267	51	39	32	42.769	512.67	.7783
MEAN	84.582	592.98	1.5070				41.688	519.90	/7595

BRØWN ARM 7/16/72
SLØPE, INTERCEPT MG/SQCM: 2.55362E-3 1.15825E-2
SLØPE, INTERCEPT G/CM : 1.72503E-2 3.89005E-2

	RADIUS			WIDTH			ULNA		
RØW	C/U.	MG/SQCM	GM/CM				C.U.	MG/SQCM	G/CM
9	86.752	561.67	1.5354	60	28	34	40.915	466.71	.7447
10	86.404	578.84	1.5294	58	31	30	40/951	530.01	.7453
11	86.743	591.41	1.5352	57	33	30	42/723	553.14	.7759
12	85.819	617.81	1.5193	54	36	29	40.852	547.11	.7436
13	85/135	624/50	1.5075	53	38	30	41.642	539.03	.7572
14	83.664	613.63	1.4821	53	37	31	42.806	536.20	.7773
15	87.067	664.00	1/5408	51	38	32	43.563	528.57	.7904
MEAN	85.941	607.41	1.5214				41/922	528.68	.7621

BRØWN ARM 7/24/72
SLØPE, INTERCEPT MG/SQCM: 2.45797E-3 4.30296E-2
SLØPE, INTERCEPT G/CM : 1.76992E-2 2.81741E-2

	RADIUS			WIDTH			ULNA		
RØW	C.U.	MG/SQCM	GM/CM				C.U.	MG/SQCM	G/CM
8	85.016	559.19	1.5329	60	29	33	41.424	493.39	.7613
9	86.273	567.71	1.5551	60	31	31	42.023	534.22	.7719
10	86.104	608.29	1.5521	56	35	29	42.018	572.20	.7719
11	85.553	615/59	1/5424	55	36	30	41.762	549.07	.7673
12	82.222	613.90	1.4834	53	38	30	41.610	547.00	.7646
13	85/168	662.17	1.5356	51	40	30	41.791	549.46	.7678
14	87.826	656/93	1.5826	53	37	31	43.504	553.66	.7982
MEAN	85.452	611.97	1.5406				42.019	542.71	.7719

BRØWN ARM 9/19/72
SLØPE, INTERCEPT MG/SQCM: 2.50028E-3 1.98479E-2
SLØPE, INTERCEPT G/CM : 1.76319E-2 3.57742E-2

RØW	RADIUS C/U.	MG/SQCM	GM/CM	WIDTH			ULNA C.U.	MG/SQCM	G/CM
7	85.519	552.78	1.5436	61	28	34	41.173	476.40	.7617
8	87.600	596/13	1.5803	58	32	31	42/927	545.90	.7927
9	85.142	600.15	1.5370	56	35	30	41.727	548.36	.7715
10	86.010	617.52	1.5523	55	35	31	41.854	532.05	.7737
11	84.624	630.66	1.5279	53	38	31	41.701	530.08	.7710
12	84.315	640/57	1/5224	52	39	30	41.809	549.45	.7729
13	84.790	657.01	1.5308	51	39	31	43.577	554.28	.8041
MEAN	85.429	613.55	1.5420				42.110	533.79	.7782

BRØWN ARM 9/21/72
SLØPE, INTERCEPT MG/SQCM: 2.46206E-3 3.40189E-2
SLØPE, INTERCEPT G/CM : 1.76424E-2 3.65336E-2

RØW	RADIUS C.U.	MG/SQCM	GM/CM	WIDTH			ULNA C.U.	MG/SQCM	G/CM
8	86.866	564.57	1.5691	61	28	33	40.493	484.57	.7509
9	87.233	597.06	1.5755	58	33	30	41.319	545/59	/7655
10	85/139	592.86	1.5386	57	33	31	43/528	556.49	.8045
11	85.467	617/34	1.5444	55	37	30	41.315	545.54	.7654
12	84.853	648.96	1.5335	52	38	30	40.555	535.25	.7520
13	83.191	648.72	1.5042	51	40	29	41.472	567.03	.7682
14	85.135	664.60	1/5394	51	40	31	42.561	543.82	.7874
MEAN	85.419	619/16	1/5435				41.606	539.75	.7706

BRØWN ARM 9/5/72
SLØPE, INTERCEPT MG/SQCM: 2.58748E-3 4.22117E-3
SLØPE, INTERCEPT G/CM : 1.70462E-2 0.039099

RØW	RADIUS C/U.	MG/SQCM	GM/CM	WIDTH			ULØA C.U.	MG/SQCM	G/CM
6	90.361	570.87	1.5794	61	26	35	41.775	459.66	.7512
7	88.960	591/14	1.5555	58	31	33	43.423	506.91	.7793
8	89.767	617.88	1.5693	56	34	30	43.991	565.08	.7890
9	88.804	622.38	1.5529	55	34	31	44.459	552.64	.7970
10	89.995	642.46	1.5732	54	35	31	44.624	554.70	.7998
11	87.488	648.60	1/5304	52	37	32	45.127	543.38	.8083
12	86.101	650.84	1.5068	51	39	32	46.786	563.42	.8366
MEAN	88/782	620.60	1.5525				44.312	535.11	.7945

BRØWN ARM 10/6/72
SLØPE, INTERCEPT MG/SQCM: 2.59534E-3 2.62044E-2
SLØPE, INTERCEPT G/CM : 1.69109E-2 3.75061E-2
IZERØ= 520

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
3	39.090	561.91	1.5441	60	28	33	41.403	473.23	.7377
4	38.505	577.75	1.5342	58	32	30	44.249	558.11	.7858
5	39.684	606.85	1.5541	56	34	29	42.839	558.97	.7619
6	90.291	611.03	1.5644	56	35	29	41.859	545.96	.7454
7	89.004	636.83	1.5426	53	37	30	44.384	559.84	.7881
8	87.215	648.69	1.5124	51	37	32	45.077	532.57	.7998
9	88.175	655.94	1.5286	51	37	30	45.625	575.78	.8091
MEAN	88.852	614.14	1.5401				43.634	543.49	.7754

ULLMAN ARM 6/12/72
SLØPE, INTERCEPT MG/SQCM: 2.6162E-3 1.17559E-2
SLØPE, INTERCEPT G/CM : 1.68947E-2 3.52302E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
4	69.976	448.85	1.2175	59	14	37	31.856	324.60	.5734
5	67.872	467.20	1.1819	55	21	34	33.262	369.44	.5972
6	68.647	500.11	1.1950	52	26	31	36.230	442.23	.6473
7	71.107	550.19	1.2366	49	30	29	38.629	504.66	.6879
8	68.942	568.38	1.2000	46	34	27	37.883	531.81	.6753
9	67.960	572.76	1.1834	45	36	29	40.489	529.17	.7193
10	67.474	595.29	1.1752	43	38	27	39.821	559.24	.7080
MEAN	68.854	528.97	1.1985				36.881	465.88	.6583

ULLMAN ARM 7/5/72
SLØPE, INTERCEPT MG/SQCM: 2.59855E-3 1.01666E-2
SLØPE, INTERCEPT G/CM : 1.72723E-2 3.62428E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
5	67.530	408.59	1.2026	63	17	36	31.488	332.69	.5801
6	66.586	430.40	1.1863	59	22	33	33.319	384.64	.6117
7	64.400	446.69	1.1486	55	28	30	34.673	440.86	.6351
8	64.719	475.05	1.1541	52	31	28	36.659	499.93	.6694
9	64.991	506.51	1.1588	49	34	28	38.217	521.34	.6963
10	66.068	548.80	1.1774	46	35	29	39.730	523.30	.7225
11	64.627	561.32	1.1525	44	37	28	40.514	552.91	.7360
MEAN	65.560	482.48	1.1686				36.371	465.09	.6645

ULLMAN ARM 7/16/72
SLØPE, INTERCEPT MG/SQCM: 2.60038E-3 2.22768E-2
SLØPE, INTERCEPT G/CM : 1.70301E-2 4.31348E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
6	68.263	436.37	1.2057	59	14	39	29.099	278.36	.5387
7	66.793	442.06	1.1807	57	20	34	32.166	355.25	.5910
8	64.964	471.87	1.1495	52	26	31	35.301	429.35	.6444
9	64.204	495.32	1.1366	49	29	30	35.836	450.80	.6535
10	66.134	532.55	1.1695	47	33	28	37.450	505.78	.6810
11	66.543	560.09	1.1764	45	36	28	36.501	492.75	.6648
12	64.391	567.30	1.1398	43	38	28	38.197	516.04	.6937
MEAN	65.899	500.79	1.1654				34.936	432.62	.6381

ULLMAN ARM 7/24/72
SLØPE, INTERCEPT MG/SQCM: 2.48593E-3 0.023482
SLØPE, INTERCEPT G/CM : 1.77048E-2 3.11234E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
4	65.573	416.03	1.1922	62	12	41	30.187	286.73	.5656
5	66.797	453.83	1.2138	58	21	34	31.890	367.85	.5957
6	63.337	471.27	1.1525	53	27	32	33.814	415.62	.6298
7	64.140	496.46	1.1667	51	30	30	35.816	470.80	.6652
8	64.958	534.93	1.1812	48	33	29	37.144	505.78	.6888
9	64.180	551.80	1.1674	46	35	28	37.186	524.79	.6895
10	65.009	584.89	1.1821	44	37	28	38.874	549.04	.7194
MEAN	64.857	501.32	1.1794				34.987	445.80	.6506

ULLMAN ARM 9/5/72
SLØPE, INTERCEPT MG/SQCM: 2.54851E-3 2.61283E-2
SLØPE, INTERCEPT G/CM : 1.72661E-2 2.68414E-2
IZERØ= 600

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
3	70.788	452.68	1.2491	60	11	42	28.793	258.75	.5240
4	70.124	490.03	1.2376	55	20	35	31.309	340.76	.5674
5	66.522	482.25	1.1754	53	25	32	34.382	411.35	.6205
6	67.126	538.48	1.1858	48	30	30	35.937	459.79	.6473
7	67.325	564.04	1.1893	46	33	30	38.325	491.02	.6886
8	64.884	568.38	1.1471	44	37	28	38.686	531.89	.6948
9	64.203	589.57	1.1354	42	40	28	39.232	539.53	.7042
MEAN	67.282	526.49	1.1885				35.238	433.30	.6353

ULLMANN ARM 9/20/72
SLØPE, INTERCEPT MG/SQCM: 2.46998E-3 3.56047E-2
SLØPE, INTERCEPT G/CM : 1.76483E-2 3.34352E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
3	63.663	429.98	1.1570	58	19	34	31.020	354.96	.5809
4	63.902	464.69	1.1612	54	23	33	34.058	403.43	.6345
5	64.367	496.56	1.1694	51	28	30	34.937	457.07	.6500
6	64.445	529.15	1.1708	48	31	29	37.052	502.86	.6873
7	64.167	562.89	1.1659	45	35	28	37.837	532.68	.7012
8	63.868	573.26	1.1606	44	37	27	36.831	537.86	.6834
9	62.962	592.51	1.1446	42	39	28	38.374	540.45	.7107
MEAN	63.911	521.29	1.1613				35.730	475.62	.6640

ULLMANN ARM 9/22/72
SLØPE, INTERCEPT MG/SQCM: 2.53287E-3 1.29112E-2
SLØPE, INTERCEPT G/CM : 1.76245E-2 3.29851E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
3	64.951	437.03	1.1777	58	20	34	32.523	372.56	.6062
4	62.054	443.60	1.1267	54	24	32	33.866	412.73	.6299
5	62.841	481.38	1.1405	51	28	31	36.935	465.30	.6839
6	64.334	524.06	1.1668	48	32	28	34.073	475.34	.6335
7	64.923	552.12	1.1772	46	34	28	36.059	503.35	.6685
8	63.081	560.92	1.1448	44	37	27	38.458	557.26	.7108
9	63.071	587.78	1.1446	42	39	28	39.401	550.47	.7274
MEAN	63.608	513.13	1.1540				35.902	476.72	.6657

ULLMANN ARM 10/10/72
SLØPE, INTERCEPT MG/SQCM: 2.57322E-3 3.88819E-2
SLØPE, INTERCEPT G/CM : 1.73149E-2 1.94992E-2

	RADIUS						ULNA		
RØW	C.U.	MG/SQCM	GM/CM	WIDTH			C.U.	MG/SQCM	G/CM
3	67.857	447.53	1.1944	57	21	34	31.064	339.95	.5574
4	68.119	457.61	1.1990	56	23	32	32.683	381.80	.5854
5	67.439	488.89	1.1872	52	28	30	37.362	468.87	.6664
6	67.227	518.07	1.1835	49	31	29	38.162	496.28	.6803
7	67.971	535.20	1.1964	48	33	27	37.668	527.06	.6717
8	66.869	562.37	1.1773	45	35	28	38.443	518.45	.6851
9	66.112	596.61	1.1642	42	39	27	39.877	558.85	.7100
MEAN	67.371	515.18	1.1860				36.466	470.18	.6509

VØGEL ARM 6/12/72
SLØPE, INTERCEPT MG/SQCM: 2.65566E-3 -3.8837E-3
SLØPE, INTERCEPT G/CM : 1.67892E-2 3.96313E-2

RØW	RADIUS C.U.	MG/SQCM	GM/CM	WIDTH			ULNA C.U.	MG/SQCM	G/CM
9	84.664	602.93	1.4611	53	38	27	36.974	517.12	.6604
10	86.452	627.50	1.4911	52	39	28	38.035	513.64	.6790
11	86.501	666.20	1.4919	49	42	29	39.307	511.85	.6996
12	85.026	654.87	1.4671	49	43	29	39.818	518.48	.7081
13	83.199	682.53	1.4365	46	44	30	41.851	526.77	.7423
14	84.183	690.58	1.4530	46	45	30	44.412	558.91	.7853
15	87.226	715.49	1.5041	46	44	31	44.482	541.78	.7864
MEAN	85.322	662.88	1.4721				40.704	526.94	.7230

VØGEL ARM 9/6/72
SLØPE, INTERCEPT MG/SQCM: 2.59645E-3 1.48836E-2
SLØPE, INTERCEPT G/CM : 1.71318E-2 3.23162E-2

RØW	RADIUS C.U.	MG/SQCM	GM/CM	WIDTH			ULNA C.U.	MG/SQCM	G/CM
5	84.412	607.67	1.4784	53	39	30	39.025	495.27	.7009
6	85.763	654.89	1.5016	50	41	30	39.408	500.19	.7074
7	84.327	657.08	1.4770	49	44	30	40.689	516.63	.7294
8	85.642	681.44	1.4995	48	44	31	41.184	505.93	.7379
9	83.342	677.21	1.4601	47	45	31	43.223	531.27	.7728
10	85.159	692.10	1.4912	47	46	31	43.807	538.52	.7828
11	84.099	698.40	1.4731	46	47	32	45.008	535.97	.8034
MEAN	84.678	666.97	1.4830				41.763	517.68	.7478

VØGEL ARM 10/10/72
SLØPE, INTERCEPT MG/SQCM: 2.56775E-3 2.79803E-2
SLØPE, INTERCEPT G/CM : 1.72743E-2 2.55904E-2

RØW	RADIUS C.U.	MG/SQCM	GM/CM	WIDTH			ULNA C.U.	MG/SQCM	G/CM
1	82.003	591.66	1.4421	53	37	27	36.171	510.83	.6504
2	83.787	628.92	1.4730	51	39	27	37.440	529.13	.6723
3	84.326	645.91	1.4823	50	41	27	37.958	536.61	.6813
4	85.309	681.25	1.4992	48	41	29	40.401	531.66	.7235
5	85.722	699.40	1.5064	47	43	28	41.034	559.84	.7344
6	84.690	690.85	1.4886	47	43	30	43.718	556.63	.7308
7	85.595	713.77	1.5042	46	43	30	44.614	568.26	.7963
MEAN	84.490	664.54	1.4851				40.191	541.85	.7199

NAME:BOBKO HEEL 6/13/72
BONE:350
WI0:542
WEDGE VALUES DATE6/13/72
SLOPE +0.2555080E-02 INTERCEPT +0.1561060E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0003	+1144.87	+1132.75	+1138.81	0121	.06	2.08
0004	+1043.50	661.00	852.25	0107	2.93	1.21
0005	736.00	691.12	713.56	0103	.40	1.27
0006	+1154.37	897.12	+1025.74	0114	1.62	1.65
0007	648.24	266.00	457.12	0009	5.72	.49
0008	923.87	239.25	581.56	0006	8.68	.44
0009	670.87	401.87	536.37	0033	3.29	.74
0010	+1184.75	254.74	719.75	0016	9.88	.47
0011	+1016.37	367.75	692.06	0038	6.53	.67

ROW	LOW:C.U. MG/SQCM		H2O:C.U. MG/SQCM		MEAN:C.U. MG/SQCM	
0003	192.57	616.78	103.38	328.28	193.22	618.87
0004	110.59	398.41	89.35	320.72	137.78	497.87
0005	111.97	419.35	86.93	324.22	115.26	431.85
0006	144.20	488.95	86.75	291.73	159.47	541.39
0007	1.65	65.67	8.05	344.24	6.52	277.59
0008	1.74	107.72	6.65	427.77	7.07	455.34
0009	14.42	164.93	24.29	282.00	23.94	277.92
0010	6.10	143.11	18.18	438.59	22.71	549.60
0011	27.56	277.78	42.30	429.58	51.59	525.23

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NAME:BOBKO HEEL 7/6/72
BONE:250
WI0:378
WEDGE VALUES DATE7/6/72
SLOPE +0.2533429E-02 INTERCEPT +0.2900630E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0004	582.75	455.99	519.37	0116	1.57	1.20
0005	602.62	418.87	510.74	0115	2.33	1.10
0006	568.25	464.00	516.12	0114	1.30	1.22
0007	567.25	463.12	515.18	0115	1.30	1.22
0008	499.49	460.37	479.93	0119	.52	1.21
0009	511.74	452.75	482.25	0126	.78	1.19
0010	540.25	438.50	489.37	0138	1.34	1.16
0011	580.37	430.24	505.31	0136	1.92	1.13
0012	599.12	425.00	512.06	0129	2.20	1.12

ROW	LOW:C.U. MG/SQCM		H2O:C.U. MG/SQCM		MEAN:C.U. MG/SQCM	
0004	195.22	652.85	173.46	578.80	210.32	704.22
0005	178.48	601.18	166.68	560.65	201.29	679.46
0006	186.90	635.71	163.53	554.79	199.04	677.73
0007	184.65	622.36	161.30	542.19	196.90	664.41
0008	179.51	584.00	156.05	506.18	184.46	600.43
0009	187.84	577.01	165.10	505.79	195.79	601.93
0010	194.89	546.02	174.41	487.41	210.04	589.34
0011	192.43	547.05	174.82	495.94	214.30	610.52
0012	199.84	600.04	184.72	553.79	223.88	673.60

NAME:BOBKO HEEL 9/20/72
WEDGE SLOPE: 2.49676E-3 INTERCEPT: 4.50713E-2 WATER I-O: 580

ROW	F-1	F-2	Y	CHANNELS	FAT EQUIV	LOW/H20
4	738.5	572	655.25	116	1.64239	0.986207
5	723.5	556	639.75	114	1.69285	0.958621
6	723.5	550.375	636.937	114	1.75822	0.948922
7	660.5	569.625	615.062	114	0.95155	0.982112
8	596	584.25	590.125	123	0.128004	1.00733
9	625.5	506.375	565.937	127	1.35819	0.87306
10	679.75	539.125	609.437	140	1.49	0.929526
11	748.375	524	636.187	135	2.29122	0.903448
12	755.375	528.875	642.125	129	2.29154	0.911853
MEAN	694.556	547.847	621.201	1112	1.51155	0.944564
S.D.	57.0779	25.4468	28.743			

ROW	LOW I-O		WATER I-O		MEAN I-O	
	C.U.	MG/CMSQ	C.U.	MG/CMSQ	C.U.	MG/CMSQ
4	193.86	651.299	195.471	656.861	209.622	705.72
5	185.543	633.822	190.361	650.747	201.538	690.018
6	181.043	618.01	187.02	639.009	197.695	676.515
7	182.869	624.425	184.926	631.655	191.618	655.164
8	182.31	575.597	181.412	572.673	183.541	579.604
9	177.343	541.233	194.583	595.604	191.466	585.773
10	192.479	532.601	202.71	561.872	209.641	581.701
11	187.808	539.139	201.516	579.806	213.998	616.84
12	200.736	605.194	212.64	642.153	225.766	682.907
MEAN	1683.99	591.258	1750.64	614.487	1824.89	641.582

NAME:BOBKO HEEL 9/22/72
BONE:400
WI0:514
WEDGE VALUES DATE9/22/72
SLOPE +0.2566760E-02 INTERCEPT +0.4505251E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0003	+ 676.12	+ 534.74	+ 605.43	0117	+ 1.50	+ 1.04
0004	+ 658.62	+ 520.12	+ 589.37	0114	+ 1.51	+ 1.01
0005	+ 637.50	+ 523.49	+ 580.50	0113	+ 1.26	+ 1.01
0006	+ 633.49	+ 519.99	+ 576.75	0114	+ 1.26	+ 1.01
0007	+ 583.75	+ 537.12	+ 560.43	0118	+ .53	+ 1.04
0008	+ 559.49	+ 477.75	+ 518.62	0120	+ 1.01	+ .92
0009	+ 593.00	+ 518.49	+ 555.75	0139	+ .86	+ 1.00
0010	+ 624.37	+ 495.12	+ 559.74	0137	+ 1.49	+ .96
0011	+ 660.00	+ 477.49	+ 568.75	0133	+ 2.08	+ .92

ROW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0003	+ 205.15	+ 665.60	+ 200.52	+ 650.18	+ 219.68	+ 713.97
0004	+ 190.36	+ 633.02	+ 189.01	+ 628.41	+ 204.61	+ 681.72
0005	+ 191.08	+ 641.27	+ 189.01	+ 634.13	+ 202.76	+ 681.54
0006	+ 181.58	+ 603.02	+ 180.26	+ 598.50	+ 193.39	+ 643.38
0007	+ 187.30	+ 600.87	+ 182.11	+ 583.73	+ 192.32	+ 617.42
0008	+ 176.46	+ 555.37	+ 185.24	+ 583.87	+ 186.32	+ 587.36
0009	+ 200.39	+ 544.11	+ 199.18	+ 540.72	+ 210.03	+ 571.14
0010	+ 194.57	+ 535.78	+ 199.70	+ 550.36	+ 211.38	+ 583.57
0011	+ 194.60	+ 552.50	+ 204.40	+ 581.20	+ 217.86	+ 620.64

NAME:BOBKO HREL
NAME:BOBKO HEEL 7/25/72
BONE:275
WI0:389
WEDGE VALUES DATE7/25/72
SLOPE +0.253287ØE-02 INTERCEPT +0.5168676E-Ø1

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0004	+ 450.50	+ 346.62	+ 398.56	0117	+ 1.68	+ .89
0005	+ 449.87	+ 359.49	+ 404.68	0115	+ 1.44	+ .92
0006	+ 437.24	+ 329.12	+ 383.18	0113	+ 1.82	+ .84
0007	+ 440.99	+ 346.24	+ 393.62	0114	+ 1.55	+ .89
0008	+ 405.74	+ 363.62	+ 384.68	0117	+ .70	+ .93
0009	+ 367.50	+ 365.37	+ 366.43	0126	+ .03	+ .93
0010	+ 369.25	+ 327.12	+ 348.18	0138	+ .77	+ .84
0011	+ 415.25	+ 327.75	+ 371.50	0137	+ 1.52	+ .84
0012	+ 448.37	+ 325.62	+ 386.99	0133	+ 2.05	+ .83

ROW	LOW:C.U. MG/SQCM	H2O:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0004	+ 200.99 + 657.83	+ 214.48 + 703.36	+ 217.32 + 712.95
0005	+ 198.79 + 662.08	+ 207.86 + 693.22	+ 212.41 + 708.83
0006	+ 181.23 + 612.82	+ 200.12 + 678.81	+ 198.42 + 672.87
0007	+ 181.77 + 609.12	+ 195.04 + 655.08	+ 196.39 + 659.74
0008	+ 187.46 + 612.16	+ 195.35 + 638.79	+ 194.04 + 634.39
0009	+ 193.61 + 586.26	+ 201.50 + 610.99	+ 193.97 + 587.40
0010	+ 189.56 + 521.93	+ 213.47 + 590.33	+ 198.18 + 546.57
0011	+ 195.85 + 544.01	+ 219.32 + 611.65	+ 213.02 + 593.48
0012	+ 198.49 + 568.82	+ 222.14 + 639.03	+ 221.46 + 636.99

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NAME:BOBKO HEEL 7/17/72
WEDGE SLOPE: 2.55487E-3 INTERCEPT: 3.11794E-2 WATER I-Ø: 399

ROW	F-1	F-2	Y	CHANNELS	FAT EQUIV	LOW/H2O
4	514.625	413.875	464.25	119	1.40062	1.03728
5	511.625	409.125	460.375	116	1.43724	1.02538
6	513.625	390.125	451.875	114	1.76803	0.977757
7	503.875	409	456.437	114	1.34108	1.02506
8	492	414.625	453.312	114	1.09996	1.03916
9	445/125	412.5	428.812	118	0.489336	1.03383
10	444.5	346.125	395.312	123	1.60811	0.867481
11	477.875	389.125	433.5	137	1.32074	0.975251
12	514.125	391.375	452.75	137	1.75372	0.98089
MEAN	490.819	397.319	444.069	1092	1.35765	0.995788
S.D.	28.8004	21.9515	21.707			

ROW	LOW I-0		WATER I-0		MEAN I-0	
	C.U.	MG/CMSQ	C.U.	MG/CMSQ	C.U.	MG/CMSQ
4	207.264	669.524	202.909	655.198	220.933	714.481
5	197.407	653.894	194.5	644.086	211.097	700.088
6	185.609	625.074	188.174	633.879	202.36	682.587
7	185.224	623.751	182.402	614.062	197.734	666.703
8	186.319	627.509	181.939	612.474	196.488	662.426
9	180.207	585.551	176.28	572.527	184.783	600.731
10	168.26	523.236	185.746	578.88	184.604	575.246
11	193.018	539.254	196.452	549.063	207.813	581.523
12	199.273	557.122	201.916	564.675	219.23	614.14
MEAN	1702.58	600/546	1710.32	602.76	1825.04	644.214

NAME:BOBKO HEEL 10/10/72
BONE:300
WI0:410
WEDGE VALUES DATE10/10/72
SLOPE +0.2559659E-02 INTERCEPT +0.1700659E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0003	539.25	422.37	480.81	0116	1.57	1.03
0004	539.62	404.62	472.12	0115	1.85	.98
0005	513.12	421.87	467.50	0113	1.25	1.02
0006	510.62	404.74	457.68	0114	1.49	.98
0007	456.75	421.75	439.24	0119	.51	1.02
0008	464.37	361.62	413.00	0120	1.60	.88
0009	490.37	405.87	448.12	0139	1.21	.98
0010	525.49	389.50	457.49	0137	1.92	.94
0011	538.50	371.62	455.06	0133	2.38	.90

ROW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0003	208.45	695.42	205.00	683.80	223.49	746.05
0004	192.95	648.86	194.47	654.02	210.69	709.14
0005	195.84	670.45	192.61	659.29	207.44	710.57
0006	185.86	630.32	187.33	635.36	199.88	678.34
0007	191.23	621.19	187.87	610.15	196.07	637.07
0008	174.29	560.78	189.35	609.83	190.23	612.68
0009	205.75	571.66	207.16	575.61	219.52	610.35
0010	198.05	558.13	205.08	578.17	220.09	621.00
0011	200.19	581.40	213.26	619.80	227.13	660.53

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NAME:CRIPPEN HEEL 6/13/72
BONE:350
WI0:538
WEDGE VALUES DATE6/13/72
SLOPE +0.2528679E-02 INTERCEPT +0.2746599E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0005	615.99	488.12	552.06	0098	1.49	.90
0006	629.37	488.50	558.93	0096	1.62	.90
0007	602.75	469.50	536.12	0095	1.60	.87
0008	609.87	504.37	557.12	0093	1.22	.93
0009	596.75	520.75	558.74	0095	.87	.96
0010	576.37	542.37	559.37	0100	.39	1.00
0011	593.49	522.12	557.81	0103	.82	.97
0012	627.00	472.62	549.81	0106	1.81	.87
0013	617.62	471.75	544.68	0101	1.73	.87

ROW	LOW:C.U. MG/SQCM	H2O:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0005	158.10	167.64	170.16
0006	144.58	153.85	157.51
0007	137.53	150.47	150.14
0008	137.29	143.29	146.54
0009	142.28	145.38	148.97
0010	148.15	147.34	151.23
0011	141.74	144.82	148.55
0012	133.25	146.98	149.28
0013	136.41	149.68	150.93

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NAME:CRIPPEN HEEL 7/6/72
BONE:225
WI0:340
WEDGE VALUES DATE7/6/72
SLOPE +0.2623780E-02 INTERCEPT +0.4422520E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0005	390.37	304.37	347.37	0097	1.59	.89
0006	385.87	297.87	341.87	0095	1.64	.87
0007	385.50	306.62	346.06	0095	1.47	.90
0008	379.25	304.37	341.81	0094	1.41	.89
0009	360.50	323.24	341.87	0096	.70	.95
0010	362.62	349.74	356.18	0103	.23	1.02
0011	365.00	314.12	339.56	0105	.96	.92
0012	375.99	284.24	330.12	0107	1.79	.83
0013	384.25	290.00	337.12	0100	1.80	.85

ROW	LOW:C.U. MG/SQCM	H2O:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0005	161.25	171.99	174.07
0006	149.43	162.00	162.52
0007	145.85	155.66	157.24
0008	139.80	150.20	150.70
0009	148.81	153.66	154.19
0010	157.26	154.34	159.13
0011	144.11	152.42	152.28
0012	137.52	156.68	153.53
0013	142.58	158.49	157.64

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NAME:CRIPPEN HEEL 7/17/72
WEDGE SLØPE: 2.58625E-3 INTERCEPT: 2.02602E-2 WATER I-Ø: 399

RØW	F-1	F-2	Y	CHANNELS	FAT EQUIV	LØW/H20
6	439.25	376.375	432.812	96	1.68613	0.943296
7	520.75	400.375	460.562	97	1.63987	1.00345
8	498.875	392.375	445.625	95	1.54374	0.983396
9	486.375	413.875	450.125	94	1.03767	1.03728
10	482.625	397.625	440.125	95	1.24541	0.996554
11	471.375	421.625	446.5	97	0.717028	1.0567
12	460.75	438	449.375	102	0.325522	1.09774
13	485.75	402.625	444.187	106	1.20657	1.00909
14	503.25	377	440.125	101	1.85684	0.944862
MEAN	488.778	402.208	445.493	883	1.25653	1.00804
S.D.	17.5893	20.0569	7.78441			

RØW	LØW I-Ø		WATER I-Ø		MEAN I-Ø	
	C.U.	MG/CMSQ	C.U.	MG/CMSQ	C.U.	MG/CMSQ
6	153.182	609.137	158.786	631.708	166.594	663.161
7	150.199	590.888	149.865	589.558	163.784	645.039
8	140.431	563.94	142.072	570.414	152.571	613.146
9	139.997	568.032	136.557	553.879	147.89	600.497
10	134.777	540.723	135.105	542.057	144.424	579.988
11	143.154	562.804	137.804	541.478	148.714	584.969
12	147.96	553.051	138.448	516.992	150.575	562.964
13	138.264	496.513	137.306	493.021	148.678	534.504
14	130.009	489.832	135.737	511.312	145.645	549.742
MEAN	1278.02	552.775	1271.68	550.102	1368.83	592.668

NAME:CRIPPEN HEEL 7/25/72
BONE:275
WIØ:398
WEDGE VALUES DATE7/25/72
SLOPE +Ø.2572060E-Ø2 INTERCEPT +Ø.1887390E-Ø1

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H20
0005	+ 510.50	+ 374.75	+ 442.62	0097	+ 1.98	+ .94
0006	+ 537.12	+ 379.00	+ 458.06	0097	+ 2.24	+ .95
0007	+ 499.49	+ 387.49	+ 443.49	0095	+ 1.63	+ .97
0008	+ 502.75	+ 406.87	+ 454.81	0094	+ 1.36	+ 1.02
0009	+ 494.49	+ 395.12	+ 444.81	0094	+ 1.44	+ .99
0010	+ 475.00	+ 426.24	+ 450.62	0097	+ .69	+ 1.07
0011	+ 457.49	+ 445.25	+ 451.37	0102	+ .17	+ 1.11
0012	+ 478.87	+ 404.25	+ 441.56	0105	+ 1.08	+ 1.01
0013	+ 520.12	+ 391.50	+ 455.81	0104	+ 1.82	+ .98

ROW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0005	+ 156.88	+ 621.47	+ 162.72	+ 644.88	+ 173.03	+ 686.19
0006	+ 146.50	+ 579.87	+ 151.24	+ 598.88	+ 164.88	+ 653.53
0007	+ 140.74	+ 568.68	+ 143.28	+ 579.08	+ 153.57	+ 621.16
0008	+ 137.71	+ 562.27	+ 135.64	+ 553.70	+ 148.18	+ 605.58
0009	+ 133.81	+ 546.15	+ 134.50	+ 548.96	+ 144.95	+ 592.20
0010	+ 143.22	+ 566.75	+ 136.57	+ 540.08	+ 148.62	+ 588.37
0011	+ 146.80	+ 552.24	+ 135.36	+ 508.62	+ 148.19	+ 557.55
0012	+ 135.68	+ 495.08	+ 134.05	+ 489.03	+ 144.95	+ 529.41
0013	+ 138.63	+ 510.94	+ 140.34	+ 517.34	+ 154.45	+ 570.07

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NAME:CRIPPEN HEEL 9/20/72
WEDGE SLØPE: 2.5177E-3 INTERCEPT: 4.17814E-2 WATER I-Ø: 590

RØW	F-1	F-2	Y	CHANNELS	FAT EQUIV	LØW/H2Ø
6	699	521.875	610.437	96	1.87857	0.884534
7	712.125	542	627.062	95	1.75492	0.918644
8	665.375	544.5	604.937	95	1.28882	0.922881
9	676.25	571.25	623.75	94	1.08473	0.96822
10	670.125	581.375	625.75	97	0.913296	0.985381
11	649.125	642.625	645.875	101	6.46968E-2	1.08919
12	678.625	595.625	637.125	107	0.838655	1.00953
13	719.625	535.625	627.625	107	1.89833	0.907839
14	689.125	541	615.062	101	1.55574	0.916949
MEAN	684.375	563.986	624.181	893	1.25308	0.955909
S.D.	22.7892	37.9299	12.7639			

RØW	LØW I-Ø		WATER I-Ø		MEAN I-Ø	
	C.U.	MG/CMSQ	C.U.	MG/CMSQ	C.U.	MG/CMSQ
6	147.235	592.571	159.014	641.304	162.283	654.83
7	138.441	562.216	146.502	595.92	152.29	620.118
8	134.845	547.183	142.469	579.059	144.845	588.99
9	134.176	550.353	137.212	563.18	142.441	585.275
10	137.696	547.231	139.124	553.081	144.831	576.447
11	145.175	554.312	136.545	520.377	145.684	556.315
12	138.775	498.542	137.759	494.773	145.982	525.294
13	129.201	463.004	139.547	501.408	146.162	525.962
14	137.853	525.519	146.61	559.956	150.812	576.48
MEAN	1243.4	537.881	1284.78	556.562	1335.33	578.857

NAME:CRIPPEN HEEL 9/22/72
BONE:400
WI0:514
WEDGE VALUES DATE9/22/72
SLOPE +0.2584699E-02 INTERCEPT +0.2942919E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0005	+ 655.87	+ 505.37	+ 580.62	0097	+ 1.67	+ .98
0006	+ 678.87	+ 498.62	+ 588.75	0096	+ 1.98	+ .97
0007	+ 646.62	+ 501.12	+ 573.87	0095	+ 1.63	+ .97
0008	+ 641.12	+ 532.37	+ 586.75	0093	+ 1.19	+ 1.03
0009	+ 644.50	+ 523.99	+ 584.25	0095	+ 1.33	+ 1.01
0010	+ 612.49	+ 533.24	+ 572.87	0098	+ .89	+ 1.03
0011	+ 617.50	+ 550.87	+ 584.18	0104	+ .73	+ 1.07
0012	+ 632.12	+ 491.12	+ 561.62	0108	+ 1.62	+ .95
0013	+ 656.12	+ 493.12	+ 574.62	0102	+ 1.83	+ .95

ROW	LOW:C.U.	+ MG/SQCM	H2O:C.U.	+ MG/SQCM	MEAN:C.U.	+ MG/SQCM
0005	+ 155.56	+ 609.07	+ 157.20	+ 615.62	+ 169.02	+ 662.78
0006	+ 143.96	+ 568.80	+ 146.87	+ 580.55	+ 159.91	+ 633.08
0007	+ 138.59	+ 553.05	+ 141.00	+ 562.86	+ 151.47	+ [illegible]
0008	+ 135.96	+ 554.23	+ 132.69	+ 540.64	+ 145.00	+ 591.85
0009	+ 136.71	+ 545.40	+ 134.88	+ 537.94	+ 147.05	+ 587.50
0010	+ 138.49	+ 535.37	+ 134.89	+ 521.14	+ 145.51	+ 563.10
0011	+ 142.45	+ 518.56	+ 135.25	+ 491.76	+ 148.56	+ 541.28
0012	+ 133.62	+ 467.31	+ 138.54	+ 484.92	+ 148.11	+ 519.20
0013	+ 138.11	+ 512.48	+ 142.34	+ 528.52	+ 153.71	+ 571.65

NAME:CRIPPEN HEEL 10/10/72
BONE:300
WI0:410
WEDGE VALUES DATE10/10/72
SLOPE +0.2567929E-02 INTERCEPT +0.1782730E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0004	501.00	382.37	441.68	0097	1.73	.93
0005	530.62	387.25	458.93	0097	2.02	.94
0006	511.12	403.87	457.49	0096	1.51	.98
0007	497.62	411.25	454.43	0095	1.22	1.00
0008	514.99	430.62	472.81	0095	1.15	1.05
0009	495.50	427.37	461.43	0097	.95	1.04
0010	460.00	458.24	459.12	0103	.02	1.11
0011	487.24	409.87	448.56	0106	1.11	.99
0012	506.99	384.75	445.87	0102	1.77	.93

ROW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0004	160.35	636.84	167.12	664.00	174.34	692.99
0005	153.63	609.82	159.16	632.05	170.10	675.96
0006	148.08	593.74	149.52	599.60	160.04	642.29
0007	143.60	581.72	143.31	580.53	153.09	620.60
0008	144.07	583.64	139.41	564.52	152.95	620.03
0009	147.55	585.44	143.53	569.28	154.99	615.31
0010	151.38	565.41	139.92	522.08	151.58	566.15
0011	138.12	500.49	138.15	500.61	147.68	535.61
0012	131.89	496.62	138.38	521.38	146.93	554.04

NAME:THORNTON HEEL 6/13/72
BONE:350
WI0:535
WEDGE VALUES DATE6/13/72
SLOPE +0.2569819E-02 INTERCEPT +0.2270020E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0001	468.62	448.12	458.37	0145	.28	.83
0002	466.12	460.62	463.37	0138	.07	.86
0003	450.50	440.12	445.31	0135	.14	.82
0004	441.75	423.87	432.81	0130	.26	.79
0005	443.49	440.12	441.81	0125	.04	.82
0006	519.99	448.12	484.06	0123	.95	.83
0007	510.50	452.12	481.31	0115	.78	.84

ROW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0001	244.15	646.39	269.84	715.34	247.43	655.19
0002	234.61	652.74	255.27	710.99	235.44	655.06
0003	226.07	642.80	252.42	718.76	227.65	647.36
0004	204.42	603.07	234.69	693.67	207.13	611.18
0005	185.83	569.66	210.23	645.63	186.30	571.15
0006	182.95	569.96	204.74	638.91	192.44	599.98
0007	198.53	662.95	217.88	728.44	205.72	687.29

NAME:THØRNTØN HEEL 7/6/72
WEDGE SLØPE: 2.67503E-3 INTERCEPT: 1.71443E-2 WATER I-Ø: 320

RØW	F-1	F-2	Y	CHANNELS	FAT EQUIV	LØW/H20
6	324.62	296.5	310.56	128	0.58248	0.926563
7	291.12	284.89	288.005	137	0.139066	0.890281
8	282.75	273.24	277.995	132	0.219938	0.853875
9	281	271.37	276.185	130	0.224174	0.848031
10	317.12	271.62	294.37	131	0.995633	0.848812
11	336.62	254.74	295.68	129	1.79172	0.796062
12	363.62	258.37	310.995	120	2.19675	0.807406
MEAN	313.836	272.961	293.399	907	0.878537	0.853004
S.D.	30.782	14.4089	13.9819			

RØW	LØW I-Ø		WATER I-Ø		MEAN I-Ø	
	C.U.	MG/CMSQ	C.U.	MG/CMSQ	C.U.	MG/CMSQ
6	246.4	713.208	256.163	741.722	252.33	730.528
7	233.76	631.445	249.682	674.89	235.25	635.51
8	225.223	631.428	246.075	690.431	227.5	637.877
9	208.074	591.927	229.503	653.548	210.36	598.502
10	200.503	565.756	221.976	627.033	211.04	595.824
11	182.505	522.469	211.927	607.731	201.73	578.182
12	191.734	590.836	217.405	670.858	213.98	660.183
MEAN	1488.2	606.731	1632.73	666.609	1552.19	633.802

NAME:THØRNTØN HEEL 7/17/72
WEDGE SLØPE: 2.48181E-3 INTERCEPT: 3.84005E-2 WATER I-Ø: 399

RØW	F-1	F-2	Y	CHANNELS	FAT EQUIV	LØW/H2O
8	379.375	378.125	378.75	137	2.12164E-2	0.947682
9	383.875	359.5	371.687	133	0.421732	0.901003
10	385.125	375.125	380.125	130	0.169127	0.940163
11	406.375	362.75	384.562	131	0.730045	0.909148
12	416.125	363.625	389.875	130	0.866974	0.911341
13	479.875	363.25	421.562	120	1.78994	0.910401
14	489.75	369.25	429.5	110	1.81556	0.925439
MEAN	420.071	367.375	393.723	891	0.830656	0.920739
S.D.	46.2284	6.99553	22.5404			

RØW	LØW I-Ø		WATER I-Ø		MEAN I-Ø	
	C.U.	MG/CMSQ	C.U.	MG/CMSQ	C.U.	MG/CMSQ
8	226.856	651.734	234.218	673.387	227.082	652.4
9	213.415	631.082	227.28	673.087	217.849	644.516
10	207.64	628.101	215.661	652.962	209.361	633.436
11	191.971	574.994	204.448	613.372	199.62	598.522
12	180.01	542.464	192.079	579.871	189.071	570.549
13	187.245	613.252	198.51	651.076	205.11	673.24
14	223.039	801.523	231.563	832.745	239.665	862.425
MEAN	1430.18	634.736	1503.76	668.071	1487.76	662.155

NAME:THORNTON HEEL 7/25/72
BONE:300
WI0:345
WEDGE VALUES DATE7/25/72
SLOPE +0.2584118E-02 INTERCEPT +0.2814310E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0008	+ 347.75	+ 332.75	+ 340.25	0136	+ .28	+ .96
0009	+ 329.37	+ 321.50	+ 325.43	0129	+ .15	+ .93
0010	+ 344.37	+ 322.62	+ 333.50	0130	+ .41	+ .93
0011	+ 396.87	+ 325.74	+ 361.31	0129	+ 1.26	+ .94
0012	+ 393.37	+ 324.49	+ 358.93	0124	+ 1.23	+ .94
0013	+ 439.37	+ 324.24	+ 381.81	0115	+ 1.95	+ .93
0014	+ 424.62	+ 332.87	+ 378.74	0108	+ 1.56	+ .96

ROW	LOW:C.U.	MG/SQCM	H20:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0008	+ 229.38	+ 641.81	+ 234.30	+ 655.80	+ 232.41	+ 650.44
0009	+ 206.24	+ 607.79	+ 215.34	+ 635.09	+ 207.81	+ 612.50
0010	+ 200.06	+ 584.65	+ 208.78	+ 610.60	+ 204.37	+ 597.48
0011	+ 190.51	+ 560.61	+ 197.91	+ 582.83	+ 203.87	+ 600.70
0012	+ 178.63	+ 546.58	+ 186.22	+ 570.29	+ 191.14	+ 585.62
0013	+ 201.14	+ 665.96	+ 208.27	+ 689.97	+ 219.93	+ 729.20
0014	+ 239.98	+ 849.02	+ 243.85	+ 862.87	+ 253.93	+ 898.98

NAME:THORNTON HEEL 9/20/72
WEDGE SLOPE: 2.52128E-3 INTERCEPT: 3.07441E-2 WATER I-0: 580

ROW	F-1	F-2	Y	CHANNELS	FAT EQUIV	LOW/H20
6	549.375	529.375	539.375	141	0.238398	0.912716
7	530.5	529.625	530.062	137	1.06119E-2	0.913147
8	531.375	524.375	527.875	130	8.52487E-2	0.904095
9	526.125	524.875	525.5	129	1.52916E-2	0.904957
10	561.25	526	543.625	128	0.416991	0.906897
11	555.375	511	533.187	125	0.535333	0.881034
12	641.125	527.75	584.437	114	1.25101	0.909914
MEAN	556.446	524.714	540.58	904	0.364693	0.90468
S.D.	39.7196	6.38916	20.3646			

ROW	LOW I-0		WATER I-0		MEAN I-0	
	C.U.	MG/CMSQ	C.U.	MG/CMSQ	C.U.	MG/CMSQ
6	235.024	648.914	247.902	685.138	237.663	656.336
7	229.455	652.092	241.902	688.129	229.568	652.42
8	212.971	637.572	226.078	677.56	213.836	640.21.
9	198.101	596.888	210.984	636.498	198.254	597.36
10	180.955	548.517	193.464	587.278	185.173	561.589
11	176.961	549.301	192.793	599.536	182.274	566.159
12	204.182	698.189	214.945	735.632	215.813	738.655
MEAN	1437.65	618.782	1528.07	658.539	1462.58	630.39

NAME:THORNTON HEEL 9/22/72
BONE:400
WI0:514
WEDGE VALUES DATE9/22/72
SLOPE +0.2591120E-02 INTERCEPT +0.3373809E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H20
0006	503.49	479.12	491.31	0140	.31	.93
0007	494.24	491.75	493.00	0136	.03	.95
0008	490.87	483.87	487.37	0131	.09	.94
0009	494.00	488.50	491.25	0127	.07	.95
0010	540.62	477.25	508.93	0127	.80	.92
0011	553.49	476.75	515.12	0123	.95	.92
0012	611.12	475.00	543.06	0115	1.61	.92

ROW	LOW:C.U.	MG/SQCM	H20:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0006	233.21	629.86	243.04	656.98	236.72	639.56
0007	228.88	636.48	234.89	653.56	229.22	637.46
0008	212.38	612.66	220.29	635.97	213.32	615.44
0009	205.33	610.97	211.80	630.60	206.05	613.13
0010	181.77	539.36	191.19	567.99	189.93	564.17
0011	178.18	546.06	187.43	575.10	187.70	575.94
0012	196.64	646.91	205.72	677.36	212.04	698.59

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NAME:THORNTON HEEL 10/10/72
BONE:350
WI0:410
WEDGE VALUES DATE10/10/72
SLOPE +0.2595779E-02 INTERCEPT +0.7244409E-02

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0007	+ 398.50	+ 379.87	+ 389.18	0135	+ .30	+ .92
0008	+ 389.50	+ 377.49	+ 383.49	0130	+ .20	+ .92
0009	+ 384.87	+ 371.74	+ 378.31	0128	+ .22	+ .90
0010	+ 447.25	+ 393.49	+ 420.37	0129	+ .82	+ .95
0011	+ 446.99	+ 369.74	+ 408.37	0122	+ 1.21	+ .90
0012	+ 512.62	+ 380.99	+ 446.81	0115	+ 1.90	+ .92
0013	+ 508.87	+ 381.99	+ 445.43	0106	+ 1.84	+ .93

ROW	LOW:C.U. MG/SQCM	H2O:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0007	+ 226.80 + 644.42	+ 237.10 + 673.82	+ 230.07 + 653.75
0008	+ 210.97 + 622.41	+ 221.71 + 654.23	+ 213.02 + 628.48
0009	+ 201.11 + 602.49	+ 213.64 + 640.22	+ 203.35 + 609.23
0010	+ 189.54 + 563.27	+ 194.84 + 579.09	+ 198.07 + 588.72
0011	+ 177.83 + 558.76	+ 190.44 + 598.56	+ 189.95 + 597.04
0012	+ 208.13 + 694.45	+ 216.57 + 722.71	+ 226.46 + 755.83
0013	+ 254.82 + 923.33	+ 262.32 + 950.58	+ 271.11 + 982.52

NAME:ULLMANN HEEL 7/16/72
BONE:250
WI0:397
WEDGE VALUES DATE7/16/72
SLOPE +0.2553569E-02 INTERCEPT +0.3126869E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H20
0006	435.87	344.25	390.06	0105	1.51	.86
0007	465.50	337.00	401.25	0106	2.07	.84
0008	448.00	336.25	392.12	0108	1.84	.84
0009	412.37	347.87	380.12	0112	1.09	.87
0010	380.37	356.24	368.31	0109	.42	.89
0011	400.49	360.25	380.37	0116	.68	.90
0012	429.62	334.99	382.31	0121	1.59	.84
0013	446.37	341.75	394.06	0116	1.71	.86
0014	445.50	337.00	391.25	0108	1.79	.84

ROW	LOW:C.U. MG/SQCM	H20:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0006	167.44 612.24	182.41 668.07	180.55 661.17
0007	161.83 585.64	179.20 649.81	180.33 653.98
0008	161.16 572.14	179.10 637.18	177.76 632.34
0009	158.54 542.09	173.33 593.82	168.47 576.81
0010	165.90 583.80	177.70 626.21	169.53 596.84
0011	168.98 558.23	180.25 596.27	175.29 579.52
0012	163.43 516.70	183.98 583.20	179.42 568.43
0013	164.48 543.03	181.86 601.71	181.00 598.80
0014	167.86 596.42	185.55 660.59	183.98 654.87

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NAME:ULLMAN HEEL 7/24/72
BONE:250
WI0:398
WEDGE VALUES DATE7/24/72
SLOPE +0.2602270E-02 INTERCEPT +0.1362259E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H20
0006	494.00	398.87	446.43	0104	1.37	1.00
0007	527.00	400.49	463.75	0104	1.76	1.00
0008	510.24	392.25	451.25	0107	1.69	.98
0009	467.12	400.74	433.93	0112	.98	1.00
0010	441.12	411.87	426.50	0109	.44	1.03
0011	449.74	397.62	423.68	0121	.79	.99
0012	516.25	381.99	449.12	0122	1.93	.95
0013	542.75	403.50	473.12	0119	1.90	1.01
0014	527.12	374.49	450.81	0110	2.19	.94

1008

ROW	LOW:C.U. MG/SQCM	H20:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0006	167.20 612.57	166.97 611.73	178.91 655.86
0007	164.26 601.70	163.60 599.30	179.51 658.05
0008	159.07 566.07	160.63 571.66	174.06 619.91
0009	153.06 519.94	152.29 517.29	161.97 550.51
0010	157.03 548.39	153.30 535.22	160.83 561.80
0011	157.33 494.45	157.45 494.81	165.02 518.84
0012	155.40 484.28	160.41 500.04	175.15 546.48
0013	158.30 505.97	156.67 500.70	177.25 567.15
0014	152.87 528.82	159.56 552.20	173.27 600.09

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540.2433 586.5211

NAME:ULLNANN HEEL 9/20/72
BONE:350
WI0:550
WEDGE VALUES DATE9/20/72
SLOPE +0.2502899E-02 INTERCEPT +0.5710710E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0004	709.62	535.24	622.43	0106	1.81	.97
0005	709.37	533.49	621.43	0105	1.83	.96
0006	708.99	536.12	622.56	0105	1.79	.97
0007	678.37	554.37	616.37	0108	1.29	1.00
0008	623.87	571.37	597.62	0111	.56	1.03
0009	576.24	491.87	534.06	0111	1.01	.89
0010	667.87	547.37	607.62	0124	1.27	.99
0011	708.87	535.24	622.06	0120	1.80	.97
0012	712.49	536.75	624.62	0113	1.82	.97

ROW	LOW:C.U. MG/SQCM	H2O:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0004	168.88 + 613.72	171.76 + 624.59	184.87 + 674.02
0005	162.27 + 594.65	165.47 + 606.82	178.29 + 655.61
0006	157.65 + 577.08	160.33 + 587.29	173.35 + 636.80
0007	159.37 + 566.78	158.52 + 563.62	170.82 + 609.14
0008	157.45 + 543.92	153.22 + 528.69	162.44 + 561.87
0009	150.02 + 517.19	162.42 + 561.82	159.16 + 550.07
0010	161.63 + 497.98	162.22 + 499.89	174.58 + 539.70
0011	159.15 + 507.07	162.41 + 517.93	177.18 + 567.13
0012	160.06 + 543.11	162.81 + 552.86	177.19 + 603.69

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NAME:ULLMANN HEEL 9/22/72
BONE:400
WI0:514
WEDGE VALUES DATE9/22/72
SLOPE +0.2556069E-02 INTERCEPT +0.4267660E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0006	645.50	504.99	575.25	0105	1.57	.98
0007	652.87	480.99	566.93	0106	1.96	.93
0008	628.25	498.37	563.31	0110	1.48	.96
0009	595.25	523.37	559.31	0108	.82	1.01
0010	564.87	518.25	541.56	0112	.55	1.00
0011	606.25	511.74	559.00	0120	1.08	.99
0012	626.87	496.12	561.49	0120	1.50	.96
0013	656.74	496.24	576.50	0114	1.80	.96
0014	653.49	483.12	568.31	0103	1.94	.93

ROW	LOW:C.U. MG/SQCM	H2O:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0006	167.80 + 608.53	169.65 + 615.44	181.48 + 659.49
0007	156.84 + 562.17	163.87 + 588.13	174.26 + 626.48
0008	160.13 + 552.84	163.53 + 564.92	173.61 + 600.76
0009	157.06 + 552.25	155.11 + 545.18	164.23 + 578.23
0010	163.54 + 554.59	162.62 + 551.37	168.47 + 571.80
0011	164.80 + 520.59	165.32 + 522.31	175.40 + 555.14
0012	158.52 + 500.13	162.77 + 513.98	173.38 + 548.56
0013	160.00 + 532.41	164.01 + 546.16	177.09 + 591.05
0014	164.70 + 608.90	171.08 + 633.14	181.43 + 672.43

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NAME:ULLMANN HEEL 9/5/72
BONE:400
WI0:567
WEDGE VALUES DATE9/5/72
SLOPE +0.2524999E-02 INTERCEPT +0.1009450E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0006	620.62	506.12	563.37	0105	1.31	.89
0007	649.87	493.62	571.75	0105	1.76	.87
0008	645.99	486.25	566.12	0108	1.82	.85
0009	605.62	530.50	568.06	0112	.85	.93
0010	569.50	507.24	538.37	0110	.74	.89
0011	619.00	518.25	568.62	0120	1.14	.91
0012	649.74	488.87	569.31	0121	1.82	.86
0013	670.99	469.75	570.37	0116	2.29	.82
0014	653.00	485.50	569.24	0106	1.90	.85

ROW	LOW:C.U. MG/SQCM	H2O:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0006	169.77 + 636.35	181.69 + 681.33	181.02 + 678.79
0007	160.12 + 599.94	174.67 + 654.83	175.54 + 658.13
0008	158.56 + 577.48	175.16 + 638.32	174.99 + 637.71
0009	158.13 + 555.18	165.58 + 581.53	165.79 + 582.27
0010	159.63 + 570.73	171.88 + 614.83	166.18 + 594.32
0011	165.76 + 543.08	176.55 + 578.68	176.89 + 579.82
0012	159.05 + 516.59	176.99 + 575.30	177.48 + 576.91
0013	153.29 + 519.37	175.12 + 593.89	175.80 + 596.24
0014	162.95 + 604.83	179.40 + 666.29	179.82 + 667.86

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NAME:ULLMANN HEEL 10/10/72
BONE:300
WI0:418
WEDGE VALUES DATE10/10.72
SLOPE +0.2466809E-02 INTERCEPT +0.5229610E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0006	533.24	404.49	468.87	0103	1.77	.96
0007	539.62	412.24	475.93	0106	1.73	.98
0008	527.75	435.12	481.43	0109	1.24	1.04
0009	490.50	443.37	466.93	0109	.64	1.06
0010	451.87	449.00	450.43	0113	.04	1.07
0011	523.62	412.00	467.81	0124	1.54	.98
0012	579.74	398.37	489.06	0122	2.41	.95
0013	562.12	404.74	483.43	0114	2.11	.96
0014	544.87	413.87	479.37	0105	1.76	.99

ROW	LOW:C.U. MG/SQCM	H2O:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0006	167.16 + 636.71	170.54 + 650.01	182.37 + 696.57
0007	164.85 + 609.26	166.32 + 614.87	180.08 + 667.50
0008	171.61 + 617.04	167.23 + 600.76	182.63 + 658.04
0009	168.48 + 605.42	162.06 + 581.52	174.13 + 626.41
0010	174.96 + 606.46	166.87 + 577.46	175.32 + 607.76
0011	168.21 + 528.73	170.00 + 534.59	183.96 + 580.23
0012	163.73 + 522.84	169.59 + 542.34	188.75 + 605.99
0013	168.96 + 579.63	172.63 + 592.69	189.21 + 651.65
0014	176.36 + 659.72	177.41 + 663.74	191.79 + 719.28

NAME:BROWN HEEL 7/5/72
BONE:250
WI0:427
WEDGE VALUES DATE7/5/72
SLOPE +0.2592747E-02 INTERCEPT +0.3041038E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0004	504.87	383.62	444.25	0107	1.76	.89
0005	513.74	383.12	448.43	0106	1.88	.89
0006	512.24	412.24	462.24	0113	1.39	.96
0007	513.12	455.00	484.06	0118	.77	1.06
0008	518.49	512.87	515.68	0126	.07	1.20
0009	568.75	443.12	505.93	0135	1.60	1.03
0010	542.50	431.87	487.18	0139	1.46	1.01
0011	584.74	393.12	488.93	0136	2.55	.92
0012	550.37	409.62	480.00	0131	1.89	.95

1111

ROW	LOW:C.U. MG/SQCM	H2O:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0004	156.89 553.81	168.35 595.12	172.59 610.40
0005	145.98 519.44	157.47 561.26	162.66 580.15
0006	153.58 512.47	157.55 526.03	166.51 556.63
0007	161.57 516.38	154.07 491.88	168.87 540.26
0008	176.09 527.31	153.01 456.64	176.78 529.42
0009	160.62 447.16	155.61 432.86	178.51 498.29
0010	166.09 449.14	164.51 444.76	182.84 495.62
0011	155.22 428.47	166.46 460.35	184.88 512.59
0012	163.83 470.62	169.27 486.64	184.59 531.77
*	491.6444		540.57

NAME:BROWN HEEL 7/16/72
BONE:250
WI0:416
WEDGE VALUES DATE7/16/72
SLOPE +0.2539147E-02 INTERCEPT +0.3936128E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0004	460.00	346.24	403.12	0107	1.82	.83
0005	457.12	338.75	397.93	0111	1.92	.81
0006	459.74	368.00	413.87	0114	1.43	.88
0007	451.99	377.25	414.62	0118	1.16	.90
0008	436.25	425.12	430.68	0126	.16	1.02
0009	479.87	383.00	431.43	0136	1.44	.92
0010	501.37	362.74	432.06	0138	2.08	.87
0011	507.87	344.62	426.24	0135	2.49	.82
0012	489.00	342.50	415.74	0126	2.28	.82

111

ROW	LOW:C.U. MG/SQCM	H2O:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0004	151.21 541.08	170.85 613.36	167.49 600.98
0005	145.41 500.42	168.21 581.32	163.28 563.84
0006	150.69 505.09	164.67 553.37	164.08 551.36
0007	152.91 494.85	164.45 533.36	164.05 532.05
0008	176.25 516.65	[illegible]	171.89 521.77
0009	162.29 454.49	173.54 487.04	178.49 501.39
0010	161.27 444.74	180.17 498.68	185.40 513.60
0011	156.44 440.88	181.85 515.01	185.14 524.60
0012	160.78 487.04	185.27 563.60	185.20 563.37
*G 5,13	487.2488		552.5511

NAME:BROWN HEEL 7/24/72
BONE:250
WI0:398
WEDGE VALUES DATE7/24/72 INTERCEPT +0.3952388E-02
SLOPE +0.2607628E-02

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H20
0004	491.37	375.74	433.56	0105	1.72	.94
0005	475.37	361.12	418.25	0108	1.76	.90
0006	493.37	371.25	432.31	0111	1.82	.93
0007	494.75	407.87	451.31	0117	1.24	1.02
0008	472.75	457.25	464.99	0123	.21	1.14
0009	521.75	432.87	477.31	0134	1.20	1.08
0010	541.37	398.50	469.93	0139	1.96	1.00
0011	593.00	390.25	491.62	0137	2.68	.98
0012	550.99	384.25	467.62	0131	2.31	.96

ROW	LOW:C.U. MG/SQCM	H20:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0004	154.09	561.29	160.13	583.35	169.12	616.17
0005	140.71	498.12	151.21	535.41	156.57	554.44
0006	144.86	498.97	152.58	525.65	161.76	557.37
0007	151.61	495.44	148.75	486.04	163.45	534.25
0008	168.44	523.66	151.37	470.44	170.51	530.10
0009	169.62	483.93	158.37	451.72	182.72	521.41
0010	157.85	433.98	157.67	433.50	180.77	497.21
0011	160.64	448.17	163.34	455.71	192.28	536.73
0012	154.40	450.50	159.01	463.98	180.13	525.80

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NAME:BROWN HEEL 9/5/72
BONE:400
WI0:532
WEDGE VALUES DATE9/5/72 INTERCEPT +0.2855059E-02
SLOPE +0.2535820E-02

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H20
0004	593.49	443.75	518.62	0107	1.86	.83
0005	610.37	457.37	533.87	0111	1.85	.85
0006	618.62	495.00	556.81	0114	1.43	.93
0007	596.87	540.37	568.62	0120	.63	1.01
0008	635.99	551.37	593.68	0130	.91	1.03
0009	634.99	527.75	581.37	0136	1.18	.99
0010	688.12	482.12	585.12	0138	2.28	.90
0011	670.99	476.62	573.81	0134	2.19	.89
0012	682.50	462.12	572.31	0123	2.50	.86

ROW	LOW:C.U. MG/SQCM	H20:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0004	146.41	538.47	165.82	610.00	163.09	599.96
0005	146.11	517.98	162.89	577.58	163.28	578.97
0006	151.17	521.82	159.39	550.25	164.59	568.22
0007	163.29	535.48	161.41	529.33	169.40	555.58
0008	167.39	506.65	162.74	492.54	177.00	535.80
0009	164.92	477.08	166.01	480.24	178.08	515.24
0010	157.96	450.28	171.55	489.10	184.68	526.64
0011	155.97	457.90	170.70	501.25	180.84	531.08
0012	161.78	517.57	179.10	573.10	188.08	601.90

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NAME:BROWN HEEL 9/19/72
BONE:300
WI0:484
WEDGE VALUES DATE9/19/72
SLOPE +0.2623909E-02 INTERCEPT +0.3154659E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H20
0004	563.12	422.24	492.68	0107	1.85	.87
0005	579.12	433.00	506.06	0107	1.86	.89
0006	572.49	467.37	519.93	0112	1.30	.96
0007	571.50	514.99	543.25	0117	.66	1.06
0008	582.87	558.50	570.68	0123	.27	1.15
0009	623.99	522.12	573.06	0134	1.14	1.07
0010	632.00	466.00	549.00	0139	1.95	.96
0011	681.49	453.24	567.37	0138	2.62	.93
0012	615.62	459.25	537.43	0128	1.88	.94

ROW	LOW:C.U.	MG/SQCM	H20:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0004	150.63	524.49	165.23	576.50	167.13	583.28
0005	144.77	503.64	156.69	546.08	161.46	563.06
0006	152.67	507.49	156.59	520.81	164.61	548.11
0007	161.48	513.97	154.21	490.31	167.72	534.33
0008	163.87	495.75	146.26	441.18	166.53	503.97
0009	158.66	439.24	148.50	410.34	171.14	474.71
0010	149.51	397.92	154.78	412.36	172.30	460.39
0011	153.73	412.53	162.78	437.54	184.72	498.12
0012	158.11	458.74	164.83	478.75	178.23	518.66

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NAME:BROWN HEEL 9/21/72
BONE:350
WI0:520
WEDGE VALUES DATE9/21/72
SLOPE +0.2597149E-02 INTERCEPT +0.2162510E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H20
0004	557.50	446.37	501.93	0106	1.42	.85
0005	578.62	430.75	504.68	0109	1.89	.82
0006	576.75	447.75	512.24	0112	1.62	.86
0007	588.87	513.74	551.31	0117	.87	.98
0008	574.62	560.50	567.56	0123	.15	1.07
0009	622.87	529.99	576.43	0133	1.03	1.01
0010	595.49	483.12	539.31	0138	1.34	.92
0011	658.99	467.75	563.37	0138	2.20	.89
0012	620.49	449.74	535.12	0130	2.06	.86

ROW	LOW:C.U.	MG/SQCM	H20:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0004	158.17	566.21	174.35	625.00	170.60	611.38
0005	148.46	516.11	168.98	588.61	165.73	577.10
0006	148.30	501.52	165.06	559.12	163.38	553.34
0007	161.12	521.93	162.54	526.59	169.38	549.10
0008	168.51	519.17	159.28	490.30	170.05	524.00
0009	165.31	470.27	162.78	462.93	176.48	502.61
0010	157.62	431.65	167.84	459.97	172.87	474.01
0011	157.88	432.19	172.49	472.96	183.55	503.81
0012	156.75	455.96	175.62	511.84	179.35	522.88

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NAME:BROWN HREL 10/6/72
BONE:350
WI0:508
WEDGE VALUES DATE10/6/72
SLOPE +0.2485139E-02 INTERCEPT +0.2960419E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0002	601.12	477.37	539.25	0106	1.48	.93
0003	611.87	456.99	534.43	0108	1.87	.89
0004	623.25	473.37	548.31	0111	1.76	.93
0005	645.87	485.00	565.43	0117	1.84	.95
0006	611.12	572.25	591.68	0123	.42	1.12
0007	656.74	551.74	604.25	0134	1.11	1.08
0008	623.74	519.50	571.62	0138	1.17	1.02
0009	720.12	491.62	605.87	0138	2.45	.96
0010	667.12	494.37	580.75	0131	1.92	.97

ROW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0002	156.36	581.68	162.96	606.70	169.28	630.72
0003	144.09	524.95	155.51	567.52	160.99	587.94
0004	143.09	506.83	150.93	535.24	159.40	565.96
0005	141.74	475.57	147.16	494.22	159.69	537.32
0006	164.28	525.54	149.63	477.62	168.39	538.98
0007	162.81	477.01	151.74	443.77	174.99	513.58
0008	157.06	446.06	153.97	437.05	170.25	484.53
0009	159.70	453.77	164.22	466.95	188.54	537.85
0010	159.24	477.23	162.80	488.17	180.33	542.02

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NAME:ALEXANDER HEEL 7/5/72
BONE:225
WIØ:431
WEDGE VALUES DATE7/5/72
SLOPE +Ø.2646538E-Ø2 INTERCEPT -Ø.2223338E-Ø2

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
Ø004	561.62	416.99	489.31	Ø109	1.91	.96
Ø005	581.50	444.37	512.93	Ø107	1.72	1.03
Ø006	545.12	443.49	494.31	Ø105	1.32	1.02
Ø007	519.62	459.74	489.68	Ø106	.78	1.06
Ø008	530.75	476.37	503.56	Ø110	.69	1.10
Ø009	606.75	457.62	532.18	Ø114	1.81	1.06
Ø010	576.62	424.49	500.56	Ø116	1.96	.98
Ø011	595.87	418.12	506.99	Ø124	2.27	.97
Ø012	607.62	405.62	506.62	Ø119	2.59	.94

RØW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
Ø004	154.53	536.54	158.13	549.02	171.96	596.96
Ø005	160.73	568.43	157.46	556.88	176.08	622.65
Ø006	160.22	577.41	157.21	566.61	171.61	618.39
Ø007	160.87	574.29	154.02	549.89	167.55	598.12
Ø008	162.56	559.24	151.55	521.42	168.66	580.21
Ø009	158.26	525.39	151.42	502.75	175.47	582.43
Ø010	145.82	475.84	147.58	481.58	164.94	538.12
Ø011	146.72	447.93	150.48	459.39	170.62	520.75
Ø012	145.25	462.06	152.47	484.99	171.71	546.07

NAME:ALEX HEEL 7/18/72
WEDGE SLØPE: 2.60033E-3 INTERCEPT: 4.27099E-3 WATER I-Ø: 380

RØW	F-1	F-2	Y	CHANNELS	FAT EQUIV	LØW/H2O
5	495.5	370.125	432.812	108	1.87539	0.974013
6	500.75	379.25	440	106	1.78657	0.998026
7	478.25	383.25	430.75	104	1.42358	1.00855
8	471.125	399.75	435.437	104	1.05611	1.05197
9	462.625	437.875	450.25	110	0.353464	1.1523
10	475.25	441.125	458.187	119	0.47901	1.16086
11	536	372.875	454.437	115	2.33287	0.98125
12	504.75	366.375	435.562	125	2.05975	0.964145
13	532.625	369.875	451.25	119	2.34419	0.973355
MEAN	495.208	391.167	443.187	1010	1.52344	1.02939
S.D.	26.2522	29.1572	10.351			

RØW	LØW I-Ø		WATER I-Ø		MEAN I-Ø	
	C.U.	MG/CMSQ	C.U.	MG/CMSQ	C.U.	MG/CMSQ
5	159.043	564.678	161.887	574.804	175.941	624.849
6	160.246	579.729	160.456	580.489	175.996	636.867
7	159.377	587.696	158.492	584.421	171.529	632.629
8	157.868	582.116	152.599	562.631	166.762	615.001
9	167.29	583.213	151.696	528.696	170.356	593.931
10	172.603	556.149	154.853	498.788	177.119	570.743
11	147.08	490.202	149.257	497.481	169.829	566.276
12	143.303	439.235	147.868	453.277	164.926	505.758
13	147.606	475.368	150.82	485.754	171.27	551.842
MEAN	1414.42	539.821	1387.93	529.593	1543.73	588.655

NAME:ALEXANDER HEEL 7/24/72
BONE:340
WI0:389
WEDGE VALUES DATE7/24/72
SLOPE +0.2575649E-02 INTERCEPT +0.2154799E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0003	482.62	406.75	444.68	0105	1.09	1.04
0004	473.99	407.37	440.68	0104	.97	1.04
0005	511.74	442.87	477.31	0105	.92	1.13
0006	509.25	463.87	486.56	0114	.59	1.19
0007	561.24	470.74	515.99	0120	1.13	1.21
0008	612.87	441.12	527.00	0126	2.11	1.13
0009	560.99	422.12	491.56	0125	1.82	1.08
0010	557.99	387.12	472.56	0120	2.35	.99
0011	553.49	384.00	468.75	0112	2.35	.98

ROW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0003	160.33	584.48	155.64	567.16	169.69	619.10
0004	160.02	589.02	155.22	571.10	168.19	619.53
0005	162.96	594.21	149.34	543.85	170.82	623.28
0006	170.34	571.78	150.27	503.43	175.78	590.31
0007	169.51	540.09	146.62	466.03	180.53	575.73
0008	157.85	478.04	142.01	429.21	180.26	547.10
0009	153.60	468.72	143.38	436.99	172.63	527.85
0010	145.88	463.61	146.46	465.49	169.81	541.04
0011	147.18	501.85	148.63	506.87	169.52	579.28

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NAME:ALEXANDER HEEL 9/21/72
BONE:350
WI0:520
WEDGE VALUES DATE9/21/72
SLOPE +0.2578588E-02 INTERCEPT +0.1916120E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0004	677.62	532.87	605.25	0109	1.54	1.02
0005	669.12	550.75	609.93	0106	1.25	1.05
0006	655.50	519.74	587.62	0105	1.49	.99
0007	645.12	559.49	602.31	0106	.91	1.07
0008	652.50	595.12	623.81	0108	.59	1.14
0009	655.24	571.24	613.25	0113	.88	1.09
0010	663.24	562.75	613.00	0117	1.05	1.08
0011	757.12	497.62	627.37	0124	2.69	.95
0012	742.62	509.62	626.12	0121	2.42	.98

ROW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0004	158.62	556.93	155.95	547.44	172.50	606.32
0005	160.33	579.14	154.24	556.86	171.15	618.73
0006	152.42	555.53	152.47	555.72	165.31	603.13
0007	156.35	564.59	148.59	536.20	164.16	593.19
0008	156.24	553.60	141.66	501.27	161.32	571.86
0009	155.34	525.70	144.72	489.24	163.36	552.21
0010	150.46	491.29	141.21	460.65	160.46	524.46
0011	137.46	422.49	142.91	439.54	166.19	512.34
0012	138.87	437.68	141.31	445.49	163.79	517.52

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NAME:ALEXANDER HEEL 9/22/72
BONE:400
WI0:514
WEDGE VALUES DATE9/22/72
SLOPE +0.2570139E-02 INTERCEPT +0.3741579E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0004	660.12	510.74	585.43	0105	1.64	.99
0005	656.62	503.37	580.00	0103	1.70	.97
0006	627.00	530.12	578.56	0104	1.07	1.03
0007	613.00	567.74	590.37	0106	.49	1.10
0008	649.87	585.87	617.87	0116	.66	1.13
0009	717.37	518.37	617.87	0115	2.08	1.00
0010	678.62	486.87	582.75	0118	2.13	.94
0011	708.00	475.87	591.93	0124	2.55	.92
0012	705.62	494.62	600.12	0117	2.28	.96

ROW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0004	156.65	565.93	157.32	568.40	170.98	619.03
0005	155.23	571.83	157.38	579.96	169.82	626.96
0006	159.66	582.77	156.45	570.76	168.75	616.79
0007	161.07	576.67	150.53	537.98	165.21	591.88
0008	168.79	551.62	153.61	500.70	174.96	572.31
0009	148.32	487.26	147.34	483.96	168.51	555.58
0010	142.30	454.66	148.70	475.75	163.51	524.60
0011	137.06	415.51	146.61	445.50	164.12	500.43
0012	144.35	465.50	148.85	480.45	166.97	540.73

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NAME:LA PINTA HEEL 6/12/72
BONE:350
WI0:548
WEDGE VALUES DATE6/12/72
SLOPE +0.2550138E-02 INTERCEPT +0.3405279E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0003	603.50	498.37	550.93	0110	1.23	.90
0004	573.62	527.99	550.81	0110	.53	.96
0005	610.12	526.00	568.06	0108	.95	.95
0006	564.24	544.87	554.56	0110	.22	.99
0007	638.25	542.99	590.62	0117	1.03	.99
0008	701.37	484.25	592.81	0126	2.38	.88
0009	765.62	466.00	615.81	0124	3.19	.85
0010	795.74	483.24	639.50	0118	3.20	.88
0011	778.12	482.50	630.31	0107	3.07	.88

ROW	LOW:C.U. MG/SQCM		H2O:C.U. MG/SQCM		MEAN:C.U. MG/SQCM	
0003	162.29	565.21	172.73	602.43	173.32	604.53
0004	163.95	571.13	168.04	585.71	168.60	587.71
0005	149.80	530.58	154.23	546.64	158.11	560.74
0006	150.18	522.01	150.60	524.26	152.11	528.93
0007	142.52	464.33	143.59	467.92	152.36	497.30
0008	131.88	397.08	147.46	445.58	157.36	476.40
0009	118.90	362.65	138.99	426.21	153.46	471.96
0010	123.12	395.82	137.96	445.13	156.18	505.68
0011	135.27	482.42	148.90	532.33	163.87	587.21

*

NAME:LA PINTA HEEL 7/6/72
BONE:300
WI0:435
WEDGE VALUES DATE7/6/72
SLOPE +0.2513937E-02 INTERCEPT +0.4722900E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0005	532.37	467.37	499.87	0115	.83	1.07
0006	524.87	452.62	488.74	0111	.95	1.04
0007	514.87	430.87	472.87	0111	1.14	.99
0008	505.74	469.12	487.43	0110	.48	1.07
0009	480.87	468.00	474.43	0113	.17	1.07
0010	565.62	439.99	502.81	0119	1.61	1.01
0011	642.75	427.25	535.00	0125	2.62	.98
0012	683.87	420.25	552.06	0120	3.13	.96
0013	716.62	405.74	561.18	0112	3.65	.93

ROW	LOW:C.U. MG/SQCM		H2O:C.U. MG/SQCM		MEAN:C.U. MG/SQCM	
0005	175.38	587.87	167.13	559.31	183.11	614.61
0006	166.86	579.19	162.45	563.39	175.38	609.74
0007	155.20	537.42	156.86	541.21	165.53	574.42
0008	156.04	545.51	147.74	515.47	160.26	560.74
0009	148.88	505.30	140.61	476.21	150.42	510.74
0010	134.00	429.14	132.64	424.59	149.88	482.22
0011	126.82	384.80	129.07	391.95	154.93	474.26
0012	124.69	394.55	128.83	408.28	157.43	503.07
0013	121.66	413.33	129.46	441.02	157.99	542.34

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NAME:LA PINTA HEEL 7/16/72
WEDGE SLØPE: 2.61445E-3 INTERCEPT: 1.35163E-2 WATER I-Ø: 361

RØW	F-1	F-2	Y	CHANNELS	FAT EQUIV	LØW/H20
6	447.25	380.25	413.75	115	1.04329	1.05332
7	[illegible]	378	[illegible]	114	1.10296	1.04709
8	442.875	353.375	398.125	114	1.4513	0.978878
9	409.125	382.875	396	111	0.426292	1.0606
10	381.75	375.5	378.625	115	0.106119	1.04017
11	455.25	346.75	401	123	1.75013	0.960526
12	524.75	330.25	427.5	122	2.97689	0.91482
13	564.875	357.375	461.125	119	2.94312	0.989958
14	590	337.25	463.625	110	3.59549	0.934211
MEAN	473.847	360.181	417.014	1043	1.71062	0.99773
S.D.	70.429	19.7682	29.1135			

RØW	LØW I-Ø		WATER I-Ø		MEAN I-Ø	
	C.U.	MG/CMSQ	C.U.	MG/CMSQ	C.U.	MG/CMSQ
6	175.944	580.019	169.97	560.148	185.654	612.314
7	171.92	571.653	166.675	554.052	182.119	605.871
8	158.722	527.371	161.156	535.537	172.315	572.978
9	162.011	553.095	155.48	530.593	165.752	565.987
10	147.535	485.531	143.006	470.469	148.488	488.701
11	135.465	416.083	140.419	431.487	153.344	471.68
12	121.418	375.495	132.279	409.548	152.907	474.218
13	132.195	419.732	133.396	423.592	162.526	517.222
14	130.676	449.216	138.162	475.245	165.684	570.944
MEAN	1335.89	486.466	1340.54	487.852	1488.79	542.213

NAME:LA PINTA HEEL 7/24/72
BONE:250
WI0:399
WEDGE VALUES DATE7/24/72
SLOPE +0.2538159E-02 INTERCEPT +0.3488860E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H20
0005	+ 501.99	+ 402.37	+ 452.18	0115	+ 1.42	+ 1.00
0006	+ 479.49	+ 408.24	+ 443.87	0114	+ 1.03	+ 1.02
0007	+ 463.75	+ 416.12	+ 439.93	0111	+ .69	+ 1.04
0008	+ 475.87	+ 398.37	+ 437.12	0111	+ 1.14	+ .99
0009	+ 453.37	+ 416.62	+ 435.00	0115	+ .54	+ 1.04
0010	+ 474.62	+ 405.87	+ 440.25	0120	+ 1.00	+ 1.01
0011	+ 549.50	+ 376.25	+ 462.87	0125	+ 2.43	+ .94
0012	+ 615.62	+ 390.74	+ 503.18	0122	+ 2.92	+ .97
0013	+ 645.99	+ 381.75	+ 513.87	0115	+ 3.38	+ .95
				1048		

ROW	LOW:C.U.	MG/SQCM	H20:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0005	+ 167.93	+ 561.58	+ 166.96	+ 558.26	+ 181.35	+ 607.56
0006	+ 173.36	+ 585.39	+ 170.74	+ 576.36	+ 182.90	+ 618.36
0007	+ 168.06	+ 582.77	+ 163.39	+ 566.21	+ 174.23	+ 604.69
0008	+ 155.76	+ 539.12	+ 155.93	+ 539.74	+ 166.06	+ 575.69
0009	+ 151.14	+ 504.06	+ 146.17	+ 487.03	+ 156.10	+ 521.06
0010	+ 142.06	+ 452.67	+ 140.01	+ 445.94	+ 151.81	+ 484.70
0011	+ 125.23	+ 380.97	+ 132.57	+ 404.10	+ 151.13	+ 462.60
0012	+ 128.78	+ 402.14	+ 131.33	+ 410.37	+ 159.63	+ 501.77
0013	+ 125.39	+ 415.85	+ 130.47	+ 433.27	+ 159.57	+ 532.95
*		491.6166				545.4866

NAME:LA PINTA HEEL 9/19/72
BONE:450
WI0:532
WEDGE VALUES DATE9/19/72
SLOPE +0.2584409E-02 INTERCEPT +0.3520710E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H20
0005	610.00	522.37	566.18	0113	.99	.98
0006	612.87	528.37	570.62	0113	.95	.99
0007	607.75	504.62	556.18	0112	1.19	.94
0008	552.87	538.50	545.68	0112	.16	1.01
0009	559.12	506.74	532.93	0116	.63	.95
0010	707.49	482.12	594.81	0124	2.46	.90
0011	751.87	478.62	615.24	0123	2.90	.89
0012	834.62	485.75	660.18	0116	3.47	.91
0013	823.50	461.37	642.43	0103	3.72	.86

ROW	LOW:C.U. MG/SQCM	H20:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0005	174.37 583.48	176.44 590.55	183.48 614.65
0006	171.85 574.85	172.63 577.50	180.55 604.61
0007	159.44 537.21	165.35 557.65	170.33 574.86
0008	156.24 526.16	154.88 521.46	157.72 531.29
0009	142.60 462.04	148.24 480.85	148.44 481.53
0010	131.81 397.71	144.02 435.80	157.86 478.98
0011	126.48 384.28	139.49 425.19	157.37 481.44
0012	125.66 405.54	136.21 440.73	161.25 524.26
0013	129.13 471.50	143.80 526.62	163.23 599.60

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NAME:LA PINTA HEEL 9/21.72
BONE:400
WI0:520
WEDGE VALUES DATE9/21/72
SLOPE +0.2563879E-02 INTERCEPT +0.2618179E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H20
0005	639.75	545.62	592.68	0115	1.02	1.04
0006	639.87	547.87	593.87	0112	.99	1.05
0007	633.37	555.12	594.24	0110	.84	1.06
0008	618.87	566.12	592.49	0111	.57	1.08
0009	593.25	557.74	575.50	0117	.39	1.07
0010	716.00	509.25	612.62	0125	2.19	.97
0011	774.25	510.74	642.50	0124	2.67	.98
0012	863.62	505.62	684.62	0119	3.44	.97
0013	873.00	512.12	692.56	0111	3.42	.98

ROW	LOW:C.U. MG/SQCM	H20:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0005	170.48 568.00	164.95 549.24	179.99 600.27
0006	167.13 571.83	161.28 551.46	176.16 603.27
0007	161.81 563.55	154.62 538.06	169.30 590.12
0008	153.60 529.51	144.16 496.37	158.65 547.27
0009	146.06 476.70	137.86 449.37	149.72 488.92
0010	132.27 404.70	135.58 412.85	156.07 476.79
0011	127.20 389.90	129.43 396.90	155.66 479.41
0012	124.17 396.79	127.51 407.73	160.24 515.00
0013	129.58 445.14	131.28 451.09	163.09 562.86

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NAME:ROSS HEEL 6/12/72
BONE:300
WI0:442
WEDGE VALUES DATE6/12/72
SLOPE +0.2510119E-02 INTERCEPT +0.3671188E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0002	690.12	455.62	572.87	0118	2.66	1.03
0003	645.62	428.00	536.81	0117	2.64	.96
0004	626.37	460.87	543.62	0120	1.97	1.04
0005	552.37	471.24	511.81	0117	1.02	1.06
0006	480.37	461.62	471.00	0119	.25	1.04
0007	529.25	455.99	492.62	0127	.95	1.03
0008	576.12	453.87	514.99	0126	1.53	1.02
0009	606.50	454.37	530.43	0124	1.85	1.02
0010	582.00	448.87	515.43	0112	1.66	1.01

ROW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0002	158.51	520.54	154.93	508.45	185.53	611.77
0003	143.87	475.26	147.63	488.08	170.37	565.50
0004	148.71	479.08	143.69	462.42	168.52	544.87
0005	140.66	464.34	133.17	438.82	150.32	497.24
0006	136.76	443.23	131.59	425.93	139.15	451.24
0007	136.87	414.75	132.91	402.32	146.69	445.52
0008	132.46	404.20	129.12	393.64	148.38	454.53
0009	127.48	394.95	124.06	383.95	146.67	456.61
0010	120.96	415.64	119.23	409.49	136.45	470.73

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NAME:ROSS HEEL 7/6/72
BONE:300
WI0:442
WEDGE VALUES DATE7/6/72
SLOPE +0.2511078E-02 INTERCEPT +0.4790658E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0005	610.12	431.37	520.75	0118	2.22	.97
0006	607.12	418.62	512.87	0118	2.38	.94
0007	579.25	420.62	499.93	0118	2.05	.95
0008	568.25	427.37	497.81	0121	1.83	.96
0009	470.74	414.87	442.81	0120	.81	.93
0010	478.50	411.62	445.06	0128	.96	.93
0011	523.24	406.37	464.81	0126	1.62	.91
0012	529.50	417.50	473.49	0124	1.52	.94
0013	521.37	402.75	462.06	0114	1.65	.91

ROW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0005	165.27	538.71	168.14	548.40	187.49	613.69
0006	153.99	500.61	160.40	522.25	177.95	581.48
0007	149.92	486.89	155.77	506.63	170.30	555.69
0008	143.95	454.71	148.02	468.11	162.41	515.46
0009	133.21	423.02	140.81	448.24	141.03	448.97
0010	138.23	411.00	147.34	439.35	148.23	442.10
0011	129.64	390.67	140.23	424.13	146.57	444.17
0012	129.43	396.60	136.50	419.31	145.04	446.73
0013	117.88	392.73	128.48	429.76	133.54	447.44

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NAME:ROSS HEEL 7/24/72
BONE:300
WI0:399
WEDGE VALUES DATE7/24/72
SLOPE +0.2603899E-02 INTERCEPT +0.5721188E-02

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H20
0005	561.62	388.24	474.93	0116	2.37	.97
0006	573.12	385.25	479.18	0115	2.55	.96
0007	530.24	383.00	456.62	0117	2.09	.95
0008	516.25	386.87	451.56	0120	1.85	.96
0009	444.25	404.25	424.25	0125	.60	1.01
0010	419.37	395.62	407.49	0127	.37	.99
0011	462.00	379.62	420.81	0128	1.26	.95
0012	517.74	378.25	448.00	0127	2.01	.94
0013	496.75	377.62	437.18	0116	1.76	.94

ROW	LOW:C.U. MG/SQCM	H20:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0005	163.06 + 537.65	166.23 + 548.13	186.44 + 615.04
0006	155.34 + 516.57	159.37 + 530.04	180.43 + 600.37
0007	146.42 + 478.42	151.21 + 494.13	166.99 + 545.94
0008	144.64 + 460.70	148.34 + 472.56	163.19 + 520.08
0009	145.36 + 444.41	143.73 + 439.39	151.40 + 462.96
0010	141.70 + 426.31	142.78 + 429.57	145.46 + 437.66
0011	137.13 + 409.24	143.50 + 428.36	150.31 + 448.80
0012	128.67 + 386.89	135.45 + 407.40	150.16 + 451.88
0013	124.62 + 410.40	131.01 + 431.55	141.61 + 466.65

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NAME:ROSS HEEL 9/19/72
BONE:484
BONE:300
WI0:484
WEDGE VALUES DATE9/19/72
SLOPE +0.2667299E-02 INTERCEPT +0.6312811E-02

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H20
0005	715.00	496.62	605.81	0116	2.34	1.02
0006	677.37	474.74	576.06	0115	2.28	.98
0007	647.24	482.37	564.81	0117	1.89	.99
0008	632.75	485.75	559.25	0120	1.69	1.00
0009	517.50	496.99	507.24	0117	.25	1.02
0010	572.25	460.75	516.49	0127	1.39	.95
0011	637.50	469.87	553.68	0130	1.96	.97
0012	586.12	460.00	523.06	0122	1.55	.95
0013	586.49	456.62	521.56	0110	1.60	.94

ROW	LOW:C.U. MG/SQCM	H20:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0005	164.20 + 528.33	161.21 + 518.67	187.25 + 602.84
0006	150.45 + 488.14	152.67 + 495.37	172.70 + 560.65
0007	150.29 + 479.22	150.68 + 480.48	168.74 + 538.37
0008	143.01 + 444.46	142.58 + 443.10	159.92 + 497.23
0009	143.02 + 455.93	139.92 + 445.99	145.41 + 463.58
0010	138.09 + 405.28	144.34 + 423.74	152.59 + 448.10
0011	135.85 + 389.42	139.70 + 400.52	157.19 + 450.95
0012	132.13 + 403.70	138.34 + 422.77	147.81 + 451.86
0013	126.15 + 427.61	132.56 + 449.44	140.78 + 477.46

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NAME:ROSS HEEL 9/21/72
BONE:350
WI0:520
WEDGE VALUES DATE9/21/72
SLOPE +0.2585549E-02 INTERCEPT +0.1903180E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0004	747.50	578.50	662.99	0121	1.64	1.11
0005	770.74	512.37	641.56	0117	2.62	.98
0006	697.25	497.50	597.37	0117	2.16	.95
0007	716.00	524.87	620.43	0118	1.99	1.00
0008	648.87	527.62	588.25	0123	1.32	1.01
0009	534.62	532.00	533.31	0128	.03	1.02
0010	626.37	501.74	564.06	0126	1.42	.96
0011	661.75	500.74	581.24	0125	1.79	.96
0012	650.99	487.87	569.43	0118	1.85	.93

ROW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0004	180.40	569.29	167.50	528.06	196.90	622.02
0005	153.50	500.07	155.23	505.78	179.81	587.03
0006	146.72	477.65	151.89	494.76	168.12	548.41
0007	147.69	476.73	146.59	473.12	167.43	541.42
0008	143.41	443.58	141.62	437.95	156.79	485.65
0009	143.63	426.63	140.71	417.81	143.94	427.59
0010	134.30	404.88	138.80	418.70	149.05	450.15
0011	128.11	389.04	132.83	403.63	146.75	446.70
0012	117.19	376.76	124.71	401.42	135.43	436.55

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NAME:VOGEL HEEL 6/12/72
BONE:350
WI0:547
WEDGE VALUES DATE6/12/72
SLOPE +0.2527939E-02 INTERCEPT +0.3687000E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0001	766.99	518.49	642.75	0101	2.51	.94
0002	717.87	499.74	608.81	0099	2.32	.91
0003	669.87	519.37	594.62	0099	1.63	.94
0004	645.99	531.49	588.75	0100	1.25	.97
0005	569.99	550.62	560.31	0111	.22	1.00
0006	581.62	520.62	551.12	0121	.71	.95
0007	616.87	494.12	555.50	0125	1.42	.90
0008	642.62	475.87	559.25	0121	1.93	.86
0009	670.50	491.12	580.81	0111	2.00	.89

ROW	LOW:C.U. MG/SQCM	H2O:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0001	161.70	618.76	167.11	639.92	183.40	703.73
0002	156.65	611.36	165.59	647.10	176.19	689.45
0003	155.29	605.95	160.42	626.44	168.69	659.47
0004	149.61	577.25	152.48	588.62	159.84	617.72
0005	170.84	594.26	170.11	591.65	172.78	601.16
0006	174.98	557.49	180.96	577.03	181.87	580.01
0007	191.84	592.53	204.55	632.75	206.48	638.85
0008	194.20	620.32	211.06	675.42	213.74	684.18
0009	217.57	760.81	229.53	803.43	236.19	827.15

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NAME:VOGEL HEEL 9/6/72
BONE:400
WI0:570
WEDGE VALUES DATE9/6/72
SLOPE +0.2474660E-02 INTERCEPT +0.2671240E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0003	830.12	551.50	690.81	0102	2.62	.96
0004	775.37	563.75	669.56	0100	2.04	.98
0005	757.25	532.37	644.81	0098	2.26	.93
0006	741.25	595.25	668.24	0099	1.41	1.04
0007	654.74	598.12	626.43	0104	.58	1.04
0008	616.12	609.75	612.93	0115	.06	1.06
0009	651.49	548.75	600.12	0126	1.10	.96
0010	681.62	527.37	604.50	0123	1.64	.92
0011	696.75	524.37	610.56	0119	1.82	.91

ROW	LOW:C.U. MG/SQCM	H2O:C.U. MG/SQCM	MEAN:C.U. MG/SQCM
0003	163.19	635.72	166.55	649.06	186.16	726.74
0004	162.65	646.47	163.75	650.93	179.85	715.98
0005	153.91	623.85	160.60	651.45	172.69	701.28
0006	164.03	658.75	159.74	641.24	175.48	705.50
0007	166.08	634.52	161.07	615.06	170.89	653.21
0008	184.29	636.80	176.54	609.56	184.89	638.90
0009	189.68	597.54	194.47	612.90	200.96	633.71
0010	197.80	639.06	207.36	670.47	214.59	694.21
0011	209.35	700.13	219.28	733.85	227.46	761.62

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NAME:VOGEL HEEL 10/10/72
BONE:300
WI0:418
WEDGE VALUES DATE10/10/72
SLOPE +0.2532730E-02 INTERCEPT +0.3194180E-01

ROW	HIGH	LOW	MEAN	CHN	FAT EQU	LOW/H2O
0003	+ 679.12	+ 440.37	+ 559.74	0104	+ 2.78	+ 1.05
0004	+ 623.00	+ 448.12	+ 535.56	0100	+ 2.11	+ 1.07
0005	+ 598.87	+ 422.87	+ 510.87	0100	+ 2.23	+ 1.01
0006	+ 594.62	+ 460.75	+ 527.68	0098	+ 1.63	+ 1.10
0007	+ 531.87	+ 469.75	+ 500.81	0104	+ .79	+ 1.12
0008	+ 476.75	+ 447.87	+ 462.31	0117	+ .40	+ 1.07
0009	+ 509.25	+ 432.37	+ 470.81	0126	+ 1.05	+ 1.03
0010	+ 545.75	+ 411.49	+ 478.62	0122	+ 1.81	+ .98
0011	+ 555.24	+ 418.25	+ 486.75	0116	+ 1.82	+ 1.00

ROW	LOW:C.U.	MG/SQCM	H2O:C.U.	MG/SQCM	MEAN:C.U.	MG/SQCM
0003	+ 170.81	+ 635.87	+ 165.39	+ 615.28	+ 195.75	+ 730.57
0004	+ 166.19	+ 643.59	+ 159.24	+ 616.11	+ 184.02	+ 713.97
0005	+ 158.49	+ 613.15	+ 157.33	+ 608.58	+ 177.39	+ 687.80
0006	+ 164.45	+ 649.96	+ 154.91	+ 611.51	+ 177.74	+ 703.51
0007	+ 166.41	+ 619.16	+ 154.27	+ 573.07	+ 173.07	+ 644.44
0008	+ 180.41	+ 596.20	+ 172.33	+ 568.95	+ 184.12	+ 608.73
0009	+ 194.23	+ 596.04	+ 189.97	+ 582.69	+ 204.96	+ 629.67
0010	+ 200.27	+ 635.54	+ 202.18	+ 641.73	+ 218.71	+ 695.21
0011	+ 218.26	+ 730.28	+ 218.19	+ 730.04	+ 235.85	+ 790.16

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