23 D/2 (108) #114

COMPUTER MAPPED
ORE GRADE DISTRIBUTION
JULIAN IRON DEPOSIT,
LABRADOR

William B. Blakeman
19 December 1973

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Introduction

This project represents an application of a computer mapping technique to ore grade determinations in respect to the Julian Iron Ore Deposit, situated between Wabush and Julienne Lakes, in Labrador. The computer program Symap V available at Carleton University has been utilized. Symap is the basic program utilized in the course Geography 45:525, Computer Cartography. The current project is submitted as a partial fulfillment of the requirements of that course.

Purpose and Scope

The main purpose of this project is to determine if the Symap program can be applied to determining the grades of ore which may be expected on six mining levels of the Julian Deposit. The secondary purpose is to provide Canadian Javelin Limited, the owners of the deposit, with not only a preliminary mining level ore grade evaluation, but also an example of an easily used and readily available computer program. The information contained in this report may become a basis on which company decisions can be made regarding the future utilization of computer mapping techniques.

The project considers ore grades on six mining elevations, namely the 1900 level to the 1400 foot level, as indicated by a series of diamond drill hole intersections at each elevation.

The values of ore at each intersection have been obtained from the drill hole logs.

Background Information

The Julian deposit is located in the Wabush Lake District of Labrador (map, figure 1), approximately 18 road miles north of the town of Wabush. The deposit, occupying a peninsula between Wabush and Julian Lakes, forms a hill rising approximately 200 feet above the lakes (figure 2).

The ore body contains metamorphosed sedimentary iron formation with average grades of 32% to 35% iron. Basically, it consists of several beds of recrystallized oxide facies iron formation (containing principally quartz and specular hematite), with a stratigraphic thickness of over 700 feet. The gross structure of the deposit resembles that of a canoe, being synclinal in form, but overturned to the northwest, with most of the beds dipping to the southeast. The axis of the main structure trends northeasterly, but second generation refolding has created a 'knuckle' in the central portion of the deposit, in which the fold axes have more northerly or northwesterly trends.

Reserves are estimated to 950,000+ tons, with approximately 450,000 tons being in the peninsular portion and 500,000 tons lying in the under-lake extensions to the northeast and southwest.

The property has been geologically and geophysically mapped in detail, diamond drilled and bulk sampled.

The writer has participated in most of the exploration programs undertaken to date.

Symap

The Symap program is written in FORTRAN IV and was developed at Harvard University. The original program has undergone several user modifications, and the current version (V) has been updated and adapted by Carleton University. The program makes use of a line printer and produces maps which spatially relate quantitative and qualitative information. Various categories of data, e.g., physical, economic and social may be weighted, manipulated, aggregated and averaged by the computer in several manners. (In this project, the contour map was selected and it was produced by assigning ore grades to coordinate locations of the drill hole intersections.)

In producing a contour map, the program prints out lines connecting all points with the same numerical (or z-axis) value. The program assumes a continuous variation between any two contour lines.

A correlation option, F-CORR (b) was selected in this project to correlate the print positions of the highest range* of values on four of the six mine level maps. The correlation feature is capable of handling only four maps, thus levels 1800 to 1500 were selected.

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*Range is used herein to denote levels, the Symap term. 'Levels' in the context of this study refers to mine or elevation level.

Preparation of Data for Computer Analysis

The 1" to 400' Julian Pit Layout was utilized as a base map, and the 1" to 200' pit cross sections were converted to 1" to 400' scale to delimit pit outlines at the various levels. Individual level maps were then prepared at the 400' scale. In order to be consistent with the cross sections, it was decided to stay within the pit outlines as they are presented on the sections. Consequently, there are a few cases in which up to 50 feet of the ore body at any level might lie outside the perimeter of the level plan. This situation occurs primarily along the south contact of the ore body. The pit outlines on the level plans include the ore zone only, thus none of the area occupied by overburden is included in any plan. This condition would apply to levels 1900 to 1700, inclusive.

The drill holes were spotted on each plan according to the mine coordinate system. In the case of drill hole number 5, inclined to the north at 50^{o}, the intersection was projected onto the 1900 level. Thus the location of hole 5 on the plan is about 40 feet north of the hole collar.

Hole collar elevations were obtained from the 1" to 200' scale topographic map, and the ore grades at the appropriate levels were obtained from the drill hole logs on the basis of 'x' feet down the hole from the collar.

In the case of drill hole number 8, in which the core at the 1400 level was lost, a reasonable value of 30.00% Fe was assigned.

The numerical difference between the highest and lowest ore grades at hole intersections on each of the maps is

relatively small, therefore, the computer was instructed to determine five data ranges which is 'standard' for the Symap Program.

The coordinates of the outlines and data points (drill hole intersections) of each level were punched onto cards with the interconnected digitizer-key punch. In addition, the identification 'pit plan' and level number, to appear within the map boundaries were punched to be included in the OTOLEGENDS package. Following the operation with the digitizer, the appropriate instructions and values (ore grades at hole intersections) cards were punched. The entire program, consisting of 550 cards was run on 18 December 1973.

Presentation of Results

The results of the computer analysis of each pit level follow as self-explanatory maps.

Discussion of Results

The Symap program determines the numerical difference between the highest and lowest grades on each map, and divides this difference by five, the standard for the program. A symbol is then automatically assigned to represent each of the value ranges. Thus, each map must be considered in respect to the highest and lowest values appearing on that particular level. In other words, value ranges 1 to 5 do not represent the same numerical values on all maps. The maps <u>can</u> be interrelated, however, in that

range 1 indicates the lowest and range five represents the highest (e.t.c.) grade zone on every level.

The line printer prints out six characters to the inch vertically and ten horizontally, forming a rectangular rather than a square pattern. This characteristic slightly distorts the scale of the reproduced map. Consequently, locations on the computer map cannot be precisely coordinated with those on the base map. This explains why the drill holes cannot be exactly superimposed from the base maps. The significant feature, however, is that each map graphically presents the general spatial relationship between the values occurring on a given level.

As mentioned above, the Symap program assumes a continuous interval (surface) between contour lines. This suggests that all of a map area covered by a given symbol will be in a particular value range. In actuallity, this is not true. The symbols should be interpreted as indicating zones in which one of the five value ranges is predominant.

The program instructs the computer to, in effect, occupy the Z axis position (value) at each drill hole intersection and to search within a given radius, for the Z axis positions of its seven (or fewer) nearest neighbors to determine the inclined linear relationships between the values of each hole intersection. The print out resulting from this procedure is not compatible with the geology or stratigraphy. Therefore, the maps cannot be used to make sensible geological interpretations. From the aspect of mining, however, the maps are meaningful

because they indicate the distribution of ore grade zones occurring on a particular plan, in this case a mining level. Information of this nature can be used to indicate the order in which working faces should be operated to obtain the appropriate blend of mill feed.

In producing the correlation map (No. 6), the computer was instructed to 'remember' the print positions of range five on levels 1800 to 1500 inclusive and to print no map number 6 a symbol for range five to specifically identify each of the levels being correlated. The effective overprinting of the specified symbols determines the portions of the ore body which, in the vertical sense, contain masses of high grade values. The F-CORR map indicates that a zone of high grade values exists between levels 1800 and 1500 in the southwest portion of the ore body and that separate high grade zones will be encountered near the center of the ore body on the 1600 level and in the northeast portion on the 1500 level.

Conclusions

This project has proven that the symap program can be used to calculate and graphically present the spatial relationships of the ore grade distribution on individual mining levels. The effective utilization of the correlation capability indicates that the program can be used to gain an impression of the vertical distribution of ore grades.

The program user must bear in mind that the print out of the values as contour lines will not follow the geology or

stratigraphy, but that it will show the areas on each level where certain grades will be encountered. The nature of the program dictates that it provide information to the mining engineer rather than to the geologist.

The computer maps would be much more meaningful if there were more drill holes, hence more data points. With a greater density of data points, the contour lines would be more precisely located. This might also allow the use of more value ranges, say eight or ten instead of the standard five. With more value ranges, each range would represent a smaller and more accurate grade value spread.

Reference

Reference Manual for Synagraphic Computer Mapping
SYMAP VERSION V - Harvard University, Updated and adapted to Carleton University XDS SIGMA 9, Revised January 1973.

F=CORELATION

2	+	1	05
3	X	1	05
4	O	1	05
5	H	1	05

A=OUTLINE

VERTEX	DOWN	ACROSS	
	ISLAND 1		
(1)	4778.00	4132.00	000
(2)	5548.00	5465.00	000
(3)	5564.00	5590.00	000
(4)	5598.00	5798.00	000
(5)	5798.00	5771.00	000
(6)	6228.00	5845.00	000
(7)	6796.00	5617.00	000
(8)	7158.00	5718.00	000
(9)	7858.00	6124.00	000
(10)	8318.00	6218.00	000
(11)	8556.00	6428.00	001
(12)	9816.00	6358.00	001
(13)	10542.00	5408.00	00
(14)	11204.00	4428.00	001
(15)	11146.00	3584.00	001
(16)	10288.00	2382.00	001
(17)	9395.00	1656.00	001
(18)	9136.00	1560.00	001
(19)	8436.00	1679.00	001
(20)	8240.00	2204.00	002
(21)	7738.00	2536.00	002
(22)	6328.00	3254.00	002
(23)	5226.00	3697.00	002
(24)	4767.00	4144.00	002

AREA=3163544.00 CENTER=(8447.61, 4218.59)

DATA POINTS

POINT	DOWN	ACROSS	
1)	5305.00	4634.00	0000
2)	8563.00	5692.00	0001
3)	5070.00	2708.00	0002

C-CTOLSSENDS

VERTEX	DOWN	ACROSS	+ROWS	+COLS
(1) 'JULIAN PIT PLAN' ACROSS FROM				
	10150.00	9740.00	0.	0.
(2) '1900 FT. LEVEL' ACROSS FROM				
	10460.00	9450.00	0.	0.

E-VALUES

DATUM	VALUE
(1)	34.41
(2)	43.28
(3)	54.29

SYMAP

JULIAN DEPOSIT

COMPUTER CALCULATED ORE GRADE

1900 FOOT LEVEL

ELECTIVE

```
 1 MAP SIZE IS          13.80 INCHES LONG BY          12.50 INCHES WIDE
 2 EXTREME POINTS ARE (      .00,      .00) AND (  14248.00,  12523.00)
 9 NO HISTOGRAM BAR CHART TO APPEAR
10 MAP TEXT
                        ORE GRADE VALUES TAKEN FROM DRILL HOLE LOGS

                        VALUES REPRESENT PERCENT IRON

                        DATA POINT NO. 1 = DDH 1

                        DATA POINT NO. 2 = DDH 2

                        DATA POINT NO. 3 = DDH 5

                        SCALE: 1 INCH = 400 FEET

                        DECEMBER, 1973
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MAP 1

JULIAN DEPOSIT
COMPUTER CALCULATED ORE GRADE
1900 FOOT LEVEL

MAP SCALE = .0010 INCHES ON OUTPUT MAP/UNITS ON SOURCE MAP

MAP SHOULD BE PRINTED AT 6.0 ROWS PER INCH AND 10.0 COLUMNS PER INCH

ROW = DOWN COORDINATE * .0058
COLUMN = (ACROSS COORDINATE + 158.30) * .0097

DATA POINTS FOR MAP

POINT	ROW	COLUMN	DATUM	VALUE	LEVEL
1)	37	47	1	34.41	1
2)	50	57	2	43.28	3
3)	47	26	3	54.29	5

STANDARD SEARCH RADIUS IS 4146.7891

*OUTLINE
****

ERTEX	DOWN	ACROSS	
	ISLAND 1		
1)	2606.00	5156.00	0000
2)	2734.00	6097.00	0001
3)	3244.00	7009.00	0002
4)	3954.00	7537.00	0003
5)	5176.00	8047.00	0004
6)	5462.00	8043.00	0005
7)	6126.00	7853.00	0006
8)	6538.00	7665.00	0007
9)	6552.00	7657.00	0008
10)	7122.00	7975.00	0009
11)	7132.00	8403.00	0010
12)	7414.00	8743.00	0011
13)	7656.00	8617.00	0012
14)	7935.00	8816.00	0013
15)	9806.00	8065.00	0014
16)	10828.00	7125.00	0015
17)	10884.00	5891.00	0016
18)	10859.00	4651.00	0017
19)	11474.00	3559.00	0018
20)	11165.00	2041.00	0019
21)	11012.00	1545.00	0020
22)	10502.00	1348.00	0021
23)	10482.00	1235.00	0022
24)	9756.00	1211.00	0023
25)	8725.00	1604.00	0024
26)	8156.00	1857.00	0025
27)	7752.00	2357.00	0026
28)	7476.00	2923.00	0027
29)	7132.00	3127.00	0028
30)	6545.00	3340.00	0029
31)	5906.00	3517.00	0030
32)	4581.00	3671.00	0031
33)	3914.00	3897.00	0032
34)	3532.00	3697.00	0033
35)	2954.00	4156.00	0034
36)	2676.00	4855.00	0035
37)	2594.00	5157.00	0036

EA=1633504.00 CENTER=(7359.16, 5136.35)

	DOWN	ACROSS	
			0000
1)	5129.00	4793.00	0001
2)	7369.00	5930.00	0002
3)	9585.00	7087.00	0003
4)	9625.00	1513.00	

TOLEGENDS

TEX	DOWN	ACROSS	+ROWS	+COLS	
1) 'JULIAN PIT PLAN' ACROSS FROM					
	9144.00	9826.00	0.	0.	006
2) '1800 FT. LEVEL' ACROSS FROM					
	9565.00	9817.00	0.	0.	007

E-VALUES

DATUM	VALUE
(1)	27.82
(2)	34.47
(3)	33.62
(4)	42.48

F=MAP

JULIAN DEPOSIT

COMPUTER CALCULATED ORE GRADE

1800 FOOT LEVEL

ELECTIVE

1 MAP SIZE IS 13.80 INCHES LONG BY 12.50 INCHES WIDE
2 EXTREME POINTS ARE (.00, .00) AND (13939.00, 12749.00)
9 NO HISTOGRAM BAR CHART TO APPEAR
10 MAP TEXT

ORE GRADE VALUES TAKEN FROM DRILL HOLE LOGS

VALUES REPRESENT PERCENT IRON

DATA POINT NO. 1 = DDH 1

DATA POINT NO. 2 = DDH 2

DATA POINT NO. 3 = DDH 4

DATA POINT NO. 4 = DDH 6
SCALE: 1 INCH = 400 FEET
DECEMBER, 1973

MAP 2

JULIAN DEPOSIT
COMPUTER CALCULATED ORE GRADE
1800 FOOT LEVEL

MAP SCALE = .0010 INCHES ON OUTPUT MAP/UNITS ON SOURCE MAP

MAP SHOULD BE PRINTED AT 6.0 ROWS PER INCH AND 10.0 COLUMNS PER INCH

ROW = (DOWN COORDINATE - 67.95) * .0059
COLUMN = ACROSS COORDINATE * .0098

DATA POINTS FOR MAP

POINT	ROW	COLUMN	DATUM	VALUE	LEVEL
1)	31	47	1	27.82	1
2)	44	56	2	34.47	3
3)	57	69	3	38.52	2
4)	57	15	4	42.48	5

STANDARD SEARCH RADIUS IS 7968.5273

TLINE

EA DOWN ACROSS

ISLAND 1

1)	2135.00	6574.00	0002
2)	2234.00	7028.00	0003
3)	2813.00	7958.00	0004
4)	3557.00	8548.00	0005
5)	4663.00	9158.00	0006
6)	5263.00	9394.00	0007
7)	5269.00	9668.00	0008
8)	7457.00	9732.00	0009
9)	8583.00	9902.00	0010
10)	9801.00	8105.00	0011
11)	10549.00	7112.00	0012
12)	11117.00	5864.00	0013
13)	11727.00	4864.00	0014
14)	12306.00	3774.00	0015
15)	12783.00	2638.00	0016
16)	13189.00	2042.00	0017
17)	13418.00	1668.00	0018
18)	13299.00	1180.00	0019
19)	12902.00	764.00	0020
20)	12253.00	352.00	0021
21)	11487.00	117.00	0022
22)	10609.00	122.00	0023
23)	9767.00	492.00	0024
24)	9359.00	826.00	0025
25)	9090.00	1360.00	0026
26)	9101.00	1825.00	0027
27)	9193.00	2167.00	0028
28)	9196.00	3566.00	0029
29)	8927.00	3764.00	0030
30)	8397.00	3824.00	0031
31)	8085.00	3795.00	0032
32)	7497.00	3787.00	0033
33)	7206.00	3834.00	0034
34)	6861.00	3725.00	0035
35)	5409.00	3539.00	0036
36)	4493.00	3492.00	0037
37)	3899.00	3460.00	0038
38)	3677.00	3516.00	0039
39)	3029.00	3861.00	0040
40)	2361.00	4340.00	0041
41)	2252.00	5620.00	0042
42)	2189.00	6075.00	0043

EA=1182D8.00 CENTER=(7629.15, 5313.34)

*DATA POINTS

OINT	DOWN	ACROSS	
1)	3955.00	3680.00	0045
2)	6175.00	4808.00	0046
3)	8413.00	5937.00	0047
4)	10541.00	7066.00	0048
5)	3329.00	7597.00	0049
6)	5093.00	8745.00	0050
7)	10647.00	1592.00	0051

C-OTOLEGENDS

VERTEX	DOWN	ACROSS	+ROWS	+COLS
(1) 'JULIAN PIT PLAN' ACROSS FROM				
	8950.00	9740.00	0.	0.
(2) '1700 FT. LEVEL' ACROSS FROM				
	9800.00	9710.00	0.	0.

E-VALUES

DATUM	VALUE
(1)	34.65
(2)	38.19
(3)	39.40
(4)	35.71
(5)	30.79
(6)	34.57
(7)	42.48

MAP

LIAN DEPOSIT

MPUTER CALCULATED ORE GRADE

700 FOOT LEVEL

LECTIVE

1 MAP SIZE IS 18.40 INCHES LONG BY 12.50 INCHES WIDE
2 EXTREME POINTS ARE (.00, .00) AND (18607.00, 12650.00)
9 NO HISTOGRAM BAR CHART TO APPEAR
10 MAP TEXT

ORE GRADE VALUES TAKEN FROM DRILL HOLE LOGS

VALUES REPRESENT PERCENT IRON

DATA POINT NO. 1 = DDH 3

DATA POINT NO. 2 = DDH 1

DATA POINT NO. 3 = DDH 2

DATA POINT NO. 4 = DDH 4

DATA POINT NO. 5 = DDH 7

DATA POINT NO. 6 = DDH 8

DATA POINT NO. 7 = DDH 6

SCALE: 1 INCH = 400 FEET

DECEMBER, 1973

MAP 3

JULIAN DEPOSIT
COMPUTER CALCULATED ORE GRADE
1760 FOOT LEVEL

MAP SCALE = .0010 INCHES ON OUTPUT MAP/UNITS ON SOURCE MAP

MAP SHOULD BE PRINTED AT 6.0 ROWS PER INCH AND 10.0 COLUMNS PER INCH

ROW = (DOWN COORDINATE + 165.26) * .0059
COLUMN = ACROSS COORDINATE * .0099

DATA POINTS FOR MAP

POINT	ROW	COLUMN	DATUM	VALUE	LEVEL
1)	24	66	1	34.65	2
2)	38	42	2	38.19	4
3)	51	58	3	39.40	4
4)	44	70	4	35.71	3
5)	21	75	5	30.79	1
6)	34	67	6	34.57	2
7)	64	18	7	42.48	5

STANDARD SEARCH RADIUS IS .6593.0508

OUTLINE

ERTEX	DOWN	ACROSS	
	ISLAND	1	
1)	552.00	10909.00	0000
2)	826.00	11404.00	0001
3)	1374.00	11601.00	0002
4)	2238.00	11253.00	0003
5)	2914.00	10542.00	0004
6)	3791.00	10584.00	0005
7)	4626.00	10486.00	0006
8)	5928.00	10364.00	0007
9)	6748.00	10108.00	0008
10)	7470.00	9752.00	0009
11)	8573.00	8926.00	0010
12)	9114.00	8488.00	0011
13)	9714.00	8106.00	0012
14)	10208.00	7641.00	0013
15)	10550.00	7101.00	0014
16)	10975.00	6932.00	0015
17)	11550.00	4816.00	0016
18)	12310.00	3748.00	0017
19)	12744.00	2650.00	0018
20)	13306.00	1936.00	0019
21)	13020.00	552.00	0020
22)	12520.00	836.00	0021
23)	11930.00	367.00	0022
24)	11504.00	344.00	0023
25)	11198.00	440.00	0024
26)	10618.00	646.00	0025
27)	9754.00	1064.00	0026
28)	9710.00	1604.00	0027
29)	9743.00	2037.00	0028
30)	9581.00	2426.00	0029
31)	9515.00	3784.00	0030
32)	9348.00	4018.00	0031
33)	8892.00	4070.00	0032
34)	8320.00	4048.00	0033
35)	7830.00	4082.00	003
36)	7518.00	4124.00	003
37)	6500.00	3923.00	003
38)	4994.00	3477.00	003
39)	4354.00	3480.00	003
40)	3326.00	3820.00	003
41)	2958.00	4542.00	004
42)	2456.00	5716.00	004
43)	2150.00	6957.00	004
44)	1750.00	8172.00	004
45)	1202.00	9312.00	004
46)	656.00	10430.00	004
47)	552.00	10954.00	004

AREA=+898832.00 CENTER=(6752.04, 6319.35)

TA POINTS

NT	DOWN	ACROSS	
			0000
1)	3854.00	3652.00	0001
2)	5102.00	4806.00	0002
3)	8338.00	5960.00	0003
4)	10404.00	7034.00	0004
5)	3252.00	7588.00	0005
6)	5486.00	8741.00	0006
7)	1580.00	10892.00	0007
8)	10606.00	1548.00	

OTOLEGENDS

XTEX	DOWN	ACROSS	#ROWS	#COLS	
1) 'JULIAN PIT PLAN' ACROSS FROM					
	12579.00	9972.00	0.	0.	0000
2) '1600 FT. LEVEL' ACROSS FROM					
	12598.00	9970.00	0.	0.	0001

E-VALUES

DATUM	VALUE
(1)	34.65
(2)	34.01
(3)	42.67
(4)	28.22
(5)	30.79
(6)	30.96
(7)	34.16
(8)	42.48

*MAP

ULIAN DEPOSIT

OMPUTER CALCULATED ORE GRADE

600 FOOT LEVEL

LECTIVE

```
  1 MAP SIZE IS          13.80 INCHES LONG BY          12.50 INCHES WIDE
  2 EXTREME POINTS ARE (      .00,      .00) AND (  13823.00,  12700.00)
  5 NO HISTOGRAM BAR CHART TO APPEAR
 10 MAP TEXT
                        ORE GRADE VALUES TAKEN FROM DRILL HOLE LOGS

                        VALUES REPRESENT PERCENT IRON

                        DATA POINT NO. 1 = DDH 3

                        DATA POINT NO. 2 = DDH 1

                        DATA POINT NO. 3 = DDH 2

                        DATA POINT NO. 4 = DDH 4

                        DATA POINT NO. 5 = DDH 7

                        DATA POINT NO. 6 = DDH 8

                        DATA POINT NO. 7 = DDH 9

                        DATA POINT NO. 8 = DDH 6

                        SCALE: 1 INCH = 400 FEET

                        DECEMBER, 1973
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MAP 4

JULIAN DEPOSIT
COMPUTER CALCULATED ORE GRADE
1650 FOOT LEVEL

MAP SCALE = .0010 INCHES ON OUTPUT MAP/UNITS ON SOURCE MAP

MAP SHOULD BE PRINTED AT 6.0 ROWS PER INCH AND 10.0 COLUMNS PER INCH

ROW = (DOWN COORDINATE = -95.90) * .0059
COLUMN = ACROSS COORDINATE * .0058

DATA POINTS FOR MAP

POINT	ROW	COLUMN	DATUM	VALUE	LEVEL
1)	23	36	1	34.65	3
2)	37	47	2	34.01	2
3)	50	59	3	42.67	5
4)	62	69	4	29.22	1
5)	20	76	5	30.79	1
6)	33	86	6	30.96	1
7)	15	107	7	34.16	2
8)	53	15	8	42.48	5

STANDARD SEARCH RADIUS IS 7327.0664

A=OUTLINE

VERTEX	DOWN	ACROSS	
	ISLAND 1		
(1)	1103.00	11341.00	000
(2)	1222.00	11491.00	00
(3)	1456.00	11489.00	000
(4)	2044.00	11063.00	000
(5)	2754.00	10693.00	00
(6)	3664.00	10487.00	000
(7)	4856.00	10261.00	000
(8)	5698.00	10119.00	000
(9)	6665.00	9547.00	000
(10)	7598.00	8699.00	000
(11)	8622.00	8787.00	001
(12)	9703.00	7915.00	001
(13)	10366.00	6934.00	001
(14)	10824.00	5745.00	001
(15)	11474.00	4603.00	001
(16)	12176.00	3560.00	001
(17)	12752.00	2487.00	01
(18)	13176.00	1295.00	001
(19)	13072.00	674.00	01
(20)	12716.00	611.00	001
(21)	12244.00	531.00	02
(22)	11850.00	663.00	02
(23)	10292.00	1246.00	02
(24)	10130.00	1823.00	02
(25)	10240.00	2611.00	02
(26)	10178.00	3957.00	02
(27)	9794.00	4120.00	02
(28)	8220.00	4375.00	02
(29)	7794.00	4332.00	02
(30)	6238.00	4014.00	02
(31)	4952.00	3703.00	003
(32)	4653.00	3748.00	03
(33)	4336.00	3881.00	03
(34)	3870.00	4231.00	03
(35)	3442.00	4757.00	003
(36)	3082.00	5991.00	003
(37)	2756.00	7250.00	03
(38)	2196.00	8357.00	03
(39)	1740.00	9655.00	03
(40)	1222.00	10679.00	003
(41)	1076.00	11347.00	004

AREA=3693888.00 CENTER=(6971.32, 6390.57)

S=DATA POINTS

POINT	DOWN	ACROSS	
(1)	5094.00	4747.00	004
(2)	8336.00	5855.00	004
(3)	3293.00	7547.00	04
(4)	5547.00	5715.00	04
(5)	1650.00	10919.00	004
(6)	10334.00	1429.00	004

C-OTOLEGNDS

VERTEX	DOWN	ACROSS	+ROWS	+COLS
(1) 'JULIAN PIT PLAN' ACROSS FROM				
	11282.00	9508.00	0.	0.
(2) '1500 FT. LEVEL' ACROSS FROM				
	11548.00	9788.00	0.	0.

E-VALUES

DATUM	VALUE
(1)	34.01
(2)	34.31
(3)	42.41
(4)	30.96
(5)	39.11
(6)	35.85

FRMAP

JULIAN DEPOSIT

COMPUTER CALCULATED ORE GRADE

1500 FOOT LEVEL

ELECTIVE

1 MAP SIZE IS 15.80 INCHES LONG BY 12.50 INCHES WIDE
2 EXTREME POINTS ARE (.00, .00) AND (13914.00, 12551.00)
9 NO HISTOGRAM BAR CHART TO APPEAR
10 MAP TEXT

ORE GRADE VALUES TAKEN FROM DRILL HOLE LOGS

VALUES REPRESENT PERCENT IRON

DATA POINT NO. 1 = DDH 1

DATA POINT NO. 2 = DDH 2

DATA POINT NO. 3 = DDH 7

DATA POINT NO. 4 = DDH 8

DATA POINT NO. 5 = DDH 9

DATA POINT NO. 6 = DDH 6

SCALE: 1 INCH = 400 FEET

DECEMBER, 1979

JULIAN DEPOSIT
COMPUTER CALCULATED ORE GRADE
1500 FOOT LEVEL

MAP SCALE = .0010 INCHES ON OUTPUT MAP/UNITS ON SOURCE MAP

MAP SHOULD BE PRINTED AT 6.0 ROWS PER INCH AND 10.0 COLUMNS PER INCH

ROW = DOWN COORDINATE = .0060
COLUMN = (ACROSS COORDINATE = -26.13) * .0099

DATA POINTS FOR MAP

POINT	ROW	COLUMN	DATUM	VALUE	LEVEL
1)	35	47	1	34.01	2
2)	50	58	2	34.81	2
3)	20	75	3	42.41	5
4)	33	87	4	30.56	1
5)	10	109	5	39.11	4
6)	51	14	6	36.85	3

STANDARD SEARCH RADIUS IS 10246.7305

=OUTLINE

VERTEX	DOWN	ACROSS	
	ISLAND 1		
1)	1642.00	10574.00	000
2)	1810.00	10826.00	000
3)	2416.00	10683.00	000
4)	3180.00	10429.00	00
5)	3903.00	10204.00	000
6)	5046.00	10002.00	000
7)	5136.00	9969.00	000
8)	7354.00	9821.00	000
9)	7862.00	9372.00	00
10)	8350.00	8932.00	000
11)	8358.00	8523.00	001
12)	9344.00	8030.00	01
13)	10080.00	6980.00	01
14)	10518.00	5864.00	01
15)	11190.00	4748.00	001
16)	11930.00	3738.00	01
17)	12606.00	2718.00	01
18)	12884.00	2178.00	01
19)	12246.00	1777.00	01
20)	11822.00	1552.00	01
21)	11358.00	1489.00	02
22)	10710.00	1702.00	02
23)	10344.00	2248.00	02
24)	10584.00	3005.00	002
25)	10434.00	4359.00	02
26)	9676.00	4626.00	002
27)	8648.00	4812.00	02
28)	7584.00	4719.00	002
29)	6534.00	4497.00	002
30)	5912.00	4480.00	002
31)	5582.00	4658.00	03
32)	4674.00	4794.00	003
33)	3718.00	5028.00	03
34)	2998.00	6276.00	003
35)	2036.00	7538.00	003
36)	2476.00	8647.00	03
37)	1880.00	9746.00	03
38)	1634.00	10574.00	003

AREA=1381424.00 CENTER=(6842.80, 6794.56)

3=DATA POINTS

POINT	DOWN	ACROSS
(1)	5988.00	4879.00
(2)	8206.00	6038.00
(3)	8166.00	7630.00
(4)	5344.00	8810.00

CHOTCLEGENDS

VERTEX	DOWN	ACROSS	+ROWS	+COLS
(1) 'JULIAN PIT PLAN' ACROSS FROM				
	12436.00	9986.00	0.	0.
(2) '1400 FT. LEVEL' ACROSS FROM				
	12792.00	9992.00	0.	0.

E-VALUES

DATUM	VALUE
(1)	34.01
(2)	34.81
(3)	38.63
(4)	30.00

F-MAP

JULIAN DEPOSIT

COMPUTER CALCULATED ORE GRADE

1400 FOOT LEVEL

ELECTIVE

1 MAP SIZE IS 13.50 INCHES LONG BY 12.50 INCHES WIDE
2 EXTREME POINTS ARE (.00, .00) AND (13471.00, 12696.00
9 NO HISTOGRAM BAR CHART TO APPEAR
10 MAP TEXT

ORE GRADE VALUES TAKEN FROM DRILL HOLE LOGS

VALUES REPRESENT PERCENT IRON

DATA POINT NO. 1 = DDH 1

DATA POINT NO. 2 = DDH 2

DATA POINT NO. 3 = DDH 7

DATA POINT NO. 4 = DDH 8 VALUE OF 30.00% AS

SCALE: 1 INCH = 400 FEET

DECEMBER, 1973

MAP 7

JULIAN DEPOSIT
COMPUTER CALCULATED ORE GRADE
1400 FOOT LEVEL %

MAP SCALE = .0010 INCHES ON OUTPUT MAP/UNITS ON SOURCE MAP

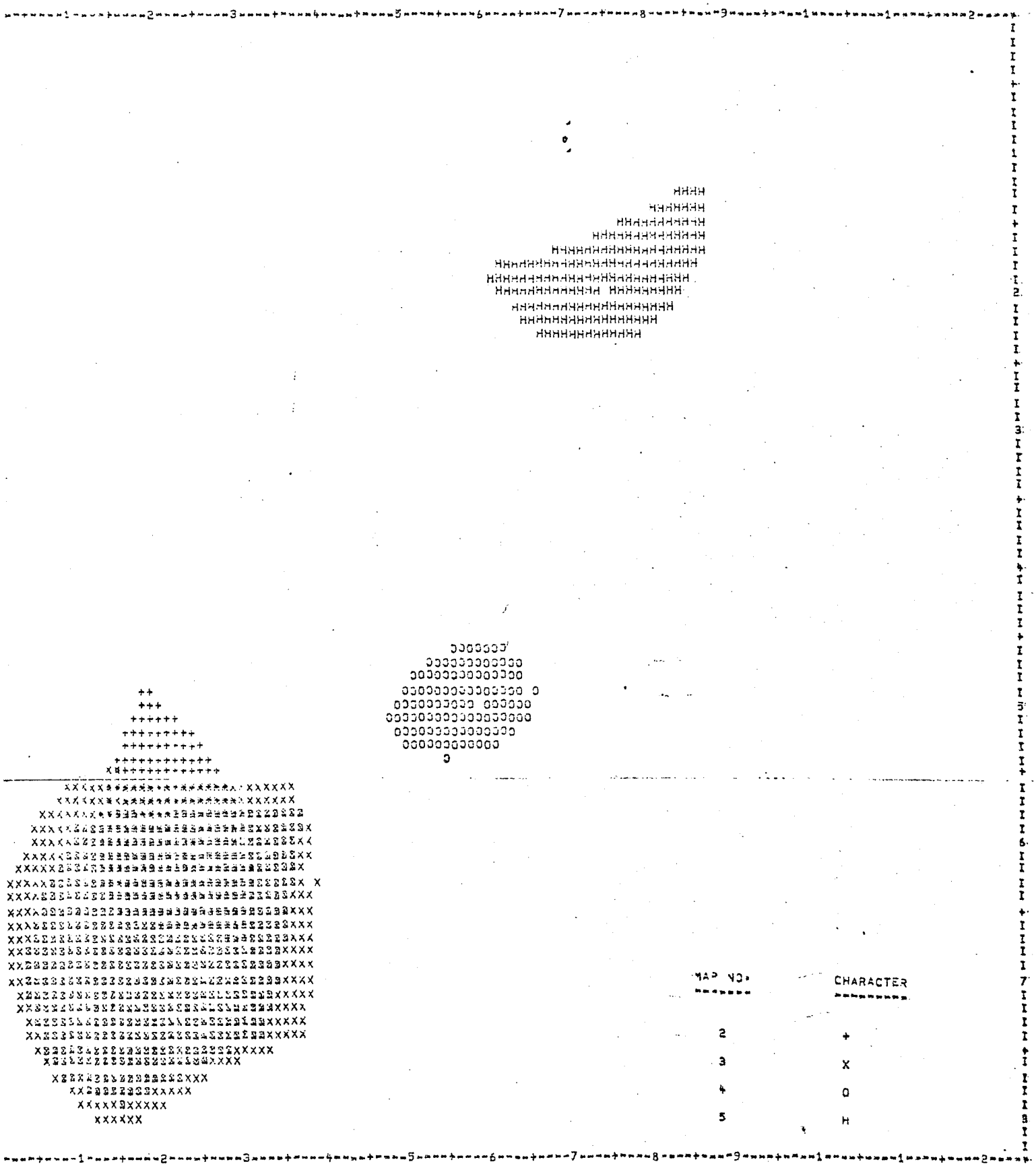
MAP SHOULD BE PRINTED AT 6.0 ROWS PER INCH AND 10.0 COLUMNS PER INCH

ROW = (DOWN COORDINATE = -272.69) * .0059
COLUMN = ACROSS COORDINATE * .0098

DATA POINTS FOR MAP

POINT	ROW	COLUMN	DATUM	VALUE	LEVEL
1)	37	48	1	34.01	3
2)	50	59	2	34.81	3
3)	20	75	3	38.63	5
4)	33	87	4	30.00	1

STANDARD SEARCH RADIUS IS 7109.9609

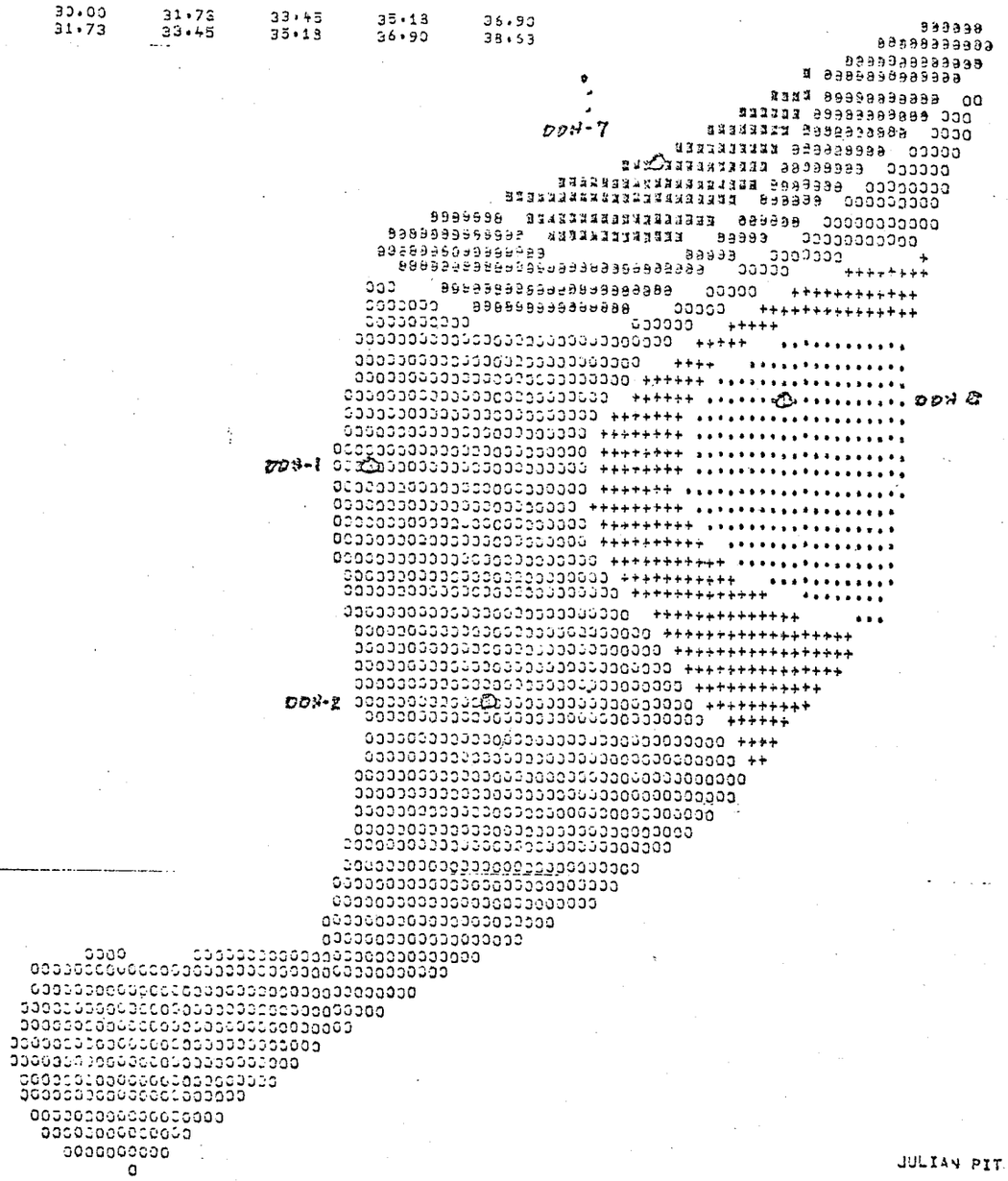


MAP NO.	CHARACTER
2	+
3	X
4	O
5	H

DATA VALUE EXTREMES ARE 30.00 38.63

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	30.00	31.73	33.45	35.18	36.90
MAXIMUM	31.73	33.45	35.18	36.90	38.63



JULIAN PIT PLAN

1400 FT. LEVEL

SYMAP

1.00000 MINUTES FOR MAP

JULIAN DEPOSIT

COMPUTER CALCULATED ORE GRADE

400 FOOT LEVEL

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5
SYMBOLS	.	+	0	8	E
FREQ.	1	0	2	0	1

ORE GRADE VALUES TAKEN FROM DRILL HOLE LOGS

VALUES REPRESENT PERCENT IRON

DATA POINT NO. 1 = DDH 1

DATA POINT NO. 2 = DDH 2

DATA POINT NO. 3 = DDH 7

DATA POINT NO. 4 = DDH 8 VALUE OF 30.00% ASSIGNED

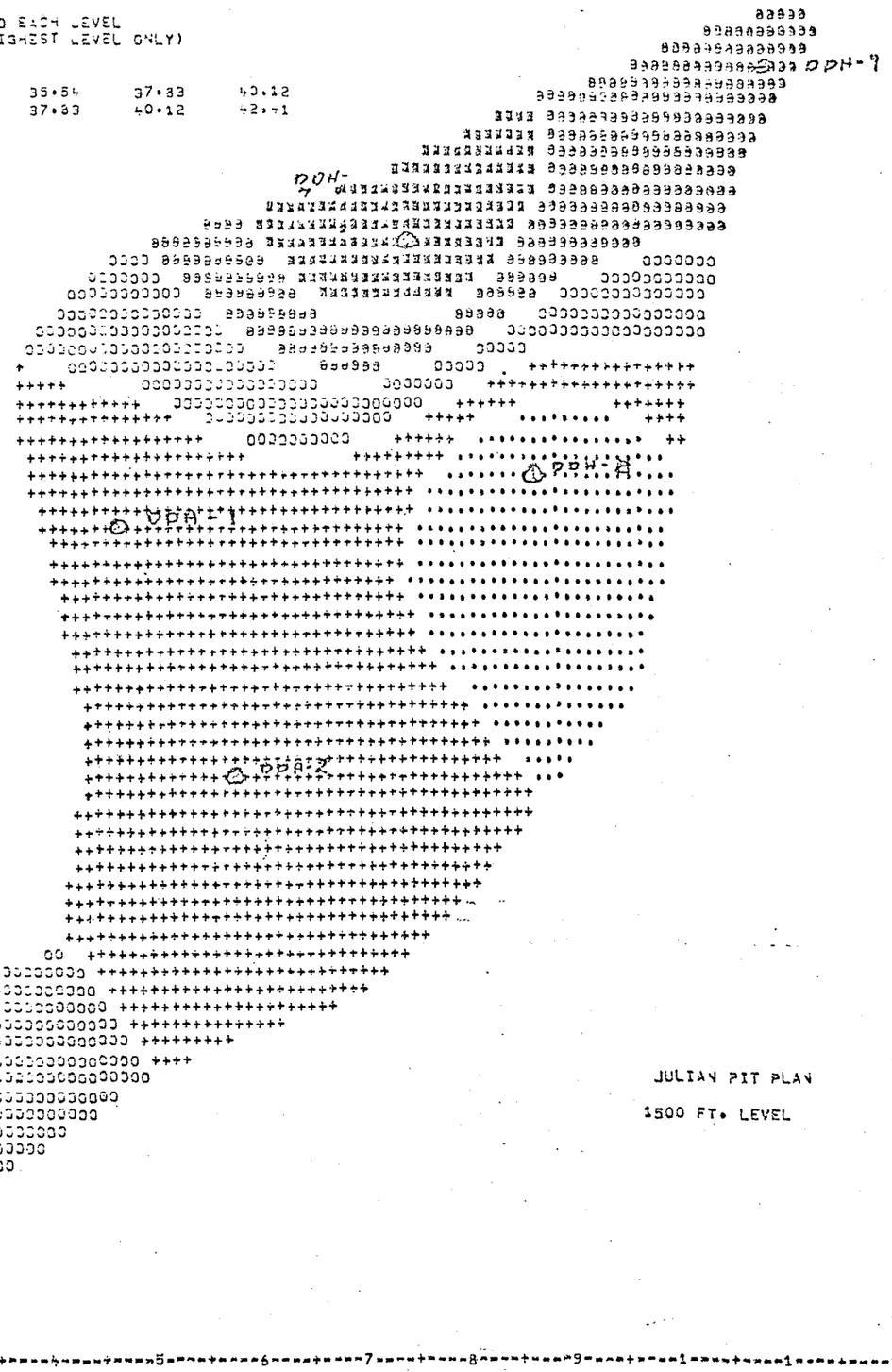
SCALE: 1 INCH = 400 FEET

DECEMBER, 1973

DATA VALUE EXTREMES ARE 30.96 42.41

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	30.96	33.25	35.54	37.83	40.12
MAXIMUM	33.25	35.54	37.83	40.12	42.41



JULIAN PIT PLAN

1500 FT. LEVEL

SYMAP

2.00000 MINUTES FOR MAP

JULIAN DEPOSIT

COMPUTER CALCULATED ORE GRADE

1500 FOOT LEVEL

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5
SYMBOLS	.	+	0	8	E
FREQ.	1	2	1	1	1

ORE GRADE VALUES TAKEN FROM DRILL HOLE LOGS

VALUES REPRESENT PERCENT IRON

DATA POINT NO. 1 = DDH 1

DATA POINT NO. 2 = DDH 2

DATA POINT NO. 3 = DDH 7

DATA POINT NO. 4 = DDH 8

DATA POINT NO. 5 = DDH 9

DATA POINT NO. 6 = DDH 6

SCALE: 1 INCH = 400 FEET

DECEMBER, 1973

SYMAP

2.00000 MINUTES FOR MAP

JULIAN DEPOSIT

COMPUTER CALCULATED ORE GRADE

1600 FOOT LEVEL

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5
SYMBOLS	.1.	+2+	0	8	E
FREQ.	3	2	1	0	2

ORE GRADE VALUES TAKEN FROM DRILL HOLE LOGS

VALUES REPRESENT PERCENT IRON

DATA POINT NO. 1 = DDH 3

DATA POINT NO. 2 = DDH 1

DATA POINT NO. 3 = DDH 2

DATA POINT NO. 4 = DDH 4

DATA POINT NO. 5 = DDH 7

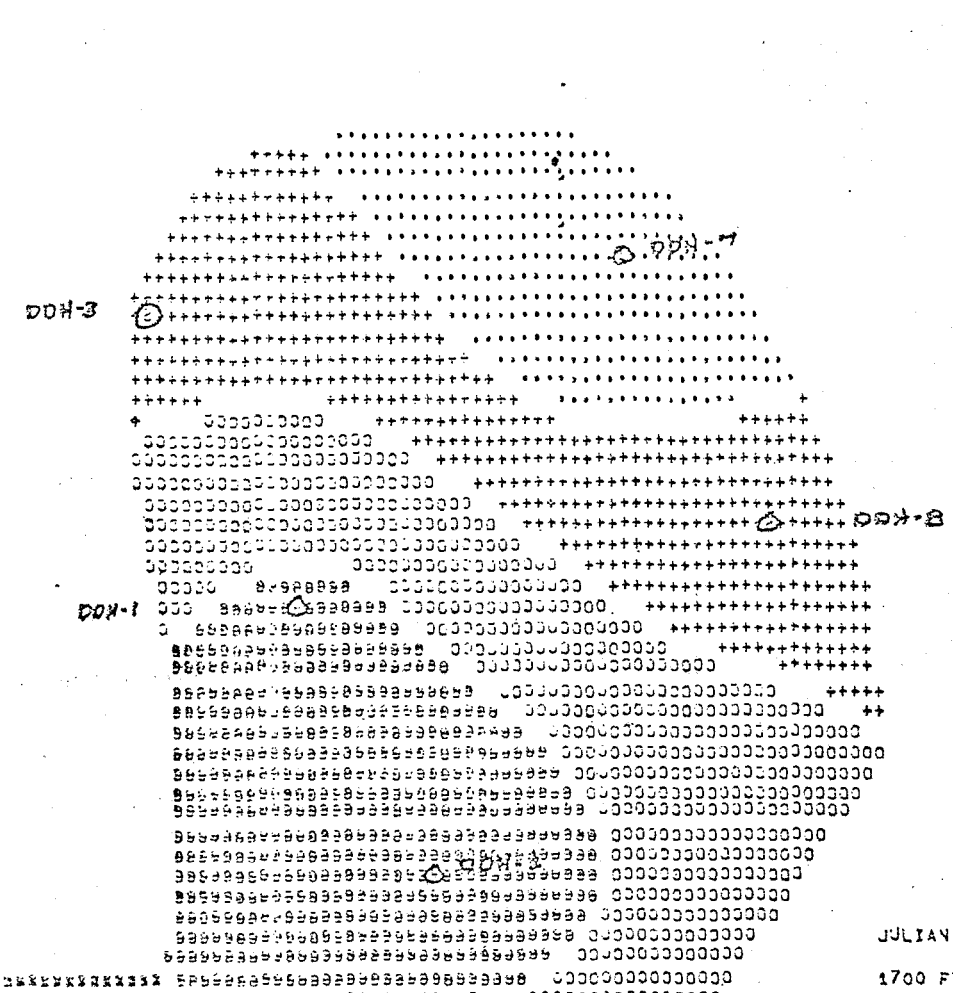
DATA POINT NO. 6 = DDH 8

DATA POINT NO. 7 = DDH 9

DATA POINT NO. 8 = DDH 6

SCALE: 1 INCH = 400 FEET

DECEMBER, 1973



JULIAN PIT PLAN

1700 FT. LEVEL

DATA VALUE EXTREMES ARE 30.79 42.48

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
("MAXIMUM" INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	30.79	33.13	35.47	37.80	40.14
MAXIMUM	33.13	35.47	37.80	40.14	42.48

YMAP

2.00000 MINUTES FOR MAP

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5
SYMBOLS	1	2	3	4	5
FREQ.	1	2	1	2	1

ULIAN DEPOSIT

OMPUTER CALCULATED ORE GRADE

00 FOOT LEVEL

ORE GRADE VALUES TAKEN FROM DRILL HOLE LOGS

VALUES REPRESENT PERCENT IRON

DATA POINT NO. 1 = DDH 3

DATA POINT NO. 2 = DDH 1

DATA POINT NO. 3 = DDH 2

DATA POINT NO. 4 = DDH 4

DATA POINT NO. 5 = DDH 7

DATA POINT NO. 6 = DDH 8

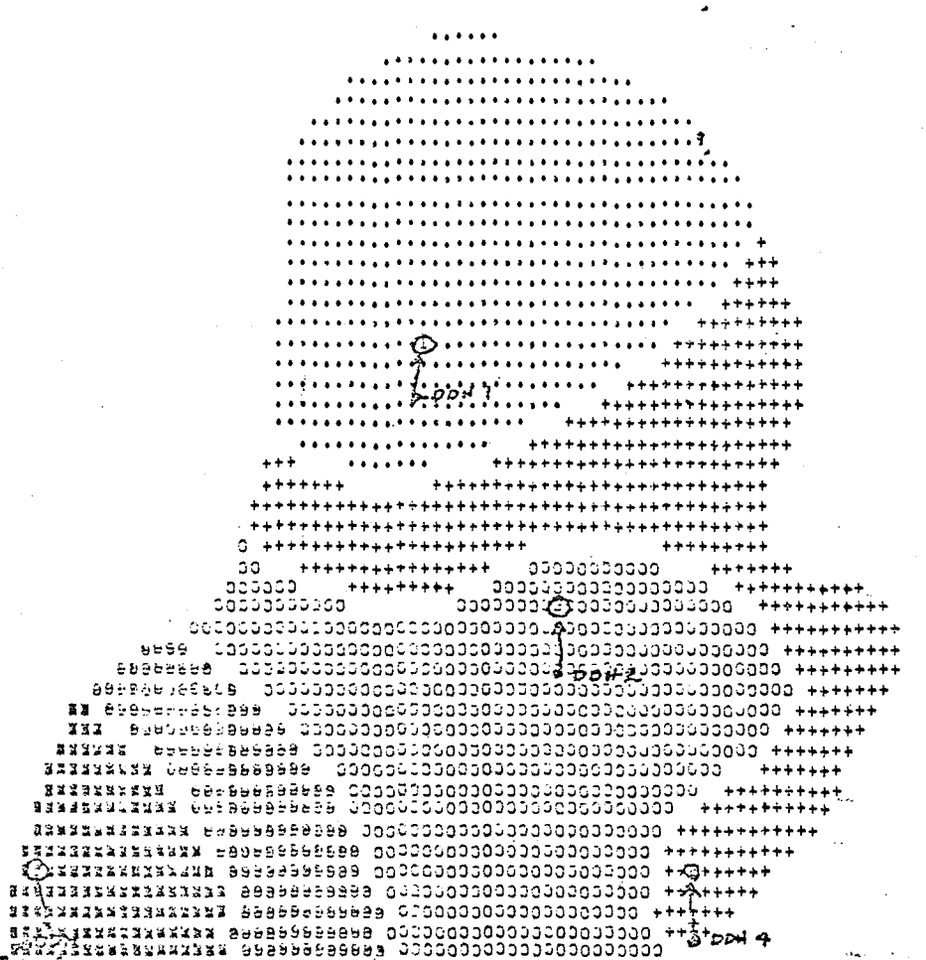
DATA POINT NO. 7 = DDH 6

SCALE: 1 INCH = 400 FEET

DECEMBER, 1973

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5
SYMBOLS	.	+	0	8	X
FREQ.	1	1	1	0	1



JULIAN PIT PLAN

1800 FT. LEVEL

DATA VALUE EXTREMES ARE 27.82 42.48

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
("MAXIMUM" INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	27.82	30.75	33.68	36.62	39.55
MAXIMUM	30.75	33.68	36.62	39.55	42.48

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

20.00	20.00	20.00	20.00	20.00

YMAP

=58.00000 MINUTES FOR MAP

IAN DEPOSIT

PUTER CALCULATED ORE GRADE

FOOT LEVEL

ORE GRADE VALUES TAKEN FROM DRILL HOLE LOGS

VALUES REPRESENT PERCENT IRON

DATA POINT NO. 1 = DDH 1

DATA POINT NO. 2 = DDH 2

DATA POINT NO. 3 = DDH 4

DATA POINT NO. 4 = DDH 6

SCALE: 1 INCH = 400 FEET

DECEMBER, 1973

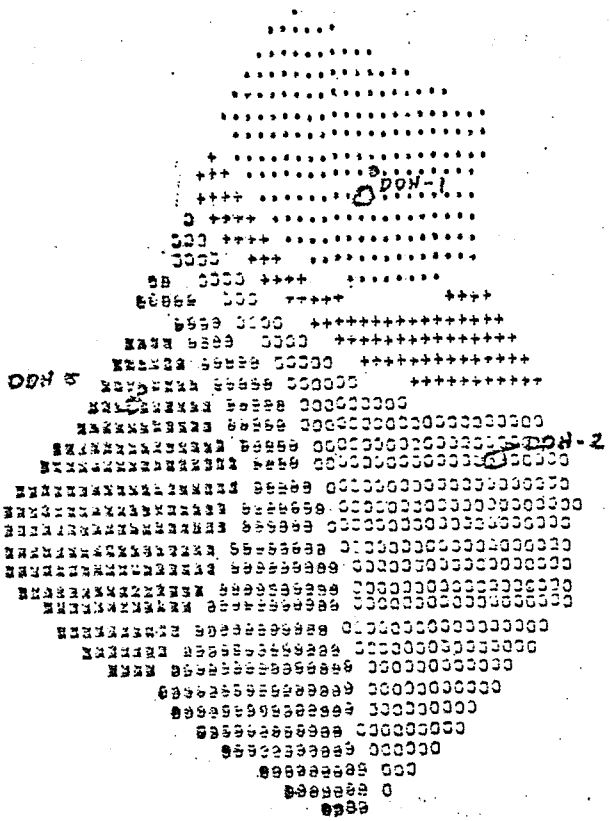
DATA VALUE EXTREMES ARE: 34.41 54.29

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
(MAXIMUM INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	34.41	38.39	42.36	46.34	5
MAXIMUM	38.39	42.36	46.34	50.31	5

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EA

20.00 20.00 20.00 20.00 ?



JULIAN PIT PLAN

1900 FT. LEVEL

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH L

LEVEL	1	2	3	4	
SYMBOLS	*	+	0	8	A
FREQ.	1	0	1	0	

SYMAP

1.00000 MINUTES FOR MAP

JULIAN DEPOSIT

COMPUTER CALCULATED ORE GRADE

1900 FOOT LEVEL

ORE GRADE VALUES TAKEN FROM DRILL HOLE LOGS

VALUES REPRESENT PERCENT IRON

DATA POINT NO. 1 = DDH 1

DATA POINT NO. 2 = DDH 2

DATA POINT NO. 3 = DDH 5

[illegible] = 200 FEET